Public Draft

TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Program Environmental Impact Report

Prepared for

West Turlock Subbasin Groundwater Sustainability Agency and East Turlock Subbasin Groundwater Sustainability Agency

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Acronyms and Other Abbreviations

AB	Assembly Bill
AF	acre-foot
CAL FIRE	California Department of Forestry and Fire Protection
CalGEM	California Geologic Energy Management Division
Caltrans	California Department of Transportation
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CGS	California Geological Survey
CMU	concrete masonry unit
CWC	California Water Code
DWR	California Department of Water Resources
EIR	environmental impact report
EOP	Emergency Operations Plan
ETS GSA	East Turlock Subbasin Groundwater Sustainability Agency
EWD	Eastside Water District
FHSZ	Fire Hazard Severity Zone
FRAP	Fire and Resource Assessment Program
GSA	groundwater sustainability agency
GSP	groundwater sustainability plan
ISA	implementation support activity
MID	Merced Irrigation District
MJHMP	Multi-Jurisdictional Hazard Mitigation Plan
MRDS	Mineral Resources Data System
MRZ	Mineral Resource Zone
NOP	Notice of Preparation
O&M	operations and maintenance
PEIR	program environmental impact report
PMAs	projects and management actions
PPIC	Public Policy Institute of California
PRC	Public Resources Code
RMP	resource management plan
SMARA	Surface Mining and Reclamation Act
SGMA	Sustainable Groundwater Management Act
SR	State Route

State Water Board	State Water Resources Control Board
TAC	Technical Advisory Committee
TID	Turlock Irrigation District
Turlock Subbasin GSAs	West Turlock Subbasin Groundwater Sustainability Agency and East Turlock Subbasin Groundwater Sustainability Agency, referred to collectively
USGS	U.S. Geological Survey
VHFHSZ	Very High Fire Hazard Severity Zone
VRM	Visual Resource Management
WTS GSA	West Turlock Subbasin Groundwater Sustainability Agency

Glossary

Construction: All construction-related activities, including site clearing; excavation; drilling; placement of structures or other materials; building or assembling of infrastructure; relocation or demolition of existing facilities; landscaping; or any mobilization activity that would move construction-related equipment and/or materials onto a site that may result either directly or indirectly in physical changes to the environment.

Direct groundwater recharge: The process of storing water by either allowing the water to percolate through the soil into the groundwater or directly injecting it into the groundwater aquifer via injection wells. Direct recharge could be accomplished by applying water onto agricultural lands at times when crops are dormant, or in amounts exceeding crop demand. Direct recharge could also occur through recharge basins, ponds, dry wells, or other facilities.

Dry well: A well that is used to transmit surface water underground into the unsaturated zone (e.g., surface runoff or stormwater).

Impact mechanisms: Possible physical direct or indirect modes of impact on environmental resources.

In-lieu groundwater recharge: Utilization of surface water "in lieu" of pumping groundwater, thereby enabling the continued storage of an equal amount in the groundwater basin. The quantity of in-lieu recharge is the amount of renewable surface water used to irrigate the farmland in place of using regular groundwater.

Interim milestone: A target numeric value at a representative monitoring site that represents measurable groundwater conditions needed to achieve measurable objectives over time, in increments of five years, as set by the groundwater sustainability agencies in the groundwater sustainability plan.

Management actions: Nonstructural programs or policies designed to incentivize or regulate actions and strategies (both required and voluntary) that will result in sustainable groundwater management and prevent undesirable results. These programs and policies are to be implemented in conjunction with projects to achieve the basin’s sustainability goal. Management actions may incentivize water conservation, promote reductions in water use by changing the existing water demand (i.e., different crop, reduced crop acreage, repurposing of land, fallowing, or pumping reduction), or encourage the development of recharge on existing parcels to recharge the aquifer.

Measurable objective: A numeric goal set to track the performance of sustainable management at representative monitoring sites.

Minimum threshold: A numeric value used to define undesirable results for each sustainability indicator at representative monitoring sites.

Operations and maintenance: The functions, duties, or labor associated with day-to-day operating projects and with keeping them operational.

Projects: Physically constructed (or structural) features that result in sustainable groundwater management and prevent undesirable results. Projects generally promote groundwater recharge either directly or indirectly through in-lieu recharge.

PMAs: Acronym used when collectively referring to all projects and management actions, as opposed to an individual project or management action.

Recharge basin: A naturally or artificially constructed basin that collects water for the recharge of an aquifer.

Regulating reservoir: A reservoir that stores water received from fluctuations in the existing canal system and pumps water back to supplement existing flows. A regulating reservoir supports water conservation by stabilizing flow rates in the system downstream of the reservoir and capturing water that is normally spilled, allowing that water to remain stored in upstream reservoirs for later use.

Sustainability indicators: The effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, become undesirable results [as defined in California Water Code Section 10721(x)]. The six sustainability indicators are lowering groundwater levels, surface water depletion, degraded water quality, land subsidence, seawater intrusion, and reduction of storage.

Sustainable groundwater management: The management and use of groundwater that can be maintained without causing an undesirable result.

Sustainable yield: The maximum quantity of water calculated over long-term conditions in the basin, including any temporary excess, that can be withdrawn annually without an undesirable result.

Undesirable result: Significant and unreasonable adverse conditions for any of the six sustainability indicators defined in the groundwater sustainability plan regulations. Undesirable results [as defined in California Water Code Section 10721(x)] that are applicable to the Turlock Subbasin are one or more of the following five effects: (1) chronic lowering of groundwater levels, indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods; (2) significant and unreasonable reduction of groundwater storage; (3) significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies; (4) significant and unreasonable land subsidence that substantially interferes with surface land uses; (5) depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water. The sixth sustainability indicator, significant and unreasonable seawater intrusion, was determined to be not applicable to the Turlock Subbasin.

Vadose zone: The earth's terrestrial subsurface that extends from the top of the ground surface to the groundwater table. Also referred to as the *unsaturated zone*.

EXECUTIVE SUMMARY

ES.1 Introduction

In 2014, Governor Edmund G. Brown Jr. signed into law the Sustainable Groundwater Management Act (SGMA) to establish a statewide goal for achieving long-term groundwater sustainability by 2042. One of SGMA's purposes is to quantify the amount of water stored in groundwater basins to ensure that annual withdrawals are sustainable. SGMA also directed the California Department of Water Resources (DWR) to develop regulations to revise groundwater basin boundaries, adopt regulations for evaluating and implementing groundwater sustainability plans (GSPs), identify basins subject to critical conditions and overdraft, identify water available for groundwater replenishment, and document best practices for sustainable groundwater management.

A legislative intent of SGMA is to recognize and preserve the authority of cities, counties, and other local agencies with land use or water regulatory authorities to manage groundwater according to their existing powers. Local agencies are expected to collaborate by forming GSAs and coordinate on a basin-wide scale to sustainably manage groundwater at a local level. Under SGMA, GSAs are tasked with developing and implementing GSPs for groundwater basins designated by DWR as high or medium priority. GSPs are planning documents that provide a road map showing how groundwater basins will reach long-term sustainability. GSAs must adopt GSPs for high- and medium-priority (but not critically overdrafted) basins by 2022 and have until 2042 to achieve groundwater basin sustainability.

The West Turlock Subbasin Groundwater Sustainability Agency (WTS GSA) and the East Turlock Subbasin Groundwater Sustainability Agency (ETS GSA) jointly prepared the Turlock Subbasin GSP. These two GSAs are referred to collectively herein as the "Turlock Subbasin GSAs" in references to the development and implementation of the Turlock Subbasin GSP. The Turlock Subbasin GSAs coordinate on GSP issues pursuant to a memorandum of agreement; however, each GSA is responsible for implementing the Turlock Subbasin GSP within its jurisdiction. Pursuant to agreement between the WTS GSA and the ETS GSA, the WTS GSA is the California Environmental Quality Act (CEQA) lead agency and has determined that a program environmental impact report (PEIR) is the appropriate CEQA document for analyzing resources potentially affected by implementation of the PMAs in the Turlock Subbasin GSP.

ES.2 Description of the Types of PMAs to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan

ES.2.1 Overview

The Turlock Subbasin GSP addresses groundwater sustainability in the Turlock Subbasin (Groundwater Basin Number 5-22.03), located in the northern San Joaquin Valley Groundwater Basin in California's Central Valley. The Turlock Subbasin was designated as a high-priority, but not critically overdrafted, groundwater basin by DWR which calls for the preparation of a GSP under SGMA to ensure that groundwater sustainability goals are met. From 2018 to 2021, the Turlock Subbasin GSP was prepared jointly by the WTS GSA and ETS GSA formed in compliance with California Water Code Section 10723.8, referred to collectively herein as the "Turlock Subbasin GSAs."

The Turlock Subbasin GSP identifies multiple PMAs that propose structural and nonstructural actions to enhance regional water supply, and allows for the development of additional PMAs as needed to meet the sustainability goals of the GSP. *Projects* can be generally categorized as either urban and municipal or agricultural; they incorporate the use of new infrastructure (e.g., regulating reservoirs, pipelines, injection wells) or existing infrastructure (e.g., canals, pipelines, recharge basins) to enhance water supply and achieve the GSP's sustainability goals. *Management actions* are intended to be implemented in addition to projects, as nonstructural actions supporting the achievement of sustainability goals (e.g., voluntary conservation programs).

ES.2.2 Plan Objectives

The objectives of the Turlock Subbasin GSP are to achieve the sustainability goal for the Turlock Subbasin by 2042 and avoid undesirable results over the remainder of a 50-year planning horizon. Broadly, the sustainability goal for the Turlock Subbasin is to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. The objectives of the Turlock Subbasin GSP are met through implementation of the PMAs described in more detail in Section 2.2, *Projects and Management Actions to be Implemented Under the Turlock Subbasin Groundwater Sustainability Plan.*

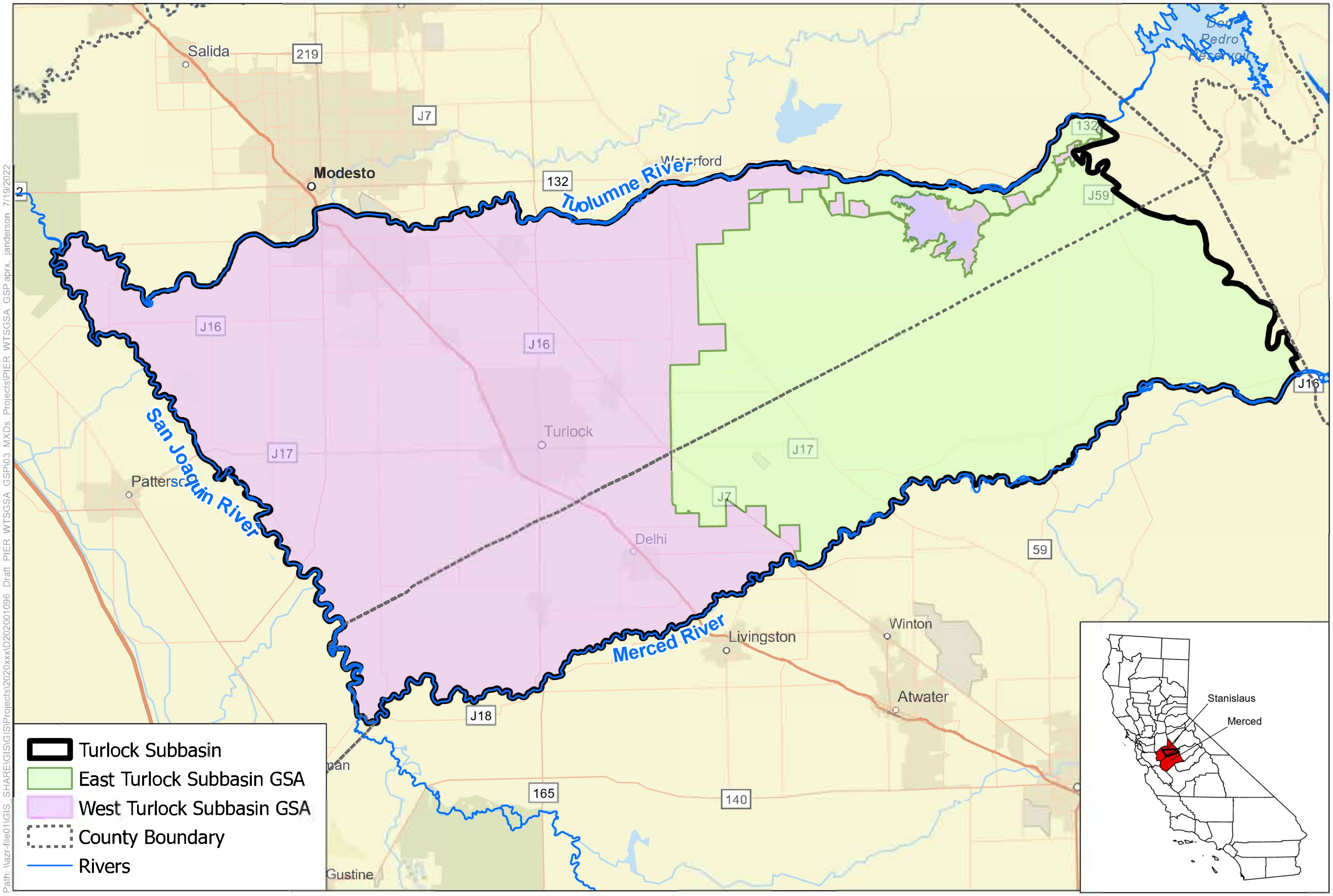
ES.2.3 Geographic Scope

The Turlock Subbasin GSP applies to the Turlock Subbasin, a 544-square-mile (348,160-acre) area in the northern San Joaquin Valley approximately 80 miles south of Sacramento in Stanislaus and Merced counties (**Figure ES-1**). The Turlock Subbasin is bounded on the north by the Tuolumne River, on the south by the Merced River, and on the west by the San Joaquin River (**Figure ES-2**). The eastern subbasin boundary is defined by crystalline basement rocks of the Sierra Nevada foothills (DWR 2006). The Turlock Subbasin is the study area evaluated in this draft PEIR. The Turlock Subbasin is part of the larger San Joaquin Valley Groundwater Basin, as defined by DWR (Groundwater Basin Number 5-22.03). The San Joaquin Valley Groundwater

SOURCE: ESA, 2021.

Figure ES-1
Regional Location

ESA



SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure ES-2
Turlock Subbasin

ESA

Basin is defined on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi mountains, on the east by the Sierra Nevada, and on the north by the Sacramento–San Joaquin Delta and Sacramento Valley.

ES.2.4 Sustainability Goals and Indicators

The sustainability goal for the Turlock Subbasin is to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. The sustainability goal is achieved through the implementation of PMAs, described in more detail in Section 2.2. This goal is supported by and includes the following actions:

- Manage the Turlock Subbasin within its sustainable yield and arrest ongoing long-term groundwater level declines.
- Support interconnected surface water to avoid adverse impacts on surface water uses.
- Manage groundwater extractions and water levels to avoid impacts from future potential land subsidence.
- Optimize conjunctive use of surface water, recycled water, and groundwater.
- Support efficient water use and water conservation.
- Coordinate with GSAs in neighboring subbasins to avoid undesirable results along the shared Turlock Subbasin boundaries.
- Adaptively manage the Turlock Subbasin over time to improve operational flexibility and to ensure the sustainability of the groundwater resources.

ES.2.5 Projects and Management Actions to Be Implemented under the Turlock Subbasin GSP

The Turlock Subbasin GSP presents multiple PMAs that were identified and considered by the Turlock Subbasin GSAs to achieve the sustainability goals for the Turlock Subbasin by 2042, and to avoid undesirable results related to the five applicable sustainability indicators over the remainder of the 50-year planning horizon, as required by SGMA regulations. The Turlock Subbasin GSP identifies additional activities, referred to as the Implementation Support Activities (ISAs), to support implementation of the PMAs.

The term *projects*, as used in this draft PEIR, generally refers to physically constructed (structural) features. These features may be designed to recharge the groundwater system using surface waters diverted from the Tuolumne and Merced rivers, floodwaters, agricultural return flows, stormwater, and recycled water; may promote conjunctive use; or may reduce demand for groundwater. **Table ES-1** summarizes the 23 projects presented in the Turlock Subbasin GSP, including the project name, project number, proponents, primary recharge mechanism, partner agencies, and a brief project description, including notable benefits to groundwater recharge.

TABLE ES-1
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 1[2]						
West Turlock Subbasin—Urban and Municipal Projects						
1	Cities of Turlock and Ceres	Regional Surface Water Supply Project	In-lieu groundwater recharge	Turlock Irrigation District	Surface water	• Provide treated drinking water from the Tuolumne River to supplement both the City of Ceres's and the City of Turlock's existing groundwater supplies. • Divert surface water from the Tuolumne River through an existing river intake, construct a new raw-water pump station and pipeline, and treat to drinking water standards at a new water treatment plant. • Potentially also use water for emergency purposes or to deliver irrigation water to agricultural users. • Provide up to approximately 30 thousand acre-feet per year of surface water for in-lieu recharge within the cities of Turlock and Ceres during full allocation years.
GROUP 2[2]						
West Turlock Subbasin—Urban and Municipal Projects						
2	Community of Hickman	Waterford/Hickman Surface Water Pump Station and Storage Tank	In-lieu groundwater recharge	City of Modesto, Modesto Irrigation District	Surface water	• Connect the city of Waterford and community of Hickman to Modesto Irrigation District's surface water supply. • Construct a 1-million-gallon water storage tank to store water piped from the existing distribution network and a pump station/transmission line to distribute the water to the City of Waterford. • Offset urban groundwater pumping demands, provide groundwater recharge benefits, and diversify water supply portfolio. • Provide up to approximately 900 AF per year during full allocation years.
3	City of Turlock	Dianne Storm Basin	Direct groundwater recharge	Turlock Irrigation District	Stormwater runoff	• Upgrade the existing Dianne storm drain basin to enhance storage for stormwater. • Install aquifer storage and recovery injection wells to enhance the volume of water that can recharge the aquifer. • Provide direct groundwater recharge by enhancing infiltration and impoundment of stormwater in dry wells. • Relieve stress on the storm drain system, mitigate flooding potential, and reduce storm loads to the wastewater treatment plant. • Provide approximately 22.5 AF per year of recharged water to the Turlock Subbasin.

TABLE ES-1 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 2[2] (cont.)						
West Turlock Subbasin—Urban and Municipal Projects (cont.)						
4	California State University, Stanislaus	Stanislaus State Stormwater Recharge	Direct groundwater recharge	N/A	Stormwater runoff	• Construct French drains and other recharge basins/infrastructure to recharge stormwater runoff. • Enhance groundwater recharge by capturing stormwater runoff in excess of the on-campus ponds. • Provide approximately 460 AF per year of recharged stormwater between November and April each year.
5[3]	City of Modesto	Advanced Metering Infrastructure Project	Water conservation	N/A	N/A	• Install Advanced Metering Infrastructure smart meters to support water reduction goals, and to assist the City of Modesto in managing water usage to identify leaks and watering on non-watering days. • Reduce urban water demand in the city of Modesto to meet future water use mandates and conservation goals.
West Turlock Subbasin—Agricultural Water Supply Projects						
6	Turlock Irrigation District	TID On-Farm Recharge Project (in WTS GSA)	Direct or in-lieu groundwater recharge	N/A	Surface water	• Collaborate with growers in the irrigation service area to identify parcels with suitable recharge conditions for non-irrigation-season on-farm recharge during wet years. • Utilize areas were recharge potential is greatest (25% of non-permanent crop lands along canals and laterals downstream of Turlock Lake) • Expand recharge to other areas during the irrigation season as well as during the non-irrigation season and encourage growers to use surface water when available • Provide approximately 4,000 acre-feet of recharge per year.
7	Turlock Irrigation District	Recycled Water from City of Turlock	In-lieu groundwater recharge	City of Turlock	Recycled water	• Divert recycled water from the city of Turlock to the TID conveyance system to irrigate fields. • Blend recycled water with existing supplies to offset existing groundwater pumping demand. • Provide approximately 2,000 AF per year in-lieu recharge.

TABLE ES-1 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 2[2] (cont.)						
West Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
8	Turlock Irrigation District	TID Ceres Main Regulating Reservoir	In-lieu groundwater recharge	N/A	Surface water	• Construct a new regulating reservoir in the TID distribution system to absorb operational fluctuations in the Ceres Main Canal caused by upstream flow adjustments. • Modify and automate existing in-canal level control structures (drop structures) with new flume gates and telemetry. • Increase flexibility in delivering surface water to customers and maintain high levels of irrigation service, thereby reducing groundwater pumping. • Reduce spillage losses by an average of approximately 10,000 AF per year and reduce groundwater pumping by approximately 575 AF per year (demand met instead by surface water). • Potentially use regulating reservoirs to hold stormwater for later use for irrigation or recharge.
East Turlock Subbasin—Agricultural Water Supply Projects						
9	Eastside Water District	Agricultural Recharge Project (in ETS GSA)	Direct or in-lieu groundwater recharge	Turlock Irrigation District	Surface water	• Deliver "replenishment water" to parcels outside of TID within the EWD and the ETS GSA. • Maximize the utility of available water supplies to offset demand for groundwater pumping, providing in-lieu recharge benefits. • Provide direct recharge benefits during field flooding on replenishment parcels during the non-irrigation season. • Provide approximately 3,400 AF per year of benefit, with approximately 1,600 AF per year of benefit from replenishment during the non-irrigation season. • Potentially expand this project as additional water supplies become available.
10	Eastside Water District	Mustang Creek Flood Control Recharge Project	Direct groundwater recharge	Stanislaus County	Floodwaters and return flows	• Convey floodwater from the primary detention basin to seven new dry wells within the flood footprint of the basin. • Supply direct groundwater recharge to the subbasin by enhancing infiltration and impoundment of stormwater in dry wells. • Provide approximately 600 AF per year of groundwater recharge.

TABLE ES-1 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 2[2] (cont.)						
East Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
11	Eastside Water District	Upland Pipeline Project	Direct or in-lieu groundwater recharge	Merced Irrigation District	Surface water	• Install a new piped conveyance system, including a new upload pipeline intake, that would supply water to EWD from Merced Irrigation District. • Convey surface water to result in ambient recharge in the streambed. • Provide approximately 1,770 AF per year of Merced River water for direct recharge during the non-irrigation season in wet and above-normal years.
GROUP 3						
West Turlock Subbasin—Urban and Municipal Water Supply Projects						
12	City of Modesto	San Joaquin River Flood Diversions	Direct or in-lieu groundwater recharge	N/A	Floodwater	• Divert floodwater from the San Joaquin River into underused storage ponds (approximately 7,830 AF) for use in the Turlock Subbasin. • Analyze flood flows from the river, and determine the occurrence and volume of flows available for diversion into the ponds to ensure the reliability of available water.
West Turlock Subbasin—Agricultural Water Supply Projects						
13	Turlock Irrigation District	La Grange Recharge Project (within TID irrigation service area)	Direct groundwater recharge	N/A	Surface water and floodwaters	• Develop recharge opportunities in areas identified as having high recharge potential. • Purposefully recharge the aquifer through on-farm flood irrigation in excess of crop water requirements.
14	Turlock Irrigation District	TID Lateral 5½ Regulating Reservoir	In-lieu groundwater recharge	N/A	Surface water	• Construct a new regulating reservoir with an operating capacity of 140 AF to enhance delivery service to customers along lower reaches. • Reduce pumping that has historically compensated for limited surface water deliveries. • Potentially use regulating reservoirs to hold stormwater for later use for irrigation or recharge.
15	Turlock Irrigation District	Additional TID Regulating Reservoirs	Direct or in-lieu groundwater recharge	N/A	Surface water	• Construct additional regulating reservoirs in the TID conveyance system to better manage mismatches in supply and demand, improve customer response time, and decrease existing groundwater pumping. • Potentially use regulating reservoirs to hold stormwater for later use for irrigation or recharge.

TABLE ES-1 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 3 (cont.)						
West Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
16	Turlock Irrigation District	Recharge from TID Conveyance System	Direct groundwater recharge	N/A	Surface water	• Develop new recharge opportunities downstream of Turlock Lake where recharge potential is high. • Divert water into existing open channels to induce seepage from the canal, and for deliveries to recharge facilities off of the canal. This could occur during the irrigation season and/or non-irrigation season.
17	Turlock Irrigation District	Intertie Projects	In-lieu groundwater recharge	N/A	Surface water	• Connect various canal segments in the TID conveyance system to enhance surface water deliveries. • Reduce the need for groundwater pumping along capacity-constrained canals, resulting in in-lieu recharge benefits and improved water quality.
East Turlock Subbasin—Agricultural Water Supply Projects						
18	Eastside Water District	Rouse Lake Pipeline Recharge Project	Direct or in-lieu groundwater recharge	N/A	Surface water or floodwater	• Install a new piped conveyance system to convey floodwater and/or surface water for direct and in-lieu recharge.
19	Eastside Water District	Sand Creek Basin Runoff Recharge Project	Direct groundwater recharge	N/A	Stormwater runoff	• Capture runoff from the Sand Creek watershed for direct recharge.
20	Eastside Water District	Merced Irrigation District Expansion Project	Direct or in-lieu groundwater recharge	Merced Irrigation District	Floodwaters	• Expand Merced Irrigation District conveyance and delivery infrastructure to service areas within the ETS GSA through delivery of excess flows (during flood flow events).
21	Eastside Water District	Development of Use of Diffused Water through Existing and New Connections for Direct Recharge, Flood-MAR, and In-Lieu Recharge	Direct or in-lieu groundwater recharge	TBD	Stormwater runoff	• Support the development of direct recharge, in-lieu recharge, and Flood-MAR (flood managed aquifer recharge) where storm flows are available, or where existing surface water facilities can be used to direct and control surface water. • Install necessary infrastructure to connect existing delivery systems.
22	Eastside Water District	Dry Creek Watershed Recharge	Direct groundwater recharge	N/A	Stormwater runoff	• Develop recharge opportunities along Dry Creek in areas where there is favorable recharge potential. • Use runoff from the Dry Creek watershed for recharge.

TABLE ES-1 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 3 (cont.)						
East Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
23	Eastside Water District	Direct Recharge in Agricultural Areas	Direct Groundwater Recharge	N/A	TBD	• Develop recharge facilities on agricultural land with good recharge potential and adequate underground storage. • Use existing water conveyance facilities (canals and outlet gates) and construct new conveyance and recharge infrastructure.

NOTES:

AF = acre-feet; ETS GSA = East Turlock Subbasin Groundwater Sustainability Agency; EWD = Eastside Water District; N/A = not applicable; TBD = to be determined; TID = Turlock Irrigation District; WTS GSA = West Turlock Subbasin Groundwater Sustainability Agency

1 The primary mechanism of the project as conceptualized. Projects may be used for multiple functions to support groundwater sustainability and multiple other benefits during implementation.
2 All Group 1 and Group 2 projects were included in modeling scenarios.
3 Project 5 is listed as a project in the Turlock Subbasin Groundwater Sustainability Plan, but is instead grouped with management actions in the following sections.

SOURCE: Todd Groundwater 2022

The Turlock Subbasin GSP categorizes projects according to their primary recharge mechanism as conceptualized—direct groundwater recharge, in-lieu groundwater recharge, or a combination of both:

- **Direct groundwater recharge** means storing water by allowing the water to percolate through the soil into the groundwater, or by injecting the water into the groundwater aquifer via injection wells or into the vadose zone through dry wells. Direct recharge could also be accomplished by applying water onto agricultural lands at times when crops are dormant, or in amounts exceeding crop demands. In addition, direct recharge could occur through recharge basins, ponds, constructed wetlands, floodplain inundation projects, or other facilities.
- **In-lieu recharge** means storing groundwater by using surface water in lieu of pumping groundwater, thereby storing an equal amount in the groundwater basin. The amount of in-lieu recharge is equal to the quantity of renewable surface water used to irrigate the farmland in place of using regular groundwater.

The term *management actions*, as used in this draft PEIR, generally refers to nonstructural programs or policies that are designed to incentivize voluntary actions and strategies, or specify required actions, to be implemented in addition to projects to achieve the sustainability goals of the Turlock Subbasin GSP. As part of implementation of the management actions, structural features may be improved or constructed, as described in more detail below. The Turlock Subbasin GSAs or their member agencies could implement the management actions as needed to mitigate overdraft within their jurisdictional areas. **Table ES-2** presents the management actions considered in each category, including a description of the primary operating mechanisms to enhance groundwater sustainability. The Turlock Subbasin GSP assigns each management action to one of three categories: demand reduction strategies, pumping management framework, or domestic well mitigation.

TABLE ES-2
MANAGEMENT ACTIONS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Category	#	Management Action	Description
Demand Reduction Strategies	1	Voluntary conservation and/or land fallowing	Site-specific conservation or in-lieu recharge through land use change and land fallowing
	2	Conservation practices	Programmatic conservation programs or incentives
Pumping Management Framework	3	Groundwater extraction reporting program	In-lieu recharge through pumping reduction
	4	Groundwater allocation and pumping management program	
	5	Groundwater extraction fee	
	6	Groundwater pumping credit market and trading program	
Domestic Well Mitigation	7	Domestic well mitigation program	Identification and mitigation of adverse impacts to domestic wells caused by unsustainable groundwater management

SOURCE: Todd Groundwater 2022

ES.2.6 Construction Overview

The term *construction*, as used in this draft PEIR, is defined as all construction-related activities, including site clearing; placement of structures or other materials; building or assembling of infrastructure; relocation or demolition of existing facilities; landscaping; or any mobilization activity that would move construction-related equipment and/or materials onto a site that may result either directly or indirectly in physical changes to the environment. Varying levels of construction would be required for implementation of the PMAs. The Turlock Subbasin GSP does not describe specific construction activities for PMAs; the level of detail provided for each project or management action varies, including the precise locations of its features and detailed descriptions of feature designs and/or modifications.

Although the magnitude and characteristics of construction activities for PMAs vary widely, construction activities to develop groundwater recharge opportunities share many commonalities, including timing, materials, and equipment. Construction activities to modify and/or construct new features were assumed using information provided in the Turlock Subbasin GSP, including the PMAs' descriptions, implementation strategies, water sources, and reliability. Once proposals for individual PMAs consistent with the Turlock Subbasin GSP are developed, the respective lead agencies/proponents for those PMAs would evaluate whether this PEIR describes the PMAs' impacts adequately, or whether the impacts would require evaluation in project-level CEQA documents (e.g., initial study, EIR) (see Figure ES-1). **Table ES-3** presents a summary of construction activities that may be necessary to implement the PMAs in the Turlock Subbasin GSP, including typical direct and indirect impact mechanisms and the features that would result from construction activities.

ES.2.7 Operations and Maintenance Overview

O&M activities are the functions, duties, or labor associated with day-to-day operations. Implementation of the PMAs identified in the Turlock Subbasin GSP would include O&M activities to inspect project facilities and/or evaluate program effectiveness. As with construction activities, the Turlock Subbasin GSP does not detail the specific O&M activities required to implement each project or management action. Rather, the implementation criteria, status, and strategy are discussed, providing the context for day-to-day operations. Thus, activities specific to the PMAs were assumed using the information presented in the Turlock Subbasin GSP, as well as incorporating general information common to the development of groundwater recharge opportunities.

Table ES-3 provides examples of O&M activities that would result from implementation of the PMAs, which are also summarized below. Upon the development of proposals for PMAs consistent with the Turlock Subbasin GSP, the lead agencies/proponents would evaluate whether this PEIR describes the impacts adequately, or if necessary, the impacts would be evaluated in project-level CEQA documents (e.g., initial study, EIR) (see Figure ES-1).

ES.2.8 Operational Considerations

Implementing the PMAs in the Turlock GSP may result in basin-scale changes to water system operations. That is, implementing one or multiple PMAs could ultimately alter the management of surface water and groundwater in the region. The Turlock Subbasin GSP does not discuss basin-scale operational changes or describe the spatial or temporal implications of implementing any individual project or management action or combination of PMAs. Therefore, the following list of key operational considerations was formulated using the information provided in the Turlock Subbasin GSP and may not reflect all possible operational considerations.

- Water right modifications, or changes in beneficial use, may be required as a result of new surface water diversions from the Tuolumne and Merced rivers.
- For projects that propose the use of floodwater, a characterization of wet and above-normal hydrologic years would be needed to determine when floodwater is available for use.
- New regulating reservoirs or other facilities may be needed to deliver surface water for in-lieu groundwater recharge projects.
- Adaptive strategies that provide water management alternatives during extreme dry years should be considered for the projected water budgets and climate change analysis presented in Chapter 5 of the Turlock Subbasin GSP.
- Expanding the existing water conveyance systems, including through the addition of regulating reservoirs and storage facilities, would enable the distribution and delivery of surface water to a greater area.
- Expanding the irrigation season to irrigate during the off-season would result in year-round water deliveries.
- Increases in canal seepage loss may result when areas receive on-farm recharge deliveries during the off-season.
- Implementing on-farm flood irrigation in excess of crop water requirements would artificially recharge the groundwater system.
- Land fallowing may result in temporary or permanent repurposing of the land from agricultural to nonagricultural uses.

TABLE ES-3
SUMMARY OF CONSTRUCTION ACTIVITIES AND OPERATIONS AND MAINTENANCE ACTIVITIES FOR PROJECTS AND MANAGEMENT ACTIONS, BY PRIMARY RECHARGE MECHANISM

Primary Recharge Mechanism[1]	Number[2]	Description	Typical Impact Mechanisms[3]	General Construction Activities	Example Features Resulting from Construction[4]	Example Operations and Maintenance Activities
PROJECTS						
Direct groundwater recharge	Project Nos. 3, 4, 10, 13, 16, 19, 22, and 23	Projects that recharge the groundwater system directly through: • Expansion of existing or creation of new recharge infrastructure (e.g., recharge basins, storm drain basins, French drains). • Installation of aquifer storage and recovery or injection wells. • Conveyance of surface water through irrigation canals to induce additional seepage. • Conveyance of surface water, floodwaters, or runoff to farmland during the off-season to recharge the aquifer.	*Construction/Direct Impacts* • Movement and placement of large amounts of soil/materials during construction • Physical disturbance of vegetation and/or habitat during construction • Release and exposure of sediments and turbidity in water • Traffic noise, motion, and vibration associated with construction • Alteration of the visual landscape • Relocation of utilities for pipeline placement • Release and exposure of construction-related contaminants or emissions • Release of additional criteria air emissions, including dust • Removal/replacement of recreational structures • Dredging, excavation scraping, or scarification to modify existing detention basins or create new recharge basins *Operational/Indirect Impacts* • Changes to water system operations (e.g., decreased flows to river systems) • Changes in water rights/points of diversion • Changes to the timing and/or amount of water being diverted from the river (e.g., Tuolumne River) or into existing open channels • Increased surface water use • Impacts from machinery and other vehicles to/from the construction site	• Mobilization of equipment and materials • Preparation of staging areas • Establishment of designated access and haul routes • Staging and storage of equipment and materials • Preparation of the project site • Preparation/use of borrow sites • Well drilling • Site restoration and/or site demobilization • Disposal of excess materials • Dewatering, excavation, fill, and placement of materials in water • Drainage modification	• Injection wells • Recharge basins • Pump station • Pipelines • Water storage tanks • French drains or other mechanisms to increase recharge potential at a site • Dry wells • Water distribution and conveyance infrastructure	• Conduct regularly scheduled inspections and evaluations of feature performance. • Install fencing and/or signage around newly constructed features. • Remove accumulated sediment around intakes. • Remove accumulated silt and vegetation from recharge basins. • Conduct water quality testing for groundwater wells.
In-lieu groundwater recharge	Project Nos. 1, 2, 7, 8, 14, and 17	Projects that recharge the groundwater system indirectly by providing surface water sources in lieu of groundwater through: • Treatment of surface water and recycled water to drinking water standards. • Connection of groundwater-reliant communities to surface water conveyance and/or distribution systems. • Storage of surface water in storage tanks/reservoirs for later use (piped or delivered via gravity). • Installation of regulating reservoirs to capture and store operational fluctuations in canal deliveries. • Construction of water conveyance and delivery infrastructure to new parcels.			• Canal interties • Regulating reservoirs • Pump station • Pipelines • Water storage tanks • Irrigation basins to enable surface water deliveries to drip/micro systems • Fish screens	• Conduct regularly scheduled inspections and evaluations of feature performance. • Conduct water quality testing for water storage tanks. • Clear debris from surface water conveyance features. • Install fencing and signage. • Establish programs, including markets and platforms for trade, exchange, or sale of pumping allocations and credits. • Manage pumping data. • Conduct ongoing monitoring of the pumping reduction strategy.
Combination of direct and in-lieu recharge	Project Nos. 6, 9, 11, 12, 15, 18, 20, and 21	Projects that use a combination of direct and in-lieu groundwater recharge through the various project activities described above.			Combination of the above	Combination of the above
MANAGEMENT ACTIONS						
Water conservation, land fallowing, and pumping reduction	Project No. 5 Management Action Nos. 1–7	Projects and management actions that incentivize conservation by: • Replacement of existing meters with an advanced metering system. • Incentivizing and promoting more efficient irrigation and conjunction use in urban and municipal service areas. • Promotion of land repurposing and fallowing during dry years to reduce both surface water and groundwater demand. • Support of groundwater pumping reductions through programs and improved data collection and monitoring.	*Construction/Direct Impacts* • For management actions resulting in modification of existing features or construction of new features, the same typical **direct** impact mechanisms as associated with projects *Operational/Indirect Impacts* • Reduced water use as a result of more efficient irrigation practices (flood to drip) • Changes in land use and/or land repurposing from agricultural uses to nonagricultural/non-irrigation uses • Changes in crop types • Earthwork for environmental easement habitat enhancement or protection	Same as above	• Smart meters • Irrigation system modification (e.g., drip irrigation) • Recharge basins or ponds • Check dams • Wells • Pipelines	• Establish programs, including programs that incentivize conjunctive use and irrigation efficiencies. • Identify staff and protocols for field inspections. • Conduct ongoing maintenance of the approved fallowed agricultural fields in compliance with any contractual agreements. • Ensure consistency with state law and related conservation and/or land fallowing programs. • Establish enforcement mechanisms and policies for groundwater pumping reduction programs.

NOTES:
1 Projects and management actions (PMAs) were grouped according to the primary recharge mechanism as conceptualized and presented in the Turlock Subbasin Groundwater Sustainability Plan (as presented in Tables ES-2 and ES-3, respectively). The term *primary mechanism*, as used here, means how the project or management action aims to recharge the groundwater system (i.e., direct, in lieu, a combination thereof). PMAs that incentivize conservation through conservation practices, land fallowing, or pumping reduction were grouped separately.
2 The project numbers and management action numbers are referenced in Tables ES-2 and ES-3, respectively.
3 Potential impact mechanisms associated with the construction or operation of typical activities associated with groundwater recharge projects.
4 Construction activities associated with these example features are described in Section 2.3.5, *Construction Activities for Specific Features of Projects and Management Actions*.

SOURCE: Data compiled by Environmental Science Associates in 2021.

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ES.3 Determining the Next Step under CEQA

Any public agency proposing to implement PMAs under the Turlock Subbasin GSP must exercise its independent judgment to determine CEQA compliance. The exercise of discretion by a lead agency for an individual project or management action will be guided by State CEQA Guidelines Section 15168. Possible scenarios are described below and depicted in **Figure ES-3**.

ES.3.1 Scenario 1: No New Significant or Substantially More Severe Impacts Identified Compared to the PEIR

If the CEQA lead agency for a specific PMA project or management action determines, under State CEQA Guidelines Section 15162, that the project or management action would result in no new significant effects and/or require no new mitigation measures, the activity could be approved as being within the scope analyzed by this PEIR. In such a case, the project or management action would not require a new or additional environmental review (e.g., EIR, negative declaration, or mitigated negative declaration). At this point, the appropriate CEQA lead agency would use this PEIR for the individual project or management action's CEQA compliance and would file a notice of determination when the project is approved.

Under this CEQA compliance approach, the CEQA lead agency for a project or management action must incorporate all feasible and appropriate mitigation measures from the PEIR into the individual project or management action to address significant or potentially significant impacts on the environment.

If the CEQA lead agency for a specific PMA project or management action determines, under State CEQA Guidelines Section 115300 through 15333, that the project or management action would be categorically exempt from CEQA (e.g., Section 15301 Existing Facilities" or Section 15304 "Minor Alterations to Land"), the CEQA lead agency would not use this PEIR for the individual project or management action and would file a notice of exemption when the project or management action is approved.

In addition, Executive Order N-7-22 (EO) was signed by Governor Newsom in March 2022 which suspended CEQA for recharge projects occurring in open and working lands under either Flood-Managed Aquifer Recharge (Flood-MAR) or DWR's Sustainable Groundwater Management Grant Program. If the CEQA lead agency for a specific project determines this EO applies, the CEQA lead agency would consult with DWR and other guidance on administering the CEQA waiver.

ES.3.2 Scenario 2: Potentially Significant or Substantially More Severe Impact Compared to the PEIR

If a project or management action would have impacts that were not fully described in the PEIR, or new impacts not examined in this PEIR, the CEQA lead agency for that project or management action would need to prepare an initial study to determine the appropriate environmental document. Should a separate environmental document be needed, the PEIR could be used to simplify the task of preparing the later environmental document (State CEQA Guidelines Section 15168[d]). That later document may be a notice of exemption, an addendum (pursuant to State CEQA Guidelines Section 15164), a supplemental document to this PEIR (pursuant to State CEQA Guidelines Section 15163), or a document that tiers from this PEIR or incorporates it by reference (i.e., negative declaration, mitigated negative declaration, or EIR pursuant to State CEQA Guidelines Section 15162).

The environmental document for the individual project or management action may tier from or incorporate any applicable elements of this PEIR by reference, such as direct and indirect impacts, mitigation measures, cumulative impacts, alternatives, or a statement of overriding considerations. As a result, the later environmental document could focus solely on the new effects that were not previously considered in this PEIR. Individual PMAs would proceed based on the independent judgment of the individual project or management action's CEQA lead agency, subject to supporting substantial evidence.

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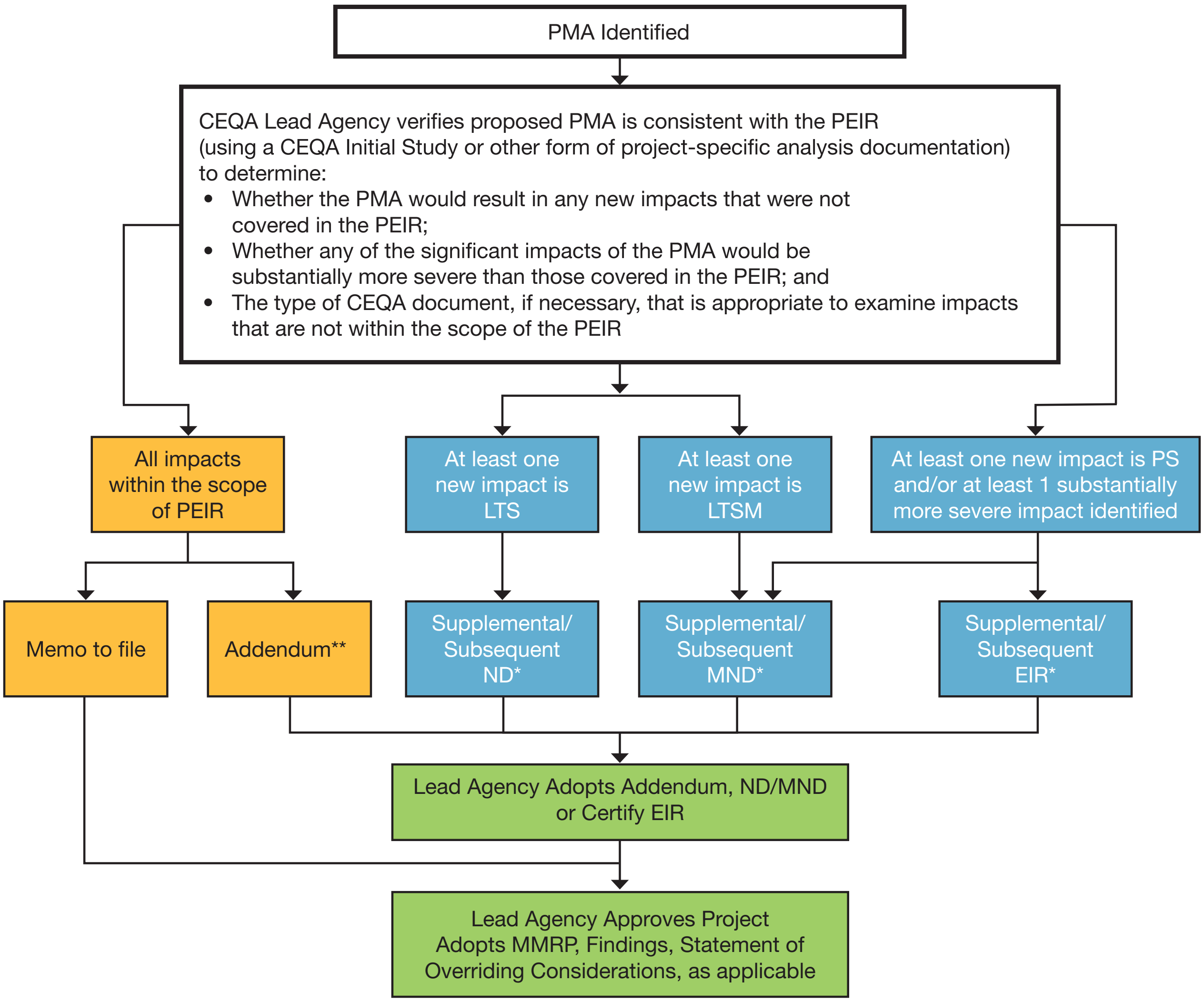

* Pursuant to CEQA Guidelines Sections 15162 (e.g. major revisions to PEIR) and 15163 (e.g. minor revisions to PEIR and doesn't meet the requirements of Section 15163)

** Pursuant to CEQA Guidelines Section 15164 (e.g. minor additions or changes to PEIR and doesn't meet the requirements of Sections 15162 or 15163)

EIR = Environmental Impact Report; LTS = Less than significant; LTSM = Less than significant with mitigation; ND = Negative Declaration; MND = Mitigated Negative Declaration; NOD = Notice of Determination; NOE Notice of Exemption; PS = Potentially Significant

Note: This figure represents the process to implement PMAs under the PEIR. Please refer to the CEQA Statute and Guidelines for additional information

SOURCE: ESA, 2021.

Figure ES-3
CEQA Flow Chart

ESA

ES.4 Alternatives to the Proposed Project

CEQA requires that an EIR describe and evaluate a reasonable range of alternatives to a project or to the location of a project that would feasibly attain most of the basin plan objectives and avoid or substantially reduce significant project impacts. The alternatives to the PMAs considered in this draft PEIR were developed based on information gathered during development of the Turlock Subbasin GSP and during the PEIR scoping process (see Section 1.4.1, *Notice of Preparation and Scoping Meeting*).

Potential alternatives were screened based on their ability to feasibly attain most of the basic Turlock Subbasin GSP (plan) objectives, their feasibility within the limits of the Sustainable Groundwater Management Act (SGMA), and their ability to reduce or eliminate any significant environmental impacts of the implementation of PMAs under the Turlock Subbasin GSP. Based on the alternatives development and screening process described above, four alternatives were identified for further evaluation in the PEIR: the No Project Alternative and three potentially feasible alternatives to the Implementation of PMAs under the Turlock Subbasin GSP.

- **No Project Alternative**.
- **Alternative 1 –** Specify more narrowly the types of PMAs implemented under the Turlock Subbasin GSP (e.g., the PMAs must provide at least 100 acre-feet of recharge per year).
- **Alternative 2 –** Eliminate certain aspects of PMAs (e.g., eliminate PMAs that propose the construction of new features).
- **Alternative 3** – Exclude entire categories of PMAs (e.g., exclude all direct and in-lieu recharge projects and only implement management actions).

Table ES-4 presents a comparison of impacts by resource issue area, after mitigation, for the No Project Alternative, and Alternatives 1, 2, and 3 as compared to the implementation of all types of PMAs under the Turlock Subbasin GSP.

TABLE ES-4
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Aesthetic and Visual Resources	**AES-1:** Implementing PMAs under the Turlock Subbasin GSP could result in substantial degradation of visual qualities.	LTSM	Similar	Similar *	Similar *	Similar *
	AES-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse effects on scenic vistas and scenic resources.	LTS	Similar	Similar *	Similar *	Similar *
	AES-3: Implementing PMAs under the Turlock Subbasin GSP could result in new sources of substantial light or glare.	LTSM	Similar	Similar *	Similar *	Similar *
Agriculture and Forestry Resources	**AG-1:** Implementing PMAs under the Turlock Subbasin GSP could convert Special Designated Farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural use.	PSU	Similar	Similar *	Similar *	Similar *
	AG-2: Implementing PMAs under the Turlock Subbasin GSP could result in other changes in the existing environment that, because of their location or nature, indirectly result in the conversion of Special Designated Farmland to nonagricultural use or conversion of forestland to nonforest use.	LTS	Similar	Similar *	Similar *	Similar *
Air Quality	**AIR-1:** Implementing PMAs under the Turlock Subbasin GSP could result in conflict with or obstruct implementation of the applicable air quality plan.	PSU	Similar	Similar *	Similar *	Similar *
	AIR-2: Implementing PMAs under the Turlock Subbasin GSP could result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard.	PSU	Similar	Similar *	Similar *	Similar *
	AIR -3: Implementing PMAs under the Turlock Subbasin GSP could expose sensitive receptors to substantial pollutant concentrations.	LTSM	Similar	Similar *	Similar *	Similar *
	AIR -4: Implementing PMAs under the Turlock Subbasin GSP could result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.	LTS	Similar	Similar *	Similar *	Similar *
Biological Resources	**BIO-1:** Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.	PSU	Similar	Similar *	Similar *	Similar *
	BIO-2: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS.	PSU	Similar	Similar *	Similar *	Similar *
	BIO-3: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means.	LTSM	Similar	Similar *	Similar *	Similar *

TABLE ES-4 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Biological Resources (cont.)	**BIO-4:** Implementing PMAs under the Turlock Subbasin GSP could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	SU	Similar	Similar *	Similar *	Similar *
	BIO-5: Implementing PMAs under the Turlock Subbasin GSP could conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.	LTSM	Similar	Similar *	Similar *	Similar *
	BIO-6: Implementing PMAs under the Turlock Subbasin GSP could conflict with the provisions of an adopted HCP, natural community conservation plan, or other approved local, regional, or state HCP.	NI	Similar	Similar *	Similar *	Similar *
Cultural Resources	**CUL-1:** Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines Section 15064.5.	SU	Similar	Similar *	Similar *	Similar *
	CUL-2: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines Section 15064.5.	SU	Similar	Similar *	Similar *	Similar *
	CUL-3: Implementing PMAs under the Turlock Subbasin GSP could disturb any human remains, including those interred outside of formal cemeteries.	SU	Similar	Similar *	Similar *	Similar *
Energy	**ENE-1:** Implementing PMAs under the Turlock Subbasin GSP could result in result in wasteful, inefficient, or unnecessary consumption of energy resources.	LTS	Similar	Similar *	Similar *	Similar *
	ENE-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	LTS	Similar	Similar *	Similar *	Similar *
Geology, Soils, and Paleontological Resources	**GEO-1:** Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-2: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-3: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-4: Implementing PMAs under the Turlock Subbasin GSP could result in substantial soil erosion or the loss of topsoil.	LTS	Similar	Similar *	Similar *	Similar *

TABLE ES-4 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Geology, Soils, and Paleontological Resources (cont.)	**GEO-5:** Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potential result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.	LTS	Similar	Similar *	Similar *	Similar *
	GEO-6: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on expansive soil creating substantial direct or indirect risks to life or property.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-7: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	LTSM	Similar	Similar *	Similar *	Similar *
Greenhouse Gas Emissions	**GHG-1:** Implementing PMAs under the Turlock Subbasin GSP could generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.	LTSM	Similar	Similar *	Similar *	Similar *
	GHG-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.	LTS	Similar	Similar *	Similar *	Similar *
Hazards and Hazardous Materials	**HAZ-1**: Implementing PMAs under the Turlock Subbasin GSP could create a significant hazard to the public or the environment through the routine transport, use, disposal, or accidental release of hazardous materials.	LTS	Similar	Similar *	Similar *	Similar *
	HAZ-2: Implementing PMAs under the Turlock Subbasin GSP could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	LTS	Similar	Similar *	Similar *	Similar *
	HAZ-3: Implementing PMAs under the Turlock Subbasin GSP could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment.	LTSM	Similar	Similar *	Similar *	Similar *
	HAZ-4: Implementing PMAs under the Turlock Subbasin GSP could be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the area.	LTS	Similar	Similar *	Similar *	Similar *
	HAZ-5: Implementing PMAs under the Turlock Subbasin GSP could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	LTSM	Similar	Similar *	Similar *	Similar *
	HAZ-6: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.	LTS	Similar	Similar *	Similar *	Similar *

TABLE ES-4 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Hydrology and Water Quality	**HYD-1:** Implementing PMAs under the Turlock Subbasin GSP could result in release of pollutants into surface and/or groundwater, including in a flood zone as a result of project inundation, that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan.	LTSM	Similar	Similar *	Similar *	Similar *
	HYD-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: result in substantial erosion or siltation on- or off-site; result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or impede or redirect flood flows.	LTSM	Similar	Similar *	Similar *	Similar *
	HYD-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of groundwater-surface water interactions.	LTS	Similar	Similar *	Similar *	Similar *
	HYD-4: Implementing PMAs under the Turlock Subbasin GSP could result in conflicts with existing water rights (beneficial use and/or point of diversion).	LTS	Similar	Similar *	Similar *	Similar *
	HYD-5: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration to groundwater conditions in adjacent basins.	LTSM	Similar	Similar *	Similar *	Similar *
Land Use and Planning	**LU-1:** Implementing PMAs under the Turlock Subbasin GSP could conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.	SU	Similar	Similar *	Similar *	Similar *
	LU-2: Implementing PMAs under the Turlock Subbasin GSP could physically divide an established community	LTS	Similar	Similar *	Similar *	Similar *
Mineral Resources	**MIN-1:** Implementing PMAs under the Turlock Subbasin GSP would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.	LTS	Similar	Similar *	Similar *	Similar *
Noise	**NOI-1:** Implementing PMAs under the Turlock Subbasin GSP could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	LTSM	Similar	Similar *	Similar *	Similar *
	NOI-2: Implementing PMAs under the Turlock Subbasin GSP could generate excessive groundborne vibration or groundborne noise levels.	LTSM	Similar	Similar *	Similar *	Similar *

TABLE ES-4 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Population and Housing	**POP-1:** Implementing PMAs under the Turlock Subbasin GSP could induce substantial unplanned population growth in the area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).	LTS	Similar	Similar *	Similar *	Similar *
	POP-2: Implementing PMAs under the Turlock Subbasin GSP could result in the displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.	LTS	Similar	Similar *	Similar *	Similar *
Recreation	**REC-1:** Implementing PMAs under the Turlock Subbasin GSP could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	LTSM	Similar	Similar *	Similar *	Similar *
	REC-2: Implementing PMAs under the Turlock Subbasin GSP could include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.	LTSM	Similar	Similar *	Similar *	Similar *
Transportation	**TRANS-1:** Implementing PMAs under the Turlock Subbasin GSP could conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.	LTSM	Similar	Similar *	Similar *	Similar *
	TRANS-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).	LTSM	Similar	Similar *	Similar *	Similar *
	TRANS-3: Implementing PMAs under the Turlock Subbasin GSP could substantially increase hazards due to a geometric design feature or incompatible uses.	LTSM	Similar	Similar *	Similar *	Similar *
	TRANS-4: Implementing PMAs under the Turlock Subbasin GSP could result in inadequate emergency access.	LTSM	Similar	Similar *	Similar *	Similar *
Tribal Cultural Resources	**TCR-1:** Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a tribal cultural resource, as defined in PRC Section 21074.	SU	Similar	Similar *	Similar *	Similar *
Utilities and Service Systems and Public Services	**UTIL-1:** Implementing PMAs under the Turlock Subbasin GSP could result in construction or relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.	PSU	Similar	Similar *	Similar *	Similar *
	UTIL-2: Implementing PMAs under the Turlock Subbasin GSP could result in landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs and fail to comply with federal, state, and local statutes and regulations related to solid waste.	LTS	Similar	Similar *	Similar *	Similar *

TABLE ES-4 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Utilities and Service Systems and Public Services (cont.)	**UTIL-3:** Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, and other public facilities.	LTS	Similar	Similar *	Similar *	Similar *
Wildfire	**WILD-1:** Implementing PMAs under the Turlock Subbasin GSP could substantially impair an adopted emergency response plan or emergency evacuation plan.	LTSM	Similar	Similar *	Similar *	Similar *
	WILD-2: Implementing PMAs under the Turlock Subbasin GSP could, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.	LTS	Similar	Similar *	Similar *	Similar *
	WILD-3: Implementing PMAs under the Turlock Subbasin GSP could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts on the environment.	LTS	Similar	Similar *	Similar *	Similar *
	WILD-4: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	LTS	Similar	Similar *	Similar *	Similar *

NOTES:

LTS—Less than significant; LTSM—Less than significant after application of feasible mitigation measure(s); NI—No Impact; PSU—Potentially Significant and Unavoidable; SU—Significant and Unavoidable.

* The impact related to the alternative could be at a lesser magnitude than the impacts from the PMAs implemented under the Turlock Subbasin GSP; however, it is assumed the final impact conclusion (e.g., LTSM, PSU, SU) is similar to the conclusion for the PMAs implemented under Turlock Subbasin GSP. For example, there may be less overall construction related to the alternative, but the construction impacts related to noise, air quality, etc., could result in the same final impact conclusion as for the PMAs implemented under the Turlock Subbasin GSP PEIR.

SOURCE: Data compiled by Environmental Science Associates in 2022.

ES.5 Areas of Known Controversy and Concern

The WTS GSA issued a notice of preparation (NOP) on January 7, 2022, to satisfy the requirements of CEQA and the State CEQA Guidelines (see **Appendix B** of the draft PEIR). The issuance of the NOP began the 30-day public comment period, which closed at 5 p.m. on February 7, 2022. A virtual scoping meeting was held via remote teleconference on the Zoom platform on Wednesday, January 26, 2022, at 5:30 p.m. to receive oral public and agency input on the scope and content of the PEIR.

The California Department of Fish and Wildlife identified areas of controversy and concern that include potential impacts for special status species and habitats known to occupy the Project area. The issues raised in these comments are addressed in this EIR, as appropriate, to the extent they pertain to compliance with CEQA.

ES.6 Next Steps for the PEIR

This draft PEIR is available to federal, state, and local agencies and interested organizations and individuals who may want to review and comment on the adequacy of the analysis. Publication of the draft PEIR marks the beginning of a 45-day public review period. The 45-day public review period for this draft PEIR is Wednesday, July 27, 2022 through 5:00 p.m. on Monday, September 12, 2022. During the public review period, written comments should be postmarked by September 12, 2022, and mailed or emailed to:

Turlock Subbasin GSP PEIR Comments
c/o Turlock Irrigation District
P.O. Box 949
Turlock, CA 95381-0949

turlockgroundwater@gmail.com

Please use "Turlock Subbasin Groundwater Sustainability Plan PEIR" in the subject line. Please also include the name of a contact person if submitting comments on behalf of an agency, tribal group, or organization. All comments received, including names and addresses, will become part of the official administrative record and may be available to the public.

The draft PEIR is available for review at the Turlock Public Library (550 N Minaret Ave, Turlock, CA 95380), the Stanislaus County Library (1500 I St, Modesto, CA 95354), and the Merced County Library (2100 O St, Merced, CA 95340). The draft PEIR is also available on the Turlock Groundwater website at www.turlockgroundwater.org.

During the 45-day review period, a virtual public workshop will be held via remote teleconference on the Zoom platform on Thursday, August 25, 2022 at 2:00 p.m.

Information about the PEIR public workshop can be found on the Turlock Groundwater website at www.turlockgroundwater.org/events. A video and audio broadcast of the PEIR public workshop will be available via the internet and can be accessed at the same website. To sign up for emails, visit www.turlockgroundwater.org/get-involved.

ES.7 Summary of Environmental Impacts of the Plan

As required by CEQA (State CEQA Guidelines Section 15126.2), this PEIR identifies and focuses on the potentially significant direct and indirect environmental effects of the types of PMAs to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP). This draft PEIR assumes that the full range of PMAs would be implemented under the Turlock Subbasin GSP and provides a broad, comprehensive analysis of potential environmental effects and impact issues across the Turlock Subbasin. This draft PEIR is designed to provide CEQA review streamlining for future PMAs implemented under the Turlock Subbasin GSP.

The Turlock Subbasin GSP applies to the Turlock Subbasin, a 544-square-mile (348,160-acre) area in the northern San Joaquin Valley approximately 80 miles south of Sacramento in Stanislaus and Merced counties. The Turlock Subbasin GSP identifies multiple PMAs that propose structural and nonstructural actions to enhance regional groundwater management and water supply, and allows for the development of additional PMAs as needed to meet the sustainability goals of the GSP.

As discussed above, the Turlock Subbasin GSP does not describe specific construction or operations and maintenance (O&M) activities required for the implementation of PMAs. The level of detail provided for each PMA varies, including the precise locations of PMA features and detailed descriptions of feature designs, modifications, and/or construction techniques. Thus, activities specific to the PMAs were assumed using the information presented in the Turlock Subbasin GSP, as well as incorporating general information common for the development of groundwater recharge opportunities.

The Turlock Subbasin GSP PEIR employs a programmatic approach to evaluation because the specific characteristics and locations of PMAs are unknown at this time. As such, the level of detail of the environmental impact analysis is also programmatic in that it addresses the full range of potential environmental effects of implementing the types of PMAs presented in the Turlock Subbasin GSP. Environmental impact conclusions are broadly and comprehensively applied to the types of PMAs to be implemented across the study area (i.e., the Turlock Subbasin).

A wide range of potential impacts are associated with the PMAs to be implemented. As described in Sections 2.2 through 2.4, and highlighted in Table ES-4, some PMAs propose the construction of new features, while others propose operational modifications to existing features or implementation of management programs. Therefore, in the context of a program-level evaluation, the scope of the impact analysis requires consideration of all potential impact mechanisms (direct/construction and indirect/operations) resulting from all types of PMAs. In addition, the impact analysis and discussion should consider the type of PMA categorized according to the primary recharge mechanism (e.g., direct recharge, in-lieu recharge, combination, or water conservation). While some impact mechanisms apply to multiple PMA types, organizing the impact discussion in this way clearly identifies the impacts associated with a particular project or management action.

Given this is a program-level CEQA document (e.g., PEIR), the analyses are generally qualitative and conservative and assume that all PMAs would be implemented. Analyses rely on the use of existing quantitative and qualitative data, including but not limited to existing plans, reports, desktop (versus field) surveys, open access databases, maps, and models. Information regarding example projects similar to the types of PMAs (e.g., groundwater recharge projects) implemented in the Turlock Subbasin were also reviewed.

Potential environmental impacts from the implementation of PMAs under the Turlock Subbasin and associated mitigation measures are summarized in **Table ES-5**.

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TABLE ES-5
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.2 Aesthetics and Visual Resources	**AES-1:** Implementing PMAs under the Turlock Subbasin GSP could result in substantial degradation of visual qualities.	LTS	PS	**Mitigation Measure AES-1: Minimize Degradation of Visual Quality.** • Use compatible colors for proposed structural features, such as fish screens and storage tanks. Use earth-tone paints and stains with low levels of reflectivity. • Minimize the vertical profile of proposed structures as much as possible. • Provide vegetative screening to soften views of structures. Landscaping should complement the surrounding landscape.	LTS	LTSM
	AES-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse effects on scenic vistas and scenic resources.	LTS	LTS	None	LTS	LTS
	AES-3: Implementing PMAs under the Turlock Subbasin GSP could result in new sources of substantial light or glare.	PS	PS	**Mitigation Measure AES-2: Avoid Effects of Project Lighting.** Proposed lighting features shall use shields, and lighting shall be directed downward and inward toward the features.	LTSM	LTSM
3.3 Agriculture and Forestry Resources	**AG-1:** Implementing PMAs under the Turlock Subbasin GSP could convert Special Designated Farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural use.	LTS	PS	**Mitigation Measure AG-1: Minimize and Avoid Loss of Farmland.** The following measures could be implemented before and during construction of PMAs identified in the Turlock Subbasin GSP: • PMAs shall be designed to minimize, to the greatest extent feasible, the loss of agricultural land with the highest values. • PMAs that result in the permanent conversion of Farmland to nonagricultural use shall preserve other Farmland in perpetuity by acquiring an agricultural conservation easement, or by contributing funds to a land trust or other entity qualified to preserve Farmland in perpetuity (at a target ratio of 1:1, depending on the nature of the conversion and the characteristics of the Farmland to be converted, to compensate for the permanent loss). • PMA features shall be designed to minimize the fragmentation or isolation of Farmland. Where a project involves acquiring land or easements, the remaining nonproject area shall be of a size sufficient to allow viable farming operations. The participating agencies shall be responsible for acquiring easements, making lot line adjustments, and merging affected land parcels into units suitable for continued commercial agricultural management. • Any utility or infrastructure serving agricultural uses shall be reconnected if it is disturbed by project construction. If a project temporarily or permanently cuts off roadway access or removes utility lines, irrigation features, or other infrastructure, the project proponents shall be responsible for restoring access as necessary to ensure that economically viable farming operations are not interrupted. • Where applicable to a project site, buffer areas shall be established between PMAs and adjacent agricultural land. The buffers shall be sufficient to protect and maintain land capability and flexibility in agricultural operations. Buffers shall be designed to protect the feasibility of ongoing agricultural operations and reduce the effects of construction-related or operational activities (including the potential to introduce special-status species in the agricultural areas) on adjacent or nearby properties. Buffers shall also protect restoration areas from noise, dust, and the application of agricultural chemicals. The width of each buffer shall be determined on a project-by-project basis to account for variations in prevailing winds, crop types, agricultural practices, ecological restoration, and infrastructure. Buffers can function as drainage swales, trails, roads, linear parkways, or other uses compatible with ongoing agricultural operations. **Mitigation Measure AG-2: Minimize Impacts on Lands Protected by Agricultural zoning or Williamson Act Contract.** PMAs shall be designed to minimize, to the greatest extent feasible, conflicts and inconsistencies with land protected by agricultural zoning or a Williamson Act contract and the terms of the applicable zoning/contract.	LTS	PSU
	AG-2: Implementing PMAs under the Turlock Subbasin GSP could result in other changes in the existing environment that, because of their location or nature, indirectly result in the conversion of Special Designated Farmland to nonagricultural use or conversion of forestland to nonforest use.	LTS	LTS	None	LTS	LTS

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.4 Air Quality	**AIR-1:** Implementing PMAs under the Turlock Subbasin GSP could result in conflict with or obstruct implementation of the applicable air quality plan.	PS	LTS	None	PSU	LTS
	AIR-2: Implementing PMAs under the Turlock Subbasin GSP could result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard.	PS	PS	**Mitigation Measure AIR-1: Implement project-specific air quality analysis for large recharge projects.** For recharge projects involving more than 180,000 cubic yards of excavated material transport, the PMA proponent shall prepare a project-specific air quality analysis conducted by a professional air quality analyst. If the analysis determines that project emissions would exceed any of the SJVAPCD thresholds of significance presented in Table 3.4-3, then the analysis should identify additional mitigation measures to reduce emissions to below the applicable threshold(s) or to the greatest extent feasible. Such additional mitigation measures may include: • Require the use of off-road equipment with USEPA-certified Tier 4 engines. • Reduce the overall window of annual construction activity. **Mitigation Measure AIR-2: Minimize dust from fallowed lands.** For projects involving land fallowing, land conversion, or other agricultural operations, implement applicable BMPs from agencies such as the U.S. Department of Agriculture Natural Resources Conservation Service and California Department of Food and Agriculture (CDFA 2022) to mitigate dust associated with fallowed lands. BMPs for fallowed lands could include, but are not limited to, the following: • Implement conservation cropping sequences and wind erosion protection measures, such as: – Plan ahead to start with plenty of vegetation residue and maintain as much residue on fallowed fields as possible. Residue is more effective for wind erosion protection if left standing. – If residues are not adequate, small grain can be seeded about the first of the year to take advantage of the winter rains and irrigated with a light irrigation if needed to get adequate growth. – Avoid any tillage if possible. – Avoid any traffic or tillage when fields are extremely dry to avoid pulverization.	PSU	LTSM
	AIR-3: Implementing PMAs under the Turlock Subbasin GSP could expose sensitive receptors to substantial pollutant concentrations.	PS	LTS	**Mitigation Measure AIR-2: Minimize dust from fallowed lands.** **Mitigation Measure AIR-3: Implement project-specific air quality analysis for certain recharge projects.** For recharge projects that involve 12 months of active construction and are within 1,000 feet of sensitive receptors, a project-specific construction health risk analysis shall be completed to demonstrate that the construction activities of individual projects under the PMA would not result in a significant acute, chronic non-cancer or cancer-related health risk to specific sensitive receptors. If construction activities would result in significant increase in health risk, then the analysis should identify additional mitigation measures to further reduce emissions to below the applicable threshold(s). Such additional mitigation measures may include: • Require the use of off-road equipment with USEPA-certified Tier 4 engines. • Use equipment fitted with a CARB-Verified Diesel Emission Control System. • Reduce the overall window of annual construction activity in the proximity of the impacted receptor.	LTSM	LTSM
	AIR-4: Implementing PMAs under the Turlock Subbasin GSP could result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.	LTS	LTS	None	LTS	LTS

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.5 Biological Resources	**BIO-1:** Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.	PS	PS	**Mitigation Measure BIO-1: Minimize Disturbance of Special-Status Species.** ***Avoid Loss of Special-Status Species Habitat.*** Select project site(s) that would avoid habitats of special-status species (which may include foraging, sheltering, migration, and rearing habitat in addition to breeding or spawning habitat) • Schedule construction to avoid special-status species' breeding, spawning, or migration locations during the seasons or active periods that these activities occur. • Establish buffers around special-status species habitats to exclude effects of construction activities. The size of the buffer shall be in accordance with USFWS and CDFW protocols for the applicable special-status species. • If nest tree removal is necessary, remove the tree only after the nest is no longer active, as determined by a qualified biologist. • Where impacts on special-status species are unavoidable, compensate for impacts by restoring or preserving in-kind suitable habitat on-site, or off-site, or by purchasing restoration or preservation credits. • Abide by any permit requirements associated with local policies and ordinances protecting native trees. ***Prevent Degradation of Fish Habitat.*** PMA sites will implement construction best management practices (BMPs) to prevent degradation of fish habitat including: • Developing and implementing a Stormwater Pollution Prevention Plan (SWPPP). • Minimizing soil disturbance, erosion, and sediment runoff from the project site. • Avoiding and minimizing contaminant spills. • Conducting biological construction monitoring to ensure that implemented BMPs are effective. ***Avoid Vegetation Disturbance.*** PMA sites will minimize, to the greatest extent feasible, the amount of soil and upland vegetation disturbance during project construction and use methods creating the least disturbance to vegetation. Disturbance to existing grades and native vegetation, the number of access routes, the size of staging areas, and the total area disturbed by the project shall be limited to the extent of all temporary and permanent impacts as defined by the final project design. ***Environmental Awareness Training.*** Prior to engaging existing or new personnel in construction activities, new construction personnel will participate in environmental awareness training conducted by an agency-approved biologist or resource specialist. Construction personnel will be informed about the identification, potential presence, legal protections, and avoidance and minimization measures relevant to special status that potentially occur on the project site. ***Environmental Monitoring.*** A biologist or resource specialist will ensure that all applicable protective measures are implemented during project construction. The agency-approved biologist or resource specialist will have authority to stop any work if they determine that any permit requirement is not fully implemented. The agency-approved biologist or resource specialist will prepare and maintain a monitoring log of construction site conditions and observations, which will be kept on file. ***Work Area and Speed Limits.*** Construction work and materials staging will be restricted to designated work areas, routes, staging areas, temporary interior roads, or the limits of existing roadways. • Prior to start of work, brightly colored fencing or flagging or other practical means shall be erected to demarcate the limits of the project activities within 100 feet of sensitive natural communities and habitat areas (e.g., any aquatic features), including designated staging areas; ingress and egress corridors; stockpile areas, soil, and materials; and equipment exclusion zones. Flagging or fencing shall be maintained in good repair for the duration of project activities. • Vehicles will obey posted speed limits and will limit speeds to 20 miles per hour within the study area on unpaved surfaces and unpaved roads to reduce dust and soil erosion and avoid harm to wildlife. **Food Trash Removed Daily.** All food trash will be properly contained within sealed containers, removed from the work site, and disposed of daily to prevent attracting wildlife to construction sites.	PSU	LTSM
	BIO-2: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS.	PS	PS	**Mitigation Measure BIO-2: Avoid and Minimize Disturbance to Sensitive Natural Communities.** ***Avoidance of Sensitive Natural Communities.*** The PMA sites will be locations that would avoid sensitive natural communities, including riparian habitats, by doing the following: • To the maximum extent practicable, project elements will be designed to avoid effects on sensitive natural communities. • Flagging or fencing will be installed by the agency-approved biologist or resource specialist around any sensitive natural community to be avoided by construction. • Flagging or fencing will remain in place throughout the duration of the construction activities, and will be inspected and maintained regularly by the agency-approved biologist or resource specialist until completion of the project. Fencing will be removed when all construction equipment is removed from the site, the area is cleared of debris and trash, and the area is returned to natural conditions. • Where impacts on sensitive natural communities other than waters of the United States or State are unavoidable, impacts will be compensated for by restoring and/or preserving in-kind sensitive natural communities on-site, or off-site at a nearby site, or by purchasing in-kind restoration or preservation credits from a mitigation bank that services the project site.	PSU	LTSM

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.5 Biological Resources (cont.)	**BIO-2** (cont.)			***Restoration of Temporarily Affected Areas.*** For any areas temporarily affected by construction activities, the contractor will implement the following: • Prepare a restoration plan for temporary impacts sites for review by CDFW. • Minimizing soil disturbance and stockpiling topsoil for later use in any areas to be graded. • Amend soil as necessary before installing replacement plants. • Utilize only native plant species for revegetation. ***Preserve Large Trees.*** Existing native vegetation shall be retained as practicable, with special focus on the retention of shade-producing and bank-stabilizing trees and brush with greater than 6-inch diameter branches or trunks. ***Avoid Excessive Soil Compaction.*** Wherever possible, vegetation disturbance and soil compaction shall be minimized by using low ground-pressure equipment with a greater reach or that exerts less pressure per square inch on the ground than other equipment. ***Native and Invasive Vegetation Removal Materials and Methods.*** If riparian vegetation is removed with chainsaws or other power equipment, machines that operate with vegetable-based bar oil will be used, if practicable. All invasive plant species (e.g., those rated as invasive by the California Invasive Plant Council or local problem species) shall, if feasible, be removed from the project site, using locally and routinely accepted agriculture practices. Stockpiling of invasive plant materials is prohibited during the flood season. ***Revegetate Disturbed Areas.*** All temporarily disturbed areas will be de-compacted and seeded/planted with a mix of native riparian, wetland, and/or upland plant species suitable for the area. The project proponent shall develop a revegetation plan, including (as applicable) a schedule; plans for grading of disturbed areas to pre-project contours; planting palette with plant species native to the study area; invasive species management; performance standards; and maintenance requirements (e.g., watering, weeding, and replanting). Plants for revegetation will come primarily from active seeding and planting; natural recruitment may also be proposed if site conditions allow for natural recruitment to reestablish vegetation and avoid potential negative risks associated with erosion and impacts on water quality. Plants imported to the restoration areas will come from local stock, and to the extent possible, local nurseries. Only native plants (genera) will be used for restoration efforts. Certified weed-free native mixes and mulch will be used for restoration planting or seeding. ***Revegetation Materials and Methods.*** Following completion of work, site contours will be returned to preconstruction conditions or re-designed to provide increased biological and hydrological functions. • Any area barren of vegetation as a result of project implementation shall be restored to a natural state by mulching, seeding, planting, or other means with native trees, shrubs, willow stakes, erosion control native seed mixes, or herbaceous plant species. • Where disturbed, topsoil shall be conserved for reuse during restoration to the extent practicable. • Native plant species comprising a diverse community structure (plantings of both woody and herbaceous species, if both are present) that follow a CDFW-approved plant palette shall be used for revegetation of disturbed and compacted areas, as appropriate. • Irrigation may also be required to ensure the survival of shrubs, trees, or other vegetation. • Soils that have been compacted by heavy equipment shall be de-compacted, as necessary, to allow for revegetation. ***Revegetation Erosion Control Materials and Methods.*** If erosion control fabrics are used in revegetated areas, they shall be slit in appropriate locations to allow for plant root growth. Only non-monofilament, wildlife-safe fabrics shall be used. ***Revegetation Monitoring and Reporting.*** All revegetated areas will be maintained and monitored for a minimum of 2 years after replanting is complete and until success criteria are met, to ensure the revegetation effort is successful. The standard for success is 60 percent absolute cover compared to an intact, local reference site. If an appropriate reference site cannot be identified, success criteria will be developed for review and approval by CDFW on a project-by-project basis based on the specific habitat impacted and known recovery times for that habitat and geography. The project proponent will prepare a summary report of the monitoring results and recommendations at the conclusion of each monitoring year.		

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.5 Biological Resources (cont.)	**BIO-3:** Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means.	PS	PS	**Mitigation Measure BIO-3: Avoid and Minimize Disturbance to Wetlands and Waters.** ***Avoidance of jurisdictional wetlands and other waters.*** The PMA sites will avoid, minimize, and, if necessary, compensate for reduction in area and/or habitat quality of wetlands and jurisdictional waters, as follows: • To the maximum extent practicable, project elements will be designed to avoid effects on wetlands and other waters, including rivers, streams, vernal pools, and seasonal wetlands. • Flagging or fencing will be installed by the agency-approved biologist or resource specialist around any jurisdictional wetland or other aquatic feature to be avoided by construction. • Flagging or fencing will remain in place throughout the duration of the construction activities, and will be inspected and maintained regularly by the agency-approved biologist or resource specialist until completion of the project. Fencing will be removed when all construction equipment is removed from the site, the area is cleared of debris and trash, and the area is returned to natural conditions. • Staging areas, access roads, and other facilities shall be placed to avoid and limit disturbance to waters of the state and other aquatic habitats (e.g., streambank or stream channel, riparian habitat) as much as possible. When possible, existing ingress or egress points shall be used and/or work shall be performed from the top of the creek banks or from barges on the waterside of the stream or levee bank, or dry gravel beds. • Replacing, restoring, or enhancing on a "no net loss" basis (in accordance with U.S. Army Corps of Engineers and State Water Resource Control Board requirements), wetlands and other waters of the United States, and waters of the State that would be removed, lost, and/or degraded.	LTSM	LTSM
	BIO-4: Implementing PMAs under the Turlock Subbasin GSP could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	PS	PS	**Mitigation Measure BIO-1: Minimize Disturbance of Special-Status Species.** **Mitigation Measure BIO-2: Avoid and Minimize Disturbance to Sensitive Natural Communities.**	PSU	LTSM
	BIO-5: Implementing PMAs under the Turlock Subbasin GSP could conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.	PS	LTS	**Mitigation Measure BIO-2: Avoid and Minimize Disturbance to Sensitive Natural Communities.**	LTSM	LTS
	BIO-6: Implementing PMAs under the Turlock Subbasin GSP could conflict with the provisions of an adopted HCP, natural community conservation plan, or other approved local, regional, or state HCP.	NI	NI	None	NI	NI
3.6 Cultural Resources	**CUL-1:** Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines Section 15064.5.	PS	PS	**Mitigation Measure CUL-1: Conduct Inventory and Significance Evaluation of Architectural Resources.** Before implementation of a project under the GSP, the need for an inventory and significance evaluation of architectural resources in the project area shall be assessed, based on the type of activity conducted and potential for built features to be present or disturbed. The assessment should consist of a review of maps and aerial photos to see if existing buildings, dams, levees, roads, or other built features are in the project area. If so, and the age of these features is either unknown or is known to be older than 45 years, then an inventory and evaluation should be completed by, or under the direct supervision of, a qualified architectural historian, defined as one who meets the U.S. Secretary of the Interior's Professional Qualifications Standards for Historical Architecture or History, and shall include the following: • Map(s) and verbal description of the project area that delineates both the horizontal and vertical extents of where a project could result in impacts, including both direct and indirect, on cultural resources. • A records search at the appropriate repository of the California Historical Resources Information System (CHRIS) for the project area and vicinity (typically areas within 0.25 or 0.5 mile, based on setting) to acquire records of previously recorded cultural resources in the project area and vicinity and previous cultural resources studies conducted for the project area and vicinity. • Background research on the history of the project area and vicinity for all projects determined to need additional historical architecture assessment. If, after review, features of the built environment are determined to be less than 45 years old, a summary statement of their age and references for this determination will be included in the project area description. No further analysis is necessary.	SU	SU

Table ES-5 (continued)
Summary of Environmental Impacts and Mitigation Measures

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.6 Cultural Resources (cont.)	**CUL-1** (cont.)			If historic-era architectural resources are determined to likely be present, an architectural field survey of the project area shall be conducted, unless previous architectural field surveys no more than 5 years old have been conducted for the project area. Any architectural resources identified in the project area during the survey shall be recorded on the appropriate California Department of Parks and Recreation 523 forms. • If resources are identified in the project area, they shall be evaluated for California Register eligibility (i.e., whether they qualify as historical resources, as defined in State CEQA Guidelines Section 15064.5). • If California Register-eligible resources are present, an assessment of potential project impacts shall be conducted. This shall include an analysis of whether the project's potential impacts on the historical resource would be consistent with the U.S. Secretary of the Interior's Standards for the Treatment of Historic Properties and applicable guidelines. If potentially significant impacts on historical resources are identified, an approach for reducing such impacts shall be developed before project implementation and in coordination with interested parties (e.g., historical societies, local communities). Typical measures for reducing impacts include: • Modifying the project to avoid impacts on historical resources. • Documentation of historical resources, to the standards of and to be included in the Historic American Buildings Survey, Historic American Engineering Record, or Historic American Landscapes Survey, as appropriate. As described in the above standards, the documentation shall be conducted by a qualified architectural historian, defined above, and shall include large-format photography, measured drawings, written architectural descriptions, and historical narratives. The completed documentation shall be submitted to the U.S. Library of Congress. • Relocation of historical resources in conformance with the U.S. Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings. • Monitoring construction-related and operational vibrations at historical resources. • For historical resources that are landscapes, preservation of the landscape's historic form, features, and details that have evolved over time, in conformance with the U.S. Secretary of the Interior's Guidance for the Treatment of Cultural Landscapes. • Development and implementation of interpretive programs or displays, and community outreach.		
	CUL-2: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines Section 15064.5.	PS	PS	**Mitigation Measure CUL-2: Conduct Inventory and Significance Evaluation of Archaeological Resources.** Before implementation of a project under the GSP that includes ground disturbance, an archaeological records search and sensitivity assessment shall be conducted. The inventory should be completed by, or under the direct supervision of, a qualified archaeologist, defined as one who meets the U.S. Secretary of the Interior's Professional Qualifications Standards for Archeology, and shall include the following: • Map(s) and verbal description of the project area that delineates both the horizontal and vertical extents of where a project could result in impacts, including both direct and indirect, on cultural resources. • A records search at the appropriate repository of the CHRIS for the project area and vicinity (typically areas within 0.25 or 0.5 mile, based on setting) to acquire records on previously recorded cultural resources in the project area and vicinity, and previous cultural resources studies conducted for the project area and vicinity. • Outreach to the California NAHC, including a request of a search of the Sacred Lands File for the project area, to determine if any documented Native American sacred sites could be affected by the project. • Consultation with California Native American Tribes pursuant to PRC Section 21080.3 to determine whether any indigenous archaeological resource or tribal cultural resources could be affected by the project. Project proponents shall submit a Sacred Lands File & Native American Contacts List Request to the NAHC at the initial stages of project development. Any tribe identified by the NAHC will require notification of the proposed project by the lead agency as soon as practicable during early design. • Background research on the history, including ethnography and indigenous presence, of the project area and vicinity. • An archaeological sensitivity analysis of the project area based on mapped geologic formations and soils, previously recorded archaeological resources, previous archaeological studies, and Native American consultation. If an archaeological survey is not warranted based on the above review, a summary of the assessment and justification of the determination will be prepared. If the CEQA lead agency agrees with the determination, no further study is needed.	SU	SU

Table ES-5 (continued)
Summary of Environmental Impacts and Mitigation Measures

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.6 Cultural Resources (cont.)	**CUL-2** (cont.)			If a survey is warranted as a result of archival studies and consultations, an archaeological field survey of the project area will be conducted. If previous archaeological field surveys no more than 10 years old have been conducted for the project area, a new field survey is not necessary. The field survey shall include, at a minimum, a pedestrian survey. If the archaeological sensitivity analysis suggests a high potential for buried archaeological resources in the project area, a subsurface survey may also be conducted. Any archaeological resources identified in the project area during the survey shall be recorded on the appropriate California Department of Parks and Recreation 523 forms. • If resources are identified in the project area, they shall be evaluated for California Register eligibility (i.e., whether they qualify as historical resources, as defined in State CEQA Guidelines Section 15064.5 or unique archaeological resources, as defined in PRC Section 21083.2). Such evaluation may require archaeological testing (excavation), potentially including laboratory analysis, and consultation with relevant Native American representatives (for indigenous resources). • If California Register-eligible resources are present, an assessment of potential project impacts shall be conducted. This shall include an analysis of whether the project's potential impacts would materially alter the resource's physical characteristics that convey its historical significance and that justify its eligibility for inclusion in the California Register. If potentially significant impacts on archaeological resources that qualify as historical resources (per State CEQA Guidelines Section 15064.5) and/or unique archaeological resources (per PRC Section 21083.2) are identified, an approach for reducing such impacts shall be developed, in coordination with interested or consulting parties (e.g., Native American representatives, historical societies, or local communities as appropriate). Typical measures for reducing impacts include: • Modify the project to avoid impacts on resources. • Plan parks, green space, or other open space to incorporate the resources. • Develop and implement a detailed archaeological resources management plan to recover the scientifically consequential information from archaeological resources before any excavation at the resource's location. Treatment for most archaeological resources consists of (but is not necessarily limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the recovery of important scientific data contained in the portion(s) of the resource to be affected by the project. • Develop and implement interpretive programs or displays, and conduct community outreach. **Mitigation Measure CUL-3: Implement Measures to Protect Archaeological Resources during Project Construction or Operation.** If cultural materials are encountered during construction or operation of any project implemented under the GSP, all activity within 100 feet of the find shall cease and the find shall be flagged for avoidance. The lead agency and a qualified archaeologist, defined as one meeting the U.S. Secretary of the Interior's Professional Qualifications Standards for Archeology, shall be immediately informed of the discovery. The qualified archaeologist shall inspect the discovery and notify the lead agency of their initial assessment. If the qualified archaeologist determines that the resource is or is potentially indigenous in origin, the lead agency shall consult with culturally affiliated California Native American Tribes to assess the find and determine whether it is potentially a tribal cultural resource. If the lead agency determines, based on recommendations from the qualified archaeologist and culturally affiliated California Native American Tribes, that the resource may qualify as a historical resource (per State CEQA Guidelines Section 15064.5), unique archaeological resource (per PRC Section 21083.2), or tribal cultural resource (per PRC Section 21074), then the resource shall be avoided if feasible. If avoidance is not feasible, the lead agency shall consult with a qualified archaeologist, culturally affiliated California Native American Tribes, and other appropriate interested parties to determine treatment measures to minimize or mitigate any potential impacts on the resource pursuant to PRC Section 21083.2 and State CEQA Guidelines Section 15126.4. Once treatment measures have been determined, the lead agency shall prepare and implement an archaeological (and/or tribal cultural) resources management plan that outlines the treatment measures for the resource. Treatment measures typically consist of the following steps: • Modify the project to avoid impacts on resources. • Plan parks, green space, or other open space to incorporate resources. • Recover the scientifically consequential information from the archaeological resource before any excavation at the resource's location. This typically consists of (but is not necessarily limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the recovery of important scientific data contained in the portion(s) of the resource to be affected by the project. • Develop and implement interpretive programs or displays. If the resource qualifies as a tribal cultural resource (per PRC Section 21074), implement measures for avoiding or reducing impacts such as the following: • Avoid and preserve the resource in place through measures that include but are not limited to the following: – Plan and construct the project to avoid the resource and protect the cultural and natural context. – Plan greenspace, parks, or other open space to incorporate the resources with culturally appropriate protection and management criteria.		

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.6 Cultural Resources (cont.)	**CUL-2** (cont.)			• Treat the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, through measures that include but are not limited to the following: – Protect the cultural character and integrity of the resource. – Protect the traditional use of the resource. – Protect the confidentiality of the resource. • Implement permanent conservation easements or other interests in real property, with cultural appropriate management criteria for the purposes of preserving or using the resource or place.		
	CUL-3: Implementing PMAs under the Turlock Subbasin GSP could disturb any human remains, including those interred outside of formal cemeteries.	PS	PS	**Mitigation Measure CUL-4: Implement Measures to Protect Human Remains during Project Construction or Operation.** If human remains are encountered during construction or operation and maintenance of any project implemented under the GSP, all work shall immediately halt within 100 feet of the find, and the lead agency shall contact the appropriate county coroner to evaluate the remains and follow the procedures and protocols set forth in State CEQA Guidelines Section 15064.5(e)(1). If human remains encountered are on or in the tide and submerged lands of California, the lead agency shall also contact the California State Lands Commission. If the coroner determines that the remains are Native American in origin, the appropriate county shall contact the California NAHC, in accordance with California Health and Safety Code Section 7050.5(c) and PRC Section 5097.98. Per PRC Section 5097.98, the project's lead agency shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located is not damaged or disturbed by further development activity until the lead agency has discussed and conferred, as prescribed PRC Section 5097.98, with the most likely descendants and the property owner regarding their recommendations, if applicable, taking into account the possibility of multiple human remains.	SU	SU
3.7 Energy Resources	**ENE-1:** Implementing PMAs under the Turlock Subbasin GSP could result in wasteful, inefficient, or unnecessary consumption of energy resources.	LTS	LTS	None.	LTS	LTS
	ENE-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	LTS	LTS	None.	LTS	LTS
3.8 Geology, Soils and Paleontological Resources	**GEO-1:** Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	PS	PS	**Mitigation Measure GEO-1: Include Geotechnical Design Recommendations.** To minimize potential impacts from seismic events and the presence of adverse soil conditions, lead agencies shall ensure that geotechnical design recommendations are included in the design of features and construction specifications. Recommended measures to address adverse conditions shall conform to applicable design codes, guidelines, and standards.	LTSM	LTSM
	GEO-2: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	PS	PS	**Mitigation Measure GEO-2: Conduct Geotechnical Investigation and Report.** A PMA geotechnical investigation shall be performed and a geotechnical report prepared for any PMA that would result in potentially significant grading activities. The geotechnical report shall include a quantitative analysis to determine whether excavation or fill placement would result in a potential for damage due to soil subsidence during and/or after construction. Project designs shall incorporate measures to reduce the potential damage to a less-than-significant level. Measures shall include but not be limited to: • Removal and recompaction of existing soils susceptible to subsidence. • Ground improvement (such as densification by compaction or grouting, soil cementation). • Reinforcement of structural components to resist deformation due to subsidence. The assessment of subsidence for specific projects shall analyze the individual PMA potential for and severity of cyclic seismic loading. A geotechnical investigation shall also be performed by an appropriately licensed professional engineer and/or geologist to determine the presence and thickness of potentially liquefiable sands that could result in loss of bearing value during seismic shaking events. Project designs shall incorporate measures to mitigate potential damage to a less-than-significant level. Measures shall include but not be limited to: • Ground improvement (such as grouting or soil cementation). • Surcharge loading by the placement of fill, excavation, soil mixing with non-liquefiable finer-grained materials, and replacement of liquefiable materials at shallow depths.	LTSM	LTSM

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.8 Geology, Soils and Paleontological Resources (cont.)	**GEO-2** (cont.)			• Reinforcement of structural components to resist deformation due to liquefaction. • An analysis of individual PMAs' probable and credible seismic acceleration values, conducted in accordance with current applicable standards of care, shall be performed to provide for a suitable project design. Geotechnical investigations shall be performed and geotechnical reports shall be prepared in the responsible care of California-licensed geotechnical professionals including professional civil engineers, certified geotechnical engineers, professional geologists, certified engineering geologists, and certified hydrogeologists, all of whom practice within the current standards of care for such work		
	GEO-3: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.	PS	PS	**Mitigation Measure GEO-2: Conduct Geotechnical Investigation and Report.**	LTSM	LTSM
	GEO-4: Implementing PMAs under the Turlock Subbasin GSP could result in substantial soil erosion or the loss of topsoil.	LTS	LTS	**Mitigation Measures AIR-2: Minimize dust from fallowed lands.**	LTS	LTS
	GEO-5: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.	LTS	LTS	None	LTS	LTS
	GEO-6: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on expansive soils, creating substantial direct or indirect risks to life or property.	PS	PS	**Mitigation Measure GEO-3: Conduct Expansive Clay Investigation.** In areas where expansive clays exist, a licensed professional engineer or geologist shall perform a hydrogeological/geotechnical investigation to identify and quantify the potential for expansion, particularly differential expansion of clayey soils caused by leakage and saturation beneath new improvements. Measures could include, but are not limited to, removing and recompacting problematic expansive soils, stabilizing soils, and/or reinforcing the constructed improvements to resist deformation from the expansion of subsurface soils.	LTSM	LTSM
	GEO-7: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	PS	PS	**Mitigation Measure GEO-04: Determination of Paleontological Potential.** Prior to issuance of a grading permit for any PMA that requires ground disturbance (i.e., excavation, grading, trenching, etc.) in previously undisturbed deposits of Holocene-age alluvium and/or the Modesto, Riverbank, or Mehrten formations, the PMA will undergo a CEQA-level analysis to determine the potential for a project to encounter significant paleontological resources, based on a review of site-specific geology and the extent of ground disturbance associated with each project. The analysis shall include, but would not be limited to: (1) a paleontological records search, (2) geologic map review, and (3) peer-reviewed scientific literature review. If it is determined that a site has the potential to disturb or destroy significant paleontological resources, a professional paleontologist (meeting the SVP standards) will be retained to recommend appropriate mitigation to reduce or avoid significant impacts on paleontological resources, based on project-specific information. Such measures could include, but would not be limited to: (1) preconstruction worker awareness training, (2) paleontological resource monitoring, and (3) salvage of significant paleontological resources.	LTSM	LTSM
3.9 Greenhouse Gas Emissions	**GHG-1:** Implementing PMAs under the Turlock Subbasin GSP could generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.	PS	LTS	**Mitigation Measure GHG-1: Implement BPS for all construction projects under the Turlock Subbasin GSP.** For all construction projects associated with PMAs, the PMA proponent shall implement the following measures, as applicable, to minimize GHG emissions to the extent practicable: • The contractor shall ensure that line power is used instead of diesel generators at all construction sites where line power is feasible. • The contractor shall ensure that the operation of any stationary, compression-ignition engines as part of construction, complies with Section 93115, Title 17, California Code of Regulations, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements as well as emission standards.	LTSM	LTS

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.9 Greenhouse Gas Emissions (cont.)	**GHG-1** (cont.)			• Fixed temporary sources of air emissions (such as portable pumps, compressors, generators) shall be electrically powered unless the contractor submits documentation and receives approval from the Engineer that the use of such equipment is not practical, feasible, or available. All portable engines and equipment units used as part of construction shall be properly registered with the CARB or otherwise permitted by the appropriate local air district, as required. • The contractor shall implement standard air emissions controls such as: – Use local sources of construction materials, including use of localized “borrow” sites, when economically feasible. – Minimize the use of diesel generators where possible. – Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes as required by the California Airborne Toxics Control Measure (ATCM) Title 13, Section 2485 of California Code of Regulations. Clear signage shall be provided for construction workers at all access points. – Minimize the idling time of diesel-powered construction equipment to 5 minutes. – Follow applicable regulations for fuel, fuel additives, and emissions standards for stationary, diesel-fueled engines. – Perform regular low-emissions tune-ups on all construction equipment, particularly haul trucks and earthwork equipment. • The contractor shall implement the following measures to reduce GHG emissions from fuel combustion: – On-road and off-road vehicle tire pressures shall be maintained to manufacturer’s specifications. Tires shall be checked and re-inflated at regular intervals. – Construction equipment engines shall be maintained to manufacturer’s specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. – Demolition debris shall be recycled for reuse to the extent feasible.		
	GHG-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.	LTS	LTS	None	LTS	LTS
3.10 Hazards and Hazardous Materials	**HAZ-1:** Implementing PMAs under the Turlock Subbasin GSP could create a significant hazard to the public or the environment through the routine transport, use, disposal, or accidental release of hazardous materials.	LTS	LTS	None	LTS	LTS
	HAZ-2: Implementing PMAs under the Turlock Subbasin GSP could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	LTS	LTS	None	LTS	LTS
	HAZ-3: PMAs implemented under the Turlock Subbasin GSP could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could create a significant hazard to the public or the environment.	PS	LTS	**Mitigation Measure HAZ-1: Conduct Phase I Assessment.** Before the start of any construction requiring ground-disturbing activities on industrial and commercial properties, as well as listed active hazardous materials cleanup sites, the project applicant shall complete a Phase I environmental site assessment for that property in accordance with American Society for Testing and Materials Standard E1527 for those active hazardous materials sites to ascertain their current status. Any recommended follow-up sampling (i.e., Phase II activities) set forth in the Phase I assessment shall be implemented before construction. The results of Phase II studies, if necessary, shall be submitted to the local overseeing agency and any required remediation or further delineation of identified contamination shall be completed before the start of construction. **Mitigation Measure HAZ-2: Prepare and Implement Site-Specific Health and Safety Plan.** For those properties for which the Phase I assessment identifies hazardous materials issues, before the start of ground-disturbing activities, including grading, trenching, or excavation, or structure demolition, the project applicant for the specific work proposed shall require that the construction contractor(s) retain a qualified professional to prepare a site-specific health and safety plan in accordance with federal Occupational Safety and Health Administration regulations (Code of Federal Regulations Title 29, Section 1910.120) and California Occupational Safety and Health Administration regulations (California Code of Regulations Title 8, Section 5192).	LTSM	LTS

Table ES-5 (continued)
Summary of Environmental Impacts and Mitigation Measures

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.10 Hazards and Hazardous Materials (cont.)	**HAZ-3** (cont.)			The construction contractor shall implement the health and safety plan to protect construction workers, the public, and the environment during all ground-disturbing and structure demolition activities. The plan shall designate a site health and safety officer, summarize the anticipated risks, describe personal protective equipment and decontamination procedures, and identify the procedures to follow if evidence of potential soil or groundwater contamination is encountered. **Mitigation Measure HAZ-3: Develop and Implement Soil and Groundwater Management Plan.** In support of the health and safety plan described in Mitigation Measure HAZ-2, the project applicant shall require that its contractor(s) develop and implement a soil and groundwater management plan for the management of soil and groundwater before any ground-disturbing activity. The soil and groundwater management plan shall describe the hazardous materials that may be encountered; the roles and responsibilities of on-site workers and supervisors; training for site workers on recognizing and responding to encounters of hazardous materials; and protocols for handling, removing, transporting, and disposing of all excavated soil and dewatering effluent in a safe, appropriate, and lawful manner.		
	HAZ-4: PMAs implemented under the Turlock Subbasin GSP that could be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, could result in a safety hazard or excessive noise for people residing or working in the area.	LTS	LTS	None	LTS	LTS
	HAZ-5: Implementing PMAs under the Turlock Subbasin GSP could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	PS	LTS	None	LTSM	LTS
	HAZ-6: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.	LTS	LTS	None	LTS	LTS
3.11 Hydrology and Water Quality	**HYD-1:** Implementing PMAs under the Turlock Subbasin GSP could result in a release of pollutants into surface water and/or groundwater, including in a flood zone as a result of project inundation, that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan.	PS	LTS	**Mitigation Measure HYD-1: Implement Water Quality Protection Measures during Construction of New Features or Modification of Existing Features.** Implementation of all typical construction mitigation measures shall be required for construction of new features. Typical mitigation measures include the following construction-related best management practices (BMPs) that would be implemented under project-specific Storm Water Pollution Prevention Plans (SWPPPs): • Soil stabilization, sediment control, wind erosion control, tracking control, non-stormwater management, and waste management/materials pollution control shall be implemented. – Gravel bags, silt fences, etc., shall be placed along the edge of all work areas to contain particulates before contact with receiving waters. – All concrete washing and spoils dumping shall occur in a designated location. • Construction stockpiles shall be covered to prevent blowoff or runoff during weather events. • Severe-weather-event erosion control materials and devices shall be stored on-site for use as needed. • Regular and post-storm inspections to deploy and adapt BMPs to minimize stormwater pollutant discharges. • Other BMPs shall be applied as determined necessary by the regulating entity (city, county). For any construction activities with the potential to cause in-water sediment disturbance associated with construction (e.g., in a river, canal, or other conveyance feature): • BMPs shall be applied to avoid or reduce temporary increases in suspended sediment. These BMPs may include but are not limited to silt curtains, cofferdams, the use of environmental dredges, erosion control on all inward slopes, and various bank stabilization techniques, including revegetation. All construction sites will include preparation of a SWPPP and BMPs designed to capture spills and prevent erosion to the water body. Turbidity shall be monitored upstream and downstream of construction sites as a measure of the impact. • Bank stabilization BMPs shall be applied as needed for any in-channel disturbance. For example: – A 100-foot vegetative or engineered buffer shall be maintained between the construction zone and the surface water body. – Native and annual grasses or other vegetative cover shall be established on construction sites immediately upon completion of work causing a disturbance, to reduce the potential for erosion close to a waterway or water body.	LTSM	LTS

Table ES-5 (continued)
Summary of Environmental Impacts and Mitigation Measures

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.11 Hydrology and Water Quality (cont.)	**HYD-2:** Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on- or off-site; result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or impede or redirect flood flows.	LTS	PS	**Mitigation Measure HYD-2: Minimize Adverse Surface Runoff Impacts.** To minimize adverse impacts from surface runoff, the proponent of a project or management action implemented under the Turlock Subbasin GSP shall do all of the following, as applicable: • Prepare a drainage or hydrology and hydraulic study assessing the need for and provide a basis for the design of drainage-related mitigation measures, such as new on-site drainage systems or new cross drainage facilities. The study shall be prepared in accordance with the applicable standards of FEMA, USACE, DWR, the CVFPB, and the local cities. Subsequent mitigation measures shall be designed in accordance with the final study and with the applicable standards of FEMA, USACE, DWR, and the CVFPB. The study shall identify potential increases in flood risks, including those that may result from new facilities. • Provide cross drainage, replacement drainage paths and facilities, and enlarged flow paths to reroute drainage around, under, or over the facilities for the project or management action, and to restore the function of any affected existing drainage or flow paths and facilities. • For areas that would be flooded as a result of the project, or where existing flooding would be increased in magnitude, frequency, or duration, purchase a flowage easement and/or property at fair market value. • Provide a long-term sediment removal program at in-river structures.	LTS	LTSM
	HYD-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of groundwater–surface water interactions.	LTS	LTS	None	LTS	LTS
	HYD-4: Implementing PMAs under the Turlock Subbasin GSP could result in conflicts with existing water rights (beneficial use and/or point of diversion).	LTS	LTS	None	LTS	LTS
	HYD-5: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration to groundwater conditions in adjacent basins.	LTS	PS	**Mitigation Measure HYD-3: Minimize Adverse Groundwater Changes.** Proponents of PMAs geographically located adjacent to the neighboring groundwater basins shall review the GSPs as part of their project planning and design to determine the extent of localized changes in groundwater conditions. Once the specific characteristics and locations of the direct and in-lieu recharge projects are known, proponents of PMAs shall confirm that their operations would not affect groundwater conditions in neighboring basins, by conducting modeling and/or considering groundwater monitoring wells within the project or management action footprint. Criteria to consider may include the location of the project relative to neighboring groundwater basins, depth to groundwater in the project area, potential for the constructed features to reach the aquifer and/or alter net subsurface flow from neighboring basins, and similar projects occurring in those neighboring basins that may complement the project. An expansive groundwater monitoring network that supports implementation of the Turlock Subbasin GSP also provides opportunities to assess groundwater conditions at the project's site. Models developed as part of the GSP's implementation may also be consulted.	LTS	LTSM
3.12 Land Use and Planning	**LU-1:** Implementing PMAs under the Turlock Subbasin GSP could conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.	LTS	PS	None	LTS	SU
	LU-2: Implementing PMAs under the Turlock Subbasin GSP could physically divide an established community	LTS	LTS	None	LTS	LTS

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.13 Mineral Resources	**MIN-1:** Implementing PMAs under the Turlock Subbasin GSP would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.	LTS	LTS	None	LTS	LTS
3.14 Noise	**NOI-1:** Implementing PMAs under the Turlock Subbasin GSP could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	PS	LTS	**Mitigation Measure NOI-1: Noise Control for pile Installation Activities.** When pile driving would occur within 100 feet of a noise-sensitive receptor, implement "quiet" pile-driving technology (such as pre-drilling of piles, sonic pile drivers, auger cast-in-place, or drilled-displacement), where feasible, in consideration of geotechnical and structural requirements and conditions. • Where the use of driven impact piles cannot be avoided, properly fit impact pile driving equipment with an intake and exhaust muffler and a sound-attenuating shroud, as specified by the manufacturer. • Limit pile driving activities to weekdays from 9:00 a.m. to 4:00 p.m. if occurring within 500 feet of a noise-sensitive receptor. • Notify neighboring noise-sensitive receptors within 500 feet of a PMA construction area at least 30 days in advance of high-intensity noise-generating activities (e.g., well drilling, pile driving, and other activities that may generate noise levels greater than 90 dBA at noise sensitive receptors) about the estimated duration of the activity. **Mitigation Measure NOI-2: Best Management Practices for Construction Noise Control within the City of Turlock.** ***Noise Control and Monitoring Plan.*** Requires that the contractor submit a plan detailing the means and methods for controlling and monitoring noise generated by construction activities, including demolition, alteration, repair, or remodeling of or to existing structures and construction of new structures, as well as by items of machinery, equipment, or devices used during construction activities on the site for the engineer's acceptance prior to any work at the jobsite. The plan shall detail the equipment and methods used to monitor compliance with the plan. ***Noise Control.*** Require contractors to implement noise controls for on-site activities and describe measures that shall be implemented to reduce the potential for noise disturbance at adjacent or nearby residences. Noise control measures required by the specification include: • Contractor is responsible for taking appropriate measures, including muffling of equipment, selecting quieter equipment, erecting noise barriers, modifying work operations, and other measures to bring construction noise into compliance. • Each internal combustion engine used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler. • Best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) shall be used for all equipment and trucks. • Stationary noise sources (e.g., chippers, grinders, compressors) shall be located as far from sensitive receptors as possible. If they must be located near receptors, adequate muffling (with enclosures) shall be used. Enclosure opening or venting shall face away from sensitive receptors. Enclosures shall be designed by a registered engineer regularly involved in noise control analysis and design. • Material stockpiles as well as maintenance/equipment staging and parking areas (all on site) shall be located as far as practicable from residential receptors. • If impact equipment (e.g., jack hammers, pavement breakers, and rock drills) is used, the contractor is responsible for taking appropriate measures, including but not limited to the following: – Hydraulically or electric-powered equipment shall be used wherever feasible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where the use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust shall be used (a muffler can lower noise levels from the exhaust by up to about 10 dB). External jackets on the tools themselves shall be used, where feasible, which could achieve a reduction of 5 dB. Quieter procedures, such as drilling rather than impact equipment, will be used whenever feasible. It is the contractor's responsibility to implement any mitigations necessary to meet applicable noise requirements. – Impact construction including jackhammers, hydraulic backhoe, concrete crushing/recycling activities, and vibratory pile drivers will be limited to between 8:00 a.m. and 4:00 p.m., Monday through Friday, within residential communities, and will be limited in duration to the maximum extent feasible. – Limit the noisiest phases of construction to 10 workdays at a time, where feasible. – Notify neighbors/occupants within 300 feet of project construction at least 30 days in advance of extreme noise-generating activities about the estimated duration of the activity.	LTSM	LTS

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.14 Noise (cont.)	**NOI-1** (cont.)			**Mitigation Measure NOI-3: Nighttime Well Construction.** If nighttime (10:00 p.m. to 7:00 a.m.) well construction within 80 feet of a residence or other noise-sensitive location is required for a given PMA, the following measures shall be implemented to reduce potential noise impacts: • The PMA proponent shall install 20-foot tall, engineered noise walls along the northern, eastern, and southern perimeter of the drill site. The walls shall consist of 20-foot by 4-foot and 20-foot by 8-foot sound panels, installed with sound curtains on the noise source side of the wall (batt insulation sewn between vinyl laminates with a weight of 1 pound per square feet). • At least 30 days prior to drilling activities drill site, the PMA applicant shall offer off-site lodging accommodations for all residences within 80 feet of the drill site.		
	NOI-2: Implementing PMAs under the Turlock Subbasin GSP could generate excessive groundborne vibration or groundborne noise levels.	PS	LTS	**Mitigation Measure NOI-1: Noise Control for pile Installation Activities (above)** **Mitigation Measure NOI-4: Vibration Avoidance from Compaction.** All PMA applicants for projects requiring compaction shall implement the following vibration avoidance and reduction measures: • Contractors shall use non-vibratory, excavator-mounted compaction wheels and small, smooth drum rollers for final compaction of asphalt base and asphalt concrete, if within 50 feet of a historic structure or 25 feet of a conventionally constructed structure. If needed to meet compaction requirements, smaller vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet vibration standards. • Avoid using vibratory rollers and clam shovel drops near sensitive areas. • Construction methods shall be modified, or alternative construction methods shall be identified, and designed to reduce vibration levels below the limits.	LTSM	LTS
3.15 Population and Housing	**POP-1:** Implementing PMAs under the Turlock Subbasin GSP could induce substantial unplanned population growth in the area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).	LTS	LTS	None	LTS	LTS
	POP-2: Implementing PMAs under the Turlock Subbasin GSP could result in the displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.	LTS	LTS	None	LTS	LTS
3.16 Recreation	**REC-1:** Implementing PMAs under the Turlock Subbasin GSP could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	LTS	PS	**Mitigation Measure REC-1: Minimize Impairment, Degradation, or Elimination of Recreational Resources.** If PMAs implemented under the Turlock Subbasin GSP result in the substantial impairment, degradation, or elimination of recreational facilities, replacement facilities of equal capacity and quality shall be developed and installed.	LTS	LTSM
	REC-2: Implementing PMAs under the Turlock Subbasin GSP could include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment.	LTS	PS	**Mitigation Measure REC-1: Minimize Impairment, Degradation, or Elimination of Recreational Resources.** If PMAs implemented under the Turlock Subbasin GSP result in the substantial impairment, degradation, or elimination of recreational facilities, replacement facilities of equal capacity and quality shall be developed and installed.	LTS	LTSM

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.17 Transportation	**TRANS-1:** Implementing PMAs under the Turlock Subbasin GSP could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.	PS	LTS	**Mitigation Measure TRANS-1: Prepare and Implement a Construction Traffic Management Plan.** The proponent(s) of a project or management action shall require that the contractor(s) prepare and implement a construction traffic management plan to manage traffic flow during construction, reduce potential interference with local emergency response plans, reduce potential traffic safety hazards, and ensure adequate access for emergency responders. Development and implementation of this plan shall be coordinated with local agencies with jurisdiction over affected roadways, and/or the construction contractor(s) shall ensure that the plan is implemented during construction. The plan may include but not be limited to the following measures: • Identify construction truck haul routes and timing to limit conflicts between truck and automobile traffic on nearby roads. The identified routes will be designed to minimize impacts on vehicular, bicycle, and pedestrian traffic, circulation, and safety. • Implement comprehensive traffic control measures, including scheduling of major truck trips and deliveries to avoid peak traffic hours, warning and detour signs (if required), lane closure procedures (if required), and traffic cones for drivers indicating potential road hazards or detours (if required). • Coordinate construction activities to ensure that one lane of traffic in each direction remains open at all times, unless flaggers or temporary traffic controls are in place, to provide emergency access. • Evaluate the need to provide flaggers or temporary traffic control at project driveways and entries to staging areas. • Notify affected adjacent property owners and public safety personnel regarding the timing of major deliveries, detours, and lane closures. • Develop a process for responding to and tracking issues pertaining to construction activity impacts on traffic, including identification of an on-site traffic manager. Post 24-hour contact information for the traffic manager on all construction sites. • Document road pavement conditions for all routes that would be used by construction vehicles before and after project construction. Make provisions to monitor the condition of roads used for haul routes so that any damage or debris attributable to haul trucks can be identified and corrected. Roads damaged by construction vehicles shall be repaired to their preconstruction condition.	LTSM	LTS
	TRANS-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or be inconsistent with State CEQA Guidelines Section 15064.3(b).	PS	LTS	**Mitigation Measure TRANS-2: Reduce Emissions.** To achieve compliance with State CEQA Guidelines Section 15064.3(b), the following measures shall be taken to reduce effects associated with increased VMT: • Limit idling time for commercial vehicles, including delivery and construction activities. • Use low- or zero-emissions vehicles, including construction vehicles. • Institute a heavy-duty off-road vehicle plan and a construction vehicle inventory tracking system for construction projects. • Promote ridesharing. • Provide the necessary facilities and infrastructure to encourage the use of low- or zero-carbon emissions vehicles (e.g., electric vehicle charging facilities and conveniently located alternative fueling stations). • Increase the cost of driving and parking private vehicles, such as by imposing tolls and parking fees. • Provide information on all locally feasible options for individuals and businesses to reduce transportation-related emissions.	LTSM	LTS
	TRANS-3: Implementing PMAs under the Turlock Subbasin GSP could substantially increase hazards due to a geometric design feature or incompatible uses.	PS	PS	**Mitigation Measure TRANS-3: Conduct Routine Inspections.** An inspection and operation plan shall be developed and implemented, where applicable. The plan shall include procedures for routine inspections and operation of infrastructure facilities to allow safe navigation should a facility become damaged or malfunction. This plan shall include the following specific components: • Routine inspections and correction procedures to ensure that the facility's safety features are in good working order. • Routine inspections and correction procedures for navigational hazards around facilities, including floating or submerged debris. **Mitigation Measure TRANS-4: Repair Damaged Roadways and Trails Following Construction.** If damage to any roads, sidewalks, trails, and/or medians occurs, the construction contractor shall coordinate with the proponent(s) of the project or management action to ensure that the damage is adequately repaired in accordance with applicable agency standards. Roads and/or driveways disturbed by construction activities or construction vehicles shall be properly restored to ensure long-term protection of road surfaces. Roadside drainage structures and road drainage features (e.g., rolling dips) shall be protected by regrading and reconstructing roads to drain properly. The construction contractor shall work with the applicable agencies to document the preconstruction conditions of road features before construction begins.	LTSM	LTSM
	TRANS-4: Implementing PMAs under the Turlock Subbasin GSP could result in inadequate emergency access.	PS	LTS	**Mitigation: Implement Mitigation Measure TRANS-1.**	LTSM	LTS

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.18 Tribal Cultural Resources	**TCR-1:** Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a tribal cultural resource, as defined in PRC Section 21074.	PS	PS	**Mitigation Measure: Implement Mitigation Measure CUL-2.** For the text of this mitigation measure, see the discussion of Impact CUL-2 in Section 3.6, *Cultural Resources*. **Mitigation Measure: Implement Mitigation Measure CUL-3.** For the text of this mitigation measure, see the discussion of Impact CUL-2 in Section 3.6, *Cultural Resources*. **Mitigation Measure: Implement Mitigation Measure CUL-4.** For the text of this mitigation measure, see the discussion of Impact CUL-3 in Section 3.6, *Cultural Resources*.	PSU	SU
3.19 Utilities and Service Systems and Public Services	**UTIL-1:** Implementing PMAs under the Turlock Subbasin GSP could result in the construction or relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.	PS	LTS	None	PSU	LTS
	UTIL-2: Implementing PMAs under the Turlock Subbasin GSP could result in a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs and fail to comply with federal, state, and local statutes and regulations related to solid waste.	LTS	LTS	None	LTS	LTS
	UTIL-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, and other public facilities.	LTS	LTS	None	LTS	LTS
3.20 Wildfire	**WILD-1:** Implementing PMAs under the Turlock Subbasin GSP could substantially impair an adopted emergency response plan or emergency evacuation plan.	PS	LTS	**Mitigation Measure: Implement Mitigation Measure TRANS-1.** For the text of this mitigation measure, see the discussion of Impact TRANS-1 in Section 3.17, *Transportation*.	LTSM	LTS
	WILD-2: Implementing PMAs under the Turlock Subbasin GSP could, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.	LTS	LTS	None	LTS	LTS

TABLE ES-5 (CONTINUED)
SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Issue Area	Impact Statement	LOS Prior to Mitigation Construction	LOS Prior to Mitigation Constructed Features and Operations and Maintenance	Mitigation	LOS After Mitigation Construction	LOS After Mitigation Constructed Features and Operations and Maintenance
3.20 Wildfire (cont.)	**WILD-3:** Implementing PMAs under the Turlock Subbasin GSP could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.	LTS	LTS	None	LTS	LTS
	WILD-4: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	LTS	LTS	None	LTS	LTS

NOTES:

LTS—Less than significant; LTSM—Less than significant after application of feasible mitigation measure(s); NI—No Impact; PS—Potentially Significant; PSU—Potentially Significant and Unavoidable; SU—Significant and Unavoidable.

SOURCE: Data compiled by Environmental Science Associates in 2022.

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CHAPTER 1
Introduction

1.1 California Groundwater Management Background

California has developed an intricate water management system, crafted over more than a century to meet diverse and competing water demands that vary from one region and location to another. In the Central Valley, municipal, agricultural, industrial, recreational, and environmental needs for water resources depend to a great extent on surface water that originates as winter snowpack in the alpine Sierra Nevada. Typically, the snowpack melts during late spring, filling rivers and streams, replenishing surface water reservoirs, and recharging groundwater aquifers. Central Valley water users also depend on groundwater for a major portion of their annual water supply, particularly during times of drought, when they use groundwater to offset surface water shortages. The degree of reliance on surface water and groundwater resources varies from location to location in the Central Valley.

Until recently, groundwater use has been largely unregulated. However, recent (early 2010s) unprecedented drought conditions contributed to the overdraft of many groundwater basins throughout the state, as water withdrawals exceeded the amount replenished from rainfall, streamflow, and irrigation return flow. As pumping causes groundwater levels to drop, aquifers can draw in water from adjacent rivers and streams, reducing river flows and harming habitat. Given the economic and environmental effects of these and other concerns, the California Legislature imposed a new regulatory framework to better manage groundwater and replenish overdrafted basins for long-term water sustainability. Sustainable groundwater management is essential to ensure a reliable and resilient water supply for California (PPIC 2017).

1.2 Sustainable Groundwater Management Act

In 2014, Governor Edmund G. Brown, Jr. signed into law the Sustainable Groundwater Management Act (SGMA) to establish a statewide goal for achieving long-term groundwater sustainability by 2042. Before 2014, groundwater regulation occurred through Assembly Bill (AB) 3030 and other voluntarily supported resource conservation programs developed in the 1990s. In addition, competing water users from the same groundwater basin often deferred to court-supervised negotiation and settlement to better define the various entities' rights to use groundwater resources (Water Education Foundation 2021). Although these efforts brought positive change in certain regions of California, they did not address the statewide crisis of overdrafted groundwater basins (DWR 2021a).

One of SGMA's purposes is to quantify the amount of water stored in groundwater basins to ensure that annual withdrawals are sustainable. SGMA also directed the California Department of Water Resources (DWR) to develop regulations to revise groundwater basin boundaries, adopt regulations for evaluating and implementing groundwater sustainability plans (GSPs), identify basins subject to critical conditions and overdraft, identify water available for groundwater replenishment, and document best practices for sustainable groundwater management.

SGMA emphasizes local management and requires local and regional agencies to form groundwater sustainability agencies (GSAs) (DWR 2021b). The State Water Resources Control Board (State Water Board) and DWR are the two state agencies that oversee implementation of SGMA. DWR acts as a facilitator and evaluator, assisting with groundwater data management, supporting local GSAs in their development of GSPs, and evaluating GSPs once they are developed. The State Water Board is authorized to enforce SGMA and ensure that basins comply with its requirements (Downing 2018).

1.2.1 Groundwater Sustainability Agencies

A legislative intent of SGMA is to recognize and preserve the authority of cities, counties, and other local agencies with land use or water regulatory authorities to manage groundwater according to their existing powers. Local agencies are expected to collaborate by forming GSAs and coordinate on a basin-wide scale to sustainably manage groundwater at a local level. Any local agency, defined by SGMA as a local public agency that has water supply, water management, or land use responsibilities within the groundwater basin, or a combination of local agencies may form a GSA for a basin.

A GSA is required to perform the duties and exercise the necessary powers of a GSA when it develops, implements, and enforces a basin's groundwater sustainability program. GSAs possess broad authority to regulate groundwater to reach sustainable yield for their designated groundwater basins. *Sustainable yield* is defined as the maximum quantity of water calculated over long-term conditions in the basin, including any temporary excess, that can be withdrawn over a year without an undesirable result (DWR 2021b).

GSAs involved in the development of the Turlock Subbasin GSP are described in more detail in Section 1.3, *Overview of the Program Environmental Impact Report*, and Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies.*

1.2.2 Groundwater Sustainability Plans

Under SGMA, GSAs are tasked with developing and implementing GSPs for groundwater basins designated by DWR as high- or medium-priority. GSPs are planning documents that provide a road map showing how groundwater basins will reach long-term sustainability. GSAs must adopt GSPs for high- and medium-priority (but not critically overdrafted) basins by 2022 and have until 2042 to achieve groundwater basin sustainability. The path for developing a GSP includes the following general process:

1. **Prepare a Notice of Intent to prepare a GSP** that contains general information about the process by which the GSA will develop the GSP, and submit the notice to DWR.
2. **Engage with basin stakeholders** who represent the many beneficial users and uses of groundwater, including overlying groundwater rights holders (both agricultural users and domestic well owners), municipal well owners, public water systems, local land use planning agencies, environmental users of groundwater, surface water users, the federal government, Native American tribes, and disadvantaged communities.
3. **Describe the basin** (characterize the "basin setting") by developing a hydrogeologic conceptual model, describing groundwater conditions, developing a water budget, and describing management areas. This section of the GSP will set the foundation for sustainable management.
4. **Establish sustainable management criteria** by defining a sustainability goal, developing minimum thresholds for avoiding undesirable results, and setting measurable objectives for each of the six sustainability indicators (as applicable) laid out by SGMA that include interim milestones set at five-year intervals. These criteria are discussed in more detail in Section 1.2.3, *Sustainable Management Criteria*.
5. **Incorporate climate change** through quantitative climate change analyses to help GSAs anticipate and plan for future impacts.
6. **Define projects and management actions** (PMAs) that aim to increase supply, manage demand, or a combination of both to achieve the determined sustainability goal.
7. **Develop a groundwater monitoring network** that promotes the collection of data characterizing groundwater and related surface water conditions in the basin to monitor for undesirable results and evaluate progress toward the basin's sustainability goals (Groundwater Exchange 2021).

As mentioned previously, DWR evaluates GSPs to determine whether they comply with SGMA and substantially comply with the GSP regulations, and whether implementing the GSP is likely to achieve the basin's sustainability goal. DWR's evaluation and assessment is based on criteria outlined in the GSP regulations, as provided in California Code of Regulations (CCR) Title 23, Division 2, Chapter 1.5, Subchapter 2 (State Water Board 2021).

1.2.3 Sustainable Management Criteria

The GSP regulations provide a framework for locally defined and quantitative sustainable management criteria. Using these criteria, the GSAs can quantitatively measure, track, and make adjustments to ongoing sustainable management in the basin. The criteria include the following terms, presented here with a brief summary of the use of each term in the GSP. Collectively, these terms provide the framework for defining sustainable management; they provide guidelines for recognizing favorable groundwater conditions, identifying unfavorable groundwater conditions and associated warning signs, selecting and evaluating appropriate PMAs, and monitoring progress toward the sustainability goal:

- **Sustainability indicators:** The effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, become undesirable results [as defined in California Water Code Section 10721(x)]. The six sustainability indicators are lowering groundwater levels, surface water depletion, degraded water quality, land subsidence, seawater intrusion, and reduction of storage.

- **Undesirable result:** Significant and unreasonable adverse conditions for any of the six sustainability indicators defined in the GSP regulations. Undesirable results, as defined in California Water Code Section 10721(x), are one or more of the following effects:
  - Chronic lowering of groundwater levels, indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
  - Significant and unreasonable reduction of groundwater storage.
  - Significant and unreasonable seawater intrusion.
  - Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
  - Significant and unreasonable land subsidence that substantially interferes with surface land uses.
  - Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.
- **Minimum threshold:** A numeric value used to define an undesirable result for each sustainability indicator at representative monitoring sites.
- **Measurable objective:** A numeric goal set to track the performance of sustainable management at representative monitoring sites.
- **Interim milestone:** A target numeric value at representative monitoring sites representing measurable groundwater conditions needed to achieve measurable objectives over time, in increments of five years, as set by the GSAs as part of the GSP.

The sustainability goal provides a mission statement for what the GSAs wish to achieve through sustainable management. The GSP regulations provide the following requirements for a GSP sustainability goal (23 CCR Section 354.24):

> *Each Agency [GSA] shall establish in its Plan [GSP] a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan [GSP] shall include a description of the sustainability goal, including information from the basin setting used to establish a sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be maintained through the planning and implementation horizon.*

The sustainability goal may be achieved by implementing PMAs that involve improving conjunctive use of surface water and groundwater, increasing surface water or groundwater supplies, conserving existing supplies, and/or reducing groundwater demand. Achieving the sustainability goal is supported by data from the GSP's groundwater monitoring network, which monitors the performance of both projects and groundwater conditions to document the persistence or absence of undesirable results.

1.3 Overview of the Program Environmental Impact Report

The West Turlock Subbasin Groundwater Sustainability Agency (WTS GSA) and the East Turlock Subbasin Groundwater Sustainability Agency (ETS GSA) jointly prepared the Turlock Subbasin GSP. These two GSAs are referred to collectively herein as the "Turlock Subbasin GSAs" in references to the development and implementation of the Turlock Subbasin GSP. The Turlock Subbasin GSAs coordinate on GSP issues pursuant to an agreement; however, each GSA is responsible for implementing the Turlock Subbasin GSP within its jurisdiction. Pursuant to agreement between the WTS GSA and the ETS GSA, the WTS GSA is the California Environmental Quality Act (CEQA) lead agency and has determined that a program environmental impact report (PEIR) is the appropriate CEQA document for analyzing resources potentially affected by implementation of the PMAs in the Turlock Subbasin GSP.

According to California Water Code Section 10728.6, the California Environmental Quality Act (CEQA) does not apply to the adoption of a GSP; however, CEQA compliance would be required for implementation of potential future PMAs called for by the Turlock Subbasin GSP. It was therefore determined by the Turlock Subbasin GSAs that a program environmental impact report (PEIR) would be prepared in accordance with State CEQA Guidelines Section 15168(c) to streamline these later activities. The WTS GSA has agreed to be the lead agency for CEQA purposes for preparation of this PEIR. The ETS GSA is also involved in preparation of the PEIR and is a responsible agency as defined by State CEQA Guidelines Section 15381. It is intended that the ETS GSA will be able to rely on and incorporate this PEIR in approving PMAs in support of the Turlock Subbasin GSP within the ETS GSA's boundaries (CEQA Guidelines Section 15050).

This PEIR will be available for proponents of future PMAs to use for CEQA compliance when they seek to approve actions that are consistent with the PMAs called for in the Turlock Subbasin GSP. Potential future proponents may include, but are not limited to, the WTS GSA and ETS GSA and their members (identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies,* in Chapter 2), as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed below:

- Ballico-Cortez Water District
- California State University, Stanislaus
- City of Ceres
- City of Hughson
- City of Modesto
- City of Turlock
- City of Waterford
- Community of Hickman
- Delhi County Water District
- Denair Community Services District
- Eastside Water District
- Hilmar County Water District
- Keyes Community Services District
- Merced County
- Merced Irrigation District
- Modesto Irrigation District
- Stanislaus County
- Turlock Irrigation District

Additional proponents and partners not listed here may choose to implement PMAs in conformance with the GSP with the approval of the Turlock Subbasin GSAs. Implementation of PMAs would need to comply with the CEQA process and requirements outlined in Section 1.3.1, *Purpose and Use of the Program Environmental Impact Report*, and Section 1.3.2, *Determining Next Steps under CEQA*.

1.3.1 Purpose and Use of the Program Environmental Impact Report

This environmental impact report (EIR) has been prepared in conformance with CEQA (Public Resources Code [PRC] Section 21000 et seq.) and the State CEQA Guidelines (14 CCR Section 15000 et seq.). More specifically, this EIR is a program EIR (PEIR) and has been prepared pursuant to and consistent with the requirements of Section 15168 of the State CEQA Guidelines.

This draft PEIR discloses the potential significant environmental effects of the PMAs in the Turlock Subbasin GSP to the public, to the extent they can be identified at this this time. Where feasible, the draft PEIR develops mitigation measures to avoid damage to the environment. It also provides sufficient information to foster informed decision-making by the Turlock Subbasin GSAs regarding potential future PMAs that may be implemented under the GSP.

This draft PEIR serves to meet the following basic purposes of CEQA (State CEQA Guidelines Section 15002[a]) at a program level of detail:

- Inform governmental decision makers and the public about the potential significant environmental effects of proposed activities.
- Identify the ways that environmental damage can be avoided or significantly reduced.
- Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.
- Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

Adoption of the Turlock Subbasin GSP did not involve the construction or operation of facilities or other physical actions, nor does the GSP describe specific construction methods, land use changes, timing, or operational requirements by the Turlock Subbasin GSAs. Therefore, this PEIR discusses (to the extent feasible) the environmental effects of implementation of the PMAs in the Turlock Subbasin GSP at a level of detail appropriate to facilitate meaningful review and decision-making from the broader context of the GSP (see State CEQA Guidelines Sections 15144, 15146, and 15151). This PEIR will allow the Turlock Subbasin GSAs to consider program-level impacts and mitigation measures and address program-wide issues and cumulative impacts. In addition, other public agencies and PMA proponents will be able to rely on this PEIR for CEQA compliance pertinent to the types of PMAs to be implemented under the Turlock Subbasin GSP.

Ultimately, this PEIR will provide program-level coverage for (1) PMAs described in the Turlock Subbasin GSP for which the CEQA process has not been started and (2) PMAs not explicitly described in the Turlock Subbasin GSP that incorporate similar approaches or features and meet the GSP's objectives. PMAs for which CEQA compliance is complete (or underway) are discussed in Chapter 4, *Cumulative Impacts*, of the PEIR.

1.3.2 Determining Next Steps under CEQA

Any public agency proposing to implement PMAs under the Turlock Subbasin GSP must exercise its independent judgment to determine CEQA compliance. The exercise of discretion by a lead agency for an individual project or management action will be guided by State CEQA Guidelines Section 15168. Possible scenarios are described below and depicted in **Figure 1-1**.

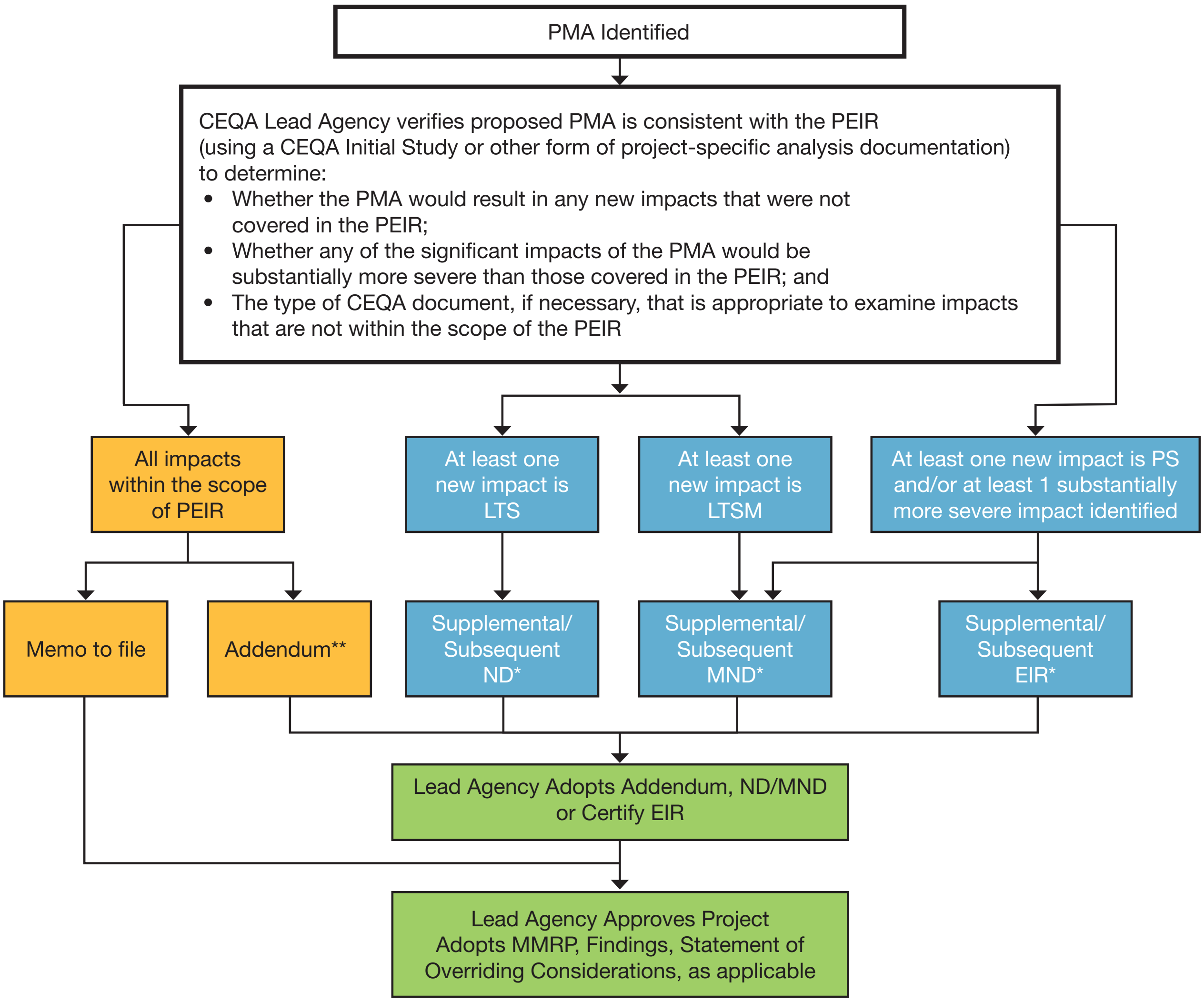
Scenario 1: No New Significant or Substantially More Severe Impacts Identified Compared to the PEIR

If the CEQA lead agency for a specific project or management action determines, under State CEQA Guidelines Section 15162, that the project or management action would result in no new significant effects and/or require no new mitigation measures, the activity could be approved as being within the scope analyzed by this PEIR. In such a case, the project or management action would not require new or additional environmental review (e.g., EIR, negative declaration, or mitigated negative declaration). At this point, the appropriate CEQA lead agency would use this PEIR for the individual project or management action's CEQA compliance and would file a notice of determination when the project is approved.

Under this CEQA compliance approach, the CEQA lead agency for a project or management action must incorporate all feasible and appropriate mitigation measures from the PEIR into the individual project or management action to address significant or potentially significant impacts on the environment.

If the CEQA lead agency for a specific project or management action determines, under State CEQA Guidelines Section 15300 through 15333, that the project or management action would be categorically exempt from CEQA (e.g., Section 15301 "Existing Facilities" or Section 15304 "Minor Alterations to Land"), the CEQA lead agency would not use this PEIR for the individual project or management action and would file a notice of exemption when the project or management action is approved.

In addition, Executive Order N-7-22 (EO) was signed by Governor Newsom in March 2022 which suspended CEQA for recharge projects occurring in open and working lands under either Flood-Managed Aquifer Recharge (Flood-MAR) or DWR's Sustainable Groundwater Management Grant Program. If the CEQA lead agency for a specific project determines this EO applies, the CEQA lead agency would consult with DWR and other guidance on administering the CEQA waiver.



* Pursuant to CEQA Guidelines Sections 15162 (e.g. major revisions to PEIR) and 15163 (e.g. minor revisions to PEIR and doesn't meet the requirements of Section 15163)
** Pursuant to CEQA Guidelines Section 15164 (e.g. minor additions or changes to PEIR and doesn't meet the requirements of Sections 15162 or 15163)
EIR = Environmental Impact Report; LTS = Less than significant; LTSM = Less than significant with mitigation; ND = Negative Declaration; MND = Mitigated Negative Declaration;
NOD = Notice of Determination; NOE Notice of Exemption; PS = Potentially Significant
Note: This figure represents the process to implement PMAs under the PEIR. Please refer to the CEQA Statute and Guidelines for additional information

Path: U:\GIS\GIS\Projects\2020xxx\D202001096_Draft_PIER_WTSGSA_GSP\03_MXDs_Projects\PIER_WTSGSA_GSP.aprx, FMarquez 7/21/2022

SOURCE: ESA, 2021.

Figure 1-1
CEQA Flow Chart

ESA

Scenario 2: Potentially Significant or Substantially More Severe Impact Compared to the PEIR

If a project or management action would have impacts that were not fully described in the PEIR, or new impacts not examined in this PEIR, the CEQA lead agency for that project or management action would need to prepare an initial study to determine the appropriate environmental document. Should a separate environmental document be needed, the PEIR could be used to simplify the task of preparing the later environmental document (State CEQA Guidelines Section 15168[d]). That later document may be a notice of exemption, an addendum (pursuant to State CEQA Guidelines Section 15164), a supplemental document to this PEIR (pursuant to State CEQA Guidelines Section 15163), or a document that tiers from this PEIR or incorporates it by reference (i.e., negative declaration, mitigated negative declaration, or EIR pursuant to State CEQA Guidelines Section 15162).

The environmental document for the individual project or management action may tier from or incorporate any applicable elements of this PEIR by reference, such as direct and indirect impacts, mitigation measures, cumulative impacts, alternatives, or a statement of overriding considerations. As a result, the later environmental document could focus solely on the new effects that were not previously considered in this PEIR. Individual PMAs would proceed based on the independent judgment of the individual project's or management action's CEQA lead agency, subject to supporting substantial evidence.

1.4 Environmental Review and Approval Process

The preparation of a PEIR involves multiple steps. The public is provided the opportunity to review and comment on the scope of the analysis, the content of the PEIR, the results and conclusions presented, and the overall adequacy of the document to meet the substantive requirements of CEQA. This section describes the steps in the environmental review process for this PEIR.

1.4.1 Notice of Preparation and Public Scoping Period

The WTS GSA issued a notice of preparation (NOP) on January 7, 2022, to satisfy the requirements of CEQA and the State CEQA Guidelines. The purpose of the NOP was twofold: (1) To notify the public, responsible agencies, trustee agencies, the Governor's Office of Planning and Research, potentially affected public agencies, involved federal agencies, and tribes regarding the WTS GSA's intent to prepare a PEIR for the PMAs to be implemented under the Turlock Subbasin GSP; and (2) to solicit input from the public and those agencies regarding the scope and content of the environmental information to be included in the PEIR.

The issuance of the NOP began the 30-day public comment period, which closed at 5 p.m. on February 7, 2022. In accordance with PRC Section 21080.4(a) and State CEQA Guidelines Section 15082(b), each responsible agency, trustee agency, and involved federal agency was requested to provide, in writing, the scope and content of the environmental information to be included in the draft PEIR related to its area of statutory responsibility. The NOP was also sent to public agencies, organizations, and individuals who requested receipt of the WTS GSA's public notices, to invite them to provide input.

A virtual scoping meeting was held via remote teleconference on the Zoom platform on Wednesday, January 26, 2022, at 5:30 p.m. to receive oral public and agency input on the scope and content of the PEIR. Members from the Turlock Subbasin GSAs and each of the GSAs' technical advisory committees attended, but no votes were conducted by any of these governing bodies at the meeting.

1.4.2 Assembly Bill 52 Notifications

AB 52 (Chapter 532, Statutes of 2014) amended CEQA to create a separate resource category called "Tribal Cultural Resources" (PRC Section 21074) and to provide that a substantial adverse change in a tribal cultural resource may be a significant effect on the environment (PRC Section 21084.2). State CEQA Guidelines Appendix G was subsequently amended to address tribal cultural resources.

AB 52 requires lead agencies to notify California Native American tribes that are traditionally and culturally affiliated with the geographic area of an individual restoration project, if they have requested notice of projects proposed in that area. Upon receipt of the notice, the tribe has 30 days to request consultation. Consultation may involve discussing the type of environmental review necessary, the significance of tribal cultural resources, the significance of the project's impacts on the tribal cultural resources, and alternatives and mitigation measures recommended by the tribe. The parties must consult in good faith. Consultation is considered concluded either when the parties agree to measures to mitigate or avoid a significant effect on a tribal cultural resource (if such a significant effect exists) or when a party concludes that mutual agreement cannot be reached.

The Turlock Subbasin GSAs sent a notification to contacts from 171 tribes (certified mail to 25 AB 52–designated tribes and standard mail to 146 Executive Order B-10-11–designated tribes) on January 21, 2022. In response to the notification letter, the Turlock Subbasin GSAs consulted with the Wilton Rancheria tribe, which responded to the project notification letter sent.

1.4.3 Draft Program Environmental Impact Report

Based on the public scoping process, the WTS GSA determined that this draft PEIR would address the following resource areas: aesthetics; agriculture and forestry resources; air quality and greenhouse gas emissions; biological resources; cultural resources; energy resources; geology and soils; hazards and hazardous materials; hydrology and water quality; land use and planning; mineral resources; noise; population and housing; recreation; transportation and traffic; tribal cultural resources; utilities and public services; and wildfire.

This draft PEIR is available to federal, state, and local agencies and interested organizations and individuals who may want to review and comment on the adequacy of the analysis. Publication of the draft PEIR marks the beginning of a 45-day public review period. The 45-day public review period for this draft PEIR is Wednesday, July 27, 2022, through 5:00 p.m. on Monday, September 12, 2022. During the public review period, written comments should be postmarked by September 12, 2022, and mailed or emailed to:

Turlock Subbasin GSP PEIR Comments
c/o Turlock Irrigation District
P.O. Box 949
Turlock, CA 95381-0949
turlockgroundwater@gmail.com

Please use "Turlock Subbasin Groundwater Sustainability Plan PEIR" in the subject line. Please also include the name of a contact person if submitting comments on behalf of an agency, tribal group, or organization. All comments received, including names and addresses, will become part of the official administrative record and may be available to the public.

The draft PEIR is available for review at the Turlock Public Library (550 N Minaret Ave, Turlock, CA 95380), the Stanislaus County Library (1500 I St, Modesto, CA 95354), and the Merced County Library (2100 O St, Merced, CA 95340). The draft PEIR is also available on the Turlock Groundwater website at www.turlockgroundwater.org.

During the 45-day review period, a virtual public workshop will be held via remote teleconference on the Zoom platform on Thursday, August 25, 2022, at 2:00 p.m. Information about the PEIR public workshop can be found on the Turlock Groundwater website at www.turlockgroundwater.org/events. A video and audio broadcast of the PEIR public workshop will be available via the internet and can be accessed at the same website. To sign up for emails, visit www.turlockgroundwater.org/get-involved.

1.4.4 Final Program Environmental Impact Report

Written and oral comments received on the draft PEIR during the public review period will be addressed in a response to comments document that, together with the draft PEIR and any changes to the draft PEIR made in response to comments received, will constitute the final PEIR. The draft PEIR and final PEIR together will compose the PEIR for the PMAs pursuant to the Turlock Subbasin GSP, as may be amended or updated from time to time.

As part of the approval process, the WTS GSA will prepare and adopt a mitigation monitoring and reporting program, as required by PRC Section 21081.6(a), for any mitigation measures in this draft PEIR that will be adopted by the WTS GSA.

1.4.5 Program Environmental Impact Report Approval Process

Under State CEQA Guidelines Section 15090(a), the WTS GSA must certify that the PEIR has been completed in compliance with CEQA; that the WTS GSA has reviewed and considered the information in the PEIR; and that the PEIR reflects the WTS GSA's independent judgment and analysis.

CEQA requires the WTS GSA to adopt appropriate findings as part of project approval, as set forth in State CEQA Guidelines Section 15091. Under State CEQA Guidelines Section 15092, a lead agency may approve or carry out a project subject to an EIR only if it determines the following:

- The project will not have a significant effect on the environment. OR
- The agency has eliminated or substantially lessened all significant effects on the environment where feasible. AND
  - Any remaining significant effects on the environment that are found to be unavoidable are acceptable due to overriding considerations, in which case it will adopt a statement of overriding considerations pursuant to State CEQA Guidelines Section 15093.

After certification of the PEIR, the WTS GSA will file a notice of determination in compliance with State CEQA Guidelines Section 15094.

1.4.6 Trustee and Responsible Agencies

A trustee agency under CEQA is a public agency having jurisdiction by law over natural resources that may be affected by a project that are held in trust for the people of the state of California. There are four trustee agencies: the California Department of Fish and Wildlife, the State Lands Commission, the California Department of Parks and Recreation, and the University of California.

In addition, under CEQA, responsible agencies are state and local public agencies, other than the lead agency, that have the authority to carry out or approve a project or are required to approve a portion of the project for which a lead agency is preparing or has prepared an EIR. The following responsible agencies may be involved with implementation of PMAs in the Turlock Subbasin GSP. Many of these agencies are potential future project proponents (as listed in Section 1.3) and/or are agencies with potential approval authority over future PMAs (as listed in Table 2-5 in Chapter 2).

State

California Air Resources Control Board

California Department of Conservation

California Department of Transportation

California Department of Water Resources

California Environmental Protection Agency

California State University

California Wildlife Conservation Board

Central Valley Flood Protection Board

Central Valley Regional Water Quality Control Board

State Water Resources Control Board

Local

Ballico-Cortez Water District
City of Ceres
City of Hughson
City of Modesto
City of Turlock
City of Waterford
Community of Hickman
Denair Community Services District
Delhi County Water District
Eastside Water District
ETS GSA
Hilmar County Water District
Keyes Community Services District
Merced County
Merced Irrigation District
Modesto Irrigation District
Stanislaus County
Turlock Irrigation District
WTS GSA

1.5 Incorporation by Reference

This PEIR incorporates by reference the information contained in the Turlock Subbasin GSP (see Section 2.1, *Overview of the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2). The approved Turlock Subbasin GSP is available at https://turlockgroundwater.org/gsp. Select chapters are provided in Appendix A.

1.6 Organization of This Program Environmental Impact Report

This draft PEIR is organized as follows:

- **Chapter 1, *Introduction*:** This chapter describes the purpose and background of the Turlock Subbasin GSP, including the regulatory framework promoting sustainable groundwater management, the purpose and intended uses of this PEIR, the CEQA public review process, and the organization of this draft PEIR.
- **Chapter 2, *Description of the Turlock Subbasin Groundwater Sustainability Plan*:** This chapter describes the objectives and geographic scope of the Turlock Subbasin GSP; provides a description of the PMAs that are in place, are planned, or may be considered for implementation under the GSP; and describes typical construction and operations and maintenance activities and methods likely to be used as part of implementation of the PMAs in the Turlock Subbasin GSP.
- **Chapter 3, *Environmental Setting, Impacts, and Mitigation Measures*:** The resource sections in this chapter evaluate the potential environmental impacts of implementing the PMAs described in the Turlock Subbasin GSP. Each section of Chapter 3 describes the existing environmental conditions (environmental setting), existing relevant regulations (regulatory setting), thresholds of significance, and analysis methodology and assumptions. Each resource section then evaluates anticipated changes to existing environmental conditions from implementation of the PMAs described in the Turlock Subbasin GSP. For

any potentially significant impact that could result, mitigation measures are presented, and the significance level with implementation of mitigation measures is determined.

- **Chapter 4, *Cumulative Impacts*:** This chapter presents an analysis of the potential cumulative impacts of implementing the PMAs described in the Turlock Subbasin GSP together with other past, present, and reasonably foreseeable future projects.
- **Chapter 5, *Other CEQA Considerations*:** This chapter identifies the potentially significant and unavoidable impacts, significant and irreversible commitment of resources, and growth-inducing impacts of implementing the PMAs described in the Turlock Subbasin GSP.
- **Chapter 6, *Alternatives*:** This chapter describes alternatives to the PMAs described in the Turlock Subbasin GSP, including the No Project Alternative; identifies alternatives eliminated from detailed consideration; and identifies the environmentally superior alternative.
- **Chapter 7, *List of Preparers*:** This chapter lists the individuals who helped to prepare this draft PEIR and identifies the qualifications and affiliations of those individuals.
- **Chapter 8, *References*:** This chapter identifies the references used as sources of information in this PEIR.
- **Appendices** contain information that support the analyses presented in this draft PEIR.

CHAPTER 2

Description of the Types of PMAs to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan

2.1 Overview of the Turlock Subbasin Groundwater Sustainability Plan

The Turlock Subbasin Groundwater Sustainability Plan (GSP) addresses groundwater sustainability in the Turlock Subbasin (Groundwater Basin Number 5-22.03), located in the northern San Joaquin Valley Groundwater Basin in California's Central Valley. The Turlock Subbasin was designated as a high-priority, but not critically overdrafted, groundwater basin by the California Department of Water Resources (DWR), which calls for the preparation of a GSP under the Sustainable Groundwater Management Act (SGMA) to ensure that groundwater sustainability goals are met. From 2018 to 2021, the Turlock Subbasin GSP was prepared jointly by the West Turlock Subbasin Groundwater Sustainability Agency (WTS GSA) and the East Turlock Subbasin Groundwater Sustainability Agency (ETS GSA). Both GSAs were formed in compliance with California Water Code Section 10723.8, and they are referred to collectively herein as the "Turlock Subbasin GSAs."

Funding for development of the Turlock Subbasin GSP was provided in part by the Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1) and the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access for All Act of 2018 (Proposition 68). Grant funding will also be evaluated and pursued to assist with implementation of the projects and management actions (PMAs) listed in the Turlock Subbasin GSP.

The Turlock Subbasin GSP identifies multiple PMAs that propose structural and nonstructural actions to enhance regional water supply, and allows for the development of additional PMAs as needed to meet the sustainability goals of the GSP. *Projects* can be generally categorized as either urban and municipal or agricultural; they incorporate the use of new infrastructure (e.g., regulating reservoirs, pipelines, injection wells) or existing infrastructure (e.g., canals, pipelines, recharge basins) to enhance water supply and achieve the GSP's sustainability goals. *Management actions* are intended to be implemented in addition to projects, as nonstructural actions supporting the achievement of sustainability goals (e.g., voluntary conservation programs).

In compliance with SGMA deadlines for high-priority, non-critically overdrafted groundwater basins, the Turlock Subbasin GSP was completed, adopted, and submitted to DWR on January 28, 2022. The approved Turlock Subbasin GSP is available at https://turlockgroundwater.org/gsp. Select chapters are provided in Appendix A and summarized herein as relevant for this draft PEIR. Specifically, chapters of the Turlock Subbasin GSP that describe the process for developing the applicable sustainable management criteria (Chapter 6), establishing a monitoring network (Chapter 7), identifying PMAs (Chapter 8), and implementing the GSP (Chapter 9), are summarized as the context for implementation of PMAs.

2.1.1 Plan Objectives

The California Environmental Quality Act (CEQA) requires that an environmental impact report (EIR) contain a "statement of the objectives sought by the proposed project." Under CEQA, "[a] clearly written statement of objectives will help the Lead Agency develop a reasonable range of alternatives to evaluate in the EIR [PEIR] and will aid the decision makers in preparing findings or a statement of overriding considerations. The statement of objectives should include the underlying fundamental purpose of the project" [State CEQA Guidelines Section 15124(b)].

The objectives of the Turlock Subbasin GSP are to achieve the sustainability goal for the Turlock Subbasin by 2042 and avoid undesirable results over the remainder of a 50-year planning horizon. Broadly, the sustainability goal for the Turlock Subbasin is to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. The objectives of the Turlock Subbasin GSP are met through implementation of the PMAs described in more detail in Section 2.2, *Projects and Management Actions to be Implemented Under the Turlock Subbasin Groundwater Sustainability Plan.*

2.1.2 Geographic Scope of the Turlock Subbasin Groundwater Sustainability Plan

The Turlock Subbasin GSP applies to the Turlock Subbasin, a 544-square-mile (348,160-acre) area in the northern San Joaquin Valley approximately 80 miles south of Sacramento in Stanislaus and Merced counties (**Figure 2-1**). The Turlock Subbasin is bounded on the north by the Tuolumne River, on the south by the Merced River, and on the west by the San Joaquin River (**Figure 2-2**). The eastern subbasin boundary is defined by crystalline basement rocks of the Sierra Nevada foothills (DWR 2006). The Turlock Subbasin is the study area evaluated in this draft PEIR.

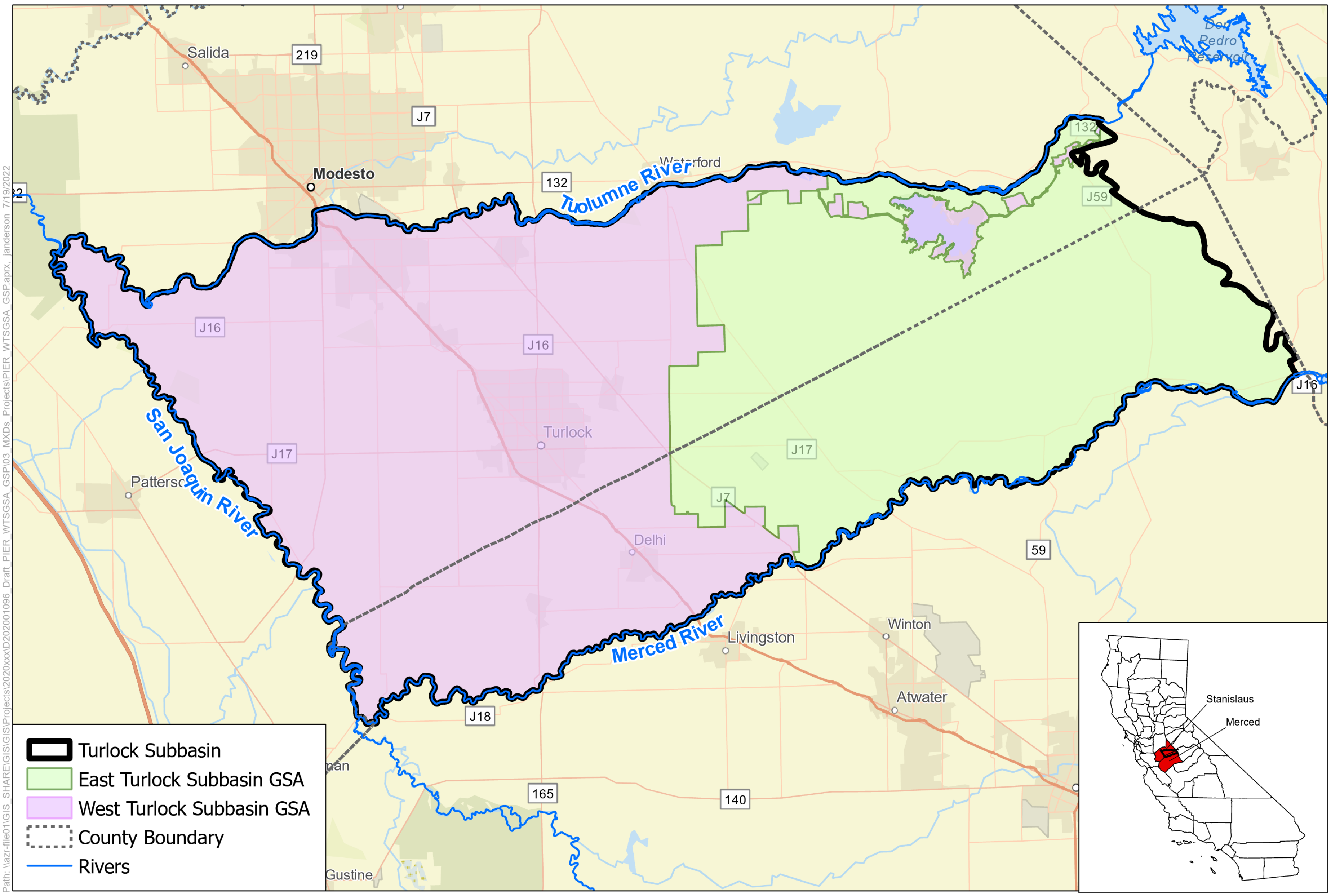
The Turlock Subbasin is part of the larger San Joaquin Valley Groundwater Basin, as defined by DWR (Groundwater Basin Number 5-22.03). The San Joaquin Valley Groundwater Basin is defined on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi mountains, on the east by the Sierra Nevada, and on the north by the Sacramento–San Joaquin Delta and Sacramento Valley.

The Turlock Subbasin is hydraulically connected with surrounding subbasins along shared river boundaries (**Figure 2-3**). Adjacent subbasins include the Merced Subbasin south of the Merced River, the Delta-Mendota Subbasin west of the San Joaquin River, and the Modesto Subbasin north of the Tuolumne River. Of these subbasins, Delta-Mendota and Merced are listed by DWR as being critically overdrafted. Potential impacts on adjacent groundwater basins and areas outside the Turlock Subbasin are addressed in Chapter 4, *Cumulative Impacts*.

SOURCE: ESA, 2021.

Figure 2-1
Regional Location

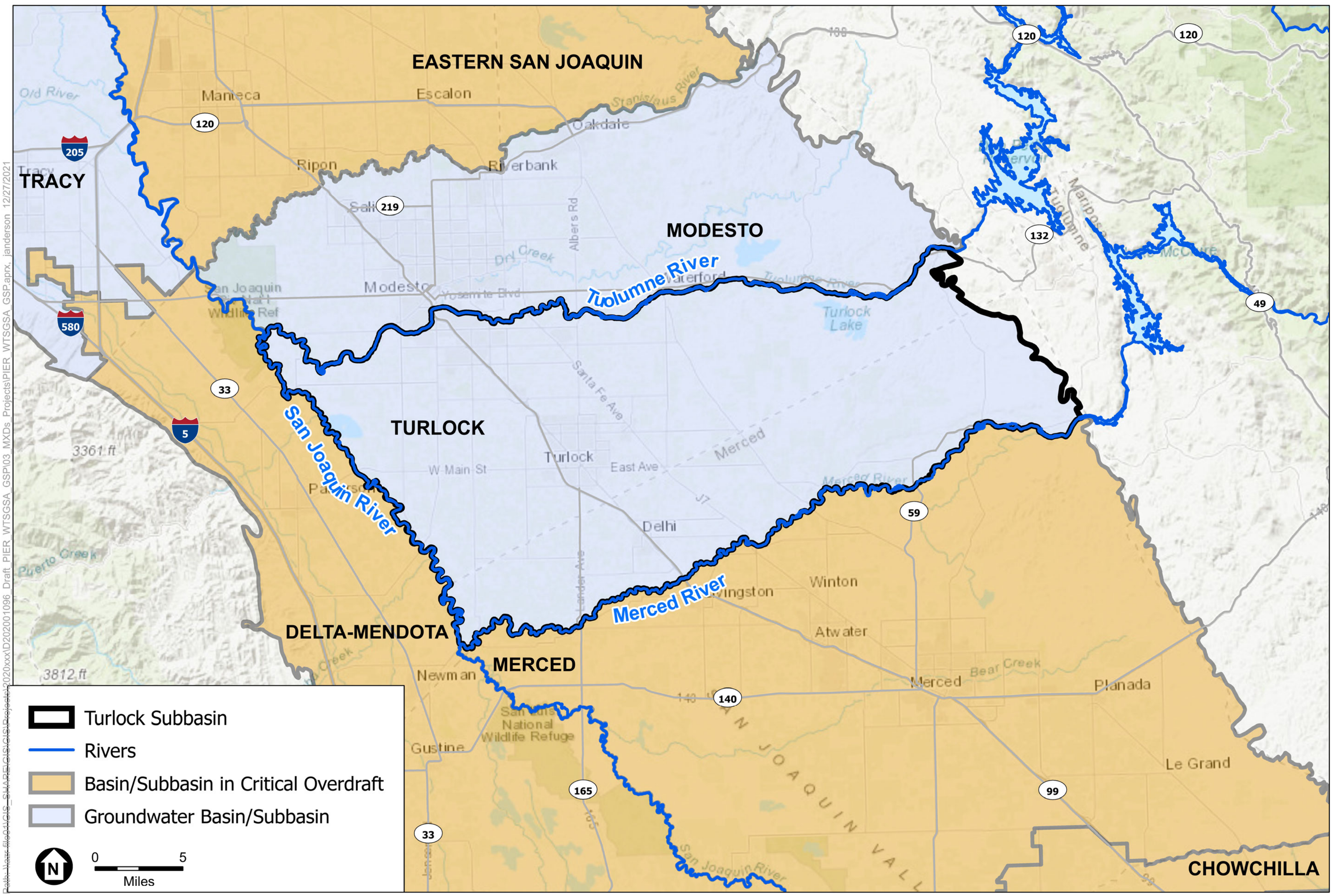
ESA



SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure 2-2
Turlock Subbasin

ESA



SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure 2-3
Adjacent Groundwater Basins

The Turlock Subbasin contains irrigation districts, water districts, municipalities, and portions of two counties (Stanislaus and Merced) (**Figure 2-4**). Turlock Irrigation District (TID) and Merced Irrigation District (MID) provide surface water supply to the Turlock Subbasin, primarily for agricultural irrigation. Water districts include Eastside Water District, the largest water district in the eastern subbasin, and the Ballico-Cortez and Stevinson Water Districts. Municipalities and urban areas entirely within the boundaries of the Turlock Subbasin include Ceres, Delhi, Denair, Hickman, Hilmar, Hughson, Keyes, and Turlock. The southern portion of the city of Modesto is in the Turlock Subbasin. Groundwater users covered under the Turlock Subbasin GSP include TID and MID; the Cities of Ceres, Turlock, Modesto, and Hughson; the Hilmar and Delhi County Water Districts; the Eastside and Ballico-Cortez Water Districts; the Keyes, Denair, and Ballico Community Services Districts; and Stanislaus and Merced counties.

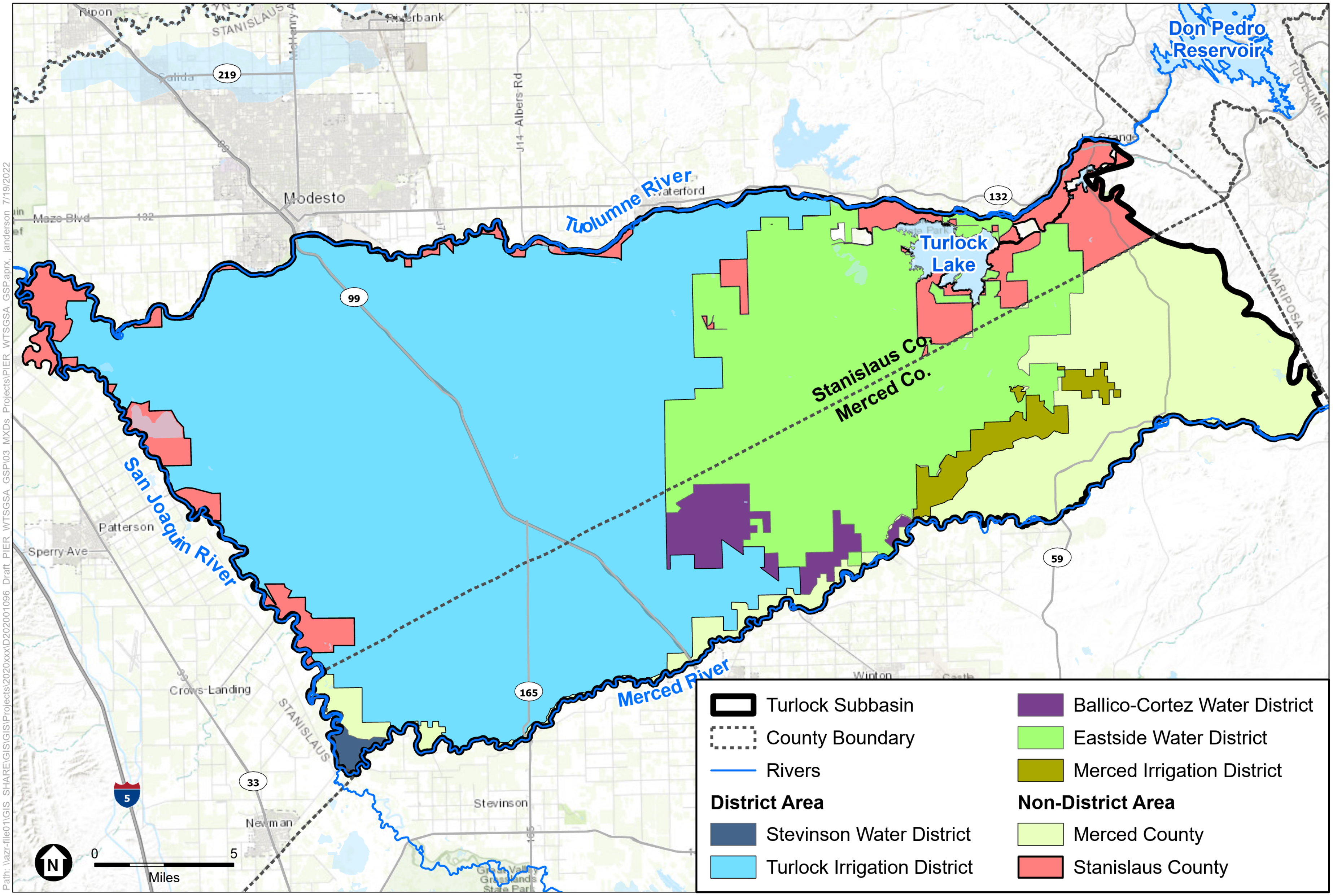
Approximately 30 percent of the Turlock Subbasin is not located within a water or irrigation district; these areas are referred to as *non-district areas*. The Turlock Subbasin also contains a state park, California Department of Fish and Wildlife–owned and operated lands and conservation easements, California conservation easements, local flood maintenance areas, and federal lands. Land use in the Turlock Subbasin is mostly irrigated agricultural (70 percent) with some urban areas (13 percent); the remaining land consists of non-irrigated agriculture, undeveloped land, and surface water (collectively 17 percent).

The two primary water sources used in the Turlock Subbasin are surface water from the Tuolumne River and groundwater pumped from the aquifer. Surface water from the Merced River, stormwater, and reused municipal and industrial wastewater provide additional water sources. An extensive existing surface water conveyance system delivers water to users across a large portion of the Turlock Subbasin (**Figure 2-5**).

See Chapter 2, *Plan Area*, of the Turlock Subbasin GSP for a detailed discussion of water sources and use, groundwater monitoring networks, and water resources management programs. See Chapter 4, *Basin Setting*, of the Turlock Subbasin GSP for a more detailed description of the groundwater basin.

2.1.3 Turlock Subbasin Groundwater Sustainability Agencies

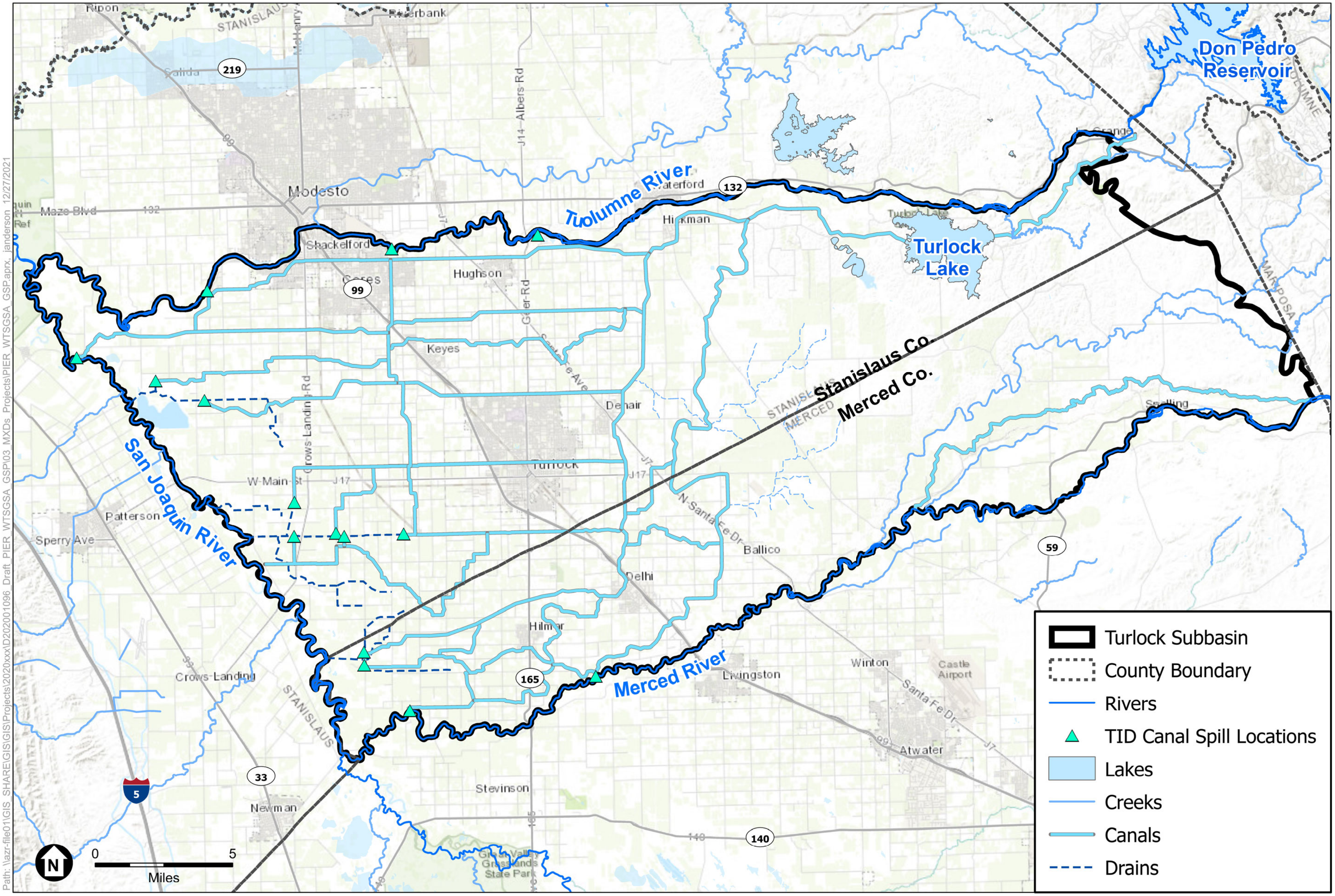
The service area boundaries for the Turlock Subbasin GSAs are aligned with the east and west subbasin boundaries, and are defined on the north and south by the Tuolumne River and the Merced River, respectively (Figure 2-2). The WTS GSA is bounded on the west by the San Joaquin River, and on the east by the eastern jurisdictional boundary of TID’s irrigation service area, which is also the western boundary of the ETS GSA (Figures 2-2 and 2-4). The ETS GSA is bounded on the east by the crystalline basement rocks of the Sierra Nevada foothills. A narrow strip that is part of the WTS GSA also extends eastward just south of the Tuolumne River and borders the ETS GSA to the north.



SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure 2-4
Jurisdictional Boundaries of Turlock Subbasin GSA Member Agencies

ESA



SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure 2-5
Surface Water Conveyance System

ESA

Table 2-1 summarizes the Turlock Subbasin GSAs, their formation dates, and the areas covering the entire 544 square miles of the Turlock Subbasin.

TABLE 2-1
TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY AGENCIES

		Area	
Agency	**Formed**	**Square Miles**	**Acres**
West Turlock Subbasin Groundwater Sustainability Agency	March 2, 2017	327	209,280
East Turlock Subbasin Groundwater Sustainability Agency	March 31, 2017	217	138,880
Total		**544**	**348,160**

SOURCE: Todd Groundwater 2022

According to the Turlock Subbasin GSP, the WTS GSA has the following member and associate member agencies:

- City of Ceres
- City of Hughson
- City of Modesto
- City of Turlock
- City of Waterford (which operates the public water system for the community of Hickman)
- Delhi County Water District
- Denair Community Services District
- Hilmar County Water District
- Keyes Community Services District
- Merced County
- Stanislaus County
- Turlock Irrigation District

The ETS GSA has the following member agencies:

- Ballico-Cortez Water District
- Eastside Water District
- Merced County
- Merced Irrigation District
- Stanislaus County

Each of the Turlock Subbasin GSAs utilizes a technical advisory committee that advises the respective GSA boards. These two committees typically meet individually and jointly each month to handle their business and action items. Selected GSA members are also part of the Turlock Subbasin GSP PEIR Ad Hoc Committee, which was appointed to support preparation of this document. See Appendix A, *Turlock Subbasin Groundwater Sustainability Plan*, Chapter 1, *Administrative Information*, for additional information about the Turlock Subbasin GSAs.

2.1.4 Sustainability Goals and Indicators

The sustainability goal for the Turlock Subbasin is to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. The sustainability goal is achieved through the implementation of PMAs, described in more detail in Section 2.2. This goal is supported by and includes the following actions:

- Manage the Turlock Subbasin within its sustainable yield and arrest ongoing long-term groundwater level declines.
- Support interconnected surface water to avoid adverse impacts on surface water uses.
- Manage groundwater extractions and water levels to avoid impacts from future potential land subsidence.
- Optimize conjunctive use of surface water, recycled water, and groundwater.
- Support efficient water use and water conservation.
- Coordinate with GSAs in neighboring subbasins to avoid undesirable results along the shared Turlock Subbasin boundaries.
- Adaptively manage the Turlock Subbasin over time to improve operational flexibility and to ensure the sustainability of the groundwater resources.

As mentioned in Chapter 1, sustainability indicators are defined by SGMA as the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, become undesirable results [as defined in California Water Code Section 10721(x)]. The six sustainability indicators are lowering groundwater levels, surface water depletion, degraded water quality, land subsidence, seawater intrusion, and reduction of storage. The significant and unreasonable occurrence of any of the six sustainability indicators constitutes an undesirable result.

Five of the six sustainability indicators identified by the SMGA were determined to be applicable in the Turlock Subbasin (seawater intrusion is not applicable).

- Chronic lowering of groundwater levels and reduction of groundwater storage have been the primary concerns for the aquifer. Water level declines in the northwestern portion of the aquifer contributed to failures of domestic wells during the 2014–2017 drought period.
- The Tuolumne, San Joaquin, and Merced rivers are all hydrologically connected to the groundwater system as defined by SGMA. Sustainable management criteria have been set for each river to prevent future potential streamflow depletions that could have significant and unreasonable effects on beneficial surface water uses and users of water, and avoid potential future disconnection from the aquifer. The most protective criteria have been set for representative monitoring sites near the Merced River, primarily to address concerns regarding falling groundwater levels on the eastern side of the subbasin.

- Concerns regarding degradation of water quality in public water supplies have been documented, particularly in the cities of Modesto, Turlock, and Ceres.
- Although no land subsidence impacts have been documented to date, areas potentially susceptible to land subsidence do exist within the Turlock Subbasin.

For each sustainability indicator, the adverse impacts that have occurred or could occur in the Turlock Subbasin were identified, along with their causes, locations, and timing. For example, undesirable results for 2015 conditions were identified for chronic lowering of water levels and reduction of groundwater in storage. As another example, without additional PMAs, undesirable results for interconnected surface water could occur under future projected conditions. Defining the undesirable results guided the selection of quantitative metrics to serve as sustainable management criteria for either improvement, or at a minimum, avoidance of worsening groundwater conditions that could lead to undesirable results.

See Appendix A.1, *Approved Turlock Subbasin Groundwater Sustainability Plan*, Chapter 6, *Sustainable Management Criteria*, for a detailed discussion of the process for selecting the sustainable management criteria.

2.2 Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan

The Turlock Subbasin GSP presents multiple PMAs that were identified and considered by the Turlock Subbasin GSAs to achieve the sustainability goals for the Turlock Subbasin by 2042, and to avoid undesirable results related to the five applicable sustainability indicators over the remainder of the 50-year planning horizon, as required by SGMA regulations. The Turlock Subbasin GSP identifies additional activities, referred to as the Implementation Support Activities (ISAs), to support implementation of the PMAs.

The number of PMAs exemplifies the spatial and temporal variation in current groundwater conditions across the Turlock Subbasin, and thus provides a range of options for avoiding undesirable results and achieving sustainability based on existing conditions. The range of PMAs presented is intended to enable both the WTS GSA and the ETS GSA to be flexible in their responses as groundwater conditions change and new and better information becomes available.

Additionally, PMAs would be implemented adaptively to achieve an optimal balance between recharge projects and demand reduction management actions. Group 3 projects (described in Section 2.2.1, *Projects Identified*) would be implemented to the extent feasible to increase recharge in specific areas, thereby decreasing the magnitude of required demand reductions. It is anticipated that not all PMAs would need to be implemented, or that some PMAs would be implemented by one GSA and not the other. Any adverse groundwater conditions or challenges in maintaining groundwater sustainability would be addressed by scaling and implementing the PMAs in a targeted and proportional manner, consistent with conditions observed in the subbasin.

Chapter 8 of the Turlock Subbasin GSP provides a detailed description of the PMAs in accordance with Sections 354.42 and 354.44 of SGMA regulations (see also Appendix A.3).

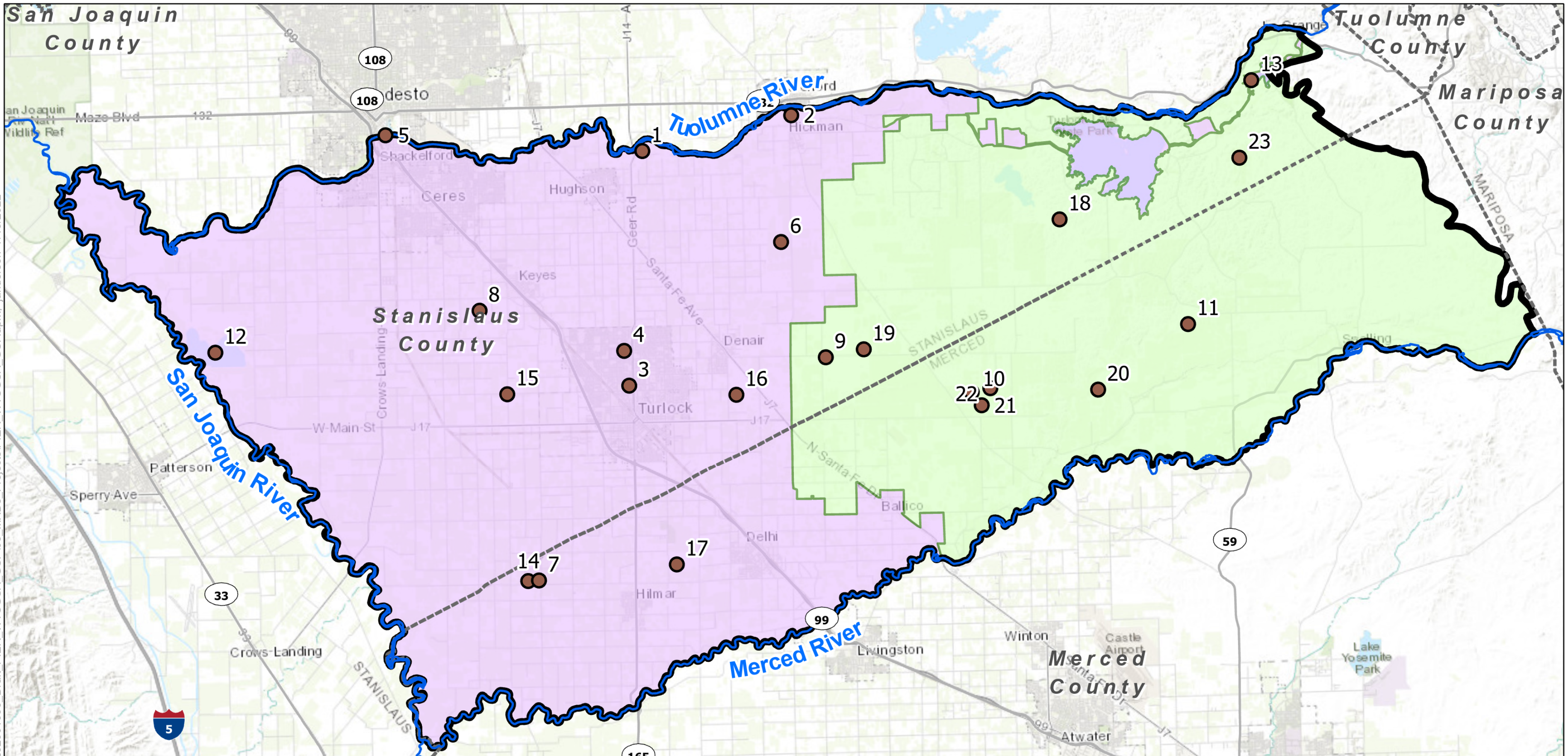
2.2.1 Projects Identified

The term *projects*, as used in this draft PEIR, generally refers to physically constructed (structural) features. These features may be designed to recharge the groundwater system using surface waters diverted from the Tuolumne and Merced rivers, floodwaters, agricultural return flows, stormwater, and recycled water; may promote conjunctive use; or may reduce demand for groundwater. The Turlock Subbasin GSP categorizes projects according to their primary recharge mechanism as conceptualized—direct groundwater recharge, in-lieu groundwater recharge, or a combination of both:

- **Direct groundwater recharge** means storing water by allowing the water to percolate through the soil into the groundwater, or by injecting the water into the groundwater aquifer via injection wells or into the vadose zone through dry wells. Direct recharge could also be accomplished by applying water onto agricultural lands at times when crops are dormant, or in amounts exceeding crop demands. In addition, direct recharge could occur through recharge basins, ponds, constructed wetlands, floodplain inundation projects, or other facilities.
- **In-lieu recharge** means storing groundwater by using surface water in lieu of pumping groundwater, thereby storing an equal amount in the groundwater basin. The amount of in-lieu recharge is equal to the quantity of renewable surface water used to irrigate the farmland in place of using regular groundwater.

Projects may be used for multiple functions to support groundwater sustainability and multiple other benefits during GSP implementation. Examples of other benefits from recharge projects include habitat enhancement, water quality improvement, improved water supply resilience, and recreational opportunities. Projects were developed to align with state grant program preferences and the Governor's Water Action Plan by providing multiple benefits, embracing innovation and new technologies, and benefiting disadvantaged communities and environmental water users. The Turlock Subbasin GSP prioritizes projects that contain multi-benefit approaches addressing multiple needs, and that emphasize the use of natural infrastructure, including the basin itself, for storage and the natural waterways and floodplains as recharge areas. Additionally, the Turlock Subbasin GSP emphasizes coordination among existing beneficial water users, the Turlock Subbasin GSAs, and neighboring basins to enhance regional groundwater sustainability.

Projects were identified through several months of collaborative effort between the Turlock Subbasin GSP Ad Hoc Committee, the Turlock Subbasin GSAs' technical advisory committees, the respective boards of directors of the WTS GSA and the ETS GSA, and technical consultants to the Turlock Subbasin GSAs. Project information was provided by the Turlock Subbasin GSAs and project proponent agencies (e.g., member agencies) and compiled into a draft list. The initial set of projects was reviewed further, and 23 projects were identified across the Turlock Subbasin (**Figure 2-6**) for inclusion in the approved Turlock Subbasin GSP. Each project is demarcated as a single point, but implementation would entail a larger footprint and broader facilities and actions.



Turlock Subbasin
County Boundary
Rivers

GSA

East Turlock Subbasin GSA
West Turlock Subbasin GSA

Projects

No.	Name
1	Regional Surface Water Supply Project
2	Waterford/Hickman Surface Water Pump Station and Storage Tank
3	Dianne Storm Basin
4	Stanislaus State Stormwater Recharge
5	Advanced Metering Infrastructure Project (AMI)
6	TID On-Farm Recharge Project (in WTSGSA)
7	Recycled Water from City of Turlock
8	TID Ceres Main Regulating Reservoir
9	Agricultural Recharge Project (in ETSGSA)
10	Mustang Creek Flood Control Recharge Project
11	Upland Pipeline Project
12	San Joaquin River Flood Diversions
13	La Grange Recharge Project (Within TID Irrigation Service Area)
14	TID Lateral 5 1/2 Regulating Reservoir
15	Additional TID Regulating Reservoirs
16	Recharge from TID Conveyance System
17	Intertie Projects
18	Rouse Lake Pipeline Project
19	Sand Creek Watershed Runoff Recharge
20	Conveyance Improvements Project
21	Development of Diffused Stormwater Project
22	Dry Creek Watershed Recharge
23	Direct Recharge in Agriculture Areas

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SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure 2-6
Project Location Map

ESA

Table 2-2 summarizes the 23 projects presented in the Turlock Subbasin GSP, including the project name, project number, proponents, primary recharge mechanism, partner agencies, and a brief project description, including notable benefits to groundwater recharge. Projects presented in the GSP were classified into three groups based on project status:

- **Group 1**—Projects that are in place and will continue to be implemented by specific participating agencies within the Turlock Subbasin to support groundwater management and implementation of the Turlock Subbasin GSP.
- **Group 2**—Projects that are currently planned and will be implemented by specific participating agencies within the Turlock Subbasin to contribute to attainment of the sustainable management criteria and will support implementation of the Turlock Subbasin GSP.
- **Group 3**—Projects that have been identified and may occur in the Turlock Subbasin in the future, but that are not yet advanced to a point where their specific design or implementation is certain. These projects, if implemented, would provide benefits in contributing to the attainment of the sustainability goal and sustainable management criteria and would otherwise support implementation of the Turlock Subbasin GSP. Group 3 projects are extensions of the Group 2 projects and/or new projects to be evaluated further and implemented adaptively, as feasible and as needed.

  Group 3 projects could also include future projects that are not explicitly identified in the Turlock Subbasin GSP, but that represent reasonably foreseeable project types expected to be implemented to meet the GSP's objectives (e.g., projects using existing infrastructure in new ways to enhance groundwater recharge). These projects types may be implemented in different geographic locations within the Turlock Subbasin, would involve the same impact mechanisms, and would result in similar operational considerations (see Sections 2.3 through 2.5).

Group 1 and Group 2 projects were analyzed using C2VSimTM (California Central Valley Groundwater-Surface Water Simulation Model for the Turlock and Modesto Subbasins) to estimate the volumetric and groundwater level benefit to the groundwater system over the project planning period (see Chapter 5, *Water Budgets*, of the Turlock Subbasin GSP for more information on the C2VSim-TM model). Group 3 projects were not evaluated by modeling; rather, they were conceptualized at a more general level.

The projects would aim to use existing features or construct new features to enhance groundwater recharge in the Turlock Subbasin, thereby diversifying the portfolios of urban and municipal and agricultural water users. Existing features typically include TID's and MID's infrastructure and surface water conveyance features, such as canals and outlet gates, existing storm drain basins in the Turlock Subbasin's geographic area, and existing streams and basins. Other infrastructure includes pipelines and intakes to be extended via interties, for example.

Many projects also propose features to be constructed and integrated into the existing water system. Among the project features typically proposed for construction are injection wells for aquifer storage and recovery, dry wells, recharge basins, regulating reservoirs, water storage tanks, water treatment plants, and drainage modifications to retain flood flows or route them to recharge areas. Also proposed are features associated with water diversion and conveyance facilities, including interties along existing canal segments, pipelines for transmission of treated and raw water, and pump stations.

TABLE 2-2
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 1[2]						
West Turlock Subbasin—Urban and Municipal Projects						
1	Cities of Turlock and Ceres	Regional Surface Water Supply Project	In-lieu groundwater recharge	Turlock Irrigation District	Surface water	• Provide treated drinking water from the Tuolumne River to supplement both the City of Ceres's and the City of Turlock's existing groundwater supplies. • Divert surface water from the Tuolumne River through an existing river intake, construct a new raw-water pump station and pipeline, and treat to drinking water standards at a new water treatment plant. • Potentially also use water for emergency purposes or to deliver irrigation water to agricultural users. • Provide up to approximately 30 thousand acre-feet per year of surface water for in-lieu recharge within the cities of Turlock and Ceres during full allocation years.
GROUP 2[2]						
West Turlock Subbasin—Urban and Municipal Projects						
2	Community of Hickman	Waterford/Hickman Surface Water Pump Station and Storage Tank	In-lieu groundwater recharge	City of Modesto, Modesto Irrigation District	Surface water	• Connect the city of Waterford and community of Hickman to Modesto Irrigation District's surface water supply. • Construct a 1-million-gallon water storage tank to store water piped from the existing distribution network and a pump station/transmission line to distribute the water to the City of Waterford. • Offset urban groundwater pumping demands, provide groundwater recharge benefits, and diversify water supply portfolio. • Provide up to approximately 900 AF per year during full allocation years.
3	City of Turlock	Dianne Storm Basin	Direct groundwater recharge	Turlock Irrigation District	Stormwater runoff	• Upgrade the existing Dianne storm drain basin to enhance storage for stormwater. • Install aquifer storage and recovery injection wells to enhance the volume of water that can recharge the aquifer. • Provide direct groundwater recharge by enhancing infiltration and impoundment of stormwater in dry wells. • Relieve stress on the storm drain system, mitigate flooding potential, and reduce storm loads to the wastewater treatment plant. • Provide approximately 22.5 AF per year of recharged water to the Turlock Subbasin.

TABLE 2-2 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 2[2] (cont.)						
West Turlock Subbasin—Urban and Municipal Projects (cont.)						
4	California State University, Stanislaus	Stanislaus State Stormwater Recharge	Direct groundwater recharge	N/A	Stormwater runoff	• Construct French drains and other recharge basins/infrastructure to recharge stormwater runoff. • Enhance groundwater recharge by capturing stormwater runoff in excess of the on-campus ponds. • Provide approximately 460 AF per year of recharged stormwater between November and April each year.
5[3]	City of Modesto	Advanced Metering Infrastructure Project	Water conservation	N/A	N/A	• Install Advanced Metering Infrastructure smart meters to support water reduction goals, and to assist the City of Modesto in managing water usage to identify leaks and watering on non-watering days. • Reduce urban water demand in the city of Modesto to meet future water use mandates and conservation goals.
West Turlock Subbasin—Agricultural Water Supply Projects						
6	Turlock Irrigation District	TID On-Farm Recharge Project (in WTS GSA)	Direct or in-lieu groundwater recharge	N/A	Surface water	• Collaborate with growers in the irrigation service area to identify parcels with suitable recharge conditions for non-irrigation-season on-farm recharge during wet years. • Utilize areas were recharge potential is greatest (25% of non-permanent crop lands along canals and laterals downstream of Turlock Lake) • Expand recharge to other areas during the irrigation season as well as during the non-irrigation season and encourage growers to use surface water when available • Provide approximately 4,000 acre-feet of recharge per year.
7	Turlock Irrigation District	Recycled Water from City of Turlock	In-lieu groundwater recharge	City of Turlock	Recycled water	• Divert recycled water from the city of Turlock to the TID conveyance system to irrigate fields. • Blend recycled water with existing supplies to offset existing groundwater pumping demand. • Provide approximately 2,000 AF per year in-lieu recharge.

TABLE 2-2 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 2[2] (cont.)						
West Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
8	Turlock Irrigation District	TID Ceres Main Regulating Reservoir	In-lieu groundwater recharge	N/A	Surface water	• Construct a new regulating reservoir in the TID distribution system to absorb operational fluctuations in the Ceres Main Canal caused by upstream flow adjustments. • Modify and automate existing in-canal level control structures (drop structures) with new flume gates and telemetry. • Increase flexibility in delivering surface water to customers and maintain high levels of irrigation service, thereby reducing groundwater pumping. • Reduce spillage losses by an average of approximately 10,000 AF per year and reduce groundwater pumping by approximately 575 AF per year (demand met instead by surface water). • Potentially use regulating reservoirs to hold stormwater for later use for irrigation or recharge.
East Turlock Subbasin—Agricultural Water Supply Projects						
9	Eastside Water District	Agricultural Recharge Project (in ETS GSA)	Direct or in-lieu groundwater recharge	Turlock Irrigation District	Surface water	• Deliver "replenishment water" to parcels outside of TID within the EWD and the ETS GSA. • Maximize the utility of available water supplies to offset demand for groundwater pumping, providing in-lieu recharge benefits. • Provide direct recharge benefits during field flooding on replenishment parcels during the non-irrigation season. • Provide approximately 3,400 AF per year of benefit, with approximately 1,600 AF per year of benefit from replenishment during the non-irrigation season. • Potentially expand this project as additional water supplies become available.
10	Eastside Water District	Mustang Creek Flood Control Recharge Project	Direct groundwater recharge	Stanislaus County	Floodwaters and return flows	• Convey floodwater from the primary detention basin to seven new dry wells within the flood footprint of the basin. • Supply direct groundwater recharge to the subbasin by enhancing infiltration and impoundment of stormwater in dry wells. • Provide approximately 600 AF per year of groundwater recharge.

TABLE 2-2 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 2[2] (cont.)						
East Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
11	Eastside Water District	Upland Pipeline Project	Direct or in-lieu groundwater recharge	Merced Irrigation District	Surface water	• Install a new piped conveyance system, including a new upload pipeline intake, that would supply water to EWD from Merced Irrigation District. • Convey surface water to result in ambient recharge in the streambed. • Provide approximately 1,770 AF per year of Merced River water for direct recharge during the non-irrigation season in wet and above-normal years.
GROUP 3						
West Turlock Subbasin—Urban and Municipal Water Supply Projects						
12	City of Modesto	San Joaquin River Flood Diversions	Direct or in-lieu groundwater recharge	N/A	Floodwater	• Divert floodwater from the San Joaquin River into underused storage ponds (approximately 7,830 AF) for use in the Turlock Subbasin. • Analyze flood flows from the river, and determine the occurrence and volume of flows available for diversion into the ponds to ensure the reliability of available water.
West Turlock Subbasin—Agricultural Water Supply Projects						
13	Turlock Irrigation District	La Grange Recharge Project (within TID irrigation service area)	Direct groundwater recharge	N/A	Surface water and floodwaters	• Develop recharge opportunities in areas identified as having high recharge potential. • Purposefully recharge the aquifer through on-farm flood irrigation in excess of crop water requirements.
14	Turlock Irrigation District	TID Lateral 5½ Regulating Reservoir	In-lieu groundwater recharge	N/A	Surface water	• Construct a new regulating reservoir with an operating capacity of 140 AF to enhance delivery service to customers along lower reaches. • Reduce pumping that has historically compensated for limited surface water deliveries. • Potentially use regulating reservoirs to hold stormwater for later use for irrigation or recharge.
15	Turlock Irrigation District	Additional TID Regulating Reservoirs	Direct or in-lieu groundwater recharge	N/A	Surface water	• Construct additional regulating reservoirs in the TID conveyance system to better manage mismatches in supply and demand, improve customer response time, and decrease existing groundwater pumping. • Potentially use regulating reservoirs to hold stormwater for later use for irrigation or recharge.

TABLE 2-2 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 3 (cont.)						
West Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
16	Turlock Irrigation District	Recharge from TID Conveyance System	Direct groundwater recharge	N/A	Surface water	• Develop new recharge opportunities downstream of Turlock Lake where recharge potential is high. • Divert water into existing open channels to induce seepage from the canal, and for deliveries to recharge facilities off of the canal. This could occur during the irrigation season and/or non-irrigation season.
17	Turlock Irrigation District	Intertie Projects	In-lieu groundwater recharge	N/A	Surface water	• Connect various canal segments in the TID conveyance system to enhance surface water deliveries. • Reduce the need for groundwater pumping along capacity-constrained canals, resulting in in-lieu recharge benefits and improved water quality.
East Turlock Subbasin—Agricultural Water Supply Projects						
18	Eastside Water District	Rouse Lake Pipeline Recharge Project	Direct or in-lieu groundwater recharge	N/A	Surface water or floodwater	• Install a new piped conveyance system to convey floodwater and/or surface water for direct and in-lieu recharge.
19	Eastside Water District	Sand Creek Basin Runoff Recharge Project	Direct groundwater recharge	N/A	Stormwater runoff	• Capture runoff from the Sand Creek watershed for direct recharge.
20	Eastside Water District	Merced Irrigation District Expansion Project	Direct or in-lieu groundwater recharge	Merced Irrigation District	Floodwaters	• Expand Merced Irrigation District conveyance and delivery infrastructure to service areas within the ETS GSA through delivery of excess flows (during flood flow events).
21	Eastside Water District	Development of Use of Diffused Water through Existing and New Connections for Direct Recharge, Flood-MAR, and In-Lieu Recharge	Direct or in-lieu groundwater recharge	TBD	Stormwater runoff	• Support the development of direct recharge, in-lieu recharge, and Flood-MAR (flood managed aquifer recharge) where storm flows are available, or where existing surface water facilities can be used to direct and control surface water. • Install necessary infrastructure to connect existing delivery systems.
22	Eastside Water District	Dry Creek Watershed Recharge	Direct groundwater recharge	N/A	Stormwater runoff	• Develop recharge opportunities along Dry Creek in areas where there is favorable recharge potential. • Use runoff from the Dry Creek watershed for recharge.

TABLE 2-2 (CONTINUED)
PROJECTS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

Project Number	Project Proponent(s)	Project Name	Primary Recharge Mechanism(s)[1]	Project Partner(s)	Water Source	Description
GROUP 3 (cont.)						
East Turlock Subbasin—Agricultural Water Supply Projects (cont.)						
23	Eastside Water District	Direct Recharge in Agricultural Areas	Direct Groundwater Recharge	N/A	TBD	• Develop recharge facilities on agricultural land with good recharge potential and adequate underground storage. • Use existing water conveyance facilities (canals and outlet gates) and construct new conveyance and recharge infrastructure.

NOTES:

AF = acre-feet; ETS GSA = East Turlock Subbasin Groundwater Sustainability Agency; EWD = Eastside Water District; N/A = not applicable; TBD = to be determined; TID = Turlock Irrigation District; WTS GSA = West Turlock Subbasin Groundwater Sustainability Agency

1 The primary mechanism of the project as conceptualized. Projects may be used for multiple functions to support groundwater sustainability and multiple other benefits during implementation.
2 All Group 1 and Group 2 projects were included in modeling scenarios.
3 Project 5 is listed as a project in the Turlock Subbasin Groundwater Sustainability Plan, but is instead grouped with management actions in the following sections.

SOURCE: Todd Groundwater 2022

Construction of additional groundwater wells is also proposed as part of the monitoring network, as described in Section 2.2.3, *Implementation Support Activities*, of this draft PEIR. Typical impact mechanisms, construction activities, and operations and maintenance (O&M) activities associated with implementation of the projects presented in Table 2-2 are described in Sections 2.3 and 2.4. This draft PEIR also includes projects that are not explicitly identified in the Turlock Subbasin GSP, but that are the same types of projects as those implemented to meet the objectives of the Turlock Subbasin GSP (e.g., projects that propose the construction of regulating reservoirs). Such projects would involve the same impact mechanisms and result in similar operational considerations (see Sections 2.3 through 2.5).

See Appendix A.3, *Turlock Subbasin Groundwater Sustainability Plan*, Chapter 8, *Projects and Management Actions*, for detailed descriptions of the projects.

2.2.2 Management Actions Identified

The term *management actions*, as used in this draft PEIR, generally refers to nonstructural programs or policies that are designed to incentivize voluntary actions and strategies, or specify required actions, to be implemented in addition to projects to achieve the sustainability goals of the Turlock Subbasin GSP. As part of implementation of the management actions, structural features may be improved or constructed, as described in more detail below. The Turlock Subbasin GSAs or their member agencies could implement the management actions as needed to mitigate overdraft within their jurisdictional areas. **Table 2-3** presents the management actions considered in each category, including a description of the primary operating mechanisms to enhance groundwater sustainability. The Turlock Subbasin GSP assigns each management action to one of three categories: demand reduction strategies, pumping management framework, or domestic well mitigation.

TABLE 2-3
MANAGEMENT ACTIONS IN THE TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

<table>
<tr><th>Category</th><th>#</th><th>Management Action</th><th>Description</th></tr>
<tr><td rowspan="2">Demand Reduction Strategies</td><td>1</td><td>Voluntary conservation and/or land fallowing</td><td>Site-specific conservation or in-lieu recharge through land use change and land fallowing</td></tr>
<tr><td>2</td><td>Conservation practices</td><td>Programmatic conservation programs or incentives</td></tr>
<tr><td rowspan="4">Pumping Management Framework</td><td>3</td><td>Groundwater extraction reporting program</td><td rowspan="4">In-lieu recharge through pumping reduction</td></tr>
<tr><td>4</td><td>Groundwater allocation and pumping management program</td></tr>
<tr><td>5</td><td>Groundwater extraction fee</td></tr>
<tr><td>6</td><td>Groundwater pumping credit market and trading program</td></tr>
<tr><td>Domestic Well Mitigation</td><td>7</td><td>Domestic well mitigation program</td><td>Identification and mitigation of adverse impacts to domestic wells caused by unsustainable groundwater management</td></tr>
</table>

SOURCE: Todd Groundwater 2022

Demand reduction strategies were developed to decrease agricultural and urban water demands to reduce the Turlock Subbasin's projected groundwater storage deficit. These strategies include adopting voluntary water conservation measures or repurposing land to decrease groundwater demand. Management actions to promote construction of distributed recharge facilities or implementation of best management practices to enhance water retention and recharge may also be implemented.

The pumping management framework consists of four separate management actions: measure or estimate the amount of groundwater pumping on a parcel basis; allocate sustainable versus unsustainable pumping based on the respective GSAs' assessment of conditions; prescribe pumping limitations; and provide operational flexibility and incentives for implementation. The net result of implementing this management framework is the achievement of targeted pumping reductions that could be associated with re-cropping, fallowing, land repurposing to non-irrigated use, improved irrigation efficiency, or a combination of these. These management actions are anticipated to be implemented by the ETS GSA and may be implemented by the WTS GSA if necessary.

The domestic well mitigation program provides outreach and education to households whose domestic wells may be affected by future changes in water levels. In addition, it provides for an escalating set of actions if the capacity and usability of domestic wells are determined to be reduced by unsustainable groundwater management practices.

Management actions may result in reasonably foreseeable construction activities, operational activities, or land use changes. For example, water conservation practices could include modifying irrigation systems to be more efficient (e.g., drip irrigation) or constructing ponds to store water and/or collect runoff. The domestic well mitigation program may result in the deepening or modification of wells, or in the construction of new wells, or the program may require connecting users to other water supplies. In addition, implementing management actions that introduce land fallowing or land repurposing may result in the temporary or permanent conversion of agricultural land to nonagricultural use. Such voluntary land use changes could include incorporation of conservation easements, habitat restoration, use of recharge facilities, or construction of renewable energy facilities (e.g., solar facilities). However, the resulting development (e.g., solar facilities, habitat restoration) is outside of the scope of this draft PEIR.

Impact mechanisms, construction activities, and O&M activities associated with implementation of the management actions presented in Table 2-3 are discussed in more detail in Sections 2.3 and 2.4. This draft PEIR also includes management actions that are not explicitly identified in the Turlock Subbasin GSP, but that represent the same types of management actions as those implemented to meet the objectives of the Turlock Subbasin GSP (e.g., management actions that incentivize conservation). Such management actions would involve the same impact mechanisms and result in similar operational considerations (see Sections 2.3 through 2.5).

See Appendix A.3, *Turlock Subbasin Groundwater Sustainability Plan*, Chapter 8, *Projects and Management Actions*, for additional information about the management actions.

2.2.3 Implementation Support Activities

The Turlock Subbasin GSP identifies a set of activities and actions to support implementation of the PMAs between 2022 and 2042, with an emphasis on the activities that would occur most immediately; within the first five years (i.e., between 2022 and 2027). Referred to in the Turlock Subbasin GSP as the "Implementation Support Activities," these activities include the following:

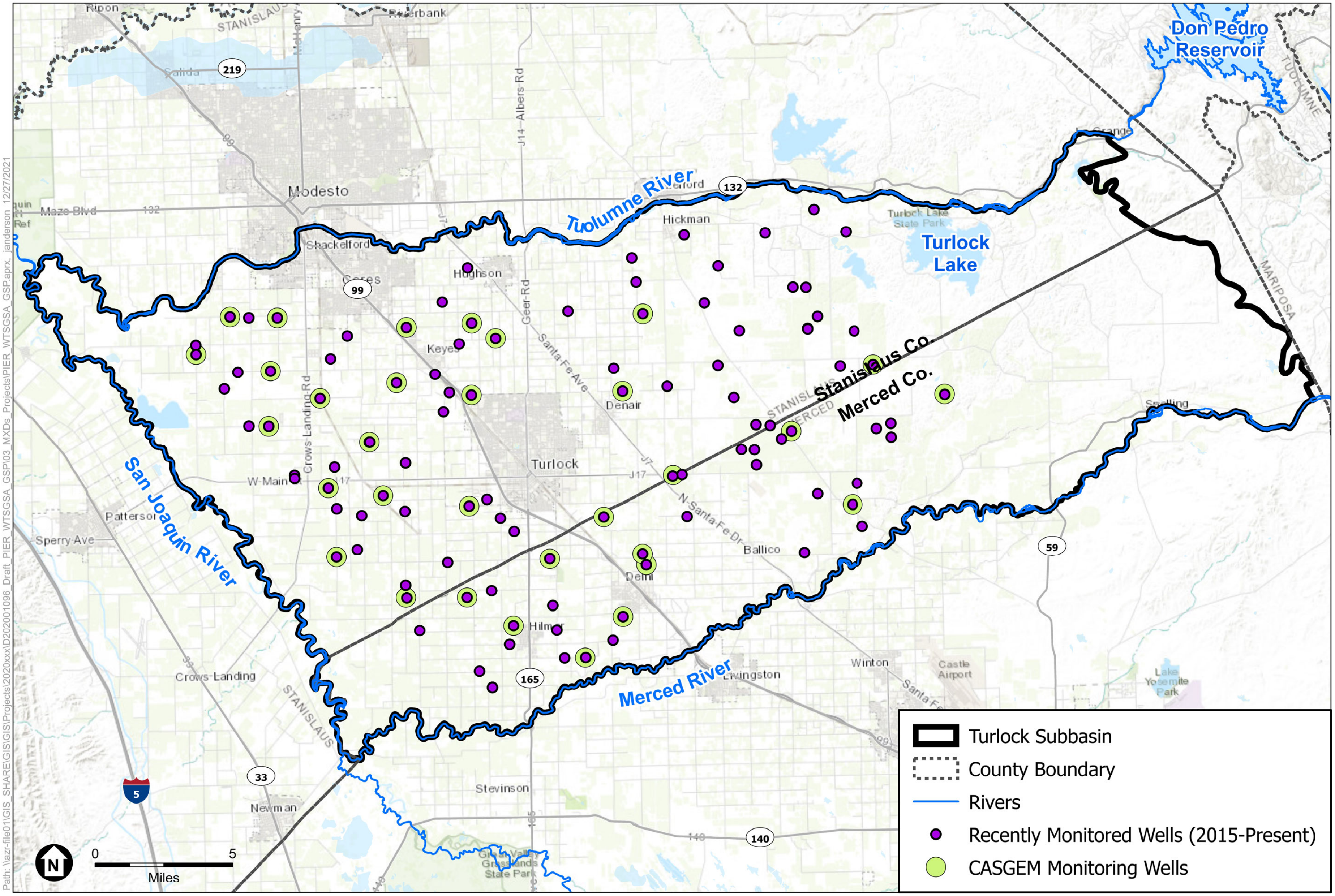
- Monitoring and reporting groundwater data.
- Addressing identified data gaps.
- Developing an accounting mechanism for water supplies within the Turlock Subbasin.
- Refining the groundwater model.
- Improving data management systems.
- Responding to potential exceedances of minimum thresholds to minimize or prevent adverse groundwater-related impacts.
- Coordinating and planning integration.
- Developing financing strategies, including seeking grant funding to implement PMAs.

Activities could also include the installation of additional monitoring wells or other mechanisms to monitor water levels and/or land subsidence. These activities support the implementation of PMAs and are considered in the evaluation of potential impacts and the effectiveness of mitigation. Their specific effects would be evaluated and refined as PMAs are implemented.

Section 21080 of the Public Resources Code exempts from the application of CEQA those projects over which public agencies exercise only ministerial authority. Discretionary projects or actions requiring CEQA are those that require the exercise of judgment or deliberation by a public agency in determining whether the project would be approved, funded, or if a permit would be issued. Therefore, implementation support activities that require only ministerial actions (e.g., reporting of groundwater data) would not require CEQA analysis. The determination whether CEQA is required for any implementation support activity would be made by the appropriate CEQA lead agency.

A monitoring network was established to yield representative information about groundwater conditions to guide and evaluate implementation of the PMAs. The monitoring network builds on existing monitoring programs: the California Statewide Groundwater Monitoring Program, public water suppliers' groundwater monitoring programs in the cities and community service districts, agricultural area monitoring programs, and the Irrigated Lands Regulatory Program (**Figure 2-7**). Ongoing and effective monitoring, modeling, reporting, and data gap assessments are key features of adaptive management during implementation to ensure that the Turlock Subbasin GSP is effective and reduces the potential for undesirable results and/or impacts.

See Appendix A.2, *Turlock Subbasin Groundwater Sustainability Plan*, Chapter 7, for a detailed description of the monitoring network; and see Appendix A.4, *Turlock Subbasin Groundwater Sustainability Plan*, Chapter 9, for a detailed description of the Implementation Support Activities.



SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure 2-7
Monitoring Well Locations

ESA

2.3 Construction Overview for Turlock Subbasin Groundwater Sustainability Plan Projects and Management Actions

The term *construction*, as used in this draft PEIR, is defined as all construction-related activities, including site clearing; placement of structures or other materials; building or assembling of infrastructure; relocation or demolition of existing facilities; landscaping; or any mobilization activity that would move construction-related equipment and/or materials onto a site that may result either directly or indirectly in physical changes to the environment. Varying levels of construction would be required for implementation of the PMAs. The Turlock Subbasin GSP does not describe specific construction activities for PMAs; the level of detail provided for each project or management action varies, including the precise locations of its features and detailed descriptions of feature designs and/or modifications.

Although the magnitude and characteristics of construction activities for PMAs vary widely, construction activities to develop groundwater recharge opportunities share many commonalities, including timing, materials, and equipment. Construction activities to modify and/or construct new features were assumed using information provided in the Turlock Subbasin GSP, including the PMAs' descriptions, implementation strategies, water sources, and reliability. Once proposals for individual PMAs consistent with the Turlock Subbasin GSP are developed, the respective lead agencies/proponents for those PMAs would evaluate whether this PEIR describes the PMAs' impacts adequately, or whether the impacts would require evaluation in project-level CEQA documents (e.g., initial study, EIR) (see Figure 1-1).

Table 2-4 presents a summary of construction activities that may be necessary to implement the PMAs in the Turlock Subbasin GSP, including typical direct and indirect impact mechanisms and the features that would result from construction activities:

- *Impact mechanisms* are defined as possible physical direct or indirect impacts on environmental resources, to be evaluated in more detail for each resource in Chapter 3, *Environmental Setting, Impacts, and Mitigation Measures*.
- *Direct impacts* include preconstruction and construction impacts and those that would result from the implementation of PMAs (e.g., direct changes to the landscape caused by construction of new features).
- *Indirect impacts* generally include resulting land use changes, changes to the purpose or place of water use, changes to water system operations, etc.

2.3.1 Construction Timing

The amount of time needed to modify or construct features associated with the PMAs would range from as short as a few days to as long as several years. Construction activities generally would be limited to certain months. Major construction activities would typically be concentrated during the dry season (May through October), with some mobilization occurring as early as April. Construction would usually occur only during daylight hours, but in rare cases, some activities may require continuous daytime and nighttime work (e.g., expedited projects, projects for which the construction schedule is nearing the flood season, well drilling activities). Construction may occur after the start of the flood season (November 15) and/or during the winter months. If a construction phase would extend into the following year's construction season, the site may be secured and "winterized" before the start of the flood season (typically November 15) as required by the permitting agencies.

Various factors and regulations may influence construction timing. For example, activities associated with the canal system would need to be performed during the non-irrigation season (November through February). Construction on agricultural fields would be timed to be compatible with seasonal cultivation cycles. In addition, work windows may be limited to the dry season as part of other regulatory approvals. Construction timing may also be restricted to avoid and minimize effects on federally listed and state-listed threatened and endangered species. All construction for projects presented in the Turlock Subbasin GSP would comply with applicable timing restrictions.

2.3.2 Construction Materials

The volume of soil borrow or imported fill material needed for project earthwork may vary considerably by project type. Imported fill material available at commercial sites can often be located many miles from the construction site, whereas borrow sites developed specifically for a project can often be near or adjacent to a construction site. Other project construction materials (e.g., gravel, concrete) may be located at various distances from the construction site. Materials such as pipes, valves, weirs, and other pre-manufactured items may need to be transported from greater distances.

2.3.3 Equipment Types

The types of equipment used would depending on the type and size of the project. The following are some of the equipment types that may be used (listed in alphabetical order):

- Backhoes
- Border plows
- Bulldozers
- Cement and mortar mixer
- Chippers/grinders (to process woody vegetation removed during site preparation)
- Compactor
- Concrete pumper
- Concrete truck
- Cranes
- Crawlers/wheeled tractors
- Diesel generator
- Ditching plows
- Dredgers
- Drill rigs
- Dump trucks
- Excavators
- Flatbed delivery truck
- Forklift
- Front-end loaders
- Graders
- Haul trucks (typically off-highway vehicles)
- Hydroseeding trucks

- Integrated tool carriers (i.e., to support operation of construction equipment)
- Loader
- Lubricating and fueling trucks (i.e., to support operation of construction equipment)
- Mowing equipment (e.g., weed eaters, commercial lawn mowers)
- Pickup trucks
- Pile drivers and vibratory hammers
- Pumps for dewatering
- Rippers
- Roller compactors
- Scrapers
- Sheepsfoot or tramping-foot rollers (for soil compaction)
- Smooth drum compactors
- Soil and geotechnical bores
- Tractors
- Truck-mounted augers
- Water hoses
- Water truck

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TABLE 2-4
SUMMARY OF CONSTRUCTION ACTIVITIES AND OPERATIONS AND MAINTENANCE ACTIVITIES FOR PROJECTS AND MANAGEMENT ACTIONS, BY PRIMARY RECHARGE MECHANISM

<table>
<tr><th>Primary Recharge Mechanism[1]</th><th>Number[2]</th><th>Description</th><th>Typical Impact Mechanisms[3]</th><th>General Construction Activities</th><th>Example Features Resulting from Construction[4]</th><th>Example Operations and Maintenance Activities</th></tr>
<tr><td colspan="7">PROJECTS</td></tr>
<tr><td>Direct groundwater recharge</td><td>Project Nos. 3, 4, 10, 13, 16, 19, 22, and 23</td><td>Projects that recharge the groundwater system directly through:
Expansion of existing or creation of new recharge infrastructure (e.g., recharge basins, storm drain basins, French drains).
Installation of aquifer storage and recovery or injection wells.
Conveyance of surface water through irrigation canals to induce additional seepage.
Conveyance of surface water, floodwaters, or runoff to farmland during the off-season to recharge the aquifer.</td><td rowspan="3">Construction/Direct Impacts
Movement and placement of large amounts of soil/materials during construction
Physical disturbance of vegetation and/or habitat during construction
Release and exposure of sediments and turbidity in water
Traffic noise, motion, and vibration associated with construction
Alteration of the visual landscape
Relocation of utilities for pipeline placement
Release and exposure of construction-related contaminants or emissions
Release of additional criteria air emissions, including dust
Removal/replacement of recreational structures
Dredging, excavation scraping, or scarification to modify existing detention basins or create new recharge basins
Operational/Indirect Impacts
Changes to water system operations (e.g., decreased flows to river systems)
Changes in water rights/points of diversion
Changes to the timing and/or amount of water being diverted from the river (e.g., Tuolumne River) or into existing open channels
Increased surface water use
Impacts from machinery and other vehicles to/from the construction site</td><td rowspan="3">Mobilization of equipment and materials
Preparation of staging areas
Establishment of designated access and haul routes
Staging and storage of equipment and materials
Preparation of the project site
Preparation/use of borrow sites
Well drilling
Site restoration and/or site demobilization
Disposal of excess materials
Dewatering, excavation, fill, and placement of materials in water
Drainage modification</td><td>Injection wells
Recharge basins
Pump station
Pipelines
Water storage tanks
French drains or other mechanisms to increase recharge potential at a site
Dry wells
Water distribution and conveyance infrastructure</td><td>Conduct regularly scheduled inspections and evaluations of feature performance.
Install fencing and/or signage around newly constructed features.
Remove accumulated sediment around intakes.
Remove accumulated silt and vegetation from recharge basins.
Conduct water quality testing for groundwater wells.</td></tr>
<tr><td>In-lieu groundwater recharge</td><td>Project Nos. 1, 2, 7, 8, 14, and 17</td><td>Projects that recharge the groundwater system indirectly by providing surface water sources in lieu of groundwater through:
Treatment of surface water and recycled water to drinking water standards.
Connection of groundwater-reliant communities to surface water conveyance and/or distribution systems.
Storage of surface water in storage tanks/reservoirs for later use (piped or delivered via gravity).
Installation of regulating reservoirs to capture and store operational fluctuations in canal deliveries.
Construction of water conveyance and delivery infrastructure to new parcels.</td><td>Canal interties
Regulating reservoirs
Pump station
Pipelines
Water storage tanks
Irrigation basins to enable surface water deliveries to drip/micro systems
Fish screens</td><td>Conduct regularly scheduled inspections and evaluations of feature performance.
Conduct water quality testing for water storage tanks.
Clear debris from surface water conveyance features.
Install fencing and signage.
Establish programs, including markets and platforms for trade, exchange, or sale of pumping allocations and credits.
Manage pumping data.
Conduct ongoing monitoring of the pumping reduction strategy.</td></tr>
<tr><td>Combination of direct and in-lieu recharge</td><td>Project Nos. 6, 9, 11, 12, 15, 18, 20, and 21</td><td>Projects that use a combination of direct and in-lieu groundwater recharge through the various project activities described above.</td><td>Combination of the above</td><td>Combination of the above</td></tr>
<tr><td colspan="7">MANAGEMENT ACTIONS</td></tr>
<tr><td>Water conservation, land fallowing, and pumping reduction</td><td>Project No. 5
Management Action Nos. 1–7</td><td>Projects and management actions that incentivize conservation by:
Replacement of existing meters with an advanced metering system.
Incentivizing and promoting more efficient irrigation and conjunction use in urban and municipal service areas.
Promotion of land repurposing and fallowing during dry years to reduce both surface water and groundwater demand.
Support of groundwater pumping reductions through programs and improved data collection and monitoring.</td><td>Construction/Direct Impacts
For management actions resulting in modification of existing features or construction of new features, the same typical direct impact mechanisms as associated with projects
Operational/Indirect Impacts
Reduced water use as a result of more efficient irrigation practices (flood to drip)
Changes in land use and/or land repurposing from agricultural uses to nonagricultural/non-irrigation uses
Changes in crop types
Earthwork for environmental easement habitat enhancement or protection</td><td>Same as above</td><td>Smart meters
Irrigation system modification (e.g., drip irrigation)
Recharge basins or ponds
Check dams
Wells
Pipelines</td><td>Establish programs, including programs that incentivize conjunctive use and irrigation efficiencies.
Identify staff and protocols for field inspections.
Conduct ongoing maintenance of the approved fallowed agricultural fields in compliance with any contractual agreements.
Ensure consistency with state law and related conservation and/or land fallowing programs.
Establish enforcement mechanisms and policies for groundwater pumping reduction programs.</td></tr>
</table>

NOTES:

1 Projects and management actions (PMAs) were grouped according to the primary recharge mechanism as conceptualized and presented in the Turlock Subbasin Groundwater Sustainability Plan (as presented in Tables 2-2 and 2-3, respectively). The term *primary mechanism*, as used here, means how the project or management action aims to recharge the groundwater system (i.e., direct, in lieu, a combination thereof). PMAs that incentivize conservation through conservation practices, land fallowing, or pumping reduction were grouped separately.

2 The project numbers and management action numbers are referenced in Tables 2-2 and 2-3, respectively.

3 Potential impact mechanisms associated with the construction or operation of typical activities associated with groundwater recharge projects.

4 Construction activities associated with these example features are described in Section 2.3.5, *Construction Activities for Specific Features of Projects and Management Actions*.

SOURCE: Data compiled by Environmental Science Associates in 2021.

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2.3.4 General Construction Activities

The following general construction activities are applicable to the projects identified in Table 2-4 and described in the Turlock Subbasin GSP.

Mobilization

Construction activities would begin with a project mobilization phase. This phase may involve installing temporary construction offices, establishing staging areas, and transporting equipment and materials to the work site.

Establishment and Use of Staging Areas

One or more staging areas would be required for storage and distribution of construction materials and equipment. Staging areas would be located on or near active construction sites and may be relocated to active work areas as construction progresses. Typically, construction projects establish staging areas in previously disturbed areas that provide parking for workers; establishing such areas may involve acquiring temporary easements from landowners.

Use of Access and Haul Routes

Access and haul routes would be designated for hauling materials to and from borrow sites, staging areas, and construction sites. Access routes would also be used for employee commuting. Typically, these routes consist of existing public roads near construction sites; however, new off-road haul routes may also be constructed between borrow sites, staging areas, and construction sites. A minor project may involve only a few trips per day for employee commutes and hauling of equipment and materials. A major project requiring substantial movement of materials could require many trips per day to haul materials from borrow sites to construction sites.

Site Preparation

Site preparation typically involves clearing the ground of structures, woody and herbaceous vegetation, and any debris, using heavy equipment such as backhoes, excavators, bulldozers, mowers, and dump trucks. Depending on the project, structures to be cleared may consist of irrigation facilities (e.g., distribution boxes, wells, ditches, standpipes, and pipes), power poles, utility lines, and piping. The clearing operation may be followed by grubbing operations to remove trees and other vegetation, stumps, root balls, and belowground infrastructure. Soil and geotechnical bores may be conducted to evaluate and/or verify underlying conditions to ensure that those facilities are designed and constructed to address site-specific seismic-related or soil stability issues and minimize the potential risk of structural failure. In addition, earthen material may be stripped from the ground as part of site preparation.

Debris generated during clearing and grubbing operations can be disposed of by various means, depending on the type of material and local conditions. These materials may be hauled off-site to landfills (e.g., building demolition waste), delivered to recycling facilities (e.g., concrete), or sold (e.g., organic material to cogeneration facilities). Excess earthen materials, such as organic soils, vegetation, and excavated material, may be temporarily stockpiled before being re-spread at the project site or used to reclaim borrow sites (as described below). No excess materials generated during site preparation or other project activities would be disposed of by open burning.

Preparation of Borrow Sites

Borrow sites are areas from which earthen materials would be removed for use in construction. Sites near the construction areas are usually preferred. Using borrow sites near construction areas reduces the potential costs and environmental effects (i.e., air pollutant emissions and traffic) of hauling materials to the construction site from greater distances. In addition, when the borrow site is within approximately 1 mile of the point of use, scrapers may be used instead of trucks to move soil material from a borrow site to the construction area, thereby reducing the amount of material that must be handled, associated construction costs, and air pollutant emissions.

Borrow sites would be prepared similarly to construction sites. Soil samples would be obtained before construction to test for contamination of the borrow site, as applicable. After structures and woody vegetation are cleared from the surface, stumps, root balls, and infrastructure would be removed from below ground. The borrow area would then be disked to chop any remaining surface vegetation and mix it with the near-surface organic soils. Next, the top layer of earthen material would be stripped from the borrow excavation area, and this soil would be stockpiled at the borrow site. These soils would be re-spread on the surface of the borrow site after the borrow has been excavated and the site has been graded to support reclamation.

Debris generated during clearing and grubbing that is unsuitable for inclusion in the stockpiled soil would be disposed of as appropriate by the various means described above (e.g., hauled off-site to landfills, recycled, or sold for commercial use). Excavation depths for borrow sites would range in depth depending on volume requirements, the quality and extent of material available, and the method of borrow site reclamation.

Site Restoration and/or Demobilization

Upon completion of construction activities, any material stripped from the soil surface during site preparation would be placed on appropriate facilities and in any temporarily disturbed areas where topsoil was removed. Temporarily disturbed areas would be stabilized, which may include activities such as decompaction and seeding with appropriate herbaceous native seed mixes (as appropriate).

Any remaining construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions (e.g., decompacted, stabilized with an herbaceous seed mix, planted for restoration to native habitat, and returned to agricultural production). Noncommercial borrow sites would be restored or reclaimed by replacing topsoil that had been set aside and regraded to allow for continued uses such as farming, or the sites may be converted to other uses.

Disposal of Excess Materials

Excess organic materials consist of woody vegetation, grasses, and roots from borrow areas in construction sites; excavated material not meeting the designated criteria; and soil not used or unsuitable for the earthen structure under construction. Organic materials would be used to reclaim borrow areas and temporarily disturbed sites, or would be provided to local farmers for incorporation into their land to improve soil quality.

Dewatering, Excavation, and Fill

Dewatering, excavation of existing earthen materials, or fill or new materials may be required during project construction. For example, construction of a regulating reservoir would require excavation. Dewatering would involve diverting waters away from the construction site. Excavation activities would include removing the total amount of cut (unsuitable fill material, cut that would be used for construction, and additional suitable fill that would be off-hauled elsewhere). As needed, the construction area may be graded to meet design specifications and accommodate the feature constructed (e.g., for a regulating reservoir, by creating compacted earthen fill embankments).

2.3.5 Construction Activities for Specific Features of Projects and Management Actions

The following describes specific activities relevant to the modification or construction of typical groundwater recharge features. Examples of such features include injection wells for aquifer storage and recovery, dry wells, recharge basins, regulating reservoirs, water storage tanks, and other features associated with water diversion and conveyance facilities.

Wells

Construction of new groundwater wells used for aquifer storage and recovery or to expand the existing monitoring network would involve drilling the well and pumping the well during initial capacity and production testing. Concrete pads and foundations for the well’s motor and pump and standby generator may be necessary. A masonry block building may be required to house the well, including any related equipment, process piping and valving, and electrical equipment. Electricity may need to be brought to the site. The entire pump station site would be fenced (or surrounded by a perimeter masonry block enclosure), gated, and locked for security purposes. The well house building (if required) would be designed to blend in architecturally with other existing buildings in the area.

Existing wells may be replaced, necessitating some construction activities. Such wells may also be deepened or abandoned as part of the domestic well mitigation program, with potential construction to connect the users of these existing wells to the public water supply. Existing or new dry wells may also be used to transmit surface water (e.g., runoff or stormwater) into the groundwater system. Note that existing dry wells may also be converted to injection wells, thus requiring less construction. Any associated water quality discharge would need approval by appropriate permitting agencies.

The appropriate lead agency (e.g., Stanislaus County, Merced County, the Turlock Subbasin GSAs) would determine future CEQA compliance for well permits, if needed, by following local ordinances (e.g., groundwater ordinances) and state law, and in cooperation with the governing GSA, as applicable.

Recharge Basins or Ponds

Construction of recharge basins, also referred to as "infiltration basins," would involve excavating material at the basin site. The project area's susceptibility to erosion and siltation would likely influence the recharge basin's design; therefore, installation of turf may be required to prevent sediment runoff from accumulating in the basin. Depending on the basin's design, an inlet structure and pipelines to convey the water to the basin may also be constructed. This could also include construction or modification of irrigation systems or ponds for in-lieu recharge.

Regulating Reservoir

Construction of regulating reservoirs is reasonably foreseeable as part of the implementation of PMAs in locations adjacent to the existing surface water conveyance system. Briefly, regulating reservoirs support water conservation by stabilizing flow rates in the system downstream of the reservoir and capturing water that is normally spilled, allowing that water to remain stored for later use. Construction would involve clearing existing facilities and vegetation from the site and excavating the total amount of cut (unsuitable fill material, cut that would be used as fill for reservoir construction, and additional suitable fill that would be off-hauled elsewhere). The project site would then be graded and the regulating reservoir would be constructed by creating compacted earthen fill embankments (e.g., using native cut) near the site's perimeter. The interior banks and floor of the reservoir may be lined with a material such as fiber reinforced concrete. Mechanisms for moving the water between the canal and the reservoir and back again would be installed, such as gates or pump stations. Electricity may be needed at the site for telemetry, pumps, or other uses.

Water Storage Tanks

Construction of tanks to store diverted surface water or pumped groundwater would involve constructing concrete pads and foundations for the tank, booster pump station, and generator for backup power. Aboveground and belowground process piping may be required for transferring water to the tank, and electrical and control systems would be housed in secure enclosures. Masonry block buildings may be constructed to house booster pumps, process piping, and electrical equipment.

Water Diversion and Conveyance Facilities

Projects proposing to expand the Turlock Subbasin's existing surface water conveyance and distribution system may involve the construction of new or improved water diversion facilities, such as surface water intakes and diversions from streams and rivers, or of new or improved water conveyance facilities, such as new pipelines, tunnels, or canals to convey water between facilities, and pump stations along pipelines, tunnels, or canals. Construction of these conveyance features (e.g., pipelines, canal interties) would also be used for direct groundwater recharge in agricultural areas adjacent to the existing canal system. These projects may also develop pertinent features associated with the diversion and conveyance facilities identified above, such as pumping plants, fish screens, siphons, and energy recovery facilities. Activities to construct these facilities would include trenching, installing materials, and backfilling (e.g., pipelines would be installed and backfilled). Such activities are likely to occur in areas identified in the Turlock Subbasin GSP and in similar areas within the subbasin, particularly in those areas identified as having high recharge potential, or areas where in-lieu recharge could readily occur.

2.4 Operations and Maintenance Overview for Turlock Subbasin Groundwater Sustainability Plan Projects and Management Actions

O&M activities are the functions, duties, or labor associated with day-to-day operations. Implementation of the PMAs identified in the Turlock Subbasin GSP would include O&M activities to inspect project facilities and/or evaluate program effectiveness. As with construction activities, the Turlock Subbasin GSP does not detail the specific O&M activities required to implement each project or management action. Rather, the implementation criteria, status, and strategy are discussed, providing the context for day-to-day operations. Thus, activities specific to the PMAs were assumed using the information presented in the Turlock Subbasin GSP, as well as incorporating general information common to the development of groundwater recharge opportunities.

Table 2-4 provides examples of O&M activities that would result from implementation of the PMAs, which are also summarized below. Upon the development of proposals for PMAs consistent with the Turlock Subbasin GSP, the lead agencies/proponents would evaluate whether this PEIR describes the impacts adequately, or if necessary, the impacts would be evaluated in project-level CEQA documents (e.g., initial study, EIR) (see Figure 1-1).

See Appendix A.3, *Turlock Subbasin Groundwater Sustainability Plan*, Chapter 8, *Projects and Management Actions*, for additional information regarding the implementation criteria, status, and strategy for the PMAs.

2.4.1 General Operations and Maintenance Activities for Projects

General O&M activities necessary to support the functionality of constructed features would primarily include regularly scheduled inspections and evaluation of feature performance. Staff resources would be designated to conduct inspections, drive to the project sites once a month to inspect and assess the integrity of the feature(s), maintain and clean features as needed, and perform repairs to ensure proper functioning. The following activities are applicable to the operation and maintenance of the features described herein:

- Water quality testing for groundwater wells and water storage tanks.

- Use of electricity for all processes and equipment and operational lights.
- Routine cleaning of surface water conveyance features, including keeping canals free of debris.
- Cleaning and off-site removal of debris from fish screens and intake structures.
- Periodic testing of screen efficiency in accordance with applicable regulatory agency requirements.
- Periodic dredging adjacent to intakes or outlet structures to mitigate sediment accumulation.
- Truck trips to deliver materials and to haul sediment, solids, and debris to permitted disposal sites.
- Vehicle trips by employees, contractors, or consultants.
- Installation of fencing and/or signage around newly constructed features.
- Use of lights as needed.
- Maintenance of access roads and vegetation.

2.4.2 General Operations and Maintenance of Management Actions

Implementing the management actions described in the Turlock Subbasin GSP would necessitate general O&M activities to ensure that the management actions would function to meet sustainability goals. Because no structures are proposed as part of the management actions, physical O&M for these planning-level strategies would be nominal.

Table 2-4 presents examples of O&M activities that would occur during implementation of the management actions listed in the Turlock Subbasin GSP. The primary O&M activities would be for program establishment, public outreach to educate community stakeholders and water users about the programs, and routine monitoring and enforcement to ensure that program objectives are met.

Briefly, the strategies developed for reducing agricultural and urban water demands in the Turlock Subbasin propose voluntary conservation or land fallowing. These planning-type efforts would result in new operations that would include stakeholder outreach to incentivize voluntary participation.

The pumping management framework strategies would incentivize reduced pumping through groundwater extraction reporting, groundwater allocation and pumping, extraction fee programs, and groundwater market programs. These strategies would require development and initiation, system setup, and public outreach. Notably, operation of a groundwater pumping credit market and trading program would require establishing rules for the use of carryover pumping allocations. Specifically, the program would require operational flexibility that would allow a groundwater pumper to exceed its allocated sustainable pumping in a given year if the exceedance was or would be offset in prior or subsequent years.

Implementation of the domestic well mitigation program would require increased coordination with other programs that support domestic well users (e.g., drinking water quality programs). Operations of this program would necessitate public outreach and coordination, well monitoring, and development of a corrective action plan for domestic well mitigation. Additionally, operating newly constructed wells and/or connecting former domestic well users to the public water supply system may necessitate changes to existing operations.

2.5 Operational Considerations in the Turlock Subbasin

Implementing the PMAs in the Turlock GSP may result in basin-scale changes to water system operations. That is, implementing one or multiple PMAs could ultimately alter the management of surface water and groundwater in the region. One example is bringing water into the canal system for recharge opportunities in the non-irrigation season when the canal would typically be dry, or utilizing stormwater for recharge when it would typically be transported to the river system. As another example, constructing a new pipeline to connect users to new water systems or expanding the existing surface water conveyance to reach additional parcels would permanently alter the way water is distributed through the system. Although the features would be constructed, operations would depend on the availability of water. For example, landowners in the Eastside Water District may be connected to the existing TID system, but water would only be delivered for on-farm recharge when excess floodwater is available and otherwise within TID’s water rights purview.

The Turlock Subbasin GSP does not discuss basin-scale operational changes or describe the spatial or temporal implications of implementing any individual project or management action or combination of PMAs. Therefore, the following list of key operational considerations was formulated using the information provided in the Turlock Subbasin GSP and may not reflect all possible operational considerations.

- Water right modifications, or changes in beneficial use, may be required as a result of new surface water diversions from the Tuolumne and Merced rivers.
- For projects that propose the use of floodwater, a characterization of wet and above-normal hydrologic years would be needed to determine when floodwater is available for use.
- New regulating reservoirs or other facilities may be needed to deliver surface water for in-lieu groundwater recharge projects.
- Adaptive strategies that provide water management alternatives during extreme dry years should be considered for the projected water budgets and climate change analysis presented in Chapter 5 of the Turlock Subbasin GSP.
- Expanding the existing water conveyance systems, including through the addition of regulating reservoirs and storage facilities, would enable the distribution and delivery of surface water to a greater area.
- Expanding the irrigation season to irrigate during the off-season would result in year-round water deliveries.

- Increases in canal seepage loss may result when areas receive on-farm recharge deliveries during the off-season.
- Implementing on-farm flood irrigation in excess of crop water requirements would artificially recharge the groundwater system.
- Land fallowing may result in temporary or permanent repurposing of the land from agricultural to nonagricultural uses.

2.6 Potential Authorizations and Approvals

The Turlock Subbasin GSA's member agencies, responsible agencies, and individual project proponents have the authority to plan and implement the PMAs identified in the Turlock Subbasin GSP. Required permitting and regulatory review would be project-specific and would be initiated through consultation with applicable governing agencies from federal, state, and/or local jurisdictions. As described in the Turlock Subbasin GSP, each individual project proponent would manage the permitting and other specific implementation oversight. Project proponents must obtain any other necessary permits or authorizations from appropriate agencies before the start of a project.

Table 2-5 provides a list of governing agencies for which consultation may be initiated to identify authorizations and permits that may be required before project construction. Note that agency consultation may also be necessary for management actions, depending on the resulting potential impacts presented.

TABLE 2-5
ANTICIPATED REGULATORY REQUIREMENTS, PERMITS, AND AUTHORIZATIONS FOR PROJECTS AND MANAGEMENT ACTIONS

Jurisdiction	Agency	Type of Approval
Federal Agencies	U.S. Fish and Wildlife Service	Consultation under federal Endangered Species Act Section 7
	U.S. Army Corps of Engineers	Clean Water Act Section 401 Clean Water Act Section 404 Section 408 letter of permission
	National Marine Fisheries Service	Consultation under federal Endangered Species Act Section 7
	State Historic Preservation Office	National Historic Preservation Act Section 106
State Agencies	Central Valley Flood Protection Board	Encroachment permit
	State Water Resources Control Board	Division of Drinking Water permit to operate; compliance withCalifornia Code of Regulations Title 22 regulations for public drinking water Coverage under State Water Resources Control Board Water Quality Order 2012-0010, General Waste Discharge Requirements for Aquifer Storage and Recovery Projects
	Central Valley RegionalWater Quality Control Board	National Pollutant Discharge Elimination System General Permit for Stormwater Discharge Associated with Construction Issuance of programmatic waste discharge requirements
	California Division ofOccupational Safety and Health	Construction or excavation permit Compliance with the California Building Standards Code, including applicable building, plumbing, mechanical, electrical, and fire codes and applicable fire marshal approvals
	California Department of Fish and Wildlife	California Fish and Game Code Section 1602 streambed alterationagreement Compliance with California Endangered Species Act
	California Air Resources Board and San Joaquin Valley Air Pollution Control District	Permit to construct and compliance with applicable air quality regulations
	California Wildlife Conservation Board, Stanislaus County Parks Department	Access permit for work in regional parks
Local Agencies	Local Agency Formation Commission	City or county boundary change
	County, city, or community	Encroachment permit or easement for construction
	Private property owners	Pipeline, construction or other easements and property acquisition
	Local utility companies	Electrical power, telephone, and broadband internet service during construction
	Railroads	Pipeline easements for specific crossings

SOURCE: Data compiled by Environmental Science Associates in 2021

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CHAPTER 3

Environmental Setting, Impacts, and Mitigation Measures

3.1 Approach to the Environmental Analysis

As required by CEQA (State CEQA Guidelines Section 15126.2), this PEIR identifies and focuses on the potentially significant direct and indirect environmental effects of the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP). This draft PEIR assumes that the full range of PMAs would be implemented under the Turlock Subbasin GSP and provides a broad, comprehensive analysis of potential environmental effects and impact issues across the Turlock Subbasin. This draft PEIR is designed to provide CEQA review streamlining for future PMAs implemented under the Turlock Subbasin GSP.

This approach is consistent with State CEQA Guidelines Section 15168, "Program EIR," which allows for the use of a Program EIR in connection with a series of actions that can be characterized as one large project. In addition, the series of actions are related geographically and include the issuance of general criteria to govern the conduct of individual activities having generally similar environmental effects that can be mitigated in similar ways.

3.1.1 Scope and Assumptions of the Analysis

As noted in Chapter 2, *Description of the Types of PMAs to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, the Turlock Subbasin GSP applies to the Turlock Subbasin, a 544-square-mile (348,160-acre) area in the northern San Joaquin Valley approximately 80 miles south of Sacramento in Stanislaus and Merced counties. The Turlock Subbasin GSP identifies multiple PMAs that propose structural and nonstructural actions to enhance regional groundwater management and water supply, and allows for the development of additional PMAs as needed to meet the sustainability goals of the GSP.

As discussed in Sections 2.3 and 2.4, *Construction Overview for Turlock Subbasin Groundwater Sustainability Plan Projects and Management Actions* and *Operations and Maintenance Overview for Turlock Subbasin Groundwater Sustainability Plan Projects and Management Actions,* respectively, the Turlock Subbasin GSP does not describe specific construction or operations and maintenance (O&M) activities required for the implementation of PMAs. The level of detail provided for each PMA varies, including the precise locations of PMA features and detailed descriptions of feature designs, modifications, and/or construction techniques. Thus, activities specific to the PMAs were assumed using the information presented in the Turlock Subbasin GSP, as well as incorporating general information common for the development of groundwater recharge opportunities.

The Turlock Subbasin GSP PEIR employs a programmatic approach to evaluation because the specific characteristics and locations of PMAs are unknown at this time. As such, the level of detail of the environmental impact analysis is also programmatic in that it addresses the full range of potential environmental effects of implementing the types of PMAs presented in the Turlock Subbasin GSP. Environmental impact conclusions are broadly and comprehensively applied to the types of PMAs to be implemented across the study area (i.e., the Turlock Subbasin). As described above, this approach is consistent with the State CEQA Guidelines provisions for a Program EIR, as described in Section 15168. See Section 1.3, *Overview of the Program Environmental Impact Report,* for more information on the use of the PEIR and the CEQA process.

3.1.2 Impacts Analysis Approach

This section explains the approach for conducting the program-level environmental impact analyses and determining the significance of environmental impacts on various resources resulting from implementation of PMAs. In doing so, it describes how PMAs were categorized for the impact analyses and identifies the scope of data used to determine impacts.

Categorizations of Projects and Management Actions

A wide range of potential impacts are associated with the PMAs to be implemented. As described in Sections 2.2 through 2.4, and highlighted in Table 2-4, some PMAs propose the construction of new features, while others propose operational modifications to existing features or implementation of management programs. Therefore, in the context of a program-level evaluation, the scope of the impact analysis requires consideration of all potential impact mechanisms (direct/construction and indirect/operations) resulting from all types of PMAs. In addition, the impact analysis and discussion should consider the type of PMA categorized according to the primary recharge mechanism (e.g., direct recharge, in-lieu recharge, combination, or water conservation). While some impact mechanisms apply to multiple PMA types, organizing the impact discussion in this way clearly identifies the impacts associated with a particular project or management action.

In considering the scope of the impact analysis, it was observed that some analyses would benefit from a discussion of *where* in the Turlock Subbasin the PMA is proposed and *who* the PMA would service. Implementation of this tailored approach ensures that the analysis considers all reasonably foreseeable impacts and facilitates greater use of the PEIR for future PMA proponents.

Given this is a program-level CEQA document (e.g., PEIR), the analyses are generally qualitative and conservative and assume that all PMAs would be implemented. Analyses rely on the use of existing quantitative and qualitative data, including but not limited to existing plans, reports, desktop (versus field) surveys, open access databases, maps, and models. Information regarding example projects similar to the types of PMAs (e.g., groundwater recharge projects) implemented in the Turlock Subbasin were also reviewed. References are provided in Chapter 8, *References*.

3.1.3 Analysis Contents

Sections 3.2 through 3.20 of this draft PEIR present a discussion of existing conditions, regulatory background, environmental impacts associated with the types of PMAs to be implemented under the Turlock Subbasin GSP, and mitigation measures to reduce the level of impact. The environmental resource topics evaluated in Chapter 3 are consistent with those identified in the notice of preparation (NOP) prepared for this PEIR (see Appendix A) and consider relevant comments provided by agencies, organizations, and the public during NOP review.

Sections 3.2 through 3.20 follow the same general format:

Introduction provides an introduction to the analysis contained in the section, including a summary of the nature of comments received in response to the NOP.

Environmental Setting presents the existing environmental conditions within the study area in accordance with Section 15125 of the State CEQA Guidelines and provides a point of reference for assessing the environmental impacts. The degree of specificity under this PEIR's program-level analysis is more generalized than a site-specific analysis, because the exact locations of PMAs are not yet known. The study area for the PMAs is subbasin-wide, spanning the western and eastern portions of the Turlock Subbasin. For this reason, each resource section provides a general discussion of the environmental setting; the manner in which the environmental setting is described varies by resource area. Where applicable and helpful for conducting the impact analysis, the setting description and environmental analysis for the PMAs are geographically organized to reflect different environmental characteristics. For example,

- Section 3.14.2, *Environmental Setting*, for the Noise analysis discusses acoustic fundamentals, the effects of noise on humans, and noise-sensitive land uses. However, the section does not provide information about individual PMAs or their locations relative to sensitive receptors (e.g., residences, libraries and schools, hospitals) because these sensitive receptors are not known at this time.
- Section 3.5.2, *Environmental Setting*, for the Biological Resources analysis discusses the environmental setting by ecoregions in the study area. The ecoregions encompass geographic areas with similar patterns of physical and biological characteristics, resulting in similar expected impact mechanisms for PMAs implemented under the Turlock Subbasin GSP.

Regulatory Setting presents the laws, regulations, plans, policies, and ordinances that are relevant to each environmental resource. Regulations originating from the federal, state, regional, and local levels are each discussed as applicable to the Turlock Subbasin study area. Similar to the environmental setting, the regulatory setting provides a point of reference for assessing the environmental impacts. This PEIR assumes that implementation of any PMA would be consistent with local plans, policies, and ordinances.

Environmental Impact Analysis identifies the thresholds of significance used to determine the level of significance of the environmental impacts for each resource topic, in accordance with the State CEQA Guidelines (Sections 15126, 15126.2, and 15143). The thresholds of significance used in this PEIR are primarily based on the checklist presented in Appendix G of the State CEQA Guidelines, best available data, applicable regulatory standards of public agencies, and professional judgement. Additional thresholds are proposed for potential issues raised during public scoping and/or identified as relevant to the Turlock Subbasin's geographic area.

The significance of each impact is determined by evaluating the physical changes in the environmental setting that would be caused by implementation of PMAs, and analyzing those effects against the identified threshold. Existing site conditions described in the environmental setting are used as a baseline for comparison. Key methods, data, and assumptions used to frame and conduct the impact analysis are also described. Issues or potential impacts not discussed further (such as issues for which the PMA would have no impact) are also described. For some resource areas, impacts are evaluated separately for direct and in-lieu recharge projects and water conservation management actions. While the impact conclusions reached may be the same, this approach will facilitate a discussion of any potential differences given that direct and in-lieu recharge projects rely more on constructed features than management actions for implementation.

Impacts are organized by letter convention for each resource (e.g., in Section 3.2, *Aesthetic and Visual Resources*, impacts are numbered as follows: Impact AES-1, Impact AES-2) and generally align with each threshold of significance. A **bold-font** impact statement, a summary of each impact, and its level of significance before application of any necessary or recommended mitigation precede the discussion of each impact (as applicable). Generally speaking, each discussion begins with an impact statement and analysis for two types of impacts:

a. **Construction-related impacts:** These are impacts of preconstruction (e.g., site preparation) and site development activities for PMAs. Construction-related impacts are often temporary.

b. **Impacts of constructed features and O&M of those features:** These are impacts of the PMA itself, once completed, and include O&M activities (e.g., monitoring). These impacts are generally considered permanent or ongoing. Routine O&M activities may be of short duration but are usually reoccurring.

The discussion that follows the impact summary presents the substantial evidence supporting the significance conclusion for the impact.

If an environmental impact cannot be avoided or maintained at a less-than-significant level, then it would be a potentially significant impact, and the PEIR must describe feasible measures that could avoid, minimize, rectify, reduce, or compensate for potentially significant adverse impacts. The measures shall be fully enforceable and adopted as a condition of approval [Public Resources Code (PRC) Section 21081.6(b)]. Mitigation measures are not required for impacts that are determined to be less than significant. Where feasible mitigation for a potentially significant impact is available, the mitigation measures are presented. Each identified mitigation measure is labeled with the same letter convention to correspond with the number of the impact that would be mitigated by the measure (e.g., Mitigation Measure AES-1 for Aesthetics). Following the mitigation measure, the measure's effectiveness at reducing the impact is described and compared against the identified threshold to determine the level of significance after mitigation. Where sufficient feasible mitigation is not available to reduce an impact to a less-than-significant level, or where the PMA proponent may lack the ability to ensure that the mitigation is implemented, the impact is identified as remaining "significant and unavoidable." **References** are presented in Chapter 8, organized by resource section.

Chapter 4 of this PEIR, *Cumulative Impacts*, presents an analysis of the potential cumulative impacts of implementing the PMAs described in the Turlock Subbasin GSP together with other past, present, and reasonably foreseeable future projects, as required by Section 15130 of the State CEQA Guidelines. Chapter 5, *Other CEQA Considerations,* identifies the potentially significant and unavoidable impacts, significant and irreversible commitment of resources, and growth-inducing impacts of implementing the PMAs described in the Turlock Subbasin GSP, as required by PRC Section 21100(b)(5). Chapter 6, *Alternatives*, presents a reasonable range of alternatives and evaluates the environmental effects of those alternatives to PMAs described in the Turlock Subbasin GSP, as required by Section 15126.6 of the State CEQA Guidelines.

3.1.4 Terminology Used in the PEIR

This draft PEIR uses the following terminology to describe environmental impacts of the PMAs to be implemented under the Turlock Subbasin GSP. Refer to the Glossary for definitions of key terms used in this draft PEIR to describe important components of the PMAs.

Thresholds of Significance: The set of criteria used to determine at what level or "threshold" an impact would be considered significant. Thresholds of significance used in this PEIR include those discussed in Appendix G of the State CEQA Guidelines; criteria based on factual or scientific information; criteria based on regulatory standards of local, state, and federal agencies; and criteria adopted by the Turlock Subbasin GSAs. In determining the level of significance, the analysis assumes that relevant federal, state, and local regulations and ordinances would be complied with.

Less-than-Significant Impact: An impact is considered less than significant when it does not reach the threshold of significance and would therefore cause no substantial adverse change in the physical environment. No mitigation is required for less-than-significant impacts.

Significant Impact: An impact is considered significant if it would result in a substantial adverse change in the physical condition of the environment. Significant impacts are identified by evaluating the effects of the project (in this case, the PMAs to be implemented under the Turlock Subbasin GSP) in the context of specific thresholds of significance. Mitigation measures are identified to reduce these impacts on the environment where feasible.

Significant and Unavoidable Impact: An impact is considered significant and unavoidable if it would result in a substantial adverse change in the environment that cannot be feasibly avoided or mitigated to a less-than-significant level. If a lead agency decides to approve a project with significant unavoidable (SU) impacts, it must adopt a statement of overriding considerations to explain its actions [State CEQA Guidelines, Section 15093(b)]. For select environmental resources, potentially significant and unavoidable (PSU) if the determination was more uncertain.

Mitigation Measures: State CEQA Guidelines (Section 15370) define mitigation as:

a) Avoiding the impact altogether by not taking a certain action or parts of an action.

b) Minimizing impacts by limiting the degree of magnitude of the action and its implementation.

c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

e) Compensating for the impact by replacing or providing substitute resources or environments, including through permanent protection of such resources in the form of conservation easements.

Note that the applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the project proponent(s) under the WTS GSA and ETS GSA and their members (identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*), as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*.

3.2 Aesthetic and Visual Resources

3.2.1 Introduction

This section describes the aesthetic and visual resources in and characteristics of the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect aesthetic resources. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan,* in Chapter 2.) As discussed below, potential impacts include a change to a scenic vista, damage to scenic resources, degradation of visual character, and creation of a new source of light or glare.

No comments specifically addressing aesthetics and visual resources were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.2.2 Environmental Setting

This section describes the aesthetic and visual resources that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. *Visual resources* include physical features that make up the visible landscape, including land, water, vegetation, geologic features, and built structures (e.g., buildings, roadways, bridges, levees). The area of analysis covers the Turlock Subbasin and includes many types of visual resources.

Sensitive Viewers

Viewer sensitivity is one factor in assessing aesthetic impacts. It is a function of several influences:

- Visibility of the landscape.
- Proximity of viewers to the visual resources.
- Frequency and duration of views.
- Number of viewers.
- Types of individuals and groups of viewers.
- Viewers' expectations, as influenced by their values, awareness, and activity.

The viewer's distance from landscape elements plays an important role in determining an area's visual quality. Landscape elements are considered higher or lower in visual importance based on their proximity to the viewer. Generally, the closer a visual resource is to the viewer, the more dominant—and thus the more visually important—it is to the viewer. For this reason, visual quality assessment methods typically separate landscapes into foreground, middleground, and background views. Generally, the *foreground* is characterized by clear details (within 0.25 or 0.5 mile from the viewer); the *middleground* is characterized by the loss of clear texture in a landscape, which creates a uniform appearance (foreground to 3–5 miles in the distance); and the *background* extends from the middleground to the limit of human sight (USFS 1974:7).

Residents

Communities within the Turlock Subbasin have varied populations, density, and character. Cities and communities in the subbasin include Bystrom, Parklawn, Ceres, Keyes, Hughson, Turlock, Delhi, Hilmar, Denair, and Hickman. Many residents live in rural communities dispersed throughout the subbasin.

Residents of these communities are potential viewers of visual resources within the Turlock Subbasin, and views are among the many factors that influence their choice of residential location. Residents tend to have high visual sensitivity. Residents of Turlock Subbasin communities routinely view the waterways (e.g., Tuolumne River, Merced River, San Joaquin River), built environment, and other aspects of the surrounding area that contribute to its visual character. These views are often in the foreground and therefore are more visually important. Residents of surrounding communities view these resources less frequently, and potentially from greater distances, which can reduce the resources' visual importance.

Workers and Commuters

Agricultural employees and commuters using roadways and rail lines through and around the Turlock Subbasin are potential viewers of the subbasin's visual resources. Most job opportunities in the area are related to agriculture. *Commuter towns* or *bedroom communities* are residential suburbs inhabited largely by people who commute to a nearby city for work. These workers routinely view the natural environment, built environment, and other aspects of the study area that contribute to its visual character. Commuters using roadways and railways may view these resources for less time, at greater speeds, and from greater distances than residents, workers, visitors to recreational areas, and other sensitive viewers. Workers and commuters generally have low visual sensitivity because their activities tend not to focus on visual surroundings. Larger cities and urban areas of the Turlock Subbasin contain less agricultural land and more built-out urban land.

Recreation Visitors, Travelers, and Tourists

The Turlock Subbasin is a 544-square-mile (348,160-acre) area in the northern San Joaquin Valley, approximately 80 miles south of Sacramento in Stanislaus and Merced counties. It is generally flat and is bounded on the north by the Tuolumne River, on the south by the Merced River, and on the west by the San Joaquin River. The subbasin's eastern boundary is defined by crystalline basement rocks of the Sierra Nevada foothills (DWR 2006). Most of the land in the Turlock Subbasin is privately owned; as a result, land-based recreation (e.g., hiking, biking, horseback riding) is generally limited to outdoor activities in parks, preserves, and other public conservation lands (see Section 3.16, Recreation). Various water-based recreation activities occur within the Turlock Subbasin, such as boating, fishing, hunting, and swimming. These activities could occur in lakes, reservoirs, and rivers. The visual character of land- and water-based recreation tends to be high quality, as the visual environment tends to factor heavily into recreation, travel, and sightseeing activities. Recreation in urban areas within the Turlock Subbasin could include activities such as the use of city parks, walkways, and museums; participation in local events; visits to tourist destinations; and picnicking. The Turlock Subbasin contains a wide variety of recreational resources and opportunities because of its size and water features.

Working Landscapes

Working landscapes are lands on which resource management and/or cultivation activities occur in large areas, mostly without buildings or structures, such as agricultural, timber, or grazing lands. Working landscapes may contain natural contours, waterways, and other features or may alter these features while maintaining a primarily unbuilt visual context.

A variety of features may define the visual character of a working landscape. The preservation, transformation, and general purpose or function of prominent features that are most noticeable in the landscape can affect the human perception of a working landscape. Working landscapes in the Turlock Subbasin are generally associated with agricultural uses. Facilities may include renewable energy features, such as solar panels.

The agricultural landscape, consisting of orchards, row crops, and pasturelands, is dominant aesthetically and defines rural areas of the Turlock Subbasin within the Central Valley. Orchards and row crops are found on large plots, where they are planted in long horizontal lines that dominate the visual field, creating a uniform form and texture.

Urban Environments

The larger cities and more urban environments in the Turlock Subbasin include communities such as Turlock, Bystrom, Shakelford, Ceres, Hughson, Keyes, Hilmar, Delhi, Denair, and Hickman. Some of these comparatively urban areas contain large built environments and proportionally less natural habitat or open space. The scenic qualities of these areas are lower than those of more rural areas because the existing built environment detracts from views of the natural landscape. Views in communities are limited to buildings, roadways, and other infrastructure.

Scenic Highways

As discussed in Section 3.17, *Transportation*, scenic highways are nominated for state designation by cities and counties. Interstate 5 is the only state-designated Scenic Highway within Stanislaus and Merced counties. However, Interstate 5 is located entirely outside of the Turlock Subbasin.

Vista Points

Roadway vista points are pullouts along roadways that allow motorists to view scenery. Vista viewpoints in Stanislaus and Merced Counties include those located along Interstate 5, State Route (SR) 33, SR 59, SR 99, SR 140, SR 152, and SR 165. Both Interstate 5 and SR 33 are located outside of the Turlock Subbasin.

Light and Glare

For the purposes of the analysis in this PEIR, *light* (also known as *light pollution*) refers to unnatural nighttime lighting that may intrude into sky darkness when added to an area that currently contains little or no artificial lighting. *Glare* refers to unnatural light or reflected natural light that can be annoying or distracting.

Lighting and glare levels tend to be much lower in undeveloped areas, particularly when these areas are located far from developed areas. Urban areas contain varied light sources, such as streetlights and car headlights, and skyglow may be present in more urbanized areas. *Skyglow* is an areawide illumination of the night sky from human-made light sources.

3.2.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to aesthetic and visual resources. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

U.S. Forest Service Scenery Management System

The U.S. Forest Service's Scenery Management System provides a framework for the inventory, analysis, and management of scenery of National Forest lands. This system includes landscape character descriptions and scenic integrity objectives that can be used to help assess the compatibility of a proposed project with the surrounding landscape. The Scenery Management System is described in detail in the 1996 U.S. Forest Service handbook *Landscape Aesthetics: A Handbook for Scenery Management.*

Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act of 1968, as amended (Public Law 90-542; United States Code Title 16, Sections 12371–1287), established the National Wild and Scenic Rivers System. The system identifies distinguished rivers of the nation that possess remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. The Wild and Scenic Rivers Act preserves the free-flowing condition of rivers that are designated and protects their local environments. Section 5(d)(1) of the act requires that all federal agencies, consider potential national wild, scenic, and recreational river areas when planning for the use and development of water and related land resources. These areas are defined as follows (National Wild and Scenic Rivers System 2022):

- **"Wild" river areas—**Those rivers or sections of rivers that are free of impoundments and are generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- **"Scenic" river areas—**Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- "**Recreational" river areas**—Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past. Scenic qualities are a major consideration in the designation of rivers as wild (pristine), scenic (largely undeveloped), or recreational (mostly developed), although river segments in any of the three categories typically maintain high scenic qualities.

Visual Resource Management

The U.S. Bureau of Land Management manages public land for multiple uses, which includes protecting scenic values within public lands through Visual Resource Management (VRM) in accordance with Section 102(a)(8) of the Federal Land Policy and Management Act of 1976. Visual resource classes are assigned through the inventory processes and serve as (1) an inventory tool that portrays the relative value of the visual resources and (2) a management tool that portrays the visual management objects (BLM 2007).

The VRM has four classes: I, II, III, and IV. These classes are assigned through resource management plans (RMPs) and are ultimately based on the management decisions made in RMPs. As described below, these classes also include the level of visual change in landscape character that would be allowed to result from the proposed management activities:

- **VRM I Objective**: The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristics should be very low and must not attract attention.
- **VRM II Objective**: The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- **VRM III Objective**: The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- **VRM IV Objective**: The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristics landscape can be high. These management activities should be made to minimize the impacts of these activities through careful location, minimal disturbance, and repeating the basic elements.
- **Rehabilitation Areas**: Areas defined by VRM that are in need of rehabilitation from a visual standpoint and should be flagged during the inventory process. The level of rehabilitation will be determined through the RMP process by assigning the VRM class approved for that particular area.

State

California State Scenic Highway Program

The California Department of Transportation (Caltrans) manages the California Scenic Highway Program to preserve and protect scenic highway corridors from changes that would affect the aesthetic value of the land adjacent to the highways. Designation as a scenic highway is determined by views of the natural landscape, scenic quality, and the extent of visual intrusion. A city or county must nominate an eligible scenic highway for official designation and adopt a corridor protection program that includes zoning and planning policies to preserve its scenic quality. These policies are discussed below in the context of county and city general plans.

California Wild and Scenic Rivers Act

The California Wild and Scenic Rivers Act (Public Resources Code Section 5093.50 et seq.) was enacted in 1972 to preserve California's designated rivers possessing extraordinary scenic, recreation, fishery, or wildlife values. This law was patterned after the 1968 National Wild and Scenic Rivers Act, and they share similar criteria and definitions regarding the protection of rivers, the process used to designate rivers, and the prohibition of new water impoundments on designated rivers. However, unlike the national act, the California Wild and Scenic Rivers Act provides protection only up to the first line of permanent vegetation and does not require a management plan for designated rivers.

The California Legislature is responsible for classifying or reclassifying rivers by statute, although the Resources Secretary may recommend classifications. State-designated rivers may be added to the federal system upon the request of the state's governor and approval by the U.S. Secretary of the Interior. Adding state rivers to the federal system under this act does not require approval of the Legislature or Congress. State rivers added to the federal system are managed by the state.

There are no wild and scenic rivers within the study area.

Regional and Local

Regional and local plans contain aesthetics goals and policies that promote preservation and enhancement of the area's visual character and areas of identified high scenic value: its natural features, view corridors, scenic routes, and/or prominent ridgelines.

Stanislaus County General Plan

The following goals and policies in the Stanislaus County General Plan (2015) are relevant to implementation of the PMAs.

Land Use Element

Goal One: Provide for diverse land use needs by designating patterns which are responsive to the physical characteristics of the land as well as to environmental, economic and social concerns of the residents of Stanislaus County.

- ***Policy Two*:** Land designated Agriculture shall be restricted to uses that are compatible with agricultural practices, including natural resources management, open space, outdoor recreation and enjoyment of scenic beauty.
- ***Policy Seven*:** Riparian habitat along the rivers and natural waterways of Stanislaus County shall to the extent possible be protected.
- ***Policy Sixteen*:** Outdoor lighting shall be designed to be compatible with other uses.

Conservation/Open Space Element

Goal One: Encourage the protection and preservation of natural and scenic areas throughout the County.

Goal Two: Conserve water resources and protect water quality in the County.

Goal Eight: Preserve areas of national, state, regional and local historical importance.

Goal Nine: Manage extractive natural resources to ensure an adequate supply without degradation of the environment.

Agricultural Element

Goal Three: Protect the natural resources that sustain our agricultural industry.

Merced County General Plan

The following goals and policies in the Merced County General Plan (2012) are relevant to implementation of the PMAs.

Natural Resources Element

Goal NR-4: Protect scenic resources and vistas.

- ***Policy NR-4.1: Special Review Process for Structures Adjacent to Scenic Highways.*** Promote the preservation of agricultural land, ranch land, and other open space areas as a means of protecting the county's scenic resources.
- ***Policy NR-4.2: New Roads.*** Coordinate with Caltrans during the review of proposed structures and activities located adjacent to state-designated scenic highways to ensure that scenic vistas and local scenic values are not significantly degraded.

Recreation and Cultural Resources Element

Goal RCR-1: Preserve, enhance, expand, and manage Merced County's diverse system of regional parks, trails, recreation areas, and natural resources for the enjoyment of present and future residents and park visitors.

- ***Policy RCR-1.11: Scenic Resource and Public Land Protection.*** Encourage the use of regional parks and open space areas as a mechanism to preserve the county's natural scenic beauty and protect land for public purposes.

Public Facilities and Services Element

- ***Policy PFS-5.6: Underground Power Transmission.*** Require power transmission and distribution facilities to be located underground within urban communities and residential centers.

City General Plans

Table 3.2-1 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.2-1
CITY GENERAL PLAN POLICIES GOVERNING AESTHETICS AND VISUAL RESOURCES WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Aesthetics
City of Turlock	Chapter 6, City Design: Policy 2.7, Policy 5.6, Policy 6.1, Policy 6.2, Policy 6.3, Policy 6.4, Policy 6.6, and Policy 6.7
City of Modesto	Chapter 3, Community Development Policies, Land Use Goals and Policies, Goal III.B
City of Ceres	Land Use and Community Design: Policy LUD 4, Policy LUD 9, Policy LUD 12, Policy LUD 14 Transportation and Circulation: Policy TRAN 7 Preservation: Policy PRES 1, Policy PRES 2, Policy PRES 3, Policy PRES 4, Policy PRES 5, Policy PRES 6
City of Hughson	Land Use Element: Goal LU-1, Policy LU-1.3, Goal LU-3, Policy LU-3.1, Policy LU-3.2, Policy LU-3.6, Policy LU-3.7, Policy LU-3.9, Policy LU-3.10

SOURCE: Data compiled by Environmental Science Associates in 2022

3.2.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on aesthetic and visual resources focuses on the potential for substantial adverse effects on a scenic vista, substantial degradation of scenic resources within a state scenic highway or degradation of existing visual character or quality, and creation of a new source of substantial light or glare. Aesthetic impacts from the types of PMAs implemented under the Turlock Subbasin GSP have been evaluated in terms of how typical construction and operation could affect existing visual resources. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes caused by the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

The following factors were considered when determining the extent and implications of potential visual changes:

- Potential changes in the visual composition, character, and specifically valued qualities of the affected environment.
- The visual context of the affected environment.
- The extent to which the affected environment contains places or features designated by plans and policies for protection or special consideration.
- The number of viewers, their activities, and the extent to which these activities are related to the aesthetic qualities affected by project changes.
- Viewer sensitivity, which is based on the visibility of the landscape, proximity of viewers, frequency and duration of views, and number and types of viewers, and on viewers' expectations as influenced by their activity (e.g., driving, boating, hiking).

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The assessment of visual impacts used a qualitative and conservative approach, assuming that all PMAs would be implemented. The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop surveys, open-access databases, maps, and models. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2, *Project Description*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on aesthetics and visual resources if it would:

- Have a substantial adverse effect on a scenic vista;
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway;
- Substantially degrade the existing visual character or quality of public views of the site and its surroundings (public views are those that are experienced from a publicly accessible vantage point), or, if the project is in an urbanized area, conflict with applicable zoning and other regulations governing scenic quality; or
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

Impacts and Mitigation Measures

Table 3.2-2 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the activities, location, and potentially significant impacts of the individual project or management action. Implementation of the mitigation measures would be the responsibility of the project's or management action's proponent(s).

TABLE 3.2-2
SUMMARY OF IMPACT CONCLUSIONS—AESTHETIC AND VISUAL RESOURCES

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
AES-1: Implementing PMAs under the Turlock Subbasin GSP could result in substantial degradation of visual qualities.	LTS	LTSM
AES-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse effects on scenic vistas and scenic resources.	LTS	LTS
AES-3: Implementing PMAs under the Turlock Subbasin GSP could result in new sources of substantial light or glare.	LTSM	LTSM

NOTES: LTS = less than significant; LTSM = less than significant with mitigation incorporated

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact AES-1: Implementing PMAs under the Turlock Subbasin GSP could result in substantial degradation of visual qualities.

Effects of Construction Activities

PMAs implemented under the Turlock Subbasin GSP would involve development of features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications. Implementation of the PMAs could include the following construction activities:

- Mobilize equipment and materials.
- Prepare staging areas.
- Establish designated access and haul routes.
- Stage and store equipment and materials.
- Prepare the project site.
- Prepare and use borrow sites.
- Drill wells.
- Restore and/or demobilize the site.
- Dispose of excess materials.
- Dewater, excavate, fill, and place materials in water.
- Modify drainage.

PMAs could also require forming and pouring concrete, pile driving, excavation, chemical or manual removal of vegetation, and plowing or disking activities. For example, construction of storage tanks or reservoirs could require clearing vegetation from the site, moving and placing large amounts of soil/material, and pouring concrete.

Construction sites for the PMAs could be visible from nearby waterways, roads, cities, residences, and recreational areas where viewer sensitivity is elevated and visual quality is moderate to high. Views of construction sites and activities could temporarily and adversely affect the visual qualities and character of the surrounding landscape. In addition, the time to construct PMAs could be as short as a few days for minor projects, to as long as several years for major projects (e.g., PMAs requiring construction during certain months of the year).

Therefore, construction activities for PMAs implemented under the Turlock Subbasin GSP could temporarily alter local visual conditions. Views could include excavation, grading, vegetation removal, construction equipment, parking of vehicles, and temporary construction offices. These elements would be removed after construction; therefore, their presence would not cause permanent changes to local visual conditions. This impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

PMAs implemented under the Turlock Subbasin GSP are expected to be beneficial; they would ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during the drought.

Constructing PMAs could result in the placement of features such as injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins to enable deliveries of surface water to drip/microsystems. These features may not have the same visual character as surrounding landscapes, and a project feature that prominently contrasts with the existing visual qualities and character of the surrounding landscape could cause a change in visual quality. For example, a new water storage tank in a recreational area might add more contrast to the area and detract from the natural setting. Although these structures may not be visible from great distances, these projects would likely have relatively localized effects and would cause substantial degradation of visual quality.

Some PMAs implemented under the Turlock Subbasin GSP could permanently alter the visual landscape as a result of changes to water system operations. For example, conveyance of surface water through new or expanded infrastructure could result in decreases in flows to stream or river systems, and such changes in water volumes would result in alterations to the visual landscape.

Because the precise locations and detailed characteristics of potential future PMAs are yet to be determined, and given the potential for future PMAs to result in permanent alteration of visual landscapes, this impact would be **potentially significant**.

Compliance with Mitigation Measure AES-1 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project's or management action's proponent(s).

Mitigation Measure AES-1: Minimize Degradation of Visual Quality.

- Use compatible colors for proposed structural features, such as fish screens and storage tanks. Use earth-tone paints and stains with low levels of reflectivity.
- Minimize the vertical profile of proposed structures as much as possible.
- Provide vegetative screening to soften views of structures. Landscaping should complement the surrounding landscape.

Implementing Mitigation Measure AES-1 would reduce this potentially significant impact to a **less-than-significant** level.

Impact AES-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse effects on scenic vistas and scenic resources.

Effects of Construction Activities

PMAs implemented under the Turlock Subbasin GSP could result in a temporary adverse effect on an existing scenic vista or scenic resource. Similar to Impact AES-1, construction activities such as dredging, excavation scraping, and physical disturbance of vegetation and/or habitat, as well as the presence of equipment, vehicle parking, and temporary staging areas, could result in temporary changes to local visual conditions.

No designated scenic highways pass through the Turlock Subbasin, but construction sites could be visible from designated scenic roads. Views from elevated roadways are typically broad and expansive. The Turlock Subbasin is generally flat and does not offer views from elevated roadways. However, the visibility of construction activities and associated equipment could temporarily and adversely affect scenic views from scenic vistas and designated scenic roads.

Construction activities for PMAs implemented under the Turlock Subbasin GSP could be visible from designated scenic roads, resulting in significant, temporary and long-term adverse changes to scenic vistas. However, construction elements would be removed after construction; therefore, their presence would not cause permanent changes to local visual conditions. This impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Construction of PMAs implemented under the Turlock Subbasin GSP, such as placement of infrastructure features (e.g., pump stations, dry wells, and other water distribution and conveyance infrastructure), could permanently alter scenic resources and views, depending on whether other similar infrastructure already exists near the PMAs. Adding a project feature that prominently contrasts with the existing visual qualities and character of the surrounding landscape could cause a substantial change in visual quality.

However, most PMAs implemented under the Turlock Subbasin GSP would not dominate or obstruct views of a scenic vista from any of the designated scenic resources within the subbasin (roads, routes, or waterways). For example, the visual appearance of canal interties and regulating reservoirs may not be considered notable because it would be similar to the existing landscape and the features would be visible in the background from many vantage points. Also, the visual appearance of features (e.g., water distribution, conveyance structures, water tanks) constructed under the Turlock Subbasin GSP near agricultural lands would not be considered notable because it would be similar to the surrounding area’s existing landscape and infrastructure, and because the features would not prominently block or affect views from vantage points. In addition, PMAs implemented under the Turlock Subbasin GSP would not obstruct views of scenic vistas from designated scenic highways within the Turlock Subbasin because there are no designated scenic highways within the subbasin’s boundaries.

Operations and maintenance (O&M) activities would introduce workers and vehicles into the study area; however, the presence of such workers and vehicles would be temporary and intermittent and would not result in substantial changes to visual quality in the project area.

PMAs implemented under the Turlock Subbasin GSP may also result in the construction and operation of projects that could result in a beneficial change to the visual qualities of the subbasin. For example, PMAs for new or expanded water storage (e.g., recharge basins, canal interties, regulating reservoirs) could increase aquatic areas, which would be considered a beneficial change to existing visual quality.

Given the relatively local nature of the effects, PMAs implemented under the Turlock Subbasin GSP would not result in substantial adverse effects on scenic vistas or scenic resources, and the visual qualities of the area would not be substantially degraded. Therefore, this impact would be **less than significant**.

Impact AES-3: Implementing PMAs under the Turlock Subbasin GSP could result in new sources of substantial light or glare.

Effects of Construction Activities

Construction activities for PMAs implemented under the Turlock Subbasin GSP could result in new sources of substantial light or glare. For example, glare could occur if reflective construction materials were to be positioned in highly visible locations where sunlight could be reflected. However, any glare would be highly transitory and short term, given the movement of construction equipment and materials in the construction area, and the effect would likely be negligible. In addition, construction activities would typically not occur on surfaces that would be large enough and flat enough to generate substantial glare.

Construction activities could require the use of nighttime floodlighting if work were to extend into the nighttime hours. For example, should the construction schedule approach the flood season or a blackout time period for sensitive species, PMAs may require continuous daytime and nighttime work. These temporary light sources could be visible by residents, businesses, and other people in the vicinity. They would be particularly noticeable in rural areas that have lower levels of light pollution from existing sources such as street lights.

Construction activities or the use of construction lighting for PMAs implemented under the Turlock Subbasin GSP could temporarily generate glare. Because these construction activities could result in a substantial adverse effect associated with night lighting and glare in the study area, this impact would be **potentially significant**.

Compliance with Mitigation Measure AES-2 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project's or management action's proponent(s).

Mitigation Measure AES-2: Avoid Effects of Project Lighting.

Proposed lighting features shall use shields, and lighting shall be directed downward and inward toward the features.

Implementing Mitigation Measure AES-2 would reduce this potentially significant impact to a **less-than-significant** level.

Effects of Constructed Features and Operations and Maintenance of Those Features

Some PMAs implemented under the Turlock Subbasin GSP could result in new and long-term or permanent lighting. For example, lighting equipment may be required for the operation of features such as water storage tanks and ancillary buildings or structures. Features and structures could include highly polished surfaces that reflect light. They would be particularly noticeable in rural areas that have lower levels of highly polished surfaces from existing structures in the area, such as agricultural lands.

Other ongoing O&M activities would temporarily introduce workers and vehicles to the area; however, such activities would occur during daylight and would not introduce substantial new sources of light or glare to the area. For example, the construction or expansion of water distribution and conveyance infrastructure could result in changes to the timing and/or amount of water being diverted from the river (e.g., Tuolumne River) or into existing open channels. These types of projects do not include materials that would produce glare or nighttime lighting. Additionally, O&M activities could include conducting water quality testing for groundwater wells or clearing debris from surface conveyance features. These activities would not introduce new sources of light or glare to the area.

Natural light reflected by construction PMAs (e.g., when additional water is present as a result of a regulating reservoir or irrigation basins) is not expected to be annoying or distracting because water features are considered aesthetically beneficial.

However, because O&M activities for PMAs implemented under the Turlock Subbasin GSP could result in a substantial adverse effect associated with new and long-term or permanent lighting, this impact would be **potentially significant**.

Compliance with Mitigation Measure AES-2 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project's or management action's proponent(s).

Mitigation Measure: Implement Mitigation Measure AES-2.

For the text of this mitigation measure, see the discussion of Impact AES-2, above.

Implementing Mitigation Measure AES-2 would reduce this potentially significant impact to a **less-than-significant** level.

3.3 Agriculture and Forestry Resources

3.3.1 Introduction

This section describes the agriculture and forestry resources in the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect agriculture and forestry resources. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2.) As discussed below, potential impacts include actions that could occupy, encroach onto, convert, or damage resources of farmlands, forestlands, or timber production zones.

No comments specifically addressing agriculture and forestry resources were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.3.2 Environmental Setting

This section describes the agriculture and forestry resources that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The agricultural and forestry statistics for the Turlock Subbasin are largely discussed at the county level (i.e., Stanislaus and Merced counties) in this document because of the broad nature of the PMAs to be implemented under the Turlock Subbasin GSP, as well as the lack of certainty about where specific projects would be located in the subbasin.

Definitions

Agricultural Land

The State of California established the Farmland Mapping and Monitoring Program (FMMP) in 1982 to continue the Important Farmland mapping efforts begun in 1975 by the U.S. Natural Resources Conservation Service (NRCS). The intent of NRCS (then named the Soil Conservation Service) was to produce maps of agricultural resources based on soil quality and land use across the nation. The California Department of Conservation sponsors the FMMP and is responsible for establishing agricultural easements in accordance with California Public Resources Code (PRC) Sections 10250–10255.

As part of the nationwide effort to map agricultural land uses, NRCS uses a series of definitions known as the Land Inventory and Monitoring criteria. These criteria classify the land's suitability for agricultural production. Suitability is determined based on the physical and chemical characteristics of soils, as well as the actual land use. Maps of Important Farmland are derived from the NRCS soil survey maps using the Land Inventory and Monitoring criteria and are available by county. The maps prepared by NRCS classify land into water and seven other categories:

- **Prime Farmland**—Land that has the best combination of features for producing agricultural crops. Prime Farmland must have been used for production of irrigated crops at some time during the 4 years before the FMMP's mapping date.

- **Farmland of Statewide Importance**—Land, other than Prime Farmland, with a good combination of physical and chemical characteristics for producing crops. Farmland of Statewide Importance must have been used for production of irrigated crops at some time during the 4 years before the mapping date.
- **Unique Farmland**—Land that has been used to produce specific crops with high economic value but does not meet the criteria for Prime Farmland or Farmland of Statewide Importance. This land is usually irrigated, but it may include non-irrigated orchards or vineyards found in some climatic zones. Unique Farmland must have been used for crops at some time during the 4 years before the mapping date.
- **Farmland of Local Importance**—Land other than Prime Farmland, Farmland of Statewide Importance, and Unique Farmland that either is currently producing crops, has the capability to produce crops, or is used to produce confined livestock. This land includes farmland of potential local importance.
- **Grazing Land**—Land on which existing vegetation, whether grown naturally or through management, is suitable for grazing or browsing by livestock.
- **Other Land**—Land that is not included in any of the other mapping categories. This land generally includes land in rural residential development; land not suitable for livestock grazing; government land; rights-of-way outside of urban and built-up areas; facilities for confined livestock or aquaculture; mines, borrow pits, or gravel pits; water bodies smaller than 40 acres; or other rural land uses not suitable for agricultural operations.
- **Urban and Built-Up Land**—Land occupied by structures with a density of at least one dwelling unit per 1.5 acres, or approximately six structures to a 10-acre parcel. This land is used for residential, industrial, commercial, institutional, public utility structures, or other developed purposes.

Prime Farmland, Farmland of Statewide Importance, and Unique Farmland are collectively called "Special Designated Farmland" in this section.

Forestry Resources

The discussion of forestry resources uses the following terms:

- **Forestland**—Land that can support 10 percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits (PRC Section 12220[g]).
- **Timberland**—Land, other than land owned by the federal government and land designated as experimental forestland, which is available for, and capable of, growing a crop of trees of any commercial species used to produce lumber and other forest products, including Christmas trees (PRC Section 4526). The criterion used to determine whether forestland qualifies as timberland is whether the land is capable of growing 22 cubic feet or more of industrial wood per acre per year (CAL FIRE 2018).

Impacts involving the conversion of riparian and oak forest habitats are addressed in Section 3.5, *Biological Resources*.

Stanislaus and Merced Counties

The Turlock Subbasin GSP applies to the Turlock Subbasin, a 544-square mile area in the northern San Joaquin Valley and includes portions of Stanislaus and Merced counties.

According to the California Department of Conservation (DOC 2019a; 2019b), the patterns of land use cover in Stanislaus and Merced counties include agriculture, developed areas, natural habitat or open space, and water. **Table 3.3-1** shows the important Farmland within the counties. In addition, **Figure 3.3-1** provides an overview of the types of farmland in the Turlock Subbasin.

Agriculture

Agricultural Land Uses

Farmland Categories and Acreage

The FMMP, which is administered by the DOC Division of Land Resource Protection, provides a consistent data source to analyze the distribution of farmland and long-term urbanization trends based on soil type and the availability of water. FMMP data do not illustrate areas of active agriculture, but can be used to analyze the potential for agricultural production. Acreages of farmland by FMMP in Stanislaus and Merced counties are presented in Table 3.3-1.

Approximately 88 percent of land with physical and chemical characteristics favorable to agriculture or meets other criteria for Farmland of Local Importance as determined by the counties (i.e., all Farmland categories as defined under CEQA, as well as Farmland of Local Importance). In particular, Stanislaus and Merced counties are located within the Central Valley, which is a contiguous stretch of farmland in the core of the state and results from rich soils, accessible irrigation water, and Mediterranean climate within the area. In 2019, Stanislaus County and Merced County were two of the top six agriculture-producing counties in California (CDFA 2021). Approximately 23 percent of Stanislaus and Merced counties contain Prime Farmland (see Table 3.3-1). Grazing land accounts for approximately 43 percent of designated land within Stanislaus and Merced counties.

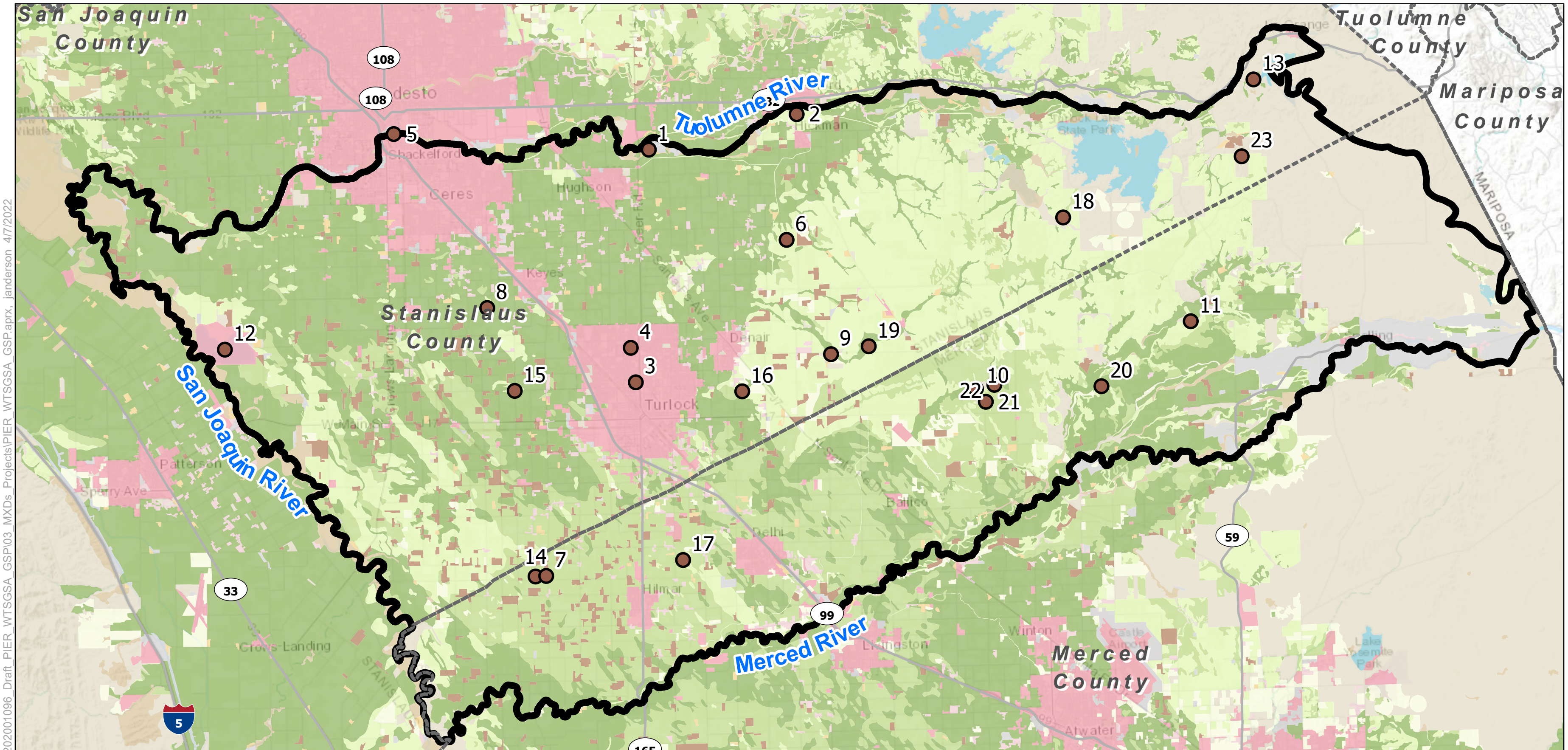
Agricultural land use changes within Stanislaus and Merced counties can be analyzed by tracking the historical designation of agricultural land over time. According to the *DOC Stanislaus County 2004-2018 Land Use Summary*, agricultural farmland (e.g., Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, and Grazing Land) decreased by approximately 14,612 acres between 2004 and 2018, with the loss of Prime Farmland comprising 80 percent of the total loss (DOC 2019a). According to the *DOC Merced County 1992–2018 Land Use Summary*, agricultural farmland decreased by approximately 33,487 acres between 1992 and 2019, with the loss of Prime Farmland comprising 75 percent of the total loss (DOC 2019b). Combined agricultural farmland for both Stanislaus and Merced counties decreased by approximately 48,099 acres, with the loss of Prime Farmland comprising 77 percent of the total loss.

TABLE 3.3-1
IMPORTANT FARMLAND IN CALIFORNIA, 2018 (STANISLAUS AND MERCED COUNTIES)

Category		Acres	Percent
Stanislaus County			
Farmland (under CEQA)	Prime Farmland	250,420	26
	Farmland of Statewide Importance	33,042	3
	Unique Farmland	121,930	13
	Subtotal	*405,392*	*42*
Other Agricultural Land	Farmland of Local Importance	23,058	2
	Grazing Land	400,541	41
	Subtotal	*423,599*	*43*
Other Land and Water	Urban and Built-Up Land	66,810	7
	Other Land[1]	66,936	7
	Water	7,436	1
	Subtotal	*141,182*	*15*
	Stanislaus County Total[2]	**970,173**	**100**
Merced County			
Farmland (under CEQA)	Prime Farmland	263,722	21
	Farmland of Statewide Importance	153,134	12
	Unique Farmland	114,430	9
	Subtotal	*531,286*	*42*
Other Agricultural Land	Farmland of Local Importance	57,904	5
	Grazing Land	557,711	44
	Subtotal	*615,615*	*49*
Other Land and Water	Urban and Built-Up Land	40,783	3
	Other Land[1]	61,434	5
	Water	16,508	1
	Subtotal	*118,725*	*9*
	Merced County Total[2]	**1,265,626**	**100**
Counties Combined			
Farmland (under CEQA)	Prime Farmland	514,142	23
	Farmland of Statewide Importance	186,176	8
	Unique Farmland	236,360	11
	Subtotal	*936,678*	*42*
Other Agricultural Land	Farmland of Local Importance	80,962	4
	Grazing Land	958,252	43
	Subtotal	*1,039,214*	*46*
Other Land and Water	Urban and Built-Up Land	107,593	5
	Other Land[1]	128,370	6
	Water	23,944	1
	Subtotal	*259,907*	*12*
	Combined Total[2]	**2,235,799**	**100**

NOTES:
CEQA = California Environmental Quality Act
1 Other Land in this table consists of the Other Land, Rural Residential, Vacant, or Disturbed Land.
2 Totals may vary from actual acreage in the study area due to rounding.

SOURCE: DOC 2018



Projects
Turlock Subbasin

Farmland Mapping and Monitoring Program (FMMP)

- Confined Animal Agriculture
- Urban and Built-up Land
- Grazing Land
- Farmland of Local Importance
- Prime Farmland
- Rural Residential Land
- Farmland of Statewide Importance
- Unique Farmland
- Vacant or Disturbed Land
- Water
- Nonagricultural or Natural Vegetation
- Semi-Agricultural and Rural Commercial Land

Projects

No.	Name
1	Regional Surface Water Supply Project
2	Waterford/Hickman Surface Water Pump Station and Storage Tank
3	Dianne Storm Basin
4	Stanislaus State Stormwater Recharge
5	Advanced Metering Infrastructure Project (AMI)
6	TID On-Farm Recharge Project (in WTSGSA)
7	Recycled Water from City of Turlock
8	TID Ceres Main Regulating Reservoir
9	Agricultural Recharge Project (in ETSGSA)
10	Mustang Creek Flood Control Recharge Project
11	Upland Pipeline Project
12	San Joaquin River Flood Diversions
13	La Grange Recharge Project (Within TID Irrigation Service Area)
14	TID Lateral 5 1/2 Regulating Reservoir
15	Additional TID Regulating Reservoirs
16	Recharge from TID Conveyance System
17	Intertie Projects
18	Rouse Lake Pipeline Project
19	Sand Creek Watershed Runoff Recharge
20	Conveyance Improvements Project
21	Development of Diffused Stormwater Project
22	Dry Creek Watershed Recharge
23	Direct Recharge in Agriculture Areas

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SOURCE: ESA, 2021; Todd Groundwater, 2021; FMMP, 2018.

Figure 3.3-1
Farmland in the Turlock Subbasin

ESA

Williamson Act

As of 2020, approximately 4,095,553 acres of farmland in counties in the San Joaquin Valley region (i.e., San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Kern, and Tulare counties) were enrolled in the Williamson Act program (described below) (DOC 2022). Much of the farmland in Stanislaus and Merced counties are enrolled in the Williamson Act program.

Agricultural Production

Agricultural land uses in Stanislaus and Merced counties include farmlands that support a variety of crops. Based on the total value of product, some of the top crops and agricultural use in Stanislaus and Merced counties are almonds, nursery, fruit and nut trees, vines, walnuts, silage, sweet potatoes, tomatoes, hay, grapes, eggs, and cotton (Merced County 2020, Stanislaus County 2020). Livestock products produced in Stanislaus and Merced counties include milk, cattle and calves, chickens, and turkeys. Milk is the most-valuable agricultural commodity produced in Merced County and the second-most valuable agricultural commodity produced in Stanislaus County.

Forest Resources

Forestland and Timberland Resources and Timber Production Zones

Forestland and timberland resources provide a range of public, economic, and environmental benefits for the state and are managed as valuable natural resources.

Neither Stanislaus nor Merced County contain any lands zoned for forestland or timberland within its boundaries, and no timber production occurs within the counties.

3.3.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to agriculture and forestry resources. Implementation of any PMA may be subject to the laws and regulations listed below, as well as other local plans, policies and ordinances depending on the project location.

Federal

Farmland Protection Policy Act

NRCS is the agency primarily responsible for implementing the federal Farmland Protection Policy Act (FPPA). The purpose of the FPPA is to minimize federal contributions to the conversion of farmland to nonagricultural uses by ensuring that federal programs are administered in a manner compatible with state, local, and private programs to protect farmland.

NRCS administers the FPPA through a voluntary program that provides funds to help purchase development rights to keep productive farmland in agricultural use. The program provides matching funds to state, local, or tribal government entities and nongovernmental organizations with existing farmland protection programs to purchase conservation easements. Participating landowners agree not to convert the land to nonagricultural uses and retain all rights to the property for future agriculture. A minimum 30-year term is required for conservation easements, and priority is given to applications with perpetual easements (NRCS 2017a).

The FPPA established the Farmland Protection Program and the Land Evaluation and Site Assessment system. The system is a tool used to rank lands for suitability and inclusion in the Farmland Protection Program. The land evaluation involves rating soils and placing them into groups ranging from the best to the least suited for a specific agricultural use, such as for cropland, forestland, or rangeland. The site assessment involves three major areas: non-soil factors related to agricultural use of a site, factors related to development pressures, and other public values of a site. Each factor selected is assigned a range of possible values according to local needs and objectives (NRCS 2017b).

Central Valley Project Improvement Act

The Central Valley Project Improvement Act (CVPIA) mandates changes in management of the Central Valley Project, particularly for the protection, restoration, and enhancement of fish and wildlife. The U.S. Bureau of Reclamation (Reclamation) and U.S. Fish and Wildlife Service (USFWS), in coordination with the State of California, participating CALFED Bay-Delta Program agencies, and other partners, have implemented numerous programs, projects, and actions to meet the goals of the CVPIA, many of which have affected land use and agriculture throughout the Central Valley, especially in the Sacramento–San Joaquin Delta watershed.

To achieve the CVPIA's purposes and the identified goals and objectives, numerous provisions for agriculture were incorporated into the statute. Specific programs, measures, and operational and management directives address water, habitat, and land management. Among these are directives for the retirement of drainage-impaired farmlands through the Land Retirement Program and implementation of an "Agricultural Waterfowl Incentives Program." The goal of the Land Retirement Program is to retire 15,000 acres of agricultural lands. As of 2013, the program had acquired more than 9,300 acres of farmland in the Sacramento–San Joaquin Delta and completed restoration on more than 6,800 acres (Reclamation and USFWS 2014). In the Agricultural Waterfowl Incentives Program, farmers are paid to keep private agricultural fields flooded during the winter months when doing so would increase the amount of habitat and the availability of food for waterfowl.

Timberland Productivity Act

The Timberland Productivity Act establishes the Legislature's declared intent "to fully realize the productive potential of the forest resources and timberlands of the state." The Act imposes mandatory restrictions on parcels zoned as timberland production. Such parcels "shall be zoned as to restrict their use to growing and harvesting timberland and to compatible uses" (Government Code [Gov. Code], Section 51115). In exchange, property owners are required to pay property taxes on the land based solely on its value for timber harvest, and not for its development potential, as is the case with qualifying agricultural and open space lands under the Williamson Act (discussed below). Gov. Code Section 51104(g) defines "timberland production zone" as an area that has been zoned pursuant to Section 51112 or 51113 and is devoted to and used for growing and harvesting timber, or for growing and harvesting timber and compatible uses.

Compatible uses are defined under Section 51104(h) and include management for watershed; management for habitat or hunting and fishing; access roads and staging areas for timber harvesting; gas, electric, water, or communication transmission facilities; grazing; or a residence or other structure necessary for timber management.

State

California Land Conservation Act of 1965 (Williamson Act)

The California Land Conservation Act of 1965, commonly known as the Williamson Act (Gov. Code Section 51200 et seq.), enables local governments to enter into contracts with private landowners to promote the continued use of the relevant land in agricultural or related open space use. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. Local governments receive an annual subvention (subsidy) of forgone property tax revenues from the state via the Open Space Subvention Act of 1971. State payments were significantly reduced several years ago and were halted when the state stopped subvention in the 2009–2010 fiscal year because of the state's budget problems.

The Williamson Act empowers local governments to establish "agricultural preserves" consisting of lands devoted to agricultural and other compatible uses. Upon establishment of such preserves, the locality may offer owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural use for at least 10 years (i.e., the contract continues to run for 10 years following the first date upon which the contract is not renewed). In return, the landowner is guaranteed a relatively stable tax rate, based on the value of the land for agricultural/open space use only and unaffected by its development potential. There are financial consequences to the landowner for early cancellation of a Williamson Act contract, and cancellations must go through a rigorous approval process.

Amendments to the Williamson Act resulted in the opportunity to create Farmland Security Zones (FSZs). A county board of supervisors creates an FSZ upon request by a landowner or group of landowners. It is an enforceable contract between a private landowner and a county that restricts land to agricultural or open space uses. The minimum initial term is 20 years. Like a Williamson Act contract, FSZ contracts self-renew annually; thus, unless either party files a notice of nonrenewal, the contract is automatically renewed each year for an additional year. FSZs offer landowners greater property tax reduction. Land restricted by an FSZ contract is valued for property assessment purposes at 65 percent of its Williamson Act valuation or 65 percent of its Proposition 13 valuation, whichever is lower.

Z'berg-Nejedly Forest Practice Act of 1973

Logging on private and corporate nonfederal land in California is regulated by the 1973 Z'berg-Nejedly Forest Practice Act. This law established the Forest Practice Rules and a politically appointed Board of Forestry to oversee their implementation. The California Department of Forestry and Fire Protection (CAL FIRE) works under the direction of the Board of Forestry and is the lead government agency responsible for approving logging plans and enforcing the Forest Practice Rules.

To log on private or corporate land, a Registered Professional Forester must prepare a Timber Harvest Plan (THP), which outlines the proposed logging operations and submit this to the state. CAL FIRE considers recommendations from reviewing agencies such as the California Department of Fish and Wildlife (CDFW) and the Water Boards, and conducts final review and approval of all THPs. The Forest Practice Rules describe THPs as having two functions: to provide information for the CAL FIRE Director to determine whether the proposed logging conforms to the rules; and to provide direction to logging operators who carry out the THP. These documents are certified as the "functional equivalent" of an EIR to comply with CEQA. THPs are required to evaluate all potential direct and cumulative impacts of the logging plan and to implement any feasible measures that would reduce these impacts to a less-than-significant level.

CAL FIRE also plays a significant statewide role in regulating and assisting with fuels hazard reduction, as well as firefighting activities.

Forest Practices and Z'berg-Warren-Keene-Collier Forest Taxation Reform Act

Based on the Forest Practices Act and the Z'berg-Warren-Keene-Collier Forest Taxation Reform Act of 1976, Timberland Preserve Zones (TPZs) were established to preserve and protect timberland from conversion to other uses and avoid land use conflicts. TPZs were established in 1976 on lands for which timber production and accessory uses would be the highest and best use. The Timberland Productivity Act of 1982 later formalized the state's policy in favor of sustainable harvest, focusing on the long-term availability of timber resources. Lands zoned as TPZs must be maintained for timber production for 10 years following the zoning declaration; after 10 years, the TPZ status automatically renews each year. If a property owner petitions to have their land rezoned out of TPZ, the land may be required to remain in TPZ for 1 year after the rezoning declaration is made. The minimum parcel size for TPZ zoning is 160 acres, although smaller parcels may be zoned TPZ if they are covered by a joint timber management plan.

Regional and Local

Stanislaus County General Plan

Policies governing agriculture and forestry resources discussed in Chapter 7, *Agricultural Element,* of the adopted 2015 Stanislaus County General Plan and local regulations for Stanislaus County are summarized below.

- ***Policy 1.9*****:** The County shall continue to protect agricultural resources by limiting the circumstances under which agricultural operations may be deemed to constitute a nuisance.
- ***Policy 1.10*****:** The County shall protect agricultural operations from conflicts with non-agricultural uses by requiring buffers between proposed non-agricultural uses and adjacent agricultural operations.
- ***Policy 1.11*****:** The County shall support state regulations requiring landowners to manage noxious weeds and pests on follow or abandoned lands.
- ***Policy 1.22*****:** The County shall encourage regional coordination of planning and development activities for the entire Central Valley.

- ***Policy 2.3*****:** The County shall ensure all lands enrolled in the Williamson Act are devoted to agricultural and compatible uses supportive of the long-term conservation of agricultural land.
- ***Policy 2.5*****:** To the greatest extent possible, development shall be directed away from the County's most productive agricultural areas.
- ***Policy 2.7*****:** Proposed amendments to the General Plan Diagram (map) that would allow the conversion of agricultural land to non-agricultural uses shall be approved only if they are consistent with the County's conversion criteria.
- ***Policy 2.14*****:** When the County determines that the proposed conversion of agricultural land to non-agricultural uses could have a significant effect on the environment, the County shall fully evaluate on a project-specific basis the direct and indirect effects, as well as the cumulative effects of the conversion.

Merced County General Plan

Policies governing agriculture and forestry resources discussed in Chapter 6, *Agricultural and Forestry Resources,* of the Draft 2030 Merced County General Plan and local regulations for Merced County are summarized below.

Goal AG-2: Ensure the long-term preservation and conservation of land used for productive agriculture, potentially productive agricultural land, and agricultural-support facilities.

- ***Policy AG-2.1: Agricultural Land Preservation.*** Project agriculturally-designed areas and direct urban growth away from productive agricultural lands into cities, Urban Communities, and New Towns.
- ***Policy AG-2.2: Agricultural Land Mitigation.*** Protect productive agricultural areas from conversion to non-agricultural uses by establishing and implementing an agricultural mitigation program in cooperation with the six cities in Merced County, with consistent standards for county and city governments, that matches acres converted with farmland acres preserved at a 1:1 ratio. In addition, the Land Evaluation and Site Assessment Model (LESA model) may be used to determine whether the conservation land is of equal or greater value than the land being converted.
- ***Policy AG-2.3: New Development.*** Formalize County-City agreements emphasizing concentration of new development in cities that include agricultural mitigation and avoidance of productive agricultural land conversion.
- ***Policy AG-2.4: Preservation Program.*** Encourage property owner participation in programs that preserve farmland, including the Williamson Act, conservation easements, and USDA funded conservation practices.
- ***Policy AG-2.11: Preservation Collaboration.*** Collaborate with landowners, cities, State and Federal agencies, colleges, universities, stakeholders, and community-based organizations to continue and expand agricultural preservation in the County.
- ***Policy AG-2.12: Antiquated Subdivisions.*** Encourage the voluntary merger of antiquated subdivision lots that conflict with adjacent agricultural uses, and continue to require environmental review of permits that could result in adverse environmental impacts in agricultural and rural areas, including traffic generation, groundwater contamination, stormwater drainage disposal, and air quality deterioration

- ***Policy AG-2.14: Viability of Smaller Parcels.*** Require applicants seeking to divide agriculturally-zoned parcels to demonstrate the continued viability of lots less than 40 acres for commercial agriculture, using specific standards (i.e., access to agricultural water, joint farm management, access for aerial spraying, size viability for specific commodities) and farm management plans.
- ***Policy AG-2.15: Merced County Agriculture Preserve Consolidation.*** Modify the Merced County Agricultural Preserve to be consistent with State Subdivision Map Act and Williamson Act rules for allowing parcels less than 10 acres for a limited number of circumstances authorized as exceptions in the County Zoning Code and consistent with State law.
- ***Policy AG-2.16: High Speed Rail Line Location.*** Coordinate with the California High Speed Rail Authority to locate the high-speed rail lines along existing major transportation corridors, such as State Routes 99 or 152, to minimize the conversion of productive agricultural land to non-agricultural uses.

City General Plans

Table 3.3-2 summarizes the key policies related to agriculture and forestry resources identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.3-2
CITY GENERAL PLAN POLICIES GOVERNING AGRICULTURE AND FORESTRY RESOURCES WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Agriculture and Forestry Resources
City of Turlock	Chapter 7, Conservation, Policies 7.2-a, 7.2-b, 7.2-c, 7.2-d, 7.2-h, 7.2-i
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, D. Agricultural Resource Policies, Goal 2, Policies 3a and 4a through 4f
City of Ceres	Chapter 4, Agriculture and Soil Resources, Goal 4.A, Policies 4.A.1 through 4.A.11
City of Hughson	Land Use Element, Goal LU-1, Policy LU-1.3, Goal LU-3, Policy LU-3.1, Policy LU-3.2, Policy LU-3.6, Policy LU-3.7, Policy LU-3.9, Policy LU-3.10

3.3.4 Environmental Impact Analysis

Analysis Methodology

Environmental impacts on agriculture and forestry resources are evaluated in terms of how typical construction and operation of PMAs implemented under the Turlock GSP could cause conversion of Special Designated Farmland and forestland and other related impacts. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might be taken in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational-related activities). Temporary impacts are those that would be temporary in nature (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The approach to assessing agricultural and forestry impacts was qualitative and conservative, assuming that all PMAs are implemented. The impact analysis relies on the use of existing quantitative and qualitative data, including (but not limited to) existing reports, desktop review, open access databases, maps, and models. Information regarding example projects similar to the types of PMAs identified in Section 2.2 were also reviewed.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A PMA implemented under the Turlock Subbasin GSP would result in a significant impact on aesthetics and visual resources if it would:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use;
- Conflict with existing zoning for agricultural use, or a Williamson Act contract;
- Conflict with existing zoning for, or cause rezoning of, forestland (as defined in PRC Section 12220[g]), timberland (as defined by PRC Section 4526), or timberland zoned Timberland Production (as defined by Gov. Code Section 51104[g]);
- Result in the loss of forestland or conversion of forest land to nonforest use; or
- Involve other changes in the existing environment which, due to their location or nature, could result in the conversion of Farmland to nonagricultural use or conversion of forestland to nonforest use.

Issues Not Evaluated Further

There is no land zoned for forestland (as defined in PRC Section 12220[g]), timberland (as defined by PRC Section 4526), or Timberland Production (as defined by Gov. Code Section 51104[g]) within the Turlock Subbasin. Therefore, PMAs implemented under the Turlock Subbasin GSP would not result in conflicts with existing zoning for, or cause for rezoning of, forestland, timberland, or Timberland Production, and this impact is not evaluated further. Impacts involving the conversion of riparian and oak forest habitats are addressed in Section 3.5, *Biological Resources*.

Impacts and Mitigation Measures

Table 3.3-3 summarizes the impact conclusions presented in this section for easy reference.

TABLE 3.3-3
SUMMARY OF IMPACT CONCLUSIONS—AGRICULTURE AND FORESTRY RESOURCES

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
AG-1: Implementing PMAs under the Turlock Subbasin GSP could convert Special Designated Farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural use.	LTS	PSU
AG-2: Implementing PMAs under the Turlock Subbasin GSP could result in other changes in the existing environment that, because of their location or nature, indirectly result in the conversion of Special Designated Farmland to nonagricultural use or conversion of forestland to nonforest use.	LTS	LTS

NOTES: LTS = less than significant; LTSM = less than significant with mitigation incorporated; SU = Significant and Unavoidable

SOURCE: Data compiled by Environmental Science Associates in 2022.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

Impact AG-1: Implementing PMAs under the Turlock Subbasin GSP could convert Special Designated Farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural use.

Effects of Construction Activities

PMAs implemented under the Turlock Subbasin GSP (e.g., injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase recharge potential at a site, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, water storage tanks, and irrigation basins to enable surface water deliveries to drip/micro systems) could occur on Special Designated Farmland or lands zoned for agricultural use, or lands under a Williamson Act contract. Approximately 42 percent of land within Stanislaus and Merced counties is Prime Farmland, Farmland of Statewide Importance, or Unique Farmland (collectively called "Farmland" in State CEQA Guidelines Appendix G, and referred to here in this section as Special Designated Farmland) (see Table 3.3-1).

Project construction work could include the mobilization of equipment and materials; preparation of staging areas; establishment of designated access and haul routes; staging and storage of equipment and materials; preparation of project sites; preparation/use of borrow sites; well drilling; site restoration and/or site demobilization; disposal of excess materials; dewatering, excavation, fill, and placement of materials in water; and drainage modifications. These activities could result in the temporary conversion of Special Designated Farmland or conflict with agricultural zoning or Williamson Act contracts if they would occur on such lands. For example, projects that recharge the groundwater system directly through the expansion of existing or creation of new recharge infrastructure would involve the movement and placement of large amounts of soil/materials, relocation of utilities, and dredging, excavation scraping, or scarification. Work may include the mobilization of equipment and materials, preparation of staging areas, establishment of designated access and haul routes, staging and storage of equipment and materials, and preparation/use of borrow sites. Excess earthen materials, such as organic soils, vegetation, and excavated material, may be temporarily stockpiled before being re-spread at a project site or used to reclaim borrow sites. Stockpiling on agricultural lands may result in the temporary conversion of Special Designated Farmland or a conflict with agricultural zoning or Williamson Act contracts.

Construction for projects implemented under the Turlock Subbasin GSP could temporarily convert Special Designated Farmland to nonagricultural use, or could conflict with a Williamson Act contract or zoning for agricultural use. However, these conversions would be temporary, and the land would be returned to agricultural use after construction. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

PMAs implemented under the Turlock Subbasin GSP could result in new long-term or permanent features that could result in the permanent conversion of Special Designated Farmland to nonagricultural use or conflict with agricultural zone or Williamson Act contracts. For example:

- Some PMAs may require features (e.g., recharge basins, water conveyance infrastructure) on agricultural lands, which could result in long-term or permanent changes in land uses that would convert Special Designated Farmland to nonagricultural uses, conflict with agricultural zoning, or conflict with Williamson Act contracts.
- Some PMAs could cause the fallowing of agricultural lands, resulting in the permanent conversion of farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural uses. Fallowing of agricultural lands could promote land repurposing to nonagricultural uses, such as open space, solar, restoration, commercial development, etc. PMAs could also include pumping reductions through fallowing to decrease overall groundwater demand. Construction and operation impacts from land repurposing (e.g., construction of solar or commercial developments) resulting from fallowing of agricultural lands is speculative at this time, beyond the scope of this Draft PEIR, and not evaluated further. Direct and indirect impacts of fallowing of land (e.g., air quality impacts from dust due to no irrigation, pumping reductions, etc.) are discussed in the respective sections of this Draft PEIR.
- Some PMAs could include water storage features that affect adjacent agricultural uses (e.g., by a decrease in readily availability surface water, irrigation water, or groundwater) and could result in long-term or permanent changes in land use that would convert Special Designated Farmland to nonagricultural uses, conflict with agricultural zoning, or conflict with Williamson Act contracts.
- Water conservation PMAs that would include recharge basins or ponds and wells could result in long-term or permanent conversion of Special Designated Farmland. For these PMAs, agricultural lands within the alignment of new or expanded infrastructure and associated off-channel infrastructure would have to be removed. Alternatively, some of the PMAs that include water storage and associated infrastructure could result in neutral or beneficial effects on the farmland. For example, regulating reservoirs to store water for agricultural purposes would further agricultural use and water conservation within the study area.

Long-term effects on groundwater recharge from the PMAs implemented under the Turlock Subbasin GSP would be neutral or beneficial, as PMAs would be implemented to ensure a reliable and sustainable groundwater supply that support supports population growth, sustains the agricultural economy, and provides beneficial uses. However, some PMAs implemented under the Turlock Subbasin GSP could result in the permanent conversion of farmland to nonagricultural use and potentially conflict with a Williamson Act contract or zoning for agricultural use. For example, pumping restrictions may result in fallowing of land, and the fallowed land may be repurposed from agriculture to nonagricultural use. As noted above, construction and operation impacts from land repurposing (e.g., construction of solar or commercial developments) resulting from fallowing of agricultural lands is speculative at this time, beyond the scope of this Draft PEIR, and not evaluated further. However, since some PMAs implemented under the Turlock Subbasin GSP could result in the long-term or permanent conversion of Special Designated Farmland to nonagricultural uses; conflict with agricultural zoning; or conflict with Williamson Act contracts, this impact would be **potentially significant**.

Compliance with Mitigation Measures AG-1 and AG-2 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the PMA proponent(s).

Mitigation Measure AG-1: Minimize and Avoid Loss of Farmland.

The following measures could be implemented before and during construction of PMAs identified in the Turlock Subbasin GSP:

- PMAs shall be designed to minimize, to the greatest extent feasible, the loss of agricultural land with the highest values.
- PMAs that result in the permanent conversion of Farmland to nonagricultural use shall preserve other Farmland in perpetuity by acquiring an agricultural conservation easement, or by contributing funds to a land trust or other entity qualified to preserve Farmland in perpetuity (at a target ratio of 1:1, depending on the nature of the conversion and the characteristics of the Farmland to be converted, to compensate for the permanent loss).
- PMA features shall be designed to minimize the fragmentation or isolation of Farmland. Where a project involves acquiring land or easements, the remaining nonproject area shall be of a size sufficient to allow viable farming operations. The participating agencies shall be responsible for acquiring easements, making lot line adjustments, and merging affected land parcels into units suitable for continued commercial agricultural management.
- Any utility or infrastructure serving agricultural uses shall be reconnected if it is disturbed by project construction. If a project temporarily or permanently cuts off roadway access or removes utility lines, irrigation features, or other infrastructure, the project proponents shall be responsible for restoring access as necessary to ensure that economically viable farming operations are not interrupted.
- Where applicable to a project site, buffer areas shall be established between PMAs and adjacent agricultural land. The buffers shall be sufficient to protect and maintain land capability and flexibility in agricultural operations. Buffers shall be designed to

protect the feasibility of ongoing agricultural operations and reduce the effects of construction-related or operational activities (including the potential to introduce special-status species in the agricultural areas) on adjacent or nearby properties. Buffers shall also protect restoration areas from noise, dust, and the application of agricultural chemicals. The width of each buffer shall be determined on a project-by-project basis to account for variations in prevailing winds, crop types, agricultural practices, ecological restoration, and infrastructure. Buffers can function as drainage swales, trails, roads, linear parkways, or other uses compatible with ongoing agricultural operations.

Mitigation Measure AG-2: Minimize Impacts on Lands Protected by Agricultural zoning or Williamson Act Contract.

PMAs shall be designed to minimize, to the greatest extent feasible, conflicts and inconsistencies with land protected by agricultural zoning or a Williamson Act contract and the terms of the applicable zoning/contract.

Mitigation Measures AG-1 and AG-2, would be implemented to reduce the impacts of PMAs implemented under the Turlock Subbasin GSP. However, because the precise locations and detailed characteristics of potential future PMAs are yet to be determined, it is not possible to conclude that the mitigation measures, or equally effective mitigation measures, would reduce significant impacts to a less-than significant level in all cases. Therefore, this impact would be **potentially significant and unavoidable**.

Impact AG-2: Implementing PMAs under the Turlock Subbasin GSP could result in other changes in the existing environment that, because of their location or nature, indirectly result in the conversion of Special Designated Farmland to nonagricultural use or conversion of forestland to nonforest use.

Effects of Construction Activities

Construction of PMAs implemented under the Turlock Subbasin GSP could negatively affect the viability of surrounding agricultural uses, impede access to agricultural areas, or disrupt agricultural infrastructure. For example, PMAs that would result in the expansion of existing or creation of new recharge infrastructure (e.g., recharge basins, storm drain basins, French drains) would involve construction activities identified in Table 2-4. These activities could include dredging, excavation, scraping, or scarification to modify existing detention basins or create new recharge basins; movement and placement of large amounts of soils/materials during construction; preparation of staging areas, staging, and storage of equipment and materials; preparation/use of borrow sites; disposal of excess materials; and dewatering, excavation, fill, and placement of materials in water. Excess earthen materials, such as organic soils, vegetation, and excavated material, may be temporarily stockpiled before being re-spread at a project site or used to reclaim borrow sites. Stockpiling on agricultural lands may result in the temporary conversion of Special Designated Farmland to nonagricultural use.

Construction activities implemented under the Turlock Subbasin GSP could temporarily restrict access to Farmland through, for example, blocking access points. Other short-term direct or indirect disturbances to agricultural lands during construction activities could occur from the disruption of irrigation systems and soil compaction affecting drainage, indirectly or removing the ability of an area of Special Designated Farmland to provide the agricultural use or level of productivity that leads to the designation. Ground disturbance, vegetation removal, and operation of construction equipment near Special Designated Farmland could result in dust generation (discussed in Section 3.4, *Air Quality*) or the spread of invasive species to new areas (discussed in Section 3.5, *Biological Resources*).

However, while construction activities for PMAs implemented under the Turlock Subbasin GSP have the potential to negatively affect the viability of surrounding agricultural uses, impede access to agricultural areas, or disrupt agricultural infrastructure, the construction would be temporary, and the land would be returned to pre-project conditions and/or agricultural use after construction. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

Operations and maintenance (O&M) activities would be limited to the footprint created during construction of PMAs implemented under the Turlock Subbasin GSP. This would be unlikely to result in the indirect conversion of Special Designated Farmland to nonagricultural use. For example, periodic maintenance could include the removal of accumulated sediment around intakes, removal of accumulated silt and vegetation from recharge basins, ongoing monitoring of pumping reduction strategy, water quality testing, management of pumping data, ongoing maintenance of approved fallowed agricultural fields, and installation of fencing and signage. These activities would not likely result in a sufficient scale or direction to indirectly convert Special Designated Farmland. Therefore, this impact would be **less than significant**.

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3.4 Air Quality

3.4.1 Introduction

This section describes and evaluates the potential for the construction and operation of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to result in significant air quality impacts. This section discusses the existing air quality conditions in the study area, presents the regulatory framework for air quality management, and analyzes the potential for the Turlock Subbasin GSP to affect existing air quality conditions, both regionally and locally, due to activities that emit criteria and non-criteria air pollutants. It analyzes the types and quantities of emissions that may be generated on a temporary basis due to proposed construction activities as well as those generated over the long term from operation and maintenance activities. Given the programmatic nature of this analysis, quantitative emissions are not always feasible for PMAs. The analysis determines whether those emissions may be significant in relation to applicable air quality standards and identifies feasible mitigation measures for significant adverse impacts or the potential for refined project-specific air quality analysis. The impact of greenhouse gas (GHG) emissions presented and discussed in Section 3.9, *Greenhouse Gases.*

No comments specifically addressing air quality were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.4.2 Environmental Setting

Regional Setting

The California Air Resources Board (CARB) has divided California into regional air basins based on to topographic features. The study area for the Turlock Subbasin GSP is located in Stanislaus and Merced counties, which are within the jurisdiction of the San Joaquin Valley Air Basin (SJVAB). The primary factors that determine air quality are the locations of air pollutant sources, the amount of pollutants emitted, and meteorological and topographical conditions affecting their dispersion. Atmospheric conditions, including wind speed, wind direction, and air temperature gradients, interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. The following sections describe the key air pollutants that affect air quality, and the existing environment as it relates to climate, meteorological conditions, and ambient air quality conditions of the SJVAB.

Criteria Air Pollutants

As required by the 1970 federal Clean Air Act (CAA), the U.S. Environmental Protection Agency (USEPA) initially identified six air pollutants that are pervasive in urban environments and for which state and federal health-based ambient air quality standards have been established. USEPA calls these pollutants “criteria air pollutants” because the agency has regulated them by developing specific public-health-based and welfare-based criteria as the basis for setting permissible levels. Ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb) are the six criteria air pollutants originally identified by USEPA. Since that time, subsets of particulate matter have been identified for which permissible levels are established. These include particulate matter of 10 microns in diameter or less (PM_{10}) and particulate matter of 2.5 microns in diameter or less ($PM_{2.5}$).

The criteria pollutants relevant to the Turlock Subbasin GSP and of concern in the air basin are briefly described below. Note that reactive organic gases (ROGs), which are also known as reactive organic compounds (ROCs) or volatile organic compounds (VOCs), are not classified as criteria pollutants. Similarly, nitrogen oxides (NOx) are not listed as a criteria pollutant. However, both ROGs and NOx are widely emitted from land development projects and participate in photochemical reactions in the atmosphere to form ozone (O_3); therefore, NOx and ROGs are of concern in the SJVAB and relevant to the Turlock Subbasin GSP and are therefore listed below.

- **Ozone (O_3).** O_3 is a gas that is formed when NO_X and ROGs, both by-products of internal combustion engine exhaust and other sources, undergo slow photochemical reactions in the presence of sunlight. Ozone concentrations are generally highest during the summer months when the combination of direct sunlight, light wind, and warm temperature conditions create conditions favorable to the formation of this pollutant.
- **Reactive Organic Gases (ROGs).** ROGs are compounds comprised primarily of atoms of hydrogen and carbon. Internal combustion associated with motor vehicles is the major source of these hydrocarbons. Adverse effects on human health are not caused directly by ROGs, but rather by reactions of ROGs to form secondary air pollutants, including ozone.
- **Nitrogen Dioxide (NO_2) and Nitrogen Oxides (NOx).** Fuel combustion produces nitrogen, which combines with oxygen to produce nitric oxide (NO). Further oxidation of NO results in the formation of NO_2, which is a criteria pollutant. NO_2 is a reddish-brown, highly reactive gas that acts as an acute irritant and, in equal concentrations, is more injurious than NO. NO and NO_2 are referred to together as oxides of nitrogen (NOx). As noted above, NOx are involved in photochemical reactions that produce ozone.
- **Carbon Monoxide (CO).** CO is a colorless, odorless gas produced by the incomplete combustion of fuels. CO concentrations tend to be the highest during winter mornings, with little to no wind, when surface-based inversions trap the pollutant at ground levels. Because CO is emitted directly from internal combustion engines and motor vehicles operating at slow speeds are the primary source of CO in the air basin, the highest ambient CO concentrations are generally found near congested transportation corridors and intersections.
- **Sulfur Dioxide (SO_2).** SO_2 is a colorless, extremely irritating gas or liquid. It enters the atmosphere as a pollutant mainly as a result of burning high-sulfur-content fuel oils and coal and from chemical processes at chemical plants and refineries. When sulfur dioxide oxidizes in the atmosphere, it forms sulfates (SO_4).
- **Respirable Particulate Matter (PM_{10}).** PM_{10} consists of extremely small, suspended particles or droplets 10 microns or smaller in diameter. Some sources of PM_{10}, like pollen and windstorms, are naturally occurring. In populated areas, however, most PM_{10} is caused by road dust, diesel soot, combustion products, abrasion of tires and brakes, and construction activities.
- **Fine Particulate Matter ($PM_{2.5}$).** $PM_{2.5}$ refers to particulate matter that is 2.5 microns or smaller in size. The sources of $PM_{2.5}$ include fuel combustion from automobiles, power plants, wood burning, industrial processes, and diesel-powered vehicles such as buses and

trucks. These fine particles are also formed in the atmosphere when gases such as sulfur dioxide, NO_X, and VOCs are transformed in the air by chemical reactions.

- **Lead (Pb).** Pb occurs in the atmosphere as particulate matter. The combustion of leaded gasoline is the primary source of airborne lead in the basin. The use of leaded gasoline is no longer permitted for on-road motor vehicles, so most such combustion emissions are associated with off-road vehicles such as racecars that use leaded gasoline. Other sources of Pb include the manufacturing and recycling of batteries, paint, ink, ceramics, ammunition, and secondary lead smelters.

Climate and Meteorology

The SJVAB, which is approximately 250 miles long and averages 80 miles wide, is the second largest air basin in the state. Air pollution, especially the dispersion of air pollutants, is directly related to a region's topographic features. The SJVAB is defined by the Sierra Nevada to the east (8,000 to 14,000 feet in elevation), the Coast Ranges to the west (averaging 3,000 feet in elevation), and the Tehachapi Mountains to the south (6,000 to 8,000 feet in elevation). The valley opens to the sea at the Carquinez Strait where the San Joaquin–Sacramento Delta (Delta) empties into San Francisco Bay.

Localized air quality can be greatly affected by elevation and topography. For most of the San Joaquin Valley, air movement through and out of the region is restricted by surrounding hills and mountains. Although marine air generally flows into the basin from the Delta, the Coast Ranges hinder wind access into the SJVAB from the west, the Tehachapi Mountains prevent the southerly passage of airflow, and the Sierra Nevada is a significant barrier to the east. These topographic features result in weak airflow in the valley, which becomes vertically blocked by high barometric pressure over the SJVAB. As a result, most of the SJVAB is highly susceptible to pollutant accumulation over time. Most of the surrounding mountains are above the normal height of the summer inversion layer (SJVAPCD 2015).

Wind speed and direction play an important role in the dispersion and transport of air pollutants. Ozone and inhalable particulates (PM_{10} and $PM_{2.5}$) are classified as regional pollutants because they can be transported away from the emission source before concentrations peak. In contrast, local pollutants, such as CO, tend to have their highest concentrations near the source of emissions. These local pollutants dissipate easily and, therefore, have the highest concentrations during low wind speeds.

During the summer, winds usually originate at the north end of the SJVAB and flow in a south-southeasterly direction through the Tehachapi Pass into the Mojave Desert Air Basin. During the winter, winds occasionally originate from the south end of the SJVAB and flow in a north-northwesterly direction. Also during winter, the SJVAB experiences light, variable winds, typically less than 10 miles per hour. Low wind speeds, combined with low inversion layers in the winter, create a climate conducive to high CO and inhalable particulate (PM_{10}) concentrations.

The vertical mixing of air pollutants is limited by the presence of persistent temperature inversions. Inversions may be either at ground level or elevated. Ground-level inversions frequently occur during early fall and winter (i.e., October through January). High concentrations of primary pollutants, which are those directly emitted into the atmosphere (e.g., CO), are typically found during ground-level inversions. Elevated inversions act as a lid over the basin and limit vertical mixing. Severe air stagnation occurs as a result of these inversions. Elevated inversions contribute to the occurrence of high levels of ozone during the summer months.

The SJVAB enjoys an inland Mediterranean climate, averaging more than 260 sunny days per year. The valley floor is characterized by warm, dry summers and cooler winters. Average daily temperatures in the basin range from 44.6 degrees Fahrenheit (°F) in January to 76.7°F in July. Summer highs often exceed 100°F, averaging in the low 90s in the northern valley and high 90s to the south. Maximum temperatures of 90°F or greater occur about 88 days per year. Although the SJVAB enjoys a high frequency of sunshine, a reduction in sunshine occurs during December and January because of fog and intermittent stormy weather. Temperatures of 32°F and below occur about 22 days per year. Nearly 90 percent of the annual precipitation falls in the 6 months between November and April.

Sensitive Receptors

Sensitive populations (sensitive receptors) are more susceptible to the effects of air pollution than is the population at large. The San Joaquin Valley Air Pollution Control District (SJVAPCD) defines sensitive receptors as "facilities that house or attract children, the elderly, people with illnesses, or others who are especially sensitive to the effects of air pollutants," which include hospitals, schools, convalescent facilities, and residential areas (SJVAPCD 2015). Sensitive receptors that are near localized sources of toxic air contaminants and CO are of particular concern. For assessing impacts, the definition of sensitive receptors is typically expanded to include residences (where elderly and young children may reside), playgrounds, rehabilitation centers, and athletic facilities.

Given the geographic extent of the Turlock Subbasin GSP, specific receptor locations will vary by project. Generally, these would include rural residential land uses located within 1,000 feet of a project site. This 1,000-foot distance is generally considered a "zone of influence"[1] with respect to localized air quality impacts (BAAQMD 2017).

Ambient Air Monitoring

CARB maintains a network of air quality sampling stations in conjunction with local air pollution control districts (APCDs) and air quality management districts (AQMDs), private contractors, and the National Park Service. The sampling stations are referred to as the State and Local Air Monitoring Stations (SLAMS) network. The SLAMS network provides air quality monitoring data, including real-time meteorological data and ambient pollutant levels, as well as historical data. The SLAMS network in the SJVAB consists of 30 monitoring stations.

1 A summary of research findings in CARB's Land Use Compatibility Handbook indicates that traffic-related pollutants were higher than regional levels within approximately 1,000 feet downwind and that differences in health-related effects could be attributed in part to the proximity to heavy vehicle and truck traffic within 300 to 1,000 feet of receptors. In the same summary report, ARB recommended avoiding siting sensitive land uses within 1,000 feet of a distribution center and major rail yard, which supports the use of a 1,000 feet evaluation distance in case such sources may be relevant to a particular project setting. A 1,000-foot zone of influence is also supported by Health & Safety Code §42301.6

These stations monitor ambient pollutant concentrations of PM_{10} and $PM_{2.5}$, O_3, and NO_2. Generally, neither CO nor SO_2 monitoring is conducted as these pollutants are in attainment within the basin. Given the geographic extent of the Turlock Subbasin GSP, specific concentrations of pollutants near project elements will vary, with the highest concentrations occurring near freeways and industrial operations.

Health Effects of Air Pollution

Air pollution is a major public health concern. Studies conducted in various parts of the world, including the United States, have documented a wide range of adverse effects of ambient air pollution on human health. Adverse health effects from short-term and long-term exposure to air pollution evaluated in this PEIR include the following:

- Increased respiratory illnesses (asthma incidence, asthma severity, hospital care for asthma, infections, and other symptoms).
- Exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease.
- Decreased lung function and lung inflammation.
- Increased mortality, including increased risk of premature death from heart or lung diseases in the elderly and people with potentially predisposing conditions (such as chronic obstructive pulmonary disease, diabetes, congestive heart failure, and myocardial infarction).
- Declines in pulmonary function growth in children.
- Potential immunological changes.
- Increase in physician and emergency room visits, and hospitalization.
- Increase in absence from school.

Although numerous air pollutants are emitted by both natural and anthropogenic sources and contribute to adverse human health effects, ozone and particulate matter are the pollutants of greatest concern. These two pollutants are also considered co-pollutants in terms of their incidence, and one pollutant has the effect of confounding the effect of the other. According to the World Health Organization, "*The correlations between ozone and other harmful air pollutants differ by season and place, making confounding control complicated. During summer, there is often a positive correlation with secondary particles, since similar conditions increase the formation of both. On the other hand, especially when ozone formation is limited (winter), there are often strong inverse correlations between ozone and primary pollutants from traffic and heating, because nitric oxide emissions scavenge ozone… A further complexity in the study of the health effects of ground level ozone, particularly the health effects associated with short-term exposures, arises from the close correlation between ozone production and depletion with meteorological conditions (Royal Society, 2008). Since high temperatures (Baccini et al., 2008) and heat waves in particular (Kovats and Hajat, 2008) are associated with increased mortality, the separation of the health effects of ozone from those of temperature is problematic.*" (WHO 2013).

Several factors influence health impacts, including the concentrations of ground-level ozone, the duration of exposure, the volume of air that is inhaled per minute, the intervals between exposures, and the sensitivity of the persons to the exposure. As noted earlier in this section, ozone is not emitted directly but is formed under certain meteorological conditions from ozone precursors (ROG and NOx). Consequently, ground-level concentrations of ozone are highly variable and are influenced by the volume of air available for dilution, the temperature, and the intensity of ultraviolet light. Similarly, concentrations of other pollutants (such as particulate matter) vary depending on meteorological conditions, distance between source and receptors, and other factors. For the same level of exposure, health effects can vary from individual to individual. Certain subgroups of the population, such as children, persons with preexisting respiratory conditions, and individuals exercising outdoors, are at greater risk from exposure to outdoor ozone and particulate matter than the general population.

Diesel Particulate Matter (DPM)

CARB identified DPM as a toxic air contaminant (TAC) in 1998, primarily based on evidence demonstrating its cancer effects in humans. The exhaust from diesel engines includes hundreds of different gaseous and particulate components, many of which are toxic. Mobile sources such as trucks and buses are among the primary sources of diesel emissions, and concentrations of DPM are higher near heavily traveled highways. The board estimated that as of 2000, the average Bay Area cancer risk from exposure to DPM, based on a population-weighted average ambient DPM concentration, is approximately 480 in one million, which is much higher than the risk associated with any other toxic air pollutant routinely measured in the region. The statewide risk from DPM as determined by the board declined from 750 in one million in 1990 to 570 in one million in 1995; by 2012, the board estimated the average statewide cancer risk from DPM at 520 in one million (CARB 2013, 2019).

In 2000, CARB approved a comprehensive Diesel Risk Reduction Plan (CARB, 2000) to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines. Subsequent board regulations apply to new trucks and diesel fuel. With the new controls and fuel requirements, 60 trucks built in 2007 would have the same particulate exhaust emissions as one truck built in 1988. The regulation was developed to result in an 80 percent decrease in statewide diesel health risk in 2020 as compared with the diesel risk in 2000. Despite notable emissions reductions, the board recommends that proximity to sources of DPM emissions be considered in the siting of new sensitive land uses. The board notes that these recommendations are advisory and should not be interpreted as defined “buffer zones,” and that local agencies must balance other considerations, including transportation needs, the benefits of urban infill, community economic development priorities, and other quality of life issues. With careful evaluation of exposure, health risks, and affirmative steps to reduce risk where necessary, CARB’s position is that infill development, mixed-use, higher density, transit-oriented development, and other concepts that benefit regional air quality can be compatible with protecting the health of individuals at the neighborhood level (CARB 2005).

3.4.3 Regulatory Setting

Federal

The 1970 Clean Air Act (last amended in 1990) requires that regional planning and air pollution control agencies prepare a regional air quality plan to outline the measures by which both stationary and mobile sources of pollutants will be controlled in order to achieve all standards by the deadlines specified in the act. These ambient air quality standards protect the public health and welfare, and they specify the concentration of pollutants (with an adequate margin of safety) to which the public can be exposed without adverse health effects. They are designed to protect those segments of the public most susceptible to respiratory distress, including asthmatics, the very young, the elderly, people weak from other illness or disease, and persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels that are somewhat above ambient air quality standards before adverse health effects are observed.

As part of its enforcement responsibilities, the USEPA requires each state with areas that do not meet the federal standards to prepare and submit a State Implementation Plan (SIP) that demonstrates the means to attain federal standards. The SIP must integrate federal, state, and local plan components and regulations to identify specific measures to reduce pollution, using a combination of performance standards and market-based programs within the time frame identified in the SIP. Please see section below (SJVAPCD Air Quality Plans) for a discussion of the current SIPs applicable in the San Joaquin Valley.

The 1990 Clean Air Act Amendments were enacted to better protect the public's health and create more-efficient methods for lowering pollutant emissions. The major areas of improvement addressed in the amendments include National Ambient Air Quality Standards (NAAQS), air basin designations, automobile/heavy-duty engine emissions, and hazardous air pollutants. The USEPA has designated air basins as being in attainment or nonattainment for each of the seven criteria pollutants (classification of the SJVAB is described below, under *State*). Nonattainment air basins for ozone are further ranked (marginal, moderate, serious, severe, or extreme) according to the degree of nonattainment. CARB is required to describe in its SIP how the state will achieve federal standards by specified dates for each air basin that has failed to attain a NAAQS for any criteria pollutant.

State

California Air Resources Board (CARB)

CARB oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the California Clean Air Act (CCAA), responding to the federal CAA planning requirements applicable to the state, and regulating emissions from motor vehicles and consumer products within the state. In addition, CARB sets health-based air quality standards and control measures for TACs. Much of CARB's research focuses on automobile emissions, as they are primary contributors to air pollution in California. Under the CCAA, CARB has the authority to establish more stringent standards for vehicles sold in California and for various types of equipment available commercially. It also sets fuel specifications to further reduce vehicular emissions.

The CCAA established a legal mandate for air basins to achieve the California Ambient Air Quality Standards (CAAQS) by the earliest practical date. These standards apply to the same seven criteria pollutants as the federal CAA and also include sulfates, visibility-reducing particles, hydrogen sulfide, and vinyl chloride. The state standards are generally more stringent than the federal standards.

CARB supervises and supports the regulatory activities of local air quality districts as well as monitors air quality itself. Health and Safety Code Section 39607(e) requires CARB to establish and periodically review area designation criteria. These designation criteria provide the basis for CARB to designate areas of the state as attainment, nonattainment, or unclassified according to state standards. CARB makes area designations for 10 criteria pollutants: O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, sulfates, lead, hydrogen sulfide, and visibility-reducing particles. The air quality of a region is considered to be in attainment of the state standards if the measured ambient air pollutant levels for O_3, CO, NO_2, PM_{10}, $PM_{2.5}$, SO_2 (1- and 24-hour), and lead do not exceed standards, and all other standards are not equaled or exceeded at any time in any consecutive 3-year period. The SJVAB is classified by the state as a nonattainment area for the O3, PM10, and PM2.5 standards.

Regional and Local

The SJVAPCD has jurisdiction over most air quality matters within the SJVAB, which includes San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties and the valley portion of Kern County. The SJVAPCD regulates most air pollutant sources in the air basin, maintains ambient air quality monitoring stations at numerous locations throughout the air basin, and prepares the air quality management/attainment plans for the SJVAB that are required under the CAA and CCAA.

SJVAPCD Air Quality Plans

The SJVAB is in nonattainment for the federal standards for ozone (8-hour) and $PM_{2.5}$. The air basin is also in nonattainment for the state standards of ozone (1-hour), ozone (8-hour), PM_{10}, and $PM_{2.5}$. Therefore, the district has prepared attainment plans for the SJVAB in order to demonstrate achievement of the state and federal ambient air quality standards for ozone, PM_{10}, and $PM_{2.5}$. The most recent plans include the following:

2016 Plan for the 2008 8-Hour Ozone Standard

The SJVAPCD approved the 2016 Plan for the 2008 8-Hour Ozone Standard (SJVAPCD, 2016) in June 2016 to severely reduce NOx emissions and meet the federal 8-hour ozone standard. In compliance with the federal CAA, the 2016 Plan provides a comprehensive strategy that builds upon current efforts to minimize 1-hour O_3, 8-hour O_3, and PM emissions. The Plan details health implications associated with O_3 and PM and the importance of preventing emissions, and explains the current standards and regulations for such pollutants. Most importantly, the Plan provides an attainment strategy that focuses on regulatory actions, incentive programs, technological advancements, and public outreach. As O_3 and PM emissions standards become more stringent, the 2016 Plan not only provides guidance for reducing such emissions, but also lays a malleable base plan to improve and expand upon in the future.

2014 Reasonably Available Control Technology State Implementation Plan (RACT SIP)

The SJVAPCD created the 2014 Reasonably Available Control Technology (RACT) SIP (SJVUAPCD, 2014) as an update to the 2009 RACT SIP, focusing on new technologies and regulations that have been developed within the 5-year period. The USEPA defines RACT as "*lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonable available considering technological and economic feasibility.*" All California air districts must develop an RACT SIP proving that regulations and efforts fulfill RACT before the SIP can be certified by USEPA. While the goal of the 2014 RACT SIP is to reduce emissions to the maximum extent possible, it recognizes that economic and technological barriers make an RACT less stringent (and more feasible in most cases) than other emissions controls, such as Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER).

2013 Plan for the Revoked 1-Hour Ozone Standard

The SJVAPCD developed the 2013 Plan (SJVAPCD, 2013) to satisfy federal requirements under USEPA's revoked 1-hour O_3 standard. The Plan adds to previous O_3 and PM strategies to lessen 1-hour O_3 concentrations in the San Joaquin Valley. As O_3 attainment can be difficult, with high levels for a couple of hours ruining years of attainment in some cases, the attainment year for this plan was 2017. The O_3 attainment standard under the 2013 Plan was met ahead of the planned attainment year, despite fires outside the SJVAB causing exceedance in pollution levels.

2018 Plan for the 1997, 2006, and 2012 $PM_{2.5}$ Standards

The 2018 Plan for the 1997, 2006, and 2012 $PM_{2.5}$ Standards (SJVAPCD, 2018) utilizes science and research, air quality modeling, and the best available information to develop a strategy to attain the federal health-based 1997, 2006, and 2012 standards, or NAAQS for fine particulate matter ($PM_{2.5}$) as expeditiously as practicable. The Plan seeks additional emissions reductions, particularly with respect to mobile sources. In addition to mobile source measures, the Plan includes a comprehensive suite of fiscally responsible local measures for stationary and area sources, including measures to further reduce emissions from industrial sources, residential wood burning, and commercial charbroiling.

SJVAPCD Rules and Regulations

The SJVAPCD's primary means of implementing its attainment plans is through its adopted rules and regulations. Some elements of the Turlock Subbasin GSP could be subject to the following rules adopted by the SJVAPCD, which are designed to reduce and control pollutant emissions throughout the basin.

- **Rule 2010 (Permits Required)** – This rule requires that any project constructing, altering, replacing, or operating any source operation, the use of which emits, may emit, or may reduce emissions, to obtain an Authority to Construct (ATC) and a Permit to Operate (PTO). This rule applies to the construction and operation of new or modified processes and equipment, except those specifically exempted from permitting requirements.

- **Rule 2201 (New and Modified Stationary Source Review) –** This rule applies to all new and modified stationary sources that would emit, after construction, a criteria pollutant for which there is an established NAAQS or CAAQS. The rule provides mechanisms by which an ATC can be granted without interfering with the basin's attainment with ambient air quality standards. These mechanisms offer methods to generate no net increases in emissions of nonattainment pollutants over specific thresholds as detailed in the rule.

- **Rule 3135 (Dust Control Plan Fee)** – This rule recovers SJVAPCD's costs for reviewing Dust Control Plan and conducting site inspections. Should a Dust Control Plan be deemed necessary to minimize air quality impacts, a project could be subject to this rule.

- **Rule 4702 (Internal Combustion Engines – Phase 2)** – This rule limits the emissions of NO_X, CO, and VOCs from internal combustion engines such as backup generators. The rule applies to any internal combustion engine with a rated brake horsepower greater than 50 horsepower. Emissions standards for the three pollutants are specified for each category of engine, along with compliance dates for each standard. The source must also comply with the monitoring methods and other requirements specified in the rule.
- **Rule 8021 (Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities)** – This rule limits fugitive dust emissions from construction, demolition, excavation, extraction, and other earthmoving activities.
- **Rule 8031 (Bulk Materials)** – This rule details steps to follow when handling bulk materials, such as utilizing wind barriers, applying water or stabilizers to limit visible dust emissions (VDE), and covering materials when storing. This rule limits fugitive dust emissions from the outdoor handling, storage, and transport of bulk materials.
- **Rule 8041 (Carryout and Track-out)** – This rule applies to sites where carryout and track-out will occur. Earthmoving activities, moving bulk materials, and unpaved roads/and traffic areas are subject to this rule, which limits vehicle trips and mandates cleanup of carryout and a Dust Control Plan.
- **Rule 8051 (Open Areas)** – This rule applies to any open area having 0.5 acre or more in urban areas or 3.0 or more acres in rural areas. To limit fugitive dust emissions, the rule mandates at least one of the following: the application of water or dust suppressants; the establishment of vegetation on disturbed areas; and/or the paving, graveling, or application of stabilizers to unvegetated areas.
- **Rule 8071 (Unpaved Vehicle/Equipment Traffic Areas)** – To limit fugitive dust emissions from unpaved areas, this rule requires compliance with Regulation VIII. The rule also mandates restricted access on disturbed surfaces and reducing such surfaces through vegetative materials, watering, graveling, paving, etc.

SJVAPCD Guide for Assessing and Mitigating Air Quality Impacts (GAMAQI)

CEQA requires local governments to assess air quality impacts, and recommend and enforce feasible mitigation of potential air quality impacts by conditioning discretionary permits, and by monitoring and ensuring implementation of the mitigation. To facilitate compliance with CEQA requirements, the SJVAPCD published in 2015 the *Guidance for Assessing and Mitigating Air Quality Impacts* (GAMAQI). The GAMAQI is an advisory document that provides local jurisdictions with procedures for addressing air quality impacts in environmental documents. The guide provides methods for assessing air quality impacts, thresholds of significance recommended in the State CEQA Guidelines and those adopted by the SJVAPCD, and recommended mitigation measures.

City General Plans

Table 3.4-1 summarizes the key policies for air quality identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.4-1
COUNTY AND CITY GENERAL PLAN POLICIES GOVERNING AIR QUALITY WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Air Quality
Merced County	Chapter AQ, Air Quality Element, Policies AQ-2.1, AQ-2.2, AQ-2.3, AQ-2.4, AQ-2.5, AQ-2.7, AQ-5.2, AQ-6.1 and AQ-6.1
Stanislaus County	Conservation/Open Space Element, Policy Six
City of Turlock	Chapter 8, Air Quality and Greenhouse Gases, Guiding Policies 8.1-a and 8.1-b; Implementing Policies 8.1-g, 8.1-h, 8.1-i, 8.1-l, 8.1-m, 8.1-n
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, H. Air Quality, Policy 2a through 2aaa
City of Ceres	Chapter 4, Agriculture and Natural Resources, Goal 4.G, Policies 4.G.1 through 4.G.15
City of Hughson	Chapter 4, Conservation and Open Space Element, Goal COS-7, Policy 7.1-7.11

3.4.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on air quality focuses on the potential for construction-related emissions or emissions from operations and maintenance (O&M) activities to exceed thresholds established by the SJVAPCD. PMAs implemented under the Turlock Subbasin GSP are evaluated in terms of how typical construction and operation could impact existing air quality conditions. However, the precise locations and extent of activities and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable emissions from implementation of the types of PMAs, and mitigation measures that might be taken in the future consistent, with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational-related activities). Temporary impacts are those that would be temporary in nature (e.g., construction-related activities). Impacts were evaluated separately for direct and in-lieu recharge projects and water conservation management actions. While the impact conclusions reached may be the same, this approach facilitates a discussion of any potential differences.

Significance determinations assume that the PMAs implemented under the Turlock Subbasin GSP will comply with relevant federal, state, and local ordinances and regulations described in Section 3.4.3, *Regulatory Setting.* Thresholds of significance used to evaluate impacts are based on Appendix G of the State CEQA Guidelines. Additional thresholds are proposed for potential issues identified as relevant to the Turlock Subbasin.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A PMA implemented under the Turlock Subbasin GSP would result in a significant impact on air quality and visual resources if it would:

a) Conflict with or obstruct implementation of the applicable air quality plan.

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard.

c) Expose sensitive receptors to substantial pollutant concentrations.

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

Impacts and Mitigation Measures

Table 3.4-2 summarizes the impact conclusions presented in this section for easy reference.

TABLE 3.4-2
SUMMARY OF IMPACT CONCLUSIONS—AIR QUALITY

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
AIR-1: Implementing PMAs under the Turlock Subbasin GSP could result in conflict with or obstruct implementation of the applicable air quality plan.		
Direct Recharge	PSU	LTS
In-lieu Recharge	PSU	LTS
Conservation	LTS	LTS
AIR-2: Implementing PMAs under the Turlock Subbasin GSP could result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard.		
Direct Recharge	PSU	LTS
In-lieu Recharge	PSU	LTS
Conservation	LTS	LTSM
AIR-3: Implementing PMAs under the Turlock Subbasin GSP could expose sensitive receptors to substantial pollutant concentrations.		
Direct Recharge	LTSM	LTS
In-lieu Recharge	LTSM	LTS
Conservation	LTSM	LTSM
AIR-4: Implementing PMAs under the Turlock Subbasin GSP could result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.	LTS	LTS

NOTES: LTS = less than significant; LTSM = less than significant with mitigation; PSU = potentially significant and unavoidable

SOURCE: Data compiled by Environmental Science Associates in 2022

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

Impact AIR-1: Implementing PMAs under the Turlock Subbasin GSP could result in conflict with or obstruct implementation of the applicable air quality plan.

Direct and In-Lieu Recharge Projects

PMAs will involve construction activities requiring the use of mobile diesel-powered construction equipment. In addition, PMAs will involve O&M (e.g., regularly scheduled inspections and evaluations of feature performance) requiring truck trips.

The Turlock Subbasin is located in the SJVAB. The SJVAPCD has local air quality jurisdiction in the Turlock Subbasin, which lies entirely in Stanislaus and Merced counties (in SJVAPCD jurisdiction). The applicable SJVAPCD air quality plans include:

- 2016 Plan for the 2008 8-Hour Ozone Standard (SJVAPCD, 2016)
- 2013 Plan for the Revoked 1-Hour Ozone Standard (SJVAPCD, 2013)
- 2018 Plan for the 1997, 2006 and 2012 PM2.5 Standards (SJVAPCD, 2018)

The SJVAPCD implements these plans and regulations required by the federal Clean Air Act and the California Clean Air Act. In that capacity, the SJVAPCD has prepared plans to attain federal and state ambient air quality standards. The SJVAPCD has established thresholds of significance for criteria pollutant emissions, which are based on SJVAPCD New Source Review (NSR) offset requirements for stationary sources. Emissions reductions achieved through implementation of SJVAPCD's offset requirements are a major component of the SJVAPCD's air quality plans. Thus, projects with emissions below the thresholds of significance for criteria pollutants would be determined to "Not conflict or obstruct implementation of the District's air quality plan" (SJVAPCD 2015). Therefore, a PMA that would exceed any of SJVAPCD's currently adopted thresholds of significance for criteria pollutant emissions would conflict with or obstruct the implementation of the Turlock Subbasin GSP.

Effects of Construction Activities

As discussed below in Impact AIR-2, PMAs involving recharge projects with large amounts of excavation and soil transport have the potential to result in criteria pollutant emissions that exceed one or more of SJVAPCD's thresholds of significance. Mitigation Measure AIR-1 is identified to reduce emissions associated with PMAs that have the potential to result in criteria pollutant air emissions that could exceed SJVAPCD thresholds of significance.

As discussed below, while the additional mitigation measures, if necessary, would further reduce emissions, because the size and duration of future recharge projects are speculative, the potential exists for a direct recharge project to result in criteria pollutant emissions that, after mitigation, may still exceed SJVAPCD thresholds. Therefore, construction-related emissions of criteria air pollutants from recharge projects may result in an impact that would be **potentially significant and unavoidable**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Once constructed, direct recharge and in-lieu projects would require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and would not exceed one or more of SJVAPCD's thresholds of significance.

Additionally, direct recharge projects may require the routine maintenance and testing of emergency backup generators. Such generators, if necessary, would require a permit from SJVAPCD, which would limit their operation to 52 hours per year. These occasional engine operations would not exceed one or more of SJVAPCD's thresholds of significance. Therefore, this impact would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Water management and conservation actions would not exceed one or more of SJVAPCD's thresholds of significance. While some conservation PMAs may require replacement of infrastructure, they would not result in the excavation or movement of substantial amounts of soil or other materials. While earthwork may be needed for environmental easement habitat enhancement or protection, these activities would be unlikely to require operation of substantial amount of off-road construction equipment. Therefore, the construction-related emissions associated with water management and conservation actions would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

While water management and conservation actions could require O&M activities to inspect project features and/or evaluate program effectiveness, these activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips (likely fewer than the recharge projects). These emissions from O&M vehicle trips would not exceed one or more of SJVAPCD's thresholds of significance and would have a **less than significant** impact.

Impact AIR -2: Implementing PMAs under the Turlock Subbasin GSP could result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.

CEQA defines cumulative impacts as two or more individual effects that, when considered together, are either significant or "cumulatively considerable," meaning they add considerably to a significant environmental impact. An adequate cumulative impact analysis considers a project over time and in conjunction with other past, present, and reasonably foreseeable future projects whose impacts might compound those of the project being assessed. By its very nature, air pollution is largely a cumulative impact. The nonattainment status of regional pollutants is a result of past and present development.

Future attainment of state and federal ambient air quality standards is a function of successful implementation of the SJVAPCD's attainment plans. Consequently, the SJVAPCD's application of thresholds of significance for criteria pollutants is relevant to the determination of whether a project's individual emissions would have a cumulatively significant impact on air quality. A project's incremental contribution to a cumulative effect may be considered not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program, including but not limited to an air quality attainment or maintenance plan that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located [CEQA Guidelines § 15064(h)(3)]. Thus, if project-specific emissions exceed the thresholds of significance for criteria pollutants, the project would result in a cumulatively considerable net increase of any criteria pollutant for which the air basin is in non-attainment under applicable federal or state ambient air quality standards. The SJVAPCD's significance for criteria pollutants are presented in **Table 3.4-3**.

TABLE 3.4-3
SJVAPCD THRESHOLDS OF SIGNIFICANCE

Pollutant/Precursor	Construction Emissions Emissions (tpy)	Operational Emissions: Permitted Equipment and Activities Emissions (tpy)	Operational Emissions: Non-Permitted Equipment and Activities Emissions (tpy)
CO	100	100	100
NOx	10	10	10
ROG	10	10	10
SOx	27	27	27
PM_{10}	15	15	15
$PM_{2.5}$	15	15	15

NOTE: tpy = tons per year

Pollutant emissions associated with construction of PMAs may be generated from the following general construction activities: (1) ground disturbance from grading, excavation, etc.; (2) vehicle trips from workers traveling to and from the construction areas; (3) trips associated with the delivery of construction supplies to, and hauling debris from, the construction areas; and (4) fuel combustion by on-site construction equipment.

Construction and operations activities associated with PMAs to be implemented under the Turlock Subbasin GSP would be reviewed to first determine if activities that generally result in pollutant emissions would be present. A conservative estimate of construction emissions (tons/year) would be presented, based on a review of the types of PMAs and compared against SJVAPCD significance thresholds for criteria pollutants.

For fugitive emissions of PM_{10} and $PM_{2.5}$, best practices typically recommend implementation of measures to mitigate construction-related emissions.

If a PMA is identified that may result in emissions exceeding SJVAPCD thresholds, PMA proponents should more closely evaluate construction- and operations-related air quality emissions through a project-specific quantitative analysis (i.e., CalEEMod modeling) to determine additional mitigation measures to reduce emissions to the extent necessary and feasible when details are better known.

PMAs are considered individually for their potential to exceed SJVAPCD thresholds below in relation to a proxy recharge project.

Direct Recharge Projects

Effects of Construction Activities

Many of the PMAs implemented under the Turlock Subbasin GSP (as presented in Table 2-4) could include direct recharge projects. These construction activities could include the mobilization of substantial off-road equipment and materials, removal of substantial soil quantities from borrow sites or off-site locations, well drilling, disposal of excess materials, dewatering, excavation, fill, and placement of materials in water. The amount of emissions from any particular PMA would depend primarily on the number, type, and duration of off-road equipment operating on a daily basis, the volume of soil imported or exported, and the distance from which these haul trucks would travel. Because of the potential for extensive grading, excavation, soil handling, and hauling of materials, the direct recharge projects would have the potential to result in a significant impact if the quantities of materials to be excavated and transported were substantial.

As a proxy for such a recharge basin project, a recent analysis for an aquifer recharge and recovery project was considered. The Watsonville Slough System Managed Aquifer Recharge and Recovery Projects Supplemental EIR (PVWMA, 2020) (in Monterey County) evaluated the air quality impacts for a total ground disturbance of 2.3 million square feet. This included 183,000 cubic yards of off-hauled soil at a default distance of 20 miles per one-way haul trip. The analysis considered a wide array of construction equipment inclusive of those identified in Section 2.3.3 of the project description for the Turlock Subbasin GSP. The air quality analysis for the Watsonville Slough project indicated that maximum daily emissions from construction would total 1 ton per year per day of ROG, 9.5 tons per year of NOx, 0.7 ton per year of PM_{10}, and 0.4 ton per year of $PM_{2.5}$. Such emissions would be less than SJVAPCD thresholds of significance presented in Table 3.4-3. Therefore, it may be conservatively assumed that direct recharge projects involving less than 183,000 cubic yards of off-hauled soil transport would have a less-than-significant impact with respect to criteria pollutant emissions. Consequently, a mitigation measure was identified to require that individual direct recharge projects involving more than 180,000 cubic yards of soil transport be required to undergo a project-level CEQA analysis. The individual direct recharge projects that involved more than 180,000 cubic yards of soil transport and found to have a significant impact could potentially reduce their annual emissions by requiring the use of off-road equipment with USEPA-certified Tier 4 engines or by reducing the overall window of construction activity.[2] However, at this time, it is unknown if the use of Tier 4 engines and reducing construction activities would get an individual project to a less-than-significant impact with respect to criteria pollutant emissions; the potential exists for a direct recharge project to result in a **potentially significant** air quality impact.

2 The proxy project assumes 260 days of activity per year or 5 days per week and 52 weeks per year.

Fugitive dust emissions may also be generated during construction phases. With respect to fugitive emissions of PM_{10} and $PM_{2.5}$, Regulation VIII specifies the following measures to control fugitive dust:

- Apply water to unpaved surfaces and areas.
- Use non-toxic chemical or organic dust suppressants on unpaved roads and traffic areas.
- Limit or reduce vehicle speed on unpaved roads and traffic areas.
- Maintain areas in a stabilized condition by restricting vehicle access.
- Install wind barriers.
- During high winds, cease outdoor activities that disturb the soil.
- Keep bulk materials sufficiently wet when handling.
- Store and handle materials in a three-sided structure.
- When storing bulk materials, apply water to the surface or cover the storage pile with a tarp.
- Don't overload haul trucks.
- Cover haul trucks with a tarp or other suitable cover. Or, wet the top of the load enough to limit visible dust emissions.
- Clean the interior of cargo compartments on emptied haul trucks prior to leaving a site.
- Prevent track-out by installing a track-out control device.
- Clean up track-out at least once a day. If along a busy road or highway, clean up track-out immediately.
- Monitor dust-generating activities and implement appropriate measures for maximum dust control.

The application of best management practices (BMPs) at construction sites significantly controls fugitive dust (WRAP 2006), with individual measures reducing fugitive dust by anywhere from 30 to 90 percent (BAAQMD 2009). Compliance with Regulation VIII would ensure that the construction-related fugitive dust emissions would be **less than significant**.

Compliance with Mitigation Measure AIR-1 would be required when applicable to a given project. Implementation of this measure would be the responsibility of the PMA proponent(s).

Mitigation Measure AIR-1: Implement project-specific air quality analysis for large recharge projects.

For recharge projects involving more than 180,000 cubic yards of excavated material transport, the PMA proponent shall prepare a project-specific air quality analysis conducted by a professional air quality analyst. If the analysis determines that project emissions would exceed any of the SJVAPCD thresholds of significance presented in Table 3.4-3, then the analysis should identify additional mitigation measures to reduce emissions to below the applicable threshold(s) or to the greatest extent feasible. Such additional mitigation measures may include:

- Require the use of off-road equipment with USEPA-certified Tier 4 engines.
- Reduce the overall window of annual construction activity.

While the additional mitigation measures would reduce emissions, because the size and duration of future recharge projects are speculative, the potential exists for a direct recharge project to result in a criteria pollutant emissions that, after mitigation, may still exceed SJVAPCD thresholds. Therefore, construction-related emissions of criteria air pollutants from recharge projects may result in an impact that would be **potentially significant and unavoidable**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Once constructed, direct recharge projects would require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would be required on an intermittent basis and would result in a minor increase in motor vehicle trips. As a practical matter, these emissions from O&M vehicle trips would not result in emissions that exceed the operational thresholds of significance presented in Table 3.4-3. This determination is supported by the SJVAPCD's Small Project Analysis Level publication (SJVAPCD, 2020), which indicates that industrial uses with fewer than 140 daily vehicle trips would have a less-than-significant air quality impact.

Direct recharge projects may also require the routine maintenance and testing of emergency backup generators. Such generators, if necessary, would require a permit from SJVAPCD, which would limit their operation to 52 hours per year. These occasional engine operations would not be substantial and would not exceed the operational thresholds of significance presented in Table 3.4-3. Therefore, this operational impact would be **less than significant**.

In-lieu Recharge Projects

Effects of Construction Activities

Analysis

Similar to direct recharge projects, in-lieu recharge projects could require storage of surface water in storage reservoirs that would need to be constructed and, therefore, require substantial excavation and earth movement. Also, in-lieu projects could require the construction of water conveyance and delivery infrastructure for later that would also involve substantial excavation and earth movement. Consequently, in-lieu recharge projects would have the same potential for significant air quality impact, and Mitigation Measure AIR-1 would also apply to these projects. Similarly, the same potential would exist for a **potentially significant-and-unavoidable** impact with respect to criteria pollutant emissions.

As with the direct recharge projects, in-lieu recharge projects would comply with Regulation VIII of the SJVAPCD and fugitive dust emissions would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Analysis

Similar to direct recharge projects, in-lieu recharge projects could require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and result in a minor increase in motor vehicle trips. These emissions from O&M vehicle trips would not result in emissions that exceed the operational thresholds of significance presented in Table 3.4-3 and would have a less-than-significant air quality impact.

In-lieu recharge projects could also require the routine maintenance and testing of emergency backup generators. Such generators, if necessary, would require a permit from SJVAPCD, which would limit their operation to 52 hours per year. These occasional engine operations would not be substantial and would not exceed the operational thresholds of significance presented in Table 3.4-3. Therefore, this operational impact would be **less than significant**.

Conservation PMAs

Effects of Construction Activities

Water management and conservation actions would have limited potential to result in construction emissions. While some conservation PMAs may require replacement of infrastructure, they would not be expected to result in excavation or movement of substantial amounts of soil or other materials. While there may be earthwork for environmental easement habitat enhancement or protection, these activities would be unlikely to require operation of a substantial amount of off-road construction equipment. Therefore, the construction-related emissions associated with water management and conservation actions would be **less than significant** with respect to criteria air pollutant emissions.

Effects of Constructed Features and Operations and Maintenance of Those Features

The potential fallowing of agricultural lands would reduce fugitive dust emissions currently associated with discing and tilling as well as the criteria air pollutant emissions associated with off-road agricultural equipment. While water management and conservation actions could require O&M activities to inspect project features and/or evaluate program effectiveness, these activities would only be required on an intermittent basis and would result in only a minor increase in motor vehicle trips; likely fewer than direct or in-lieu recharge projects. These emissions from O&M vehicle trips would not result in emissions that exceed the operational thresholds of significance presented in Table 3.4-3 and would have a **less than significant** air quality impact.

Fallowing of agricultural lands and/or changes in crop patterns (e.g., switching from high water-using crops to low water-using crops) could result in an increase of blowing dust (e.g., particulate matter). Land that is fallowed or idled is more susceptible to soil erosion due to the reduced vegetative cover to secure the soil and prevent soils from being blown or washed away. This could result in an increase in particulate matter at levels that could violate air quality standards or exceed SJVAPCD thresholds of significance for particulate matter. Therefore, this could have a **potentially significant** impact on air quality.

Implementing procedures that control dust have the potential to improve visibility, reduce wind erosion and loss of top soil, minimize damage to roads and structures, and limit health impacts due to poor air quality associated with land fallowing (CDFA 2022).

Compliance with Mitigation Measure AIR-2 would be required when applicable to a given project that potentially creates significant dust from fallowing lands (i.e., removing vegetation and irrigation causing dust). This could include projects that involve the fallowing of agricultural parcels greater than one acre in size for one or more growing seasons. Implementation of this measure would be the responsibility of the PMA proponent(s).

Mitigation Measure AIR-2: Minimize dust from fallowed lands.

For projects involving land fallowing, land conversion, or other agricultural operations, implement applicable BMPs from agencies such as the U.S. Department of Agriculture Natural Resources Conservation Service and California Department of Food and Agriculture (CDFA 2022) to mitigate dust associated with fallowed lands.

BMPs for fallowed lands could include, but are not limited to, the following:

- Implement conservation cropping sequences and wind erosion protection measures, such as:
  - Plan ahead to start with plenty of vegetation residue and maintain as much residue on fallowed fields as possible. Residue is more effective for wind erosion protection if left standing.
  - If residues are not adequate, small grain can be seeded about the first of the year to take advantage of the winter rains and irrigated with a light irrigation if needed to get adequate growth.
  - Avoid any tillage if possible.
  - Avoid any traffic or tillage when fields are extremely dry to avoid pulverization.

With implementation of this mitigation measure, the impacts associated with constructed features and operations and maintenance of conservation PMAs is considered to be **less than significant with mitigation**.

Impact AIR-3: Implementing PMAs under the Turlock Subbasin GSP could expose sensitive receptors to substantial pollutant concentrations.

Direct Recharge Projects

Effects of Construction Activities

As discussed in Impact AIR-2, above, many of the PMAs implemented under the Turlock Subbasin GSP could include direct recharge project that require construction activities that include the mobilization of substantial off-road equipment and materials, removal of substantial soil quantities from borrow sites or off-site locations, and well drilling that would result in emissions of DPM, a toxic air contaminant.

SJVAPCD guidance does not provide a specific methodology for assessing construction-related health risk impacts at the programmatic level. Without specific information about the year of construction or the phasing sequence of PMAs, a quantitative analysis of construction-phase human health is not feasible.

Nonetheless, the human health risk impact associated with direct recharge projects would be potentially significant and require mitigation. Specifically, **Mitigation Measure AIR-3** would require that for proposed PMA construction projects that involve 12 months of active construction and are within 1,000 feet of sensitive receptors, a project-specific construction health risk analysis shall be completed to demonstrate that the construction activities of individual projects under the PMA would not result in a significant acute, chronic non-cancer or cancer-related health risk to specific sensitive receptors. Implementation of Mitigation Measure AIR-2 would ensure that potential impacts related to exposure of sensitive receptors to substantial pollutant concentrations or health risk from construction activities resulting from direct recharge projects would be **less than significant**.

Mitigation Measure AIR-3: Implement project-specific air quality analysis for certain recharge projects.

For recharge projects that involve 12 months of active construction and are within 1,000 feet of sensitive receptors, a project-specific construction health risk analysis shall be completed to demonstrate that the construction activities of individual projects under the PMA would not result in a significant acute, chronic non-cancer or cancer-related health risk to specific sensitive receptors. If construction activities would result in significant increase in health risk, then the analysis should identify additional mitigation measures to further reduce emissions to below the applicable threshold(s). Such additional mitigation measures may include:

- Require the use of off-road equipment with USEPA-certified Tier 4 engines.
- Use equipment fitted with a CARB-Verified Diesel Emission Control System.
- Reduce the overall window of annual construction activity in the proximity of the impacted receptor.

These additional mitigation measures, if necessary, would further reduce emissions exposures. Therefore, the impact from construction-related emissions of TACs from recharge projects would be **less than significant with mitigation**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Analysis

Once constructed, direct recharge projects would require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and result in a minor increase in motor vehicle trips (and mostly conducted using vehicles equipped with non-diesel engines). Therefore, the potential impact with respect to exposure to TACs would be less than significant.

Additionally, direct recharge projects may require the routine maintenance and testing of diesel-powered backup generators. Such generators, if necessary, would require a permit from

SJVAPCD, who would require a health risk assessment and would not issue such a permit if increased cancer risk would exceed 10 in one million at the maximally impacted sensitive receptor. Because of SJVAPCD permit requirements, these occasional engine operations would not result in a substantial health risk concern. Therefore, this operational impact would be **less than significant.**

In-lieu Recharge Projects

Effects of Construction Activities

Analysis

Similar to direct recharge projects, in-lieu recharge projects could require storage of surface water in storage reservoirs that would need to be constructed and, therefore, require substantial excavation and earth movement. Also, in-lieu projects could require the construction of water conveyance and delivery infrastructure for later that would also involve substantial excavation and earth movement. Consequently, in-lieu recharge projects would have the same potential for significant health risk impact, and Mitigation Measure AIR-3 would also apply to these projects. Similarly, this mitigation measure would be sufficient to reduce the risk to **less than significant with mitigation** with respect to health risk impacts.

Effects of Constructed Features and Operations and Maintenance of Those Features

Analysis

Similar to direct recharge projects, in-lieu recharge projects could require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips (mostly using vehicles equipped with non-diesel engines). Therefore, the potential impact with respect to exposure to TACs would be less than significant.

Additionally, in-lieu recharge projects may require the routine maintenance and testing of diesel-powered backup generators. Such generators, if necessary, would require a permit from SJVAPCD, who would conduct a health risk assessment and would not issue such a permit if increased cancer risk would exceed 10 in one million at the maximally impacted sensitive receptor. Because of SJVAPCD permit requirements, these occasional engine operations would not result in a substantial health risk concern. Therefore, this operational impact would be **less than significant.**

Conservation Management Actions

Effects of Construction Activities

Water management and conservation actions would have a limited potential to generate construction emissions. While some conservation PMAs may require replacement of infrastructure, they would probably not involve the excavation or movement of substantial amounts of soil or other materials. While there may be earthwork for environmental easement habitat enhancement or protection, these activities are unlikely to require a substantial amount of off-road construction equipment. Therefore, the construction-related emissions associated with water management and conservation actions would be less than significant with respect to health risk and TAC exposure. If there is substantial movement of soil or off-road construction equipment, then compliance with Mitigation Measure AIR-1 and/or AIR-3 could be implemented to minimize health risk and TAC exposure and ensure impacts are **less than significant with mitigation**.

Effects of Constructed Features and Operations and Maintenance of Those Features

The potential fallowing of agricultural lands would reduce localized emissions of DPM currently associated with off-road agricultural equipment performing discing and tilling or generators powering groundwater pumps. While water management and conservation actions could require O&M activities to inspect project features and/or evaluate program effectiveness, these activities would only be required on an intermittent basis and result in a minor increase in motor vehicle trips (likely fewer than recharge projects). These O&M vehicle trips would generate emissions that result in a negligible increase in health risk exposure from TACs and would have a **less-than-significant** air quality impact.

For the reasons described above, compliance with Mitigation Measure AIR-2 would be required when applicable to a given project that potentially creates dust from fallowing lands (i.e., removing vegetation and irrigation causing dust) (CDFA 2022) in order to ensure impacts from the operations and maintenance of conservation PMAs are **less than significant with mitigation**.

Impact AIR-4: Implementing PMAs under the Turlock Subbasin GSP could result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

All Projects and Management Actions

Due to the subjective nature of odor impacts, the number of variables that can influence the potential for an odor impact, and the variety of odor sources, there are no quantitative or formulaic methodologies to determine the presence of a significant odor impact (SJVAPCD 2015). SJVAPCD has identified some common types of facilities that have produced odors in the San Joaquin Valley. These include wastewater treatment plants, oil refineries, asphalt plants, chemical manufacturing, painting/coating operations, coffee roasters, food processing facilities, recycling operations, and metal smelters. For such odor sources of particular concern, SJVAPCD recommends buffer zones of 1 to 2 miles to avoid potential odor conflicts, and also requires a permit. There are no facilities of these types proposed by the Turlock Subbasin GSP and, consequently, operational odor impacts of the PMAs would be **less than significant**.

During construction, the various diesel-powered vehicles and equipment in use on PMA sites would create localized odors. These odors would be temporary and depend on specific construction activities occurring at certain times and are not likely to be noticeable for extended periods of time beyond the boundaries of the project site. Therefore, the potential for diesel odor impacts is considered less than significant. Consequently, the potential for the Turlock Subbasin GSP to result in objectionable odors is **less than significant**.

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3.5 Biological Resources

3.5.1 Introduction

This section describes the biological resources in and characteristics of the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect biological resources (see Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2). As discussed below, potential impacts include impacts on special-status plant, wildlife species, and fishes and their habitats; impacts on sensitive natural communities, such as riparian zones; impacts on jurisdictional waters or wetlands; impacts on wildlife corridors and nursery sites; impacts on local biological ordinances such as tree ordinances; and impacts on habitat conservation plan lands.

One comment letter specifically addressing biological resources was received from the California Department of Fish and Wildlife (CDFW) in response to the notice of preparation (NOP). The letter noted potential impacts on least Bell's vireo (*Vireo belli pusillus*), Swainson's hawk (*Buteo swainsoni*), tricolored blackbird (*Agelaius tricolor*), California tiger salamander (*Ambystoma californiense*), western pond turtle (*Emys marmorata*), burrowing owl (*Athene cunicularia*), native bumblebees, special-status bats, special-status plant species, wetlands, and riparian areas. See Appendix B for NOP comment letters.

3.5.2 Environmental Setting

This section describes the biological resources that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and includes many types of biological resources.

Most of the Turlock Subbasin, referred to as the study area, is located in a matrix of agricultural and urban uses that includes orchards, row crops, ruderal vegetation, and barren areas. Riparian woodlands are present near the Tuolumne and Merced rivers and patchily near smaller streams and canals. The plant communities and wildlife species that may occur within the study area are described below.

Data Sources

In preparation of this section, Environmental Science Associates (ESA) reviewed publicly available and subscription-based sources of biological resource data. The following sources assisted in this analysis:

- A U.S. Fish and Wildlife Service (USFWS) list of species that may be present in the study area (USFWS 2022a)
- The California Native Plant Society (CNPS) online database of plant species (CNPS 2021) of the following quadrangles: Brush Lake, Westley, Crows Landing, Gustine, Ceres, Hatch, Denair, Montpelier, Paulsell, Cooperstown, Turlock, Turlock Lake, Cressey, Winton, Yosemite Lake, Snelling, Stevinson, and La Grange.

- The CDFW California Natural Diversity Database (CNDDB) list of plant and wildlife species documented within the study area (CDFW 2022a).
- CDFW Essential Habitat Connectivity Project maps (Caltrans and CDFG 2010)
- California Wildlife Habitat Relationships database (CDFW 2022b).
- USFWS Critical Habitat (USFWS 2022a)
- USFWS Wetland Mapper (USFWS 2022b)
- The Nature Conservancy's GDE Pulse (The Nature Conservancy 2021).
- Topographic maps (USGS 2022)
- Google Earth aerial imagery (Google Earth 2022)

Natural Communities/Landcover Types

Aquatic Habitats

The study area is bordered by the Tuolumne, Merced, and San Joaquin rivers, and contains Turlock Lake and seasonal wetlands, as well as smaller reservoirs and numerous irrigation canals and drains. The margins of these bodies of water often contain emergent vegetation such as cattail (*Typha latifolia*) and bulrushes (*Schoenoplectus californicus*), and may contain seasonally inundated wetland habitats adjacent to the streams. Much of the existing water conveyance canals within the study area are either completely lined with concrete, partially lined, or undergo periodic maintenance, meaning these features are much less likely to support emergent vegetation compared to riverine and seasonal wetland features with soft bottoms. The rivers host federally threatened steelhead (*Oncorhynchus mykiss*) and declining populations of other federally listed salmonid species, and other native fish. Both rivers and canals may host special-status native fish, birds, giant garter snake (*Thamnophis gigas*), and western pond turtle. Waterways with side-channels and emergent vegetation provide important nursery habitat for young fish and amphibians.

Groundwater Dependent Ecosystems

The riparian and aquatic habitats associated with shallow groundwater or perennial base flow are referred to as groundwater dependent ecosystems (GDEs). These GDEs are associated with phreatophytic vegetation, plants that generally rely upon a constant source of available shallow groundwater for the water they need. Because California's Mediterranean climate is dry in summer, access to the water table supports vegetative health throughout the dry season, resulting in lush vegetation with high ecological value. Within the study area, most GDEs are associated with areas along the Tuolumne, Merced, and San Joaquin rivers, as well as along Dry Creek and Turlock Lake (Todd Groundwater 2022).

Orchards/Croplands

Much of the study area is comprised of agricultural lands, primarily planted in orchards or row crops or left as fallow lands. Common site crops include almond (*Prunus dulcis*) orchards, the most common nut tree in the area, as well as English walnut (*Juglans regia*), pistachio (*Pistacia* *vera*) and olive (*Olea europa*) orchards. Ornamental trees are also present at residences. The understory vegetation that would provide food and cover for wildlife is typically sparse in orchards, limiting the abundance and diversity of wildlife species that may be found there. Species such as pocket gopher (*Thomomys bottae*), squirrel (*Citellus* spp.), and western brush rabbit (*Sylvilagus bachmani*) can occur in orchards. Birds such as American crow (*Corvus brachyrhyncos*) and yellow-billed magpie (*Pica nuttalli*), which forage on nut crops, and smaller songbirds which feed on seeds and insects, may also be present. Alfalfa (*Medicago sativa*) and other hay crops are also present and may support bees required for pollination, along with a low diversity of other wildlife species.

Developed/Ruderal

Developed land in the study area includes the urban areas of Ceres, Turlock, and other small towns, as well as residences and other structures in unincorporated Stanislaus and Merced counties. These lands are mainly barren with some weedy, ruderal vegetation, mainly consisting of non-native grasses and forbs. Ruderal vegetation typically supports a relatively low diversity and abundance of wildlife species compared to undisturbed habitats.

Non-Native Annual Grassland

Non-native annual grassland is not a sensitive plant community. Non-native herbaceous plants common in the study area include Bermuda grass (*Cynodon dactylon*), ripgut brome (*Bromus diandrus*), black mustard (*Brassica nigra*), white sweet clover (*Melilotus albus*), wild radish (*Raphanus sativa*), and bull thistle (*Cirsium vulgare*). Non-native annual grasslands within the study area could provide marginal habitat, and orchards may provide foraging grounds for burrowing owl. Other wildlife species that may occur include alligator lizard (*Elgaria multicarinata*), California ground squirrel (*Otospermophilus beecheyi*), black-tailed jackrabbit (*Lepus californicus*), house mouse (*Mus musculus*), and deer mouse (*Peromyscus maniculatus*).

Common bird species expected in grasslands include mourning dove (*Zenaida macroura*), western meadowlark (*Sturnella neglecta*), European starling (*Sturnus vulgaris*), American crow, and Brewer's blackbird (*Euphagus cyanocephalus*). Burrowing owl, a California Species of Special Concern, generally prefers open areas and grasslands with low-growing or grazed vegetation and may roost in burrow systems created by medium-sized mammals (e.g., ground squirrels) or in artificial sites (e.g., drainpipes, culverts). Adjacent large ornamental trees such as cottonwood (*Populus* spp.), cedar (*Cedrus* spp.), and redwood (*Sequoia sempervirens*) used as residential landscaping may support nesting birds in grassland areas. Large trees could also provide roosts for western red bat (*Lasierus blossevillii*) and hoary bat (*L. cinerus*).

Riparian Woodlands

Sensitive plant communities in the study area may include two types of riparian woodland: arroyo willow (*Salix lasiolepis*) riparian scrub and blue elderberry (*Sambucus nigra* ssp. *caerulea*) stand (Sawyer et al. 2009). Arroyo willow scrub may be present along riversides. The sparse overstory canopy in the arroyo willow scrub includes other riparian species, such as black willow (*Salix goodingii*), California sycamore (*Platanus racemosa*), Fremont's cottonwood (*Populus* *fremontii*), and valley oak (*Quercus lobata*). In the shrub stratum, narrow-leaf willow (*Salix exigua*), blue elderberry, box elder (*Acer negundo* var. *californicum*), and button bush (*Cephalanthus occidentalis*) may occur. Various wetland and mesic grasses, rushes and sedges, and forbs are typically present in the understory, depending on the depth to groundwater and proximity to the river.

Blue elderberry stands may occur on embankments and slopes in open grassland settings, sometimes with a sparse tree layer that includes live oak (*Quercus agrifolia*), Fremont's cottonwood, and non-native tree of heaven (*Ailanthus altissima*). The shrub layer may include coyote brush (*Baccharis* spp.), non-native tobacco bush (*Nicotiana glauca*), and willow, and the understory consists of non-native annual grassland. Elderberry is the exclusive host plant of the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (VELB), federally listed as threatened and a California Species of Concern. Adult beetles of this subspecies feed and lay eggs on elderberry shrubs in riparian communities of the Central Valley. The larvae remain within the elderberry stems until they emerge through exit holes as adults.

Riparian woodlands provide cover, food, and nesting habitat for a variety of wildlife species, including nesting habitat for Swainson's hawk, a species listed as threatened in California. White-tailed kite (*Elanus leucurus*) and loggerhead shrike (*Lanius ludovicianus*), both special-status species, could also nest in riparian habitat. Other raptor species that may nest and forage in riparian woodlands include great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), and American kestrel (*Falco sparverius*). Foraging habitat for raptors is present in open elderberry stands and also in agricultural areas.

Yellow warbler (*Setophaga petechia*) and yellow-breasted chat (*Icteria virens*) are passerine birds that often nest in riparian willow thickets. Other avian species frequently observed in this habitat include belted kingfisher (*Megaceryle alcyon*), downy woodpecker (*Picoides pubescens*), northern flicker (*Colaptes auratus*), ash-throated flycatcher (*Myiarchus cinerascens*), oak titmouse (*Baeolophus inornatus*), black phoebe (*Sayornis nigricans*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), lazuli bunting (*Passerina amoena*), blue grosbeak (*Passerina caerulea*), and goldfinches (*Carduelis* spp.). Mammals such as raccoon (*Procyon lotor*), desert cottontail (*Sylvilagus audubonii*), striped skunk (*Mephitis mephitis*), American beaver (*Castor canadensis*), and coyote (*Canis latrans*) are common in riparian woodlands.

Special-Status Species

Special-status species are species that are legally protected or otherwise considered sensitive by federal or state resource agencies (federal Endangered Species Act, California Endangered Species Act, or Species of Special Concern) or by local resource agencies. These species, subspecies, distinct population segments (DPS), or varieties fall into one or more of the following categories, regardless of their legal or protection status:

- Plant and wildlife species identified as rare, threatened, or endangered under the federal or state Endangered Species Acts.
- Species that are candidates for listing under either federal or state law.

- CDFW species of special concern or otherwise recognized by CDFW as "special animals."
- Species protected by the federal Migratory Bird Treaty Act (16 United States Code [U.S.C.] Sections 703–711).
- Bald and golden eagles protected by the federal Bald and Golden Eagle Protection Act (16 USC 668).
- Species that meet the definitions of rare and endangered under CEQA. CEQA Section 15380 provides that a plant or animal species may be treated as rare or endangered even if the species is not on one of the official lists (State CEQA Guidelines Section 15380).
- Plants considered by CDFW and CNPS to be "rare, threatened or endangered in California" (California Rare Plant Ranks [CRPRs] 1A, 1B, 2A, and 2B).
- Bat species identified by the Western Bat Working Group (WBWG) as Medium Priority, Medium/High Priority, or High Priority species.

Species recognized under these terms are collectively referred to as *special-status species*. Database searches of the CNDDB, CNPS, and USFWS species list were conducted for the study area to identify previously reported occurrences of special-status species. (CDFW 2022a; CNPS 2022; USFWS 2022a). Critical habitat for any species that overlaps any part of the study area is shown in **Figure 3.5-1**. CNDDB occurrences in the study area are shown on **Figure 3.5-2**. **Table 3.5-1** lists the special-status species with potential to occur in suitable habitat within the study area.

Special-Status Wildlife

Species listed in the Table 3.5-1 are described in more detail below. These species all have potential to be present within the study area within their appropriate habitat(s). Projects located in suitable habitat for these species should consider them likely to be present, and pursue appropriate avoidance and minimization measures (see Section 3.5.4).

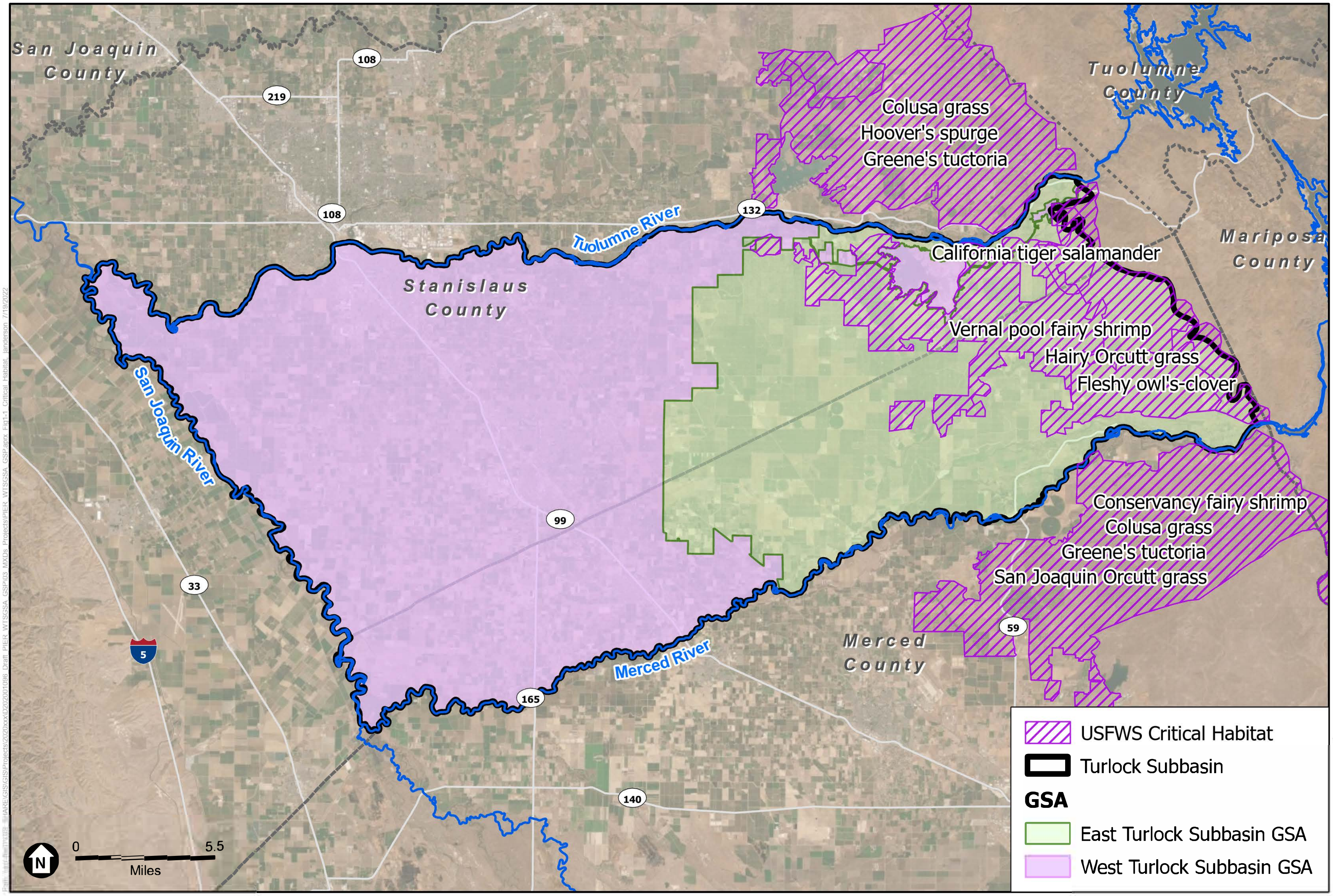
Invertebrates

Vernal Pool Fairy Shrimp

Vernal pool fairy shrimp (*Branchinecta lynchi*) is federally listed as threatened. It inhabits primarily vernal pools but also occurs in other wetlands that provide habitat similar to vernal pools: alkaline rain-pools, ephemeral drainages, rock outcrop pools, ditches, stream oxbows, stock ponds, vernal swales, and seasonal wetlands. It has also been detected in disturbed vernal pools. It is threatened primarily by habitat loss and fragmentation from the expansion of agricultural and developed lands.

Conservancy Fairy Shrimp

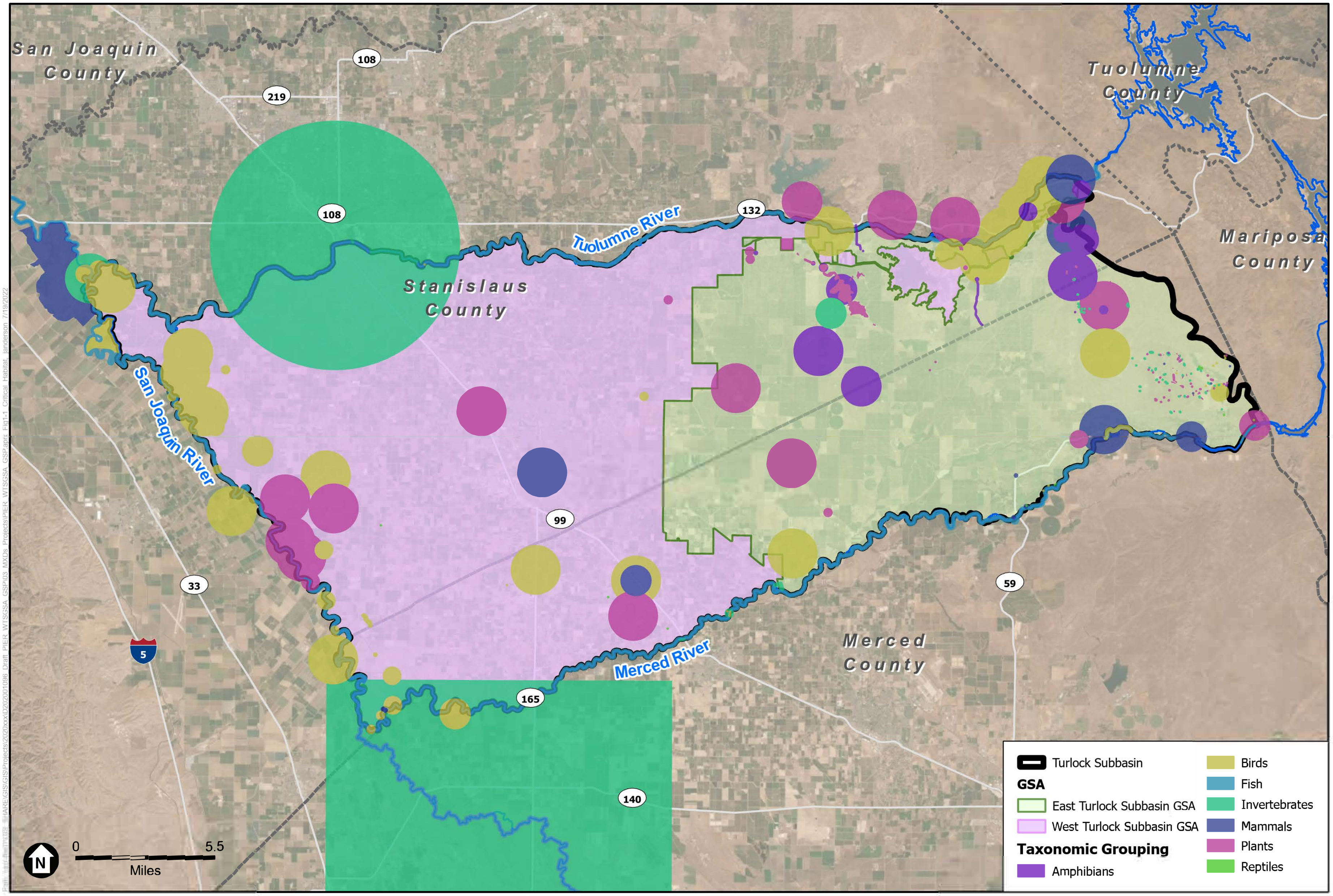
Conservancy fairy shrimp (*Branchinecta conservatio*) is federally listed as endangered. It occurs in turbid vernal pools ranging from large, playa-type vernal pools to long-inundation, smaller vernal pools. The Conservancy fairy shrimp is threatened primarily by habitat loss and fragmentation resulting from expansion of agricultural and developed land.



SOURCE: MAXAR, 2021; USFWS 2021; ESA, 2022

Figure 3.5-1
Critical Habitat Areas

ESA



SOURCE: MAXAR, 2021; USFWS 2021; ESA, 2022

Turlock Subbasin PEIR

Figure 3.5-2
CNDDB Occurrences

ESA

TABLE 3.5-1
SPECIAL-STATUS SPECIES RECORDED IN THE STUDY AREA

Name	Listing Status*	Habitat Requirements and Range
Invertebrates		
Conservancy fairy shrimp (*Branchinecta conservatio*)	FE/--	Vernal pools, generally grassy swales or clear water depressions; scattered populations remain in the Central Valley.
Vernal pool fairy shrimp (*Branchinecta lynchi*)	FT/--	Grassland vernal pools, generally small clear water sandstone depressions or grassy swales, from eastern San Francisco Bay through the Central Valley.
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT/--	Occurs in exclusive association with host plant blue elderberry (Sambucus mexicanus). Adults feed and lay eggs on shrubs and larvae emerge from exit holes in stems. Found in riparian communities of the Central Valley.
Vernal pool tadpole shrimp (*Lepidurus packardi*)	FE/--	Inhabits vernal pools and swales in clear to highly turbid water, in unplowed grasslands of the Sacramento Valley and Bay Area.
Fish		
Hardhead (*Mylopharadon conocephalus*)	--/CSC	Inhabits deep pools over rocky and sandy substrates in small to large rivers. Known from the drainages of the Sacramento and San Joaquin rivers.
Steelhead Central Valley DPS (*Oncorhynchus mykiss irideus* pop 11)	FT/--	Enters Sacramento and San Joaquin rivers and tributaries July to May, and spawns from December to April. Young rear in and through Sacramento and San Joaquin rivers, Delta, and San Pablo and San Francisco Bays.
Sacramento splittail (*Pogonichthys, macrolepidotus*)	--/CSC	Spawns in shallow water over flooded vegetated habitat with flowing water. Larvae and juveniles remain in riparian vegetation along shallow edges of floodplains.
Amphibians		
California tiger salamander (*Ambystoma californiense*)	FT/ ST	Vernal or temporary pools in annual grasslands, or open stages of woodlands. Typically, adults use mammal burrows. The species occurs from Petaluma in Sonoma County, east to Yolo and Sacramento counties, south to Tulare County, and from the San Francisco Bay south to Santa Barbara County.
California red-legged frog (*Rana draytonii*)	FT/CSC	Streams, freshwater pools, and ponds with overhanging vegetation. Also found in woods adjacent to streams. Requires permanent or ephemeral water sources such as reservoirs and slow-moving streams and needs pools of >0.5 m depth for breeding. Historical range is Sacramento Valley east into the Sierra Nevada foothills.
Foothill yellow-legged frog (*Rana boylii*)	--/SE	Breeds and overwinters in and near sunny, rocky headwaters of perennial streams. Coast Ranges and Sierra foothills.
Western spadefoot toad (*Spea hamondii*)	--/CSC	Breeds in temporary shallow pools formed from winter rains. Occurs in grasslands of Central Valley and lays eggs in late winter through March.
Reptiles		
Northern California legless lizard (*Anniella pulchra*)	--/CSC	Occurs in coastal dune, valley foothills, chaparral, and coastal scrub habitats with sandy or loose organic soils and plenty of leaf litter. Often burrow in loose soil or leaf litter.
Western pond turtle (*Emys marmorata*)	--/CSC	Aquatic turtle of ponds, marshes, rivers, streams, and irrigation ditches, usually with aquatic vegetation, at elevations below 6,000 feet. Requires basking sites in aquatic habitat, and suitable sandy or grassy upland habitat for nesting.
Giant garter snake (*Thamnophis gigas*)	FT/ST	Dwells in marshes, ponds, sloughs, low-gradient streams, and other waterways including irrigation and drainage canals with emergent vegetation, rice fields, and agricultural wetlands. Uses adjacent uplands including small mammal burros and crevices in grasslands.

TABLE 3.5-1 (CONTINUED)
SPECIAL-STATUS SPECIES RECORDED IN THE STUDY AREA

Name	Listing Status*	Habitat Requirements and Range
Birds		
Tricolored blackbird (*Agelaius tricolor*)	--/ST	Nests in colonies in freshwater marshes with dense stands of cattails or bulrushes, occasionally in willows, thistles, mustard, blackberry brambles, and dense shrubs and grains. Requires open water, protected areas for nests, foraging habitat with insects. Largely endemic to California.
Burrowing owl (*Athene cunicularia)*	--/CSC	Yearlong resident of open, dry grasslands with burrows for nesting, often California ground squirrel (*Spermophilus beecheyi*) burrows. Prefers low-growing grasslands to scout for predators.
Swainson's hawk (*Buteo swainsoni*)	--/ST	Breeds in grasslands with scattered trees, riparian woodland, agricultural or ranch lands with lines of trees for nesting. Forages in grasslands, alfalfa, or grain fields for rodents.
Mountain plover (*Charadrius montanus*)	--CSC	Winters in California in open, semi-arid, sparsely vegetated prairies and grasslands.
White-tailed kite (*Elanus leucurus)*	--/CFP	Nests in foothills and valley margins with scattered trees and marshes near deciduous woodland for nesting, and open grasslands, meadows, agricultural fields, or marshes for foraging.
Bald eagle (*Haliaetus leucocephalus*)	--/SE/CFP	Found near large bodies of water or rivers with abundant fish and snags or other perches. Permanent resident or winter migrant, more common in Northern California.
Loggerhead shrike (*Lanius ludovicianus*)	--/CSC	Year-round resident of agricultural fields and grassy lowlands in central California. Nests in dense foliage of shrubs or trees and feeds on insects and rodents.
Song sparrow (Modesto population) (*Melospiza melodia maillardi*)	--/CSC	Associated with woody riparian habitat along rivers and other waterways in the north Central Valley, where it nests in dense vegetation.
Least Bell's vireo (*Vireo belli pusillus*)	FE/SE	Summer resident of low riparian habitat near water or dry river bottoms below 2,000 feet elevation in Southern California. Nests on twigs or bushes of willow, coyotebrush, or mesquite.
Mammals		
Pallid bat (*Antrozous pallidus*)	--/CSC	Grasslands, shrublands, woodlands, and forests. Common in arid regions with rocky outcroppings, particularly near water. Roosts in rock crevices, buildings, and under bridges. Very sensitive to disturbance.
Townsend's big-eared bat (*Corynorhinus townsendii*)	--/CSC	Throughout California in varied habitats. Roosts in caves, mines, tunnels, or buildings; most abundant in mesic habitat.
Western red bat (*Lasiurus blossevillii*)	--/CSC	Found in cismontane woodland, lower montane conifers, or riparian woodlands, where it roosts in trees and forages at habitat edges.
Hoary bat (*Lasiurus cinereus*)	WBWG Medium	Found in forested habitats in trees along clearing edges with dense foliage. Forages in trees and along streams and lake shores.
American badger (*Taxidea taxus*)	--/CSC	Found in drier open stages of shrub, forest, and grassland habitats. Needs friable soils and open uncultivated ground for burrowing. Preys on burrowing rodents.
San Joaquin kit fox (*Vulpes macrotis mutica*)	FE/ST	Found in arid habitats in undeveloped grasslands, desert, scrubland, and agricultural land where it burrows in daytime and feeds on rodents and rabbits.
Plants		
Alkali milk-vetch (*Astragalus tener* var. *tener*)	--/--/1B.2	Annual herb of alkaline playas, vernal pools, valley and foothill grasslands with adobe clay. Elevation 3 to 200 feet Blooms March through June.
Heartscale (*Atriplex cordulata* var. *cordulata*)	--/--/1B.2	Annual herb of saline or alkaline soils of chenopod scrub, meadows and seeps, sandy valley, and foothill grassland. Elevation 0 to 1500 feet. Blooms April through October.
Brittlescale (*Atriplex depressa)*	--/--/1B.2	Chenopod scrub, meadows and seeps, playas, valley and foothill grassland, vernal pools; alkaline, clay. Annual herb. Blooms April through October. Elevation 10 to 3,500 feet.

TABLE 3.5-1 (CONTINUED)
SPECIAL-STATUS SPECIES RECORDED IN THE STUDY AREA

Name	Listing Status*	Habitat Requirements and Range
Plants (cont.)		
Lesser saltscale (*Atriplex minuscula*)	--/--/1B.1	Chenopod scrub, alkali playa, valley and foothill grassland in east Bay Area and Central Valley. Elevation 50 to 250 feet. Blooms May through October.
Vernal pool smallscale (*Atriplex persistens)*	--/--/1B.2	Annual herb of alkaline vernal pools. Elevation 30 to 150 feet. Blooms June through October.
Subtle orache (*Atriplex subtilis)*	--/--/1B.2	Annual herb of alkaline valley and foothill grasslands. Elevation 125 to 350 feet. Blooms June through September/October.
Lemmon's jewelflower *(Caulanthus lemmoni)*	--/--/1B.2	Grasslands, chaparral, and scrub habitats. Annual herb. Elevation 260 to 3,280 feet. Blooms March through May.
Fleshy owl's-clover (*Castilleja campestris* ssp. *succulenta*)	FT/SE/1B.2	Vernal pools of the eastern San Joaquin Valley and southern Sierra foothills. Annual herb (hemiparasitic).
Beaked clarkia (*Clarkia rostrate)*	--/--1B.3	Annual herb of cismontane woodland and valley and foothill grassland. Elevation 200 to 1,600 feet. Blooms April to May.
Delta button-celery (*Eryngium racemosum)*	--/SE/1B.1	Annual or perennial herb of vernally mesic clay depressions in riparian scrub. Elevation 10 to 100 feet. Blooms June through October.
Hoover's spurge (*Euphorbia hooveri*)	FT/--/1B.2	Vernal pools, freshwater wetlands, and valley grasslands. Annual herb.
San Joaquin spearscale (*Extriplex joaquinana*)	--/--/1B.2	Chenopod scrub, meadow and seep, alkali meadow, playa, valley and foothill grassland
Alkali-sink goldfields (*Lasthenia chrysantha)*	--/--/1B.1	Valley grassland, alkali sink, wetland-riparian. Annual herb. Blooms February-June. Elevation 0 to 300 feet.
Prostrate navarretia (*Navarretia prostrata*)	--/--/1B.2	In mesic, alkali areas of coastal scrub and grassland, particularly vernal pools in Coast Ranges and Central Valley.
Colusa grass (*Neostapfia colusana)*	FT/SE/1B.1	Annual herb of large, adobe clay vernal pools. Elevation 15 to 600 feet. Blooms May through August.
San Joaquin Orcutt grass (*Orcuttia inaequalis)*	FT/SE/1B.1	Annual herb of vernal pools. Elevation 30 to 2500 feet. Blooms April through September.
Hairy Orcutt grass (*Orcuttia pilosa)*	FE/SE/1B.1	Annual herb of vernal pools in the Central Valley. Elevation 30 to 2,500 feet. Blooms May through September.
California alkali grass (*Puccinellia simplex*)	--/--/1B.2	Annual herb of alkaline, vernally mesic sinks, flats and lake margins in chenopod scrub, meadows, and seeps, valley and foothill grassland, and vernal pools. Elevation 6 to 3000 feet. Blooms March to May.
Prairie wedge grass (*Sphenophlis obtusata)*	--/--/2B.2	Perennial herb of mesic areas in cismontane woodland, and meadows and seeps. Elevation 1,000 to 6,000 feet. Blooms April through July.
Greene's tuctoria *(Tuctoria greenei)*	FE/SR/1B.1	Annual herb of vernal pools. Elevation 60 to 3200 feet. Blooms May through July to September.

NOTES:

USGS 7.5-minute quads Brush Lake, Westley, Crows Landing, Gustine, Ceres, Hatch, Denair, Montpelier, Paulsell, Cooperstown, Turlock, Turlock Lake, Cressey, Winton, Yosemite Lake, Snelling, Stevinson, La Grange

***STATUS LEGEND:**
FE = Federally Endangered
FT = Federally Threatened
CFP = CDFW Fully Protected Species
SE = State Endangered
ST = State Threatened
SR = State Rare
CSC = California Species of Concern

California Rare Plant Rank (CRPR):
1B: Plants rare, threatened, or endangered in California and elsewhere
2B: Plants rare, threatened, or endangered in California, but more common elsewhere
4: Plants of limited distribution – watch list

Threat Rank:
1 – Seriously threatened in California
2 – Fairly threatened in California
3 - Fairly threatened in California and elsewhere

Western Bat Working Group (WBWG):
M = Medium Priority species
MH = Medium/High Priority species
H = High Priority species

Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is federally listed as threatened. It requires elderberry shrubs and is generally associated with riparian habitats. Valley elderberry longhorn beetle is threatened by loss and fragmentation of riparian habitat.

Vernal Pool Tadpole Shrimp

Vernal pool tadpole shrimp (*Lepidurus packardi*) is federally listed as endangered. It occurs in a wide variety of seasonal habitats: vernal pools, ponded clay flats, alkaline pools, ephemeral stock ponds, and roadside ditches. Habitats where vernal pool tadpole shrimp have been observed range in size from small, clear, vegetated vernal pools to highly turbid pools and large winter lakes. The vernal pool tadpole shrimp is threatened primarily by habitat loss and fragmentation from the expansion of agricultural and developed lands.

Fish

Hardhead

Hardhead (*Mylopharadon conocephalus*) is a California species of special concern. Hardhead is a native species that is widely distributed in low to mid-elevation streams in the Sacramento and San Joaquin drainages.

Stream-dwelling juvenile hardhead are often found in small aggregations in pools and runs during the day, actively feeding at the water's surface, holding in moving water to feed on drifting material, or browsing from the benthos (Moyle 2002). Hardhead mature following their second year and spawn in the spring, mainly in April and May (Moyle 2002) judging by the upstream migrations of adults into smaller tributary streams during this time of the year. Estimates based on juvenile recruitment suggest that hardhead spawn by April–June in Central Valley streams, although the spawning season may occasionally extend into August in the foothill streams of the Sacramento-San Joaquin drainage.

The apparent ongoing declines in hardhead distribution and abundance are a result of synergistic impacts from habitat loss, decline in water quality, and invasions of alien species (Moyle 2002). The principal threats to hardhead include: (1) dams and diversions, (2) agriculture, (3) urbanization, (4) instream mining, (5) stream modification for transportation, (6) fisheries management ("harvest" associated with past eradication of "rough fishes" to benefit recreational fisheries), and (7) alien species.

Steelhead

The Central Valley DPS of steelhead (*Oncorhynchus mykiss irideus*) is federally listed as threatened. Critical habitat for this DPS of steelhead has been designated within specified stream reaches in Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, and Contra Costa counties (70 Federal Register [FR] 52488). Critical habitat includes stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 Code of Federal Regulations [CFR] 329.11).

Prior to dam construction, water development, and watershed perturbations, Central Valley steelhead were widely distributed throughout the Sacramento and San Joaquin rivers (McEwan 2001). Until recently, steelhead were thought to be extirpated from the San Joaquin River system. Recent monitoring has detected small, self-sustaining populations of steelhead in the Stanislaus, Mokelumne, and Calaveras rivers (NMFS 2009).

As a result of the extensive agricultural development within the Central Valley, exposure to pesticides and herbicides is a significant concern for salmon and other fish species. In addition, sublethal concentrations of toxics may interact with other stressors on salmonids, increasing their vulnerability to mortality from exposure to seasonally elevated water temperatures, predation, or disease.

Sacramento Splittail

Sacramento splittail (*Pogonichthys macrolepidotus*) is a California species of special concern. Adult splittail spawn within the mainstem rivers and major tributaries in the Central Valley. Collection of larvae and young juveniles indicates that inundation of terrestrial habitat within the levees of the San Joaquin River provides suitable spawning habitat (Moyle et al. 2004).

Adult splittail begin a gradual upstream migration toward spawning areas sometime between late November and late January. The relationship between migrations and river flows is poorly understood, but it is likely that splittail respond positively to increases in flows. Feeding in flooded riparian areas in the weeks just prior to spawning may be important for later success of spawning and for post-spawning survival. Evidence of splittail spawning on floodplains has been found on both the San Joaquin and Sacramento rivers. In the San Joaquin River drainage, spawning has apparently occurred in wet years in the region where the San Joaquin River is joined by the Tuolumne and Merced rivers.

Amphibians

California Tiger Salamander

California tiger salamander (*Ambystoma californiense*) is federally listed as threatened in the Central Valley and is state listed as threatened. It requires vernal pools, ponds (natural or human made), or semi-permanent calm waters (where ponded water is present for at least 10 to 12 weeks) for breeding and larval maturation. It also requires adjacent upland areas that contain small-mammal burrows or other suitable refugia for aestivation (summer dormancy). Primary threats to California tiger salamander include the alteration of either breeding ponds or upland habitat through the introduction of exotic predators (e.g., bullfrogs *[Lithobates catesbeianus])* or the construction of barriers that fragment habitat and reduce connectivity (e.g., roads, berms, and certain types of fences).

California Red-Legged Frog

California red-legged frog (*Rana draytonii*) is federally listed as threatened and is a California species of special concern. It uses ponds, stream courses, permanent pools, and intermittent streams. The most significant threats to the California red-legged frog are habitat loss and alteration, introduced predators, water management, mismanagement of grazing livestock, chemical contamination from urban and industrial runoff, and extended drought conditions.

Foothill Yellow-Legged Frog

Foothill yellow-legged frog (*Rana boylii*) has different listing statuses under the California Endangered Species Act, depending on which clade is being considered. The study area is located within the East/Southern Sierra clade. This clade is listed as endangered based on the California Fish and Game Commission (2020) findings. The foothill yellow-legged frog is found in or near rocky streams in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types. Adults often bask on exposed rock surfaces near streams. During periods of inactivity, especially during cold weather, individuals seek cover under rocks in the streams or on shore close to water. This species is rarely encountered far from permanent water (even on rainy nights). They have been found underground or beneath surface objects more than 155 feet away from water, but generally these frogs spend most of their time in or near streams at all times of the year.

Western Spadefoot Toad

Western spadefoot toad (*Spea hammondii*) is a California species of special concern. It ranges throughout the Central Valley and adjacent foothills. It is also found in the Coast Ranges. This species primarily occurs in grasslands. Most of the year, they are found in underground burrows up to 36 inches deep that they construct themselves. Breeding and egg laying occur almost exclusively in shallow, temporary pools formed by heavy winter rains. Recently metamorphosed juveniles seek refuge in the immediate vicinities of breeding ponds for up to several days after transformation. Most surface movements by adults are associated with rains or high humidity at night. During dry periods, the moist soil inside burrows provides water for this species through absorption through the skin.

Reptiles

Northern California Legless Lizard

Northern California legless lizard (*Anniella pulchra*) is a California species of special concern. This species is potentially found through the floor of the San Joaquin Valley. They sometimes seek cover under surface objects such as flat boards and rocks, where they lie barely covered in loose soil. They are found primarily in areas with sandy or loose organic soils or where there is plenty of leaf litter.

Western Pond Turtle

The western pond turtle is a California species of special concern, most commonly found in ponds, marshes, creeks, and irrigation ditches. This species frequently basks on logs or other objects out of the water when water temperatures are low and air temperatures are greater than water temperatures. Mating typically occurs in late April or early May but may occur year-round. Nests are located in upland locations that may be a considerable distance from the aquatic site (up to ¼ mile). Hatchling turtles are thought to emerge from the nest and move to aquatic sites in the spring. This species may occur in or near sloughs, channels, and canals of the study area.

Giant Garter Snake

Giant garter snake (*Thamnophis gigas*) is federally listed and state listed as threatened. This species resides in marshes, ponds, sloughs, small lakes, low-gradient streams, and other waterways and agricultural wetlands, including irrigation and drainage canals, rice fields, and the adjacent uplands. Giant garter snake is threatened primarily by habitat conversion, fragmentation, and degradation resulting from urban development.

Birds

Tricolored Blackbird

Tricolored blackbird is state listed as threatened. It is a colonial nesting bird that is largely restricted to California. In recent history, this species has concentrated its breeding colonies within the agricultural fields of the Central Valley. The species often exploits the combination of resources available around dairies in California; for example, triticale, a hybrid of wheat and rye often grown as silage for dairies, provides robust structure for nesting and is associated with plentiful food resources.

Burrowing Owl

The burrowing owl is a California species of special concern. In California's Central Valley, the burrowing owl is a year-round resident of open spaces such as grasslands and agricultural fields. Nests are generally found in the abandoned burrows of small mammals such as ground squirrels; however, they can dig their own burrows in soft soil, and they occasionally use culverts and other artificial structures. Breeding occurs from March to August, peaking in April to May. Burrowing owls forage on insects and small mammals, and also consume reptiles, birds, and carrion. Open grassland in the study area is potential habitat for burrowing owls, especially in areas with short grass that are undisturbed.

Swainson's Hawk

The Swainson's hawk is state-listed as a threatened species in California. It nests in the Central Valley, Klamath Basin, and some mountain areas, where it prefers stands of trees in agricultural environments, oak savanna, riparian areas, or juniper-sage flats. In the San Joaquin Valley, it typically nests in riparian trees in isolated clusters, often near rural residences or agricultural fields. Swainson's hawk forages in crop fields in the Central Valley, as well as grasslands, rangelands, and fallow agricultural fields.

Mountain Plover

The mountain plover (*Charadrius montanus*) is a California species of special concern. Mountain plovers breed in the Great Plains and down to southeastern New Mexico and Texas. They migrate to various locations to winter, including California, Arizona, Texas, and north-central Mexico. They typically forage and roost in flocks ranging from 2 to more than 1,000 individuals throughout the winter. Mountain plovers often roost in depressions in the landscape, such as small-mammal burrows, depressions caused by cattle hoof prints, or furrows. They commonly use grassland habitats and recently tilled fields as their overwintering habitat.

White-tailed Kite

White-tailed kite (*Elanus leucurus)* is a state fully protected species. It nests in trees and shrubs in grasslands, oak woodlands, savannas, and riparian scrub throughout the Delta. Preferred foraging habitats include wetlands and grasslands, particularly herbaceous lowlands with minimal shrub and tree growth. The primary threats to the white-tailed kite are habitat loss, fragmentation, and degradation. In the Central Valley, the loss of nest trees and human disturbance of nest sites have degraded habitat.

Bald Eagle

The bald eagle (*Haliaetus leucocephalus*) was removed from the federal list of threatened and endangered species, but it is currently state listed as endangered and is a California fully protected species. It requires large bodies of water, or free-flowing rivers with abundant fish, and adjacent snags or other perches. It nests in large, old-growth, or dominant live trees with open branchwork. They usually nest near a permanent water source. In California it is restricted to breeding mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties. Winter range extends to most of the state and is a fairly common local winter migrant at a few inland waters in Southern California.

Loggerhead Shrike

Loggerhead shrike (*Lanius ludovicianus*) is a California species of special concern. Loggerhead shrikes are a year-round resident of lowlands in central California. They nest in dense foliage of shrubs and trees, and forage in open habitats for insects and small vertebrates such as mice for prey. They primarily nest and forage in croplands and grasslands.

Song Sparrow (Modesto Population)

Song sparrow (Modesto population) (*Melospiza melodia maillardi*) is a California species of special concern. The Modesto song sparrow resides in the north-central portion of the Central Valley. Their highest densities occur in the Butte Sink area of the Sacramento Valley and in the Sacramento-San Joaquin Delta. A year-round resident, they are locally numerous in areas where wetlands remain. They also breed in vegetation along irrigation canals and in riparian forests.

Least Bell's Vireo

Least Bell's vireo is federally listed and state listed as endangered. It nests and roosts in low riparian thickets of willows and shrubs, usually near water, but sometimes along dry, intermittent streams. Besides willows, other associated vegetation includes cottonwood trees, mulefat, blackberry, and mesquite (in desert). Least Bell's vireo was formerly a common and widespread summer resident throughout the Sacramento and San Joaquin valleys and in the coastal valleys and foothills from Santa Clara County south, but its numbers have drastically declined, and the species has vanished from much of its California range.

Mammals

Pallid Pat

Pallid bat (*Antrozous pallidus*) is a California species of special concern that favors roosting sites in crevices, rock outcrops, caves, hollow trees, abandoned mines, and human-made structures such as barns, attics, and sheds. Although pallid bats are gregarious, they tend to group in small colonies of 10 to 100 individuals. Pallid bats are a nocturnal hunter and capture prey in flight, but unlike most American bats, the species has been observed foraging for flightless insects, which it seizes after landing. Pallid bats have the potential to roost in trees within riparian habitat within the study area.

Townsend's Big-eared Bat

Townsend's big-eared bat (*Corynorhinus townsendii*) is a California species of special concern and is found in western desert scrub, pine forests, native grasslands, riparian communities, and active agricultural areas. Townsend's big-eared bats use caves, rock crevices, buildings, artificial structures, and tree hollows for roosting and are sensitive to disturbance at roosting sites. Townsend's big-eared bats forage along riparian edge habitats in a variety of wooded habitats and typically hibernate in caves and abandoned mines. Moderately suitable habitat conditions for Townsend's big-eared bats are present within riparian habitat within the study area.

Western Red Bat

Western red bat (*Lasiurus blossevillii*) is a California species of special concern. It roosts primarily in tree foliage, occasionally shrubs. Western red bats roost in small family groups rather than large colonies as other bats. The species prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging, including grasslands, shrublands, and open woodlands. The year-round range spans the Central Valley and other areas of the state, including the Coast Ranges and the coast.

Hoary Bat

Hoary bat (*Lasiurus cinereus*) is the most widespread bat in North America and is found throughout California. It is categorized by WBWG as a Medium Priority bat species. Suitable habitat includes woodlands and forests with medium to large trees with dense foliage. Their preferred roosting sites are hidden from above and with few branches below. They prefer habitat mosaics with access to trees for cover and open areas for feeding.

American Badger

American badger (*Taxidea taxus*) is a California species of special concern. It is associated with drier open shrub, forest, and herbaceous habitats with friable soils. Its distribution is currently fragmented throughout the San Joaquin Valley.

San Joaquin Kit Fox

San Joaquin kit fox (*Vulpes macrotis mutica*) is federally listed as endangered and state listed as threatened. It occurs in open grasslands and scrub and makes dens where there are loose-textured soils. Threats include loss and fragmentation of habitat and the introduction of barriers to dispersal, such as highways and canals.

Special-Status Plants

Alkali Milk-Vetch

Alkali milk-vetch (*Astragalus tener* var. *tener*) is a CRPR 1B.2 species. Alkali milk-vetch was historically distributed throughout the southern Sacramento Valley, northern San Joaquin Valley, and San Francisco Bay Area but is believed to be extirpated from all historic occurrences except those in Alameda, Merced, Solano, and Yolo counties. Alkali milk-vetch is an herbaceous annual plant in the pea family (Fabaceae). It is distinguished from Ferris' milk-vetch (*Astragalus tener* var. *ferrisiae*) based on the morphology of its fruits. Alkali milk-vetch has short, stout, strongly curved pods. Its elevation range is up to 2,000 feet.

The main threat to the survival of alkali milk-vetch is conversion of habitat to agricultural land uses. Competition from nonnative species is another threat. Livestock grazing is frequently mentioned as a possible threat in CNDDB occurrence reports, but some level of grazing may be beneficial to control competition from nonnative species. Because remaining populations are small and scattered, extirpation from random events such as flood, drought, or disease is also a concern.

Heartscale

Heartscale (*Atriplex cordulata* var. *cordulata*) is a CRPR 1B.2 species. Endemic to California, its range extends through the Central Valley from Glenn County in the north to Fresno County in the south. Heartscale is found in meadows, seeps, riparian wetlands, chenopod scrub, and valley and foothill grasslands in various soils that are either saline or alkaline. Heartscale is a small- to medium-sized 4- to 20-inch-tall annual herb of the goosefoot family (Chenopodiaceae) that blooms from April to October. Heartscale can be found at elevations up to 1,840 feet. Reported threats to heartscale include agriculture intensification, development, nonnative plants, overgrazing, and trampling.

Brittlescale

Brittlescale (*Atriplex depressa*) is a CRPR 1B.2 species and is endemic to California. Its range extends from Glenn and Colusa counties in the north, to Merced County in the south. Brittlescale is found in meadows, seeps, and vernal pools, with alkaline clay soils. Brittlescale is a small (less than 8 inches) annual herb of the goosefoot family (Chenopodiaceae) that blooms from June to October. Brittlescale is found at elevations of 3 to 1,050 feet. The primary threat to brittlescale is the loss of suitable habitat within its range. Other threats include livestock grazing and trampling invasive species, and the periodic inundation of managed marshes to create habitat for waterfowl.

Lesser Saltscale

Lesser saltscale (*Atriplex minuscula*) is a CRPR 1B.1 species. Its range includes the Sacramento and San Joaquin Valleys. It grows on sandy soils in alkaline areas at low elevations of 330 feet or less, often in association with slough systems and river floodplains.

Vernal Pool Smallscale

Vernal pool smallscale (*Atriplex persistens*) is a CRPR 1B.2 species. It is found in scattered locations throughout the Central Valley from Glenn County to Tulare County. It is associated with alkaline vernal pools.

Subtle Orache

Subtle orache (*Atriplex subtilis*) is a CRPR 1B.2 species. It is endemic to California, occurring in vernal pool habitats. It is endemic to Butte, Fresno, Kern, Kings, Madera, Merced, Stanislaus, and Tulare counties.

Lemmon's Jewelflower

Lemmon's jewelflower (*Caulanthus lemmoni*) is a CRPR 1B.2 species. It is found in grassland, chaparral, and scrub habitat. Its range includes the South Coastal Ranges, San Joaquin Valley, and San Francisco Bay Area.

Fleshy owl's clover

Fleshy owl's clover (*Castilleja campestris* ssp. *succulenta*) is federally listed as threatened, state listed as endangered. It is also a CRPR 1B.2 species. Its known range includes the northern San Joaquin Valley, including Fresno, Madera, Mariposa, Merced, San Joaquin, and Stanislaus counties. This species is associated with vernal pools. It is threatened by urbanization, agricultural, livestock grazing, and flood control projects.

Beaked Clarkia

Beaked clarkia (*Clarkia rostrate*) is a CRPR 1B.3 species. This species is found in the grasslands and oak woodlands of the central Sierra Nevada foothills. It is endemic to Merced, Mariposa, Stanislaus, and Tuolumne counties.

Hoover's spurge

Hoover's spurge (*Euphorbia hooveri*) is a federally threatened species. It is also a CRPR 1B.2 species. It is associated with vernal pool habitat. Its range includes populations throughout the Central Valley. It has been documented in Butte, Glen, Merced, Stanislaus, Tehama, and Tulare counties. It is threatened by livestock grazing, agricultural and competition with non-native plants.

Delta Button-celery

Delta button-celery (*Eryngium racemosum)* is state listed as endangered and is a CRPR 1B.1 species. The species' elevation range is 10 to 100 feet. Delta button-celery, a perennial herbaceous member of the carrot family (Apiaceae), has prostrate or decumbent stems that are branched above the basal rosettes. The tiny flowers are produced in small heads subtended by spiny bracts, are white to faintly purplish, and bloom between June and September. This species is found on clay soils in seasonally inundated floodplain depressions in riparian scrub habitat. Disturbance may be important in creating and maintaining, or conversely in eliminating, habitat for this species. Much of the occupied habitat is inundated periodically, and recently deposited fine sediment has been observed at several occupied sites. Several occupied sites also experience grazing and various anthropogenic disturbances (e.g., from off-road vehicles, road maintenance). Delta button-celery is threatened by agricultural conversion and flood control activities.

San Joaquin Spearscale

San Joaquin spearscale (*Extriplex joaquinana*) is a CRPR 1B.2 species. Endemic to California, its range includes Glenn, Colusa, and Yolo counties to the north; Contra Costa, Santa Clara, San Benito, Napa, Solano, and Alameda counties to the west; and Sacramento, Fresno, Merced, and San Joaquin counties to the south. It is an annual herb with a blooming period from April to October. San Joaquin spearscale occurs in alkali grassland and meadows and other seasonal wetlands with alkaline soils. Threats to this species include development, intensive agricultural, waterfowl management, and invasive plant species that lead to loss of habitat and degradation of the specific soils this species requires.

Alkali-sink Goldfield

Alkali-sink goldfield (*Lasthenia chrysantha*) is a CRPR 1B.1 species. It is endemic to the Central Valley where it grows in vernal pools and alkali flats. It is threatened by habitat loss from agriculture and urban development.

Prostrate Navarretia

Prostrate navarretia (*Navarretia prostrata*) is a CRPR 1B.2 species. It is found in moist to wet areas, including alkane floodplains and vernal pools. It is predominately associated with coastal sage scrub communities, and is occasionally encountered within alkaline valley and foothill grassland communities.

Colusa Grass

Colusa grass (*Neostapfia colusana)* is federally listed as threatened, state listed as endangered, and CRPR 1B.1. A recovery plan was established in 2005 (USFWS 2005) and critical habitat was designated in 2006 (71 FR 7117, February 10, 2006). Colusa grass grows in large or deep vernal pools with substrates of high mud content. It is found at the edges of alkaline basins and vernal pools in the Sacramento and San Joaquin valleys and on acidic soils of alluvial fans and stream terraces at the eastern margin of the San Joaquin Valley and adjacent foothills. The majority of the extant occurrences are in the southern Sierra Foothills, concentrated northeast of the City of Merced in Merced County and east of Hickman in Stanislaus County.

Colusa grass is a robust, tufted annual in the grass family (Poaceae) that grows 3–12 inches tall. The plant is pale-gray-green when young, turning brown as it ages due to the hardening of sticky, glandular exudates on the stems. The lower portions of the stems lie on the ground; the upper portions are erect and terminate in dense cylindrical, spike-like inflorescences that superficially resemble small ears of corn. The blooming period is May to August. The two biggest threats to Colusa grass agricultural conversion and development, especially in Stanislaus and Merced counties, respectively. Other threats are herbicide contaminated runoff, contaminated groundwater by industrial chemicals, flood control and alteration of hydrology, inappropriate grazing practices, and competition from nonnative plants.

San Joaquin Orcutt Grass

San Joaquin Orcutt grass (*Orcuttia inaequalis*) is federally listed as threatened, state listed as endangered, and CRPR 1B.1. Its range is restricted to vernal pools of the Central Valley.

Historically, its range included the eastern margin of the Central Valley, from Stanislaus County to Tulare counties. Most of the historical populations of this species have been extirpated.

Hairy Orcutt Grass

Hairy Orcutt grass (*Orcuttia pilosa*) is federally listed as endangered, state listed as endangered, and CRPR 1B.1. The remaining known extant occurrences of hairy Orcutt grass occur in two areas: Glenn and Tehama counties in the north, and Madera and Stanislaus counties farther to the south. Like other vernal pool annuals, the size of this species' population fluctuates dramatically from year-to-year. This species is found on high or low stream terraces and alluvial fans.

California Alkali Grass

California alkali grass (*Puccinellia simplex*) is a CRPR 1B.2 species. This annual grass is native to California but also occurs in Utah. It has a blooming period from March to May. The species occurs on alkaline soils in areas such as chenopod scrub, meadows, seeps, valley and foothill grasslands, and vernal pools. It is mainly documented within the Central Valley, with scattered occurrences in the Coast Ranges and the western Mojave Desert. Threats to California alkali grass include changes in hydrology, urbanization, agricultural conversion, and habitat fragmentation.

Prairie Wedge Grass

Prairie wedge grass (*Sphenophlis obtusata*) is a CRPR 2B.2 species. It is widespread throughout southern Canada and the United States. It occurs in various types of habitats including prairie, marshes, dunes, and disturbed areas. It is more commonly found at higher elevations, but this species is also documented on the San Joaquin Valley floor.

Greene's Tuctoria

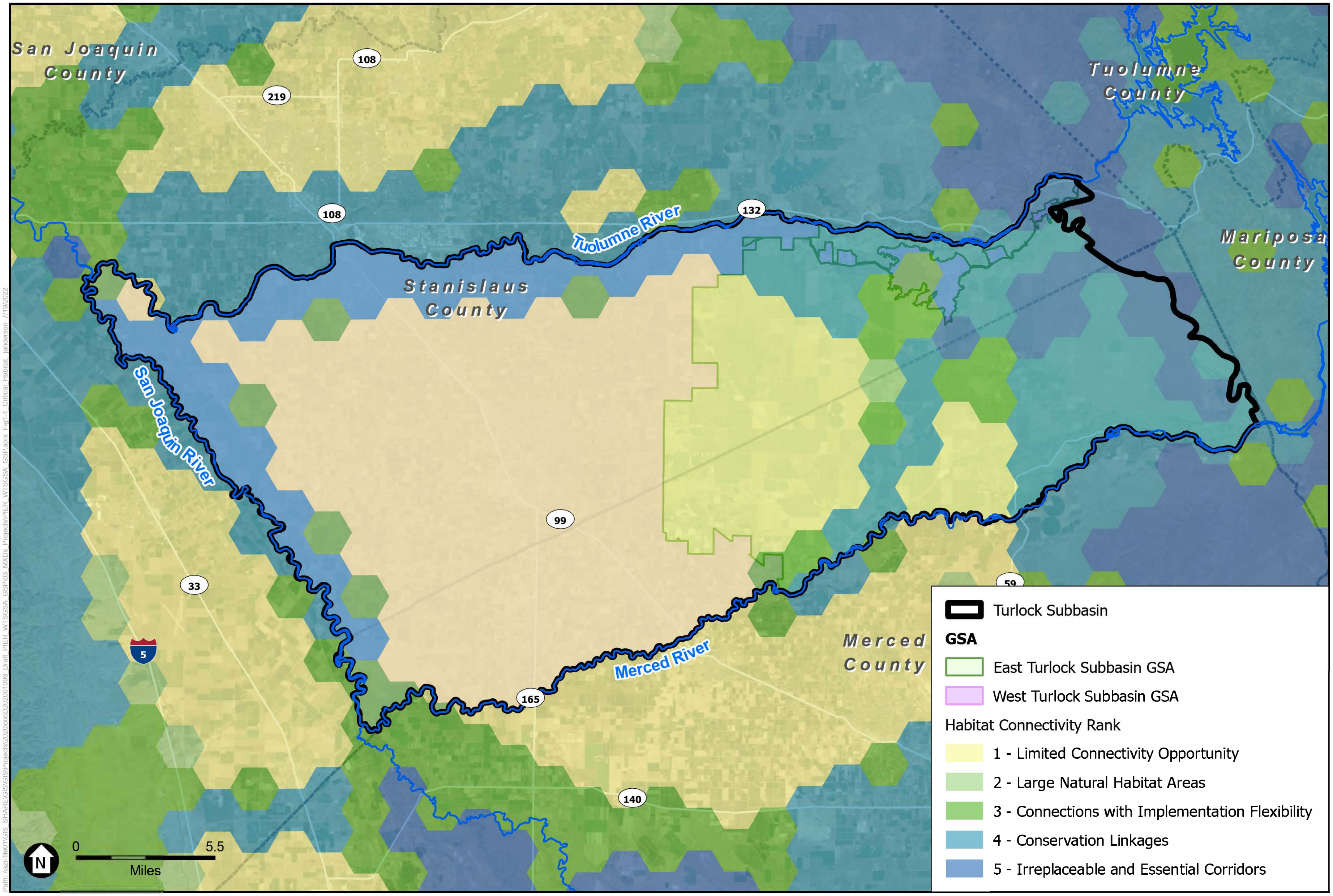
Greene's tuctoria (*Tuctoria greenei*) is federally listed as endangered, state listed as rare, and CRPR 1B.1. It is restricted to vernal pools in the Central Valley. It has been documented on clay, loam, and stony clay loam soils, and pools underlain by iron-silica cemented hardpan, tuffaceous alluvium, or claypan.

Wildlife Corridors

Movements of wildlife generally fall into three basic categories:

- Movements along corridors or habitat linkages associated with home range activities such as foraging, territory defense, and breeding.
- Dispersal movements, which are typically one-way (e.g., juvenile animals leaving their natal areas or individuals colonizing new areas).
- Temporal migration movements, essentially dispersal actions that involve returning to the place of origin (e.g., deer moving from winter grounds to summer ranges and fawning areas).

Important wildlife corridors in the study area are represented by essential habitat connectivity areas shown on **Figure 3.5-3**. These connectivity areas primarily consist of the riparian corridors along the Tuolumne and Merced rivers, and the less developed far eastern foothill portions of the study area, where wildlife have the forage and cover required for movement (CDFW, 2022b).



SOURCE: MAXAR, 2021; USFWS 2021; ESA, 2022

Figure 3.5-3
Habitat Connectivity Corridors

ESA

3.5.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to biological resources. Implementation of any PMA may be subject to the laws and regulations listed below, as well as other local plans, policies, and ordinances depending on the actual PMA location.

Federal

Endangered Species Act of 1973 (FESA), as amended (16 U.S.C. §§1531-1543)

The FESA and subsequent amendments provide guidance for the conservation of endangered and threatened species and the ecosystems upon which they depend. In addition, the FESA defines species as threatened or endangered and provides regulatory protection for listed species. The FESA also provides a program for the conservation and recovery of threatened and endangered species as well as the conservation of designated critical habitat that USFWS determines is required for the survival and recovery of these listed species.

Section 9 of the act lists those actions that are prohibited under the FESA. The definition of "take" includes to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Although unauthorized take of a listed species is prohibited, take may be allowed when it is incidental to an otherwise legal activity. Section 9 prohibits take of listed species of fish, wildlife, and plants without special exemption. The definition of "harm" includes significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns related to breeding, feeding, or shelter. "Harass" is defined as actions that create the likelihood of injury to listed species by disrupting normal behavioral patterns related to breeding, feeding, and shelter significantly.

Section 10 provides a means whereby a nonfederal action with the potential to result in take of a listed species can be allowed under an incidental take permit.

Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§703-711)

The MBTA is the domestic law that affirms and implements a commitment by the United States to four international conventions (with Canada, Mexico, Japan, and Russia) for the protection of a shared migratory bird resource. Unless and except as permitted by regulations, the MBTA makes it unlawful at any time, by any means, or in any manner to intentionally pursue, hunt, take, capture, or kill migratory birds anywhere in the United States. The law also applies to disturbance and removal of nests occupied by migratory birds or their eggs during the breeding season, whether intentional or incidental.

Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. §668)

The federal Bald and Golden Eagle Protection Act of 1940 protects bald eagles and golden eagles (*Aquila chrysaetos*) by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this act. Take of bald and golden eagles includes to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" (16 U.S.C.

§668c). "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle; (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (72 FR 31132; 50 CFR §22.3).

Clean Water Act of 1972

The Clean Water Act was enacted as an amendment to the federal Water Pollution Control Act of 1972, which outlined the structure for regulating discharges of pollutants to waters of the United States. The Clean Water Act is the primary federal law for protecting the quality of the nation's surface waters: lakes, rivers, and coastal wetlands.

Clean Water Act Section 401

Under Clean Water Act Section 401, applicants for a federal license or permit to conduct activities that may discharge a pollutant into waters of the United States (defined below under *Clean Water Act Section 404*) must obtain certification from the state in which the discharge would originate. If appropriate, the applicant must obtain certification from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect a state's water quality—including projects that require approval by a federal agency, such as issuance of a Section 404 permit, described below—must also comply with Clean Water Act Section 401.

Clean Water Act Section 402

Pursuant to Clean Water Act Section 402, the State Water Resources Control Board (State Water Board) has adopted the General Construction Activity Storm Water Permit. This general permit applies to stormwater discharges from any construction activity that would disturb at least 1 acre of total land area, including clearing, grading, excavation, reconstruction, and dredging and filling activities. The general permit requires the site owner to notify the State, prepare and implement a storm water pollution prevention plan, and monitor the plan's effectiveness.

Minor (i.e., *de minimis*) discharge activities regulated by an individual or general permit under the National Pollutant Discharge Elimination System (NPDES), such as discharges resulting in construction dewatering, also require the General Order for Dewatering and Other Low Threat Discharge to Surface Waters Permit (Clean Water Act Section 402). Project applicants/ proponents should apply for this permit at the same time they apply for the NPDES permit.

Clean Water Act Section 404

Clean Water Act Section 404 regulates the discharge of dredged and fill materials into waters of the United States. The term *waters of the United States* refers to oceans, bays, rivers, streams, lakes, ponds, and wetlands. Before proceeding with proposed activities, applicants must obtain a permit from the United States Army Corps of Engineers (USACE) for all discharges of dredged or fill material into waters of the United States, including wetlands. Waters of the United States are under the jurisdiction of USACE and the U.S. Environmental Protection Agency.

To comply with Clean Water Act Section 404, a project must first comply with several other environmental laws and regulations. USACE cannot issue an individual permit or verify the use of a general nationwide permit until the project has met the requirements of the National Environmental Policy Act (NEPA), the FESA, and the National Historic Preservation Act. In addition, USACE cannot issue or verify any permit until a water quality certification or a waiver of certification has been issued under Clean Water Act Section 401.

State

California Endangered Species Act (CESA) (Fish and Game Code §2050 et seq.)

The CESA establishes state policy to conserve, protect, restore, and enhance threatened or endangered species and their habitats. The CESA mandates that state agencies should not approve projects that would jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. For projects that would affect a listed species under both the CESA and the FESA, compliance with the FESA would satisfy the CESA if CDFW determines that the federal incidental take authorization is "consistent" with the CESA under Fish and Game Code Section 2080.1. Before a project results in take of a species listed under the CESA, a take permit must be issued under Section 2081(b).

Fish and Game Code §§2080, 2081

Section 2080 of the Fish and Game Code states, "*No person shall import into this state [California], export out of this state, or take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the [State Fish and Game] Commission determines to be an endangered species or threatened species, or attempt any of those acts, except as otherwise provided in this chapter, or the Native Plant Protection Act, or the California Desert Native Plants Act.*" Pursuant to Section 2081, CDFW may authorize individuals or public agencies to import, export, take, or possess state-listed endangered, threatened, or candidate species. These otherwise prohibited acts may be authorized through permits or Memoranda of Understanding, if the take is incidental to an otherwise lawful activity, impacts of the authorized take are minimized and fully mitigated, the permit is consistent with any regulations adopted pursuant to any recovery plan for the species, and the project operator ensures adequate funding to implement the measures required by CDFW. CDFW makes this determination based on available scientific information and considers the ability of the species to survive and reproduce.

Fish and Game Code §§3503, 3503.5, and 3513

Under these sections of the Fish and Game Code, a project operator is not allowed to conduct activities that would result in the taking, possessing, or destroying of any birds of prey; the taking or possessing of any migratory nongame bird; the taking, possessing, or needlessly destroying of the nest or eggs of any raptors or nongame birds; or the taking of any nongame bird pursuant to Fish and Game Code Section 3800, whether intentional or incidental.

Fully Protected Species

Certain species are considered fully protected, meaning that the California Fish and Game Code explicitly prohibits all take of individuals of these species except for scientific research. Section 5050 lists fully protected amphibians and reptiles, Section 5515 lists fully protected fish, Section 3511 lists fully protected birds, and Section 4700 lists fully protected mammals. A species can be protected under the California Fish and Game Code but not be fully protected. For instance, mountain lion (*Puma concolor*) is protected under Section 4800 et seq. but is not a fully protected species.

Species of Special Concern

CDFW maintains lists of candidate-endangered species and candidate-threatened species. California candidate species are afforded the same level of protection as listed species. California also designates species of special concern, which are species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational value. These species do not have the same legal protection as listed species or fully protected species, but may be added to official lists in the future. CDFW intends the species of special concern list to be a management tool for consideration in future land use decisions.

California Environmental Quality Act Guidelines §15380

In addition to the protections provided by specific federal and state statutes, CEQA Guidelines Section 15380 provides that a species not listed on the federal or state list of protected species nonetheless may be considered rare or endangered for purposes of CEQA if the species can be shown to meet certain specified criteria:

(A) When its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors; or

(B) Although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or

(C) The species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in the FESA.

Native Plant Protection Act (NPPA) (Fish and Game Code §§1900-1913)

California's NPPA requires all state agencies to use their authority to carry out programs to conserve endangered and rare native plants. Provisions of the NPPA prohibit the taking of endangered or rare plants from the wild and require notification of CDFW at least 10 days in advance of any change in land use in areas that support listed plants.

California Rare Plant Ranking System

CDFW works in collaboration with CNPS to maintain a list of plant species native to California that have low numbers or limited distribution, or are otherwise threatened with extinction. These species are categorized by rarity in the California Rare Plant Rank (CRPR). This information is published in the Inventory of Rare and Endangered Vascular Plants of California. Potential impacts on populations of CRPR species may receive consideration under CEQA review. The system ranks rare plants using the following definitions:

- **Rank 1A:** Plants presumed extirpated in California and either rare or extinct elsewhere.
- **Rank 1B:** Plants rare, threatened, or endangered in California and elsewhere.
- **Rank 2A:** Plants presumed extirpated in California, but more common elsewhere.
- **Rank 2B:** Plants rare, threatened, or endangered in California, but more common elsewhere.
- **Rank 3:** Plants about which more information is needed—a review list.
- **Rank 4:** Plants of limited distribution—a watch list.

In general, plants with CRPR 1A, 1B, or 2 are considered to meet the criteria of State CEQA Guidelines Section 15380 (discussed above). In addition, plants with CRPR Rank 1A, 1B, or 2 meet the definitions of California Fish and Game Code Section 1901, Chapter 10 (Native Plant Protection Act) and Sections 2062 and 2067 (CESA).

Regional and Local

Pacific Gas and Electric (PG&E) San Joaquin Valley Operation and Maintenance Habitat Conservation Plan

The PG&E San Joaquin Valley Operation and Maintenance Habitat Conservation Plan (O&M HCP) protects 23 wildlife and 42 plant species within nine counties of the San Joaquin Valley. This HCP covers routine operations and maintenance activities, as well as minor new construction, on any PG&E gas and electrical transmission and distribution facilities, easements, private access routes, or lands owned by PG&E (PG&E 2006).

Stanislaus County General Plan

The Stanislaus County General Plan (2015) includes goals and policies to identify, protect, and enhance Stanislaus County's important biological resources. Below is a summary of the key policies identified in the Stanislaus County General Plan relevant to implementation of the PMAs.

Conservation and Open Space Element

- ***Policy 3*****:** Areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways and other waterfowl habitats, etc.) including those habitats and plant species listed by state or federal agencies shall be protected from development and/or disturbance.
- ***Policy 4*****:** Protect and enhance oak woodlands and other native hardwood habitat.
- ***Policy 5*****:** Protect groundwater aquifers and recharge areas, particularly those critical for the replenishment of reservoirs and aquifers.
- ***Policy 6*****:** Preserve natural vegetation to protect waterways from bank erosion and siltation.

- ***Policy 7*:** New development that does not derive domestic water from pre-existing domestic and public water supply systems shall be required to have a documented water supply that does not adversely impact Stanislaus County water resources.
- ***Policy 29*:** Habitats of rare and endangered fish and wildlife species, including special status wildlife and plants, shall be protected.

Merced County General Plan

The Merced County General Plan (2013) includes goals and policies to identify, protect, and enhance Merced County's important biological resources. Key policies identified in the Merced County General Plan relevant to implementation of the PMAs are summarized below.

- ***Policy NR-1.1: Habitat Protection*.** Identify areas that have significant long-term habitat and wetland values including riparian corridors, wetlands, grasslands, rivers and waterways, oak woodlands, vernal pools, and wildlife movement and migration corridors, and provide information to landowners.
- ***Policy NR-1.2: Protected Natural Lands*.** Identify and support methods to increase the acreage of protected natural lands and special habitats, including but not limited to, wetlands, grasslands, vernal pools, and wildlife movement and migration corridors, potentially through the use of conservation easements.
- ***Policy NR-1.3: Forest Protection*.** Preserve forests, particularly oak woodlands, to protect them from degradation, encroachment, or loss.
- ***Policy NR-1.4: Important Vegetative Resource Protection*.** Minimize the removal of vegetative resources which stabilize slopes, reduce surface water runoff, erosion, and sedimentation.
- ***Policy NR-1.5: Wetland and Riparian Habitat Buffer*.** Identify wetlands and riparian habitat areas and designate a buffer zone around each area sufficient to protect them from degradation, encroachment, or loss.
- ***Policy NR-1.6: Terrestrial Wildlife Mobility*.** Encourage property owners within or adjacent to designated habitat connectivity corridors that have been mapped or otherwise identified by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service to manage their lands in accordance with such mapping programs. In the planning and development of public works projects that could physically interfere with wildlife mobility, the County shall consult with the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service to determine the potential for such effects and implement any feasible mitigation measures.
- ***Policy NR-1.7: Agricultural Practices*.** Encourage agricultural, commercial, and industrial uses and other related activities to consult with environmental groups in order to minimize adverse effects to important or sensitive biological resources.
- ***Policy NR-1.8: Use of Native Plant Species for Landscaping*.** Encourage the use of native plant species in landscaping, and, where the County has discretion, require the use of native plant species for landscaping.
- ***Policy NR-1.10: Aquatic and Waterfowl Habitat Protection*.** Cooperate with local, State, and Federal water agencies in their efforts to protect significant aquatic and waterfowl

habitats against excessive water withdrawals or other activities that would endanger or interrupt normal migratory patterns or aquatic habitats.

- ***Policy NR-1.11: On-Going Habitat Protection and Monitoring.*** Cooperate with local, State, and Federal agencies to ensure that adequate on-going protection and monitoring occurs adjacent to rare and endangered species habitats or within identified significant wetlands.
- ***Policy NR-1.12: Wetland Avoidance.*** Avoid or minimize loss of existing wetland resources by careful placement and construction of any necessary new public utilities and facilities, including roads, railroads, high speed rail, sewage disposal ponds, gas lines, electrical lines, and water/wastewater systems.
- ***Policy NR-1.17: Agency Coordination.*** Consult with private, local, State, and Federal agencies to assist in the protection of biological resources and prevention of degradation, encroachment, or loss of resources managed by these agencies.
- ***Policy NR-1.18: San Joaquin River Restoration Program Support.*** Monitor the San Joaquin River Restoration Program efforts to ensure protection of landowners, local water agencies, and other third parties.
- ***Policy NR-1.19: Merced River Restoration Program Support.*** Support the restoration efforts for the Merced River consistent with the Merced River Corridor Restoration Plan.
- ***Policy W-1.4: Groundwater Recharge Projects.*** Support implementation of groundwater recharge projects consistent with adopted Integrated Regional Water Management Plans to minimize overdraft of groundwater and ensure the long-term availability of groundwater.
- ***Policy W-1.10: Groundwater Overdraft Protection.*** Where a water supply source is nearby and accessible, encourage large water consumers to use available surface irrigation water (secondary water) for school athletic fields, sports complexes, and large landscape areas.
- ***Policy W-2.3: Natural Drainage Channels.*** Encourage the use of natural channels for drainage and flood control to benefit water quality and other natural resource values.
- ***Policy W-3.1: Water Availability and Conservation.*** Support efforts of water agencies and districts to prevent the depletion of groundwater resources and promote the conservation and reuse of water.

City General Plans

Table 3.5-2 summarizes the key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.5-2
CITY GENERAL PLAN POLICIES GOVERNING BIOLOGICAL RESOURCES WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Biological Resources
City of Turlock	Chapter 7 Conservation, Guiding Policy 7.4-a, Implementing Policies 7.4-b, 7.4-c, 7.4-d, 7.4-e, 7.4-f, including tree regulations.
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, E. Wildlife and Other Natural Resources, Policy 2a and 3a through 3c
City of Ceres	Chapter 4, Agriculture and Natural Resources, Goal 4.C, Policy 4.C.1, 4.C.2, 4.C.3, 4.C.4; Goal 4.D, Policy 4.D.1, 4.D.2, 4.D.3, 4.D.4, 4.D.5, 4.D.6; Goal 4.E, Policy 4.E.1, 4.E.2; City Ordinance Section 12.16.120 for trees.
City of Hughson	Conservation and Open Space Element, Land Use Element, Goal COS-3, Policy COS-3.1, COS-3.2, COS-3.3, COS-3.4, COS-3.5, COS-3.6; Code 17.03.92 trees.

3.5.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on biological resources focuses on the potential for substantial adverse effects to biological resources as a result of implementation of the types of PMAs implemented under the Turlock Subbasin GSP. Impacts were evaluated in terms of how construction activities, construction features, and operation and maintenance of those features resulting from PMAs could impact existing biological resources. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might be taken in the future consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational-related activities). Temporary impacts are those that would be temporary in nature (e.g., construction-related activities). Impacts were evaluated separately for direct and in-lieu recharge projects and water conservation management actions. While the impact conclusions reached may be the same, this approach facilitates a discussion of any potential differences.

The approach to assessing biological resource impacts was qualitative and conservative, assuming that all PMAs are implemented. The impact analysis relies on the use of existing quantitative and qualitative data including but not limited to existing reports, desktop (versus field) surveys, open access databases, and maps. Information regarding example projects similar to the types of PMAs identified in Section 2.2 were also reviewed. Significance determinations assume that the PMAs implemented under the Turlock Subbasin GSP will comply with relevant federal, state, and local ordinances and regulations described in the regulatory setting.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. Implementation of PMAs under the Turlock Subbasin GSP would result in a significant impact on biological resources if it could result in:

- A substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS;
- A substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS;
- A substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (CWA) (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means;
- Substantial interference with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflicts with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflicts with the provisions of an adopted HCP, natural community conservation plan, or other approved local, regional, or state HCP.

Impacts and Mitigation Measures

Table 3.5-3 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

Impact BIO-1: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.

Direct and In-lieu Recharge Projects

Effects of Construction Activities

The types of construction activities necessary to implement direct and in-lieu recharge projects include modifications to existing and construction of new features such as injection wells, recharge basins, pipelines, French drains, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins.

Construction of direct and in-lieu recharge projects implemented under the Turlock Subbasin GSP could adversely affect special-status species, either through direct mortality or injury (e.g., crushing wildlife or plants by heavy machinery) or through the loss of suitable habitat (e.g., fill of habitat for new water conveyance infrastructure), which may be either temporary if such habitat is restored to pre-project conditions following completion of construction, or permanent if no

TABLE 3.5-3
SUMMARY OF IMPACT CONCLUSIONS—BIOLOGICAL RESOURCES

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
BIO-1: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.	PSU	LTSM
BIO-2: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS.	PSU	LTSM
BIO-3: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means.	LTSM	LTSM
BIO-4: Implementing PMAs under the Turlock Subbasin GSP could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	PSU	LTSM
BIO-5: Implementing PMAs under the Turlock Subbasin GSP could conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.	LTSM	LTS
BIO-6: Implementing PMAs under the Turlock Subbasin GSP could conflict with the provisions of an adopted HCP, natural community conservation plan, or other approved local, regional, or state HCP.	NI	NI

NOTES: LTS = less than significant; LTSM = less than significant with mitigation SU = significant and unavoidable NI: No Impact

SOURCE: Data compiled by Environmental Science Associates in 2022

such restoration activities are possible (e.g., it would not be possible to restore habitat in the footprint of where permanent infrastructure is being installed, such as canals for water conveyance infrastructure or the location of new regulating reservoirs).

Ground disturbance would be limited to the construction footprint; still, construction work could result in other types of disturbance. Examples include excess noise that could disturb the normal behavior patterns of wildlife, or spillover of nighttime construction lighting that could disturb the resting or food-seeking patterns of wildlife. Construction activities that are sited on or adjacent to already developed areas (e.g., water pipeline installation within existing roadways within a municipality) would have a much-reduced potential to affect special-status wildlife, since local wildlife are likely already acclimated to human activity. Similarly, previously disturbed areas typically include more weedy, ruderal vegetation, decreasing the likelihood that special-status plant species, which are generally more commonly encountered within areas that are either undeveloped or have been previously restored.

Special-status plants could be affected by the construction of direct and in-lieu recharge projects. Temporary habitat disturbance could result from the clearing of vegetation within haul routes and in equipment staging areas; and accumulation of fugitive dust on leaves, which impedes a plant’s ability to photosynthesize; and general grading, recontouring, or relocation. In addition, construction equipment would increase the potential for an accidental spill of contaminants (e.g., fuels or lubricants), which could degrade sensitive habitats such as riparian forest and wetland habitats where many special-status plants are found. Direct impacts on special-status plants from constructing a direct and in-lieu recharge project would often be related to site preparation work involving grading and excavation (e.g., to install new canal segments). This groundwork could bury, crush, or remove an individual or cluster of special-status plants.

Some of the direct and in-lieu recharge projects implemented under the Turlock Subbasin GSP may involve the construction of new or improved water diversion facilities, such as new or improved surface water intakes and diversion from streams and rivers within the study area. Such construction activities could involve in-water work, which has the potential to affect special-status fish species. In-water aquatic habitat may be physically disturbed during construction of such new or improved surface water intakes and diversion structures, including from activities such as dewatering, excavation, fill, and placement of materials into aquatic habitat. These activities could affect special-status fish species by causing direct injury or mortality, or through disrupting their normal behaviors (e.g., displacing them from their preferred areas). Any in-water work associated with the construction of new or improved water diversion facilities would only affect a small portion of a stream's or river's width (e.g., the area immediately adjacent to the stream's or river's bank), which is expected to allow for juvenile and adult fishes to detect areas of construction disturbance and volitionally move away to adjacent areas of suitable habitat where available.

In-water work and work along the banks to construct new or improved water diversion facilities could increase turbidity and levels of suspended sediments in aquatic habitat immediately adjacent to the work site and areas farther downstream. These increases in turbidity and suspended sediment concentrations can affect special-status fish species in the area around the work site by reducing their feeding efficiencies, deplete the level of available dissolved oxygen, and impair their respiratory functionality by clogging their gills. These effects of increased turbidity and suspended sediment concentrations would be temporary, but nonetheless could still affect resident and migratory special-status fish species that would be in the vicinity of construction work on new or improved water intakes and diversions.

This analysis conservatively assumes that the direct and in-lieu recharge projects implemented under the Turlock Subbasin GSP would have the ability to directly or indirectly affect any special-status species identified within the study area, including both plants and wildlife species. During project-level planning, when the specific location and design of the project are defined, other data sources would need to be utilized to more specifically evaluate which special-status species could be affected by construction. These data sources may include but are not limited to: (1) reconnaissance and/or protocol-level surveys of the project site; (2) professional knowledge of local biologists, including those connected to the agency authorizing the project, (3) relevant environmental documents and reports for similar projects or other nearby projects; and (4) species lists available from the National Marine Fisheries Service (NMFS), USFWS, CDFW, and CNPS. For special-status plant species, localized information about soil conditions, elevations, types and locations of natural communities present, local precipitation patterns, disturbance regimes (e.g., vegetation could be regularly disked or mowed), and local hydrology could be assessed to refine which specific special-status plant species could be present within affected work areas based on the presence of suitable habitat conditions. Consideration of these additional data would substantially reduce the number of special-status plant and wildlife species considered to have the potential to occur within a given project's footprint. Therefore, this impact is **potentially significant**.

Compliance with **Mitigation Measure BIO-1** to avoid or minimize disturbance of special-status species would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the PMA proponent(s).

Mitigation Measure BIO-1: Minimize Disturbance of Special-Status Species.

Avoid Loss of Special-Status Species Habitat. Select project site(s) that would avoid habitats of special-status species (which may include foraging, sheltering, migration, and rearing habitat in addition to breeding or spawning habitat):

- Schedule construction to avoid special-status species' breeding, spawning, or migration locations during the seasons or active periods that these activities occur.
- Establish buffers around special-status species habitats to exclude effects of construction activities. The size of the buffer shall be in accordance with USFWS and CDFW protocols for the applicable special-status species.
- If nest tree removal is necessary, remove the tree only after the nest is no longer active, as determined by a qualified biologist.
- Where impacts on special-status species are unavoidable, compensate for impacts by restoring or preserving in-kind suitable habitat on-site, or off-site, or by purchasing restoration or preservation credits.
- Abide by any permit requirements associated with local policies and ordinances protecting native trees.

Prevent Degradation of Fish Habitat. PMA sites will implement construction best management practices (BMPs) to prevent degradation of fish habitat including:

- Developing and implementing a Stormwater Pollution Prevention Plan (SWPPP).
- Minimizing soil disturbance, erosion, and sediment runoff from the project site.
- Avoiding and minimizing contaminant spills.
- Conducting biological construction monitoring to ensure that implemented BMPs are effective.

Avoid Vegetation Disturbance. PMA sites will minimize, to the greatest extent feasible, the amount of soil and upland vegetation disturbance during project construction and use methods creating the least disturbance to vegetation. Disturbance to existing grades and native vegetation, the number of access routes, the size of staging areas, and the total area disturbed by the project shall be limited to the extent of all temporary and permanent impacts as defined by the final project design.

Environmental Awareness Training. Prior to engaging existing or new personnel in construction activities, new construction personnel will participate in environmental awareness training conducted by an agency-approved biologist or resource specialist. Construction personnel will be informed about the identification, potential presence, legal protections, and avoidance and minimization measures relevant to special status that potentially occur on the project site.

Environmental Monitoring. A biologist or resource specialist will ensure that all applicable protective measures are implemented during project construction. The agency-approved biologist or resource specialist will have authority to stop any work if they determine that any permit requirement is not fully implemented. The agency-approved biologist or resource specialist will prepare and maintain a monitoring log of construction site conditions and observations, which will be kept on file.

Work Area and Speed Limits. Construction work and materials staging will be restricted to designated work areas, routes, staging areas, temporary interior roads, or the limits of existing roadways.

- Prior to start of work, brightly colored fencing or flagging or other practical means shall be erected to demarcate the limits of the project activities within 100 feet of sensitive natural communities and habitat areas (e.g., any aquatic features), including designated staging areas; ingress and egress corridors; stockpile areas, soil, and materials; and equipment exclusion zones. Flagging or fencing shall be maintained in good repair for the duration of project activities.
- Vehicles will obey posted speed limits and will limit speeds to 20 miles per hour within the study area on unpaved surfaces and unpaved roads to reduce dust and soil erosion and avoid harm to wildlife.

Food Trash Removed Daily. All food trash will be properly contained within sealed containers, removed from the work site, and disposed of daily to prevent attracting wildlife to construction sites.

For most PMAs, implementation of Mitigation Measure BIO-1 would reduce impacts on special-status species from PMA construction to less than significant by minimizing the loss of vegetation in habitat areas, providing environmental awareness training to workers, and monitoring by a qualified biologist in sensitive areas. However, because the location, size, and timing of all PMAs to be implemented under the GSP are not specifically defined, the magnitude of such impacts may exceed the feasible mitigation; thus, the impact is **potentially significant and unavoidable**.

Effects of Constructed Features and Operations and Maintenance of those Features

Operation and maintenance of direct and in-lieu recharge projects could also adversely affect special-status species through direct mortality or injury from vehicle traffic and machinery, or loss of habitat due to conversion from suitable habitat to constructed features.

Operations and maintenance typically involve fewer workers and affect smaller areas than construction; thus, biological resource impacts would likely be mitigable. However, due to possible impacts from constructed features, this would be **potentially significant**.

Groundwater-surface water interactions are dynamic, making specific projections of any benefits to GDEs within the study area challenging. In general, without implementation of the direct and in-lieu recharge PMAs, groundwater elevations within the study area are expected to trend lower, which consequently would be expected to result in degradation of the extent and quality of GDEs. Thus, stabilizing or potentially even increasing localized groundwater elevations which support existing GDEs through operation of direct and in-lieu recharge projects is expected to benefit those special-status species associated with riparian habitat and other GDEs.

Compliance with Mitigation Measure BIO-1 would be required to address impacts on special-status plant and wildlife species by a given project. Implementation of this mitigation measure would be the responsibility of the PMA proponent(s). With implementation of this mitigation measure, the impacts associated with operations and maintenance of direct and in-lieu recharge projects is considered to be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Water conservation management actions could include the modification of irrigation systems to be more efficient (e.g., transitioning from flood irrigation to drip irrigation), installation of more advanced water metering systems, or construction of ponds to store water and/or collect runoff. Construction of recharge ponds could affect special-status species in a similar manner as described for direct and in-lieu recharge projects, with effects generally associated with either direct mortality or injury (e.g., crushing wildlife or plants by heavy machinery) or through the loss of suitable habitat. Construction related to the installation of advanced water metering systems would have minimal effects on special-status species. Such efforts would typically involve the removal of existing metering systems and installation of more advanced water meters (e.g., smart meters), the location of which is often in previously disturbed areas.

For agricultural areas where water efficiency conservation measures would be implemented, such as conversion of existing irrigation infrastructure to drip irrigation, heavy equipment would be utilized to install the drip line (e.g., to excavate a trench to place the drip tubing). Most special-status plants are not found in actively farmed areas; however, certain wildlife species have grown accustomed to and will utilize farmland. For example, Swainson's hawks use agricultural lands managed in irrigated pasture, grain, and alfalfa fields as preferred foraging habitat. Construction-related activities associated with the installation of new drip irrigation infrastructure (e.g., underground drip lines and drip emitters) for farm fields to reduce irrigation water consumption would not substantially disrupt Swainson's hawk foraging because this species would be accustomed to a general level of ongoing localized agricultural operations, which includes the use of mechanized equipment such as tractors.

Implementation of Mitigation Measure BIO-1 would reduce potentially significant impacts on special-status species to a **less than significant** level.

Effects of Constructed Features and Operations and Maintenance of those Features

Some conservation management actions could result in the fallowing of agricultural lands. Fallowing of agricultural lands may result in thicker growth of herbaceous vegetation, reducing habitat suitability for species such as burrowing owl. Fallowed farmland may, however, improve habitat conditions for species such as Swainson's hawk, which often benefit from an increased availability of fallow farm fields since conditions mimic their historical foraging habitat within native annual grasslands. If such fallowed agricultural lands are ultimately converted to solar generation fields, there would be expected to be a decline in Swainson's hawk foraging habitat quality, because the presence of the photovoltaic panels and their associated support structures can interfere with the ability for Swainson's hawks and other raptors to capture their prey. Placement of conversation easements on agricultural lands that are taken out of production as part of a conservation management PMA would maintain such properties in a long-term open space use, which would be expected to be protective of those sites as potential habitat for species such as Swainson's hawks and burrowing owls.

The effect of operations and maintenance of ponds established to store water and/or collect runoff for water conservation purposes on special-status species would be similar to those previously described regarding operations and maintenance direct and in-lieu recharge projects. Operations of replaced water meters with more advanced features would not have any effect on special-status species; maintenance of these more advanced water meters would have effects similar on special-status species to those described for construction of these items; however, the effect is expected to be smaller in magnitude.

Implementation of Mitigation Measure BIO-1 would reduce potentially significant impacts on special-status species to a **less than significant** level.

Impact BIO-2: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS.

Direct and In-lieu Recharge Projects

Effects of Construction Activities

Construction of direct and in-lieu recharge projects – such as injection wells, recharge basins, pipelines, French drains, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins – could result in ground disturbance of varying extents and disturbance within and adjacent to the construction sites. Construction-related ground and surface water disturbance could result in temporary damage to or the permanent removal of sensitive natural communities located in and adjacent to the construction site. The direct and in-lieu recharge PMAs implemented under the Turlock Subbasin GSP could include new surface water basins and regulating basins, with the potential to permanently inundate large tracts of land and substantially affect sensitive natural communities. The actual effects on sensitive natural communities would depend on the size of the facility footprint and its location relative to sensitive community occurrences. Affected sensitive natural communities could include seasonal wetlands, vernal pools, riparian forest and scrub, oak woodlands, and other sensitive communities.

A temporary loss of sensitive natural communities could result from clearing vegetation for equipment staging areas and access routes. Additionally, construction equipment increases the potential for accidental spills of contaminants (e.g., fuels or lubricants), which could degrade sensitive habitats such as riparian forest, oak woodlands, and wetlands. A permanent loss of sensitive natural communities could result if permanently constructed infrastructure (e.g., water distribution and conveyance infrastructure) is placed in areas where sensitive natural communities are currently located. Construction of new or improved surface water intakes and diversions from streams and rivers could adversely affect near-shore sensitive natural communities, such as riparian scrub and forest. The loss of acreage of a particular habitat type would persist into perpetuity unless it is actively replaced. Therefore, this impact is **potentially significant**. Compliance with **Mitigation Measure BIO-2** to avoid or minimize impacts on sensitive natural communities would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the PMA proponent(s).

Mitigation Measure BIO-2: Avoid and Minimize Disturbance to Sensitive Natural Communities.

Avoidance of Sensitive Natural Communities. The PMA sites will be locations that would avoid sensitive natural communities, including riparian habitats, by doing the following:

- To the maximum extent practicable, project elements will be designed to avoid effects on sensitive natural communities.
- Flagging or fencing will be installed by the agency-approved biologist or resource specialist around any sensitive natural community to be avoided by construction.
- Flagging or fencing will remain in place throughout the duration of the construction activities, and will be inspected and maintained regularly by the agency-approved biologist or resource specialist until completion of the project. Fencing will be removed when all construction equipment is removed from the site, the area is cleared of debris and trash, and the area is returned to natural conditions.
- Where impacts on sensitive natural communities other than waters of the United States or State are unavoidable, impacts will be compensated for by restoring and/or preserving in-kind sensitive natural communities on-site, or off-site at a nearby site, or by purchasing in-kind restoration or preservation credits from a mitigation bank that services the project site.

Restoration of Temporarily Affected Areas. For any areas temporarily affected by construction activities, the contractor will implement the following:

- Prepare a restoration plan for temporary impacts sites for review by CDFW.
- Minimizing soil disturbance and stockpiling topsoil for later use in any areas to be graded.
- Amend soil as necessary before installing replacement plants.
- Utilize only native plant species for revegetation.

Preserve Large Trees. Existing native vegetation shall be retained as practicable, with special focus on the retention of shade-producing and bank-stabilizing trees and brush with greater than 6-inch diameter branches or trunks.

Avoid Excessive Soil Compaction. Wherever possible, vegetation disturbance and soil compaction shall be minimized by using low ground-pressure equipment with a greater reach or that exerts less pressure per square inch on the ground than other equipment.

Native and Invasive Vegetation Removal Materials and Methods. If riparian vegetation is removed with chainsaws or other power equipment, machines that operate with vegetable-based bar oil will be used, if practicable. All invasive plant species (e.g., those rated as invasive by the California Invasive Plant Council or local problem species) shall, if feasible, be removed from the project site, using locally and routinely accepted agriculture practices. Stockpiling of invasive plant materials is prohibited during the flood season.

Revegetate Disturbed Areas. All temporarily disturbed areas will be de-compacted and seeded/planted with a mix of native riparian, wetland, and/or upland plant species suitable for the area. The project proponent shall develop a revegetation plan, including (as applicable) a schedule; plans for grading of disturbed areas to pre-project contours; planting palette with plant species native to the study area; invasive species management; performance standards; and maintenance requirements (e.g., watering, weeding, and replanting).

Plants for revegetation will come primarily from active seeding and planting; natural recruitment may also be proposed if site conditions allow for natural recruitment to reestablish vegetation and avoid potential negative risks associated with erosion and impacts on water quality. Plants imported to the restoration areas will come from local stock, and to the extent possible, local nurseries. Only native plants (genera) will be used for restoration efforts. Certified weed-free native mixes and mulch will be used for restoration planting or seeding.

Revegetation Materials and Methods. Following completion of work, site contours will be returned to preconstruction conditions or re-designed to provide increased biological and hydrological functions.

- Any area barren of vegetation as a result of project implementation shall be restored to a natural state by mulching, seeding, planting, or other means with native trees, shrubs, willow stakes, erosion control native seed mixes, or herbaceous plant species.
- Where disturbed, topsoil shall be conserved for reuse during restoration to the extent practicable.
- Native plant species comprising a diverse community structure (plantings of both woody and herbaceous species, if both are present) that follow a CDFW-approved plant palette shall be used for revegetation of disturbed and compacted areas, as appropriate.
- Irrigation may also be required to ensure the survival of shrubs, trees, or other vegetation.
- Soils that have been compacted by heavy equipment shall be de-compacted, as necessary, to allow for revegetation.

Revegetation Erosion Control Materials and Methods. If erosion control fabrics are used in revegetated areas, they shall be slit in appropriate locations to allow for plant root growth. Only non-monofilament, wildlife-safe fabrics shall be used.

Revegetation Monitoring and Reporting. All revegetated areas will be maintained and monitored for a minimum of 2 years after replanting is complete and until success criteria are met, to ensure the revegetation effort is successful. The standard for success is 60 percent absolute cover compared to an intact, local reference site. If an appropriate reference site cannot be identified, success criteria will be developed for review and approval by CDFW on a project-by-project basis based on the specific habitat impacted and known recovery times for that habitat and geography. The project proponent will prepare a summary report of the monitoring results and recommendations at the conclusion of each monitoring year.

Implementation of mitigation measures to avoid or minimize impacts on sensitive natural communities following the installation of PMAs would reduce the severity of any potentially substantial adverse effects to sensitive natural communities. However, since the nature of the impacts cannot be precisely identified at this programmatic level, this impact is potentially **significant and unavoidable**.

Effects of Constructed Features and Operations and Maintenance of those Features

Operations and maintenance of direct and in-lieu recharge projects could also adversely affect sensitive natural communities through the loss of vegetation due to the need to establish small staging areas (typically less than 0.5 acre), stockpile areas, spoil areas, access roads, and haul roads. These areas are often sited within previously disturbed areas, reducing the likelihood that their presence would result in the conversion of sensitive natural communities. Generally, the potential effect of operations and maintenance of constructed features would be similar to those described for construction of those features; however, the effect would be smaller in magnitude. Certain maintenance activities, however, may arise that may necessitate placing such areas within existing sensitive natural communities. As such, the operational and maintenance impacts would be **potentially significant**.

PMAs implemented under the Turlock Subbasin GSP are intended to bring the Turlock Subbasin into sustainable conditions and avoid a disconnect between the groundwater and surface water systems. Stabilizing or potentially even increasing localized groundwater elevations are expected to support certain sensitive natural communities, such as riparian forests and those seasonal wetlands whose hydrology is closely connected to groundwater sources. Groundwater-surface water interactions are extremely complex, making specific projections of any benefits to sensitive natural communities within the study area challenging.

Compliance with **Mitigation Measure BIO-2** to avoid or minimize impacts on sensitive natural communities would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the PMA proponent(s). With implementation of this mitigation measure, the impacts associated with operations and maintenance of direct and in-lieu recharge projects would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Water conservation PMAs could include modification of irrigation systems to be more efficient (e.g., transitioning from flood irrigation to drip irrigation), installation of more advanced water metering systems, or construction of ponds to store water and/or collect runoff. Construction of recharge ponds would affect sensitive natural communities in a similar manner as described for direct and in-lieu recharge projects, with the potential for temporary damage to or the permanent removal of sensitive natural communities located in and adjacent to the construction site. Installation of advanced water metering systems would have minimal to no effects on sensitive natural communities since such features would be installed in more developed or previously disturbed areas where sensitive natural communities are not currently present.

In agricultural areas where water efficiency conservation measures would be implemented, such as conversion of existing irrigation infrastructure to drip irrigation, such work would not be expected to contribute to any loss of sensitive natural communities, as it would occur in existing managed farmland where sensitive natural communities are no longer present. With implementation of **Mitigation Measure BIO-2**, the impacts on sensitive natural communities associated with implementation of Conservation PMAs is considered to be **less than significant.**

Effects of Constructed Features and Operations and Maintenance of those Features

The effect on sensitive natural communities of operations and maintenance of ponds established to store water and/or collect runoff as part of the conservation management actions would be similar to those previously described regarding operations and maintenance direct and in-lieu recharge PMAs. Operations of replaced water meters with more advanced features would not have any effect on special-status species; maintenance of these more advanced water meters would have effects on special-status species similar to those described for construction of these items; however, the effect would be smaller in magnitude.

Some conservation management actions could result in fallowing of agricultural fields in order to save the water that would have been used to irrigate planted crops. Since such lands were already managed in agricultural production, fallowing of such farmland would not result in any changes in the extent of sensitive natural communities. There is uncertainty about the long-term usage of any long-term fallowed agricultural land; voluntary land use changes could include the placement of conservation easements, habitat restoration, recharge facilities, or construction of renewable energy facilities (e.g., solar facilities) on the fallowed land. While implementation of habitat restoration actions on fallowed land could contribute to an increase in the extent of sensitive natural communities, any assumptions regarding the future use of agricultural lands fallowed as part of a conservation management action is outside the scope of the PEIR.

Implementation of Mitigation Measure BIO-2 would reduce potentially significant impacts on sensitive natural communities to a **less-than-significant** level.

Impact BIO-3: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on state or federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means.

Direct and In-lieu Recharge Projects

Effects of Construction Activities

Wetlands and waters could be directly impacted during the construction of direct and in-lieu recharge projects due to the installation of pumps, pipelines, and other infrastructure in wetland areas. These wetland areas could also be indirectly affected by construction of direct and in-lieu recharge projects from siltation and chemical spills into waterways. Habitat disturbance and permanent wetland loss could result from general grading, re-contouring, relocating, and/or filling portions of wetlands to accommodate implementation of construction of direct and in-lieu recharge projects such as injection wells, pipelines, distribution and conveyance infrastructure, and canal interties. Permanent habitat loss means that the loss of acreage of a particular habitat type would persist into perpetuity unless it is actively replaced. Wetlands could also be impacted during construction work as a result of disturbance from vehicle access and equipment staging. Additionally, wetlands could be indirectly affected by construction activities such as through the accidental spills of contaminants (e.g., fuels or lubricants) from heavy machinery and because of the increased potential for erosion and sediment runoff associated with construction-related ground disturbance, which could result in the discharge of fill into wetland features. If regulating reservoirs and irrigation basins are placed in areas of existing wetlands, wetland habitat could be converted to other aquatic features; in such circumstances, while there would likely be a net expansion of inundated area as a result of construction of the PMAs, the work would likely result in a net loss of wetland extent. This impact is **potentially significant**.

Implementation of Mitigation Measure BIO-3 to minimize the loss of wetlands and restore wetlands from temporary impacts following the installation of PMAs would reduce the severity of any potentially substantial adverse effects. Both federal and state permitting would require compensatory mitigation for all permanent loss of wetlands.

Mitigation Measure BIO-3: Avoid and Minimize Disturbance to Wetlands and Waters.

Avoidance of jurisdictional wetlands and other waters. The PMA sites will avoid, minimize, and, if necessary, compensate for reduction in area and/or habitat quality of wetlands and jurisdictional waters, as follows:

- To the maximum extent practicable, project elements will be designed to avoid effects on wetlands and other waters, including rivers, streams, vernal pools, and seasonal wetlands.
- Flagging or fencing will be installed by the agency-approved biologist or resource specialist around any jurisdictional wetland or other aquatic feature to be avoided by construction.
- Flagging or fencing will remain in place throughout the duration of the construction activities, and will be inspected and maintained regularly by the agency-approved

biologist or resource specialist until completion of the project. Fencing will be removed when all construction equipment is removed from the site, the area is cleared of debris and trash, and the area is returned to natural conditions.

- Staging areas, access roads, and other facilities shall be placed to avoid and limit disturbance to waters of the state and other aquatic habitats (e.g., streambank or stream channel, riparian habitat) as much as possible. When possible, existing ingress or egress points shall be used and/or work shall be performed from the top of the creek banks or from barges on the waterside of the stream or levee bank, or dry gravel beds.
- Replacing, restoring, or enhancing on a "no net loss" basis (in accordance with U.S. Army Corps of Engineers and State Water Resource Control Board requirements), wetlands and other waters of the United States, and waters of the State that would be removed, lost, and/or degraded.

With implementation of **Mitigation Measure BIO-3**, the impacts on wetlands would be to be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

Operation and maintenance of direct and in-lieu recharge projects would be unlikely to directly impact wetlands because these areas could be avoided by human and vehicle traffic. However, indirect impacts on wetlands could occur, such as through chemical spills or sedimentation into waterways. However, the effect would be much smaller in magnitude than the potential effects to wetlands during the construction phase of direct and in-lieu recharge projects implemented under the Turlock Subbasin GSP.

Operation of recharge basins can potentially result in the creation of wetlands. Additionally, the implementation of PMAs to improve groundwater supplies either through direct recharge or in-lieu recharge would generally help maintain existing or under certain circumstances increase local groundwater elevations. These benefits to groundwater supply will be particularly beneficial to GDEs, such as certain wetlands, as a result of groundwater-surface water interactions. Refer to Section 3.11, *Hydrology and Water Quality*, for additional discussion of potential impacts of PMAs implemented under the Turlock Subbasin GSP on groundwater-surface water interactions.

Compliance with **Mitigation Measure BIO-3** to avoid or minimize impacts on wetlands and waters would be required when applicable to a given project. Implementation of this mitigation measure, as well as permitting requirements and all applicable project BMPs, would be the responsibility of the PMA proponent(s). With implementation of **Mitigation Measure BIO-3**, the impacts on wetlands are considered to be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Water conservation management actions could include the modification of irrigation systems to be more efficient (e.g., transitioning from flood irrigation to drip irrigation), installation of more advanced water metering systems, or construction of ponds to store water and/or collect runoff.

Construction of recharge ponds could affect wetlands in a similar manner as described for direct and in-lieu recharge projects. Construction related to the installation of advanced water metering systems would have minimal to no effects on wetland resources, since such devices (e.g., smart meters) would be installed in uplands, in typically developed or previously developed landcover.

In agricultural areas where water efficiency conservation measures would be implemented, such as the conversion of existing irrigation infrastructure to drip irrigation, wetland areas are generally not expected to be present. Since agricultural operations in the San Joaquin Valley often involve farmland being leveled for more consistent application of irrigation water and the soil often tilled, it is not expected that wetlands would be present in actively farmed agricultural areas. As such, the installation of drip irrigation infrastructure pursuant to the conservation PMAs to be implemented under Turlock Subbasin GSP would not result in any conversion of existing wetland habitat.

With implementation of **Mitigation Measure BIO-3**, the impacts on wetlands associated with implementation of Conservation PMAs is considered to be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

The effect of operations and maintenance of ponds established to store water and/or collect runoff for water conservation purposes on special-status species would be similar to those previously described regarding operations and maintenance direct and in-lieu recharge PMAs. Such ponds could be potentially beneficial for wetlands. The ponds could improve groundwater replenishment, which would benefit groundwater-dependent ecosystems, such as certain wetlands, as a result of surface and groundwater interactions.

Some conservation management actions could result in fallowing of agricultural fields in order to save the water that would have been used to irrigate planted crops. Such fallowing is not expected to directly affect the extent of wetland areas. These management actions are expected to help to contribute towards more sustainable groundwater elevations within the study area, which would indirectly benefit those wetlands whose hydrology are closely connected to groundwater sources. Groundwater-surface water interactions are extremely complex, making more specific projections of any benefits to wetlands within the study area challenging.

Operations of replaced water meters with more advanced features would not have any effect on wetlands. Maintenance of these devices may result in indirect effects to wetlands, such as through unintentional spills from equipment and vehicles used to access and service these water meters; however, the magnitude of these potential effects would be small, especially since such meters would be installed in more developed or previously disturbed areas. Therefore, this impact would be **less than significant**.

Impact BIO-4: Implementing PMAs under the Turlock Subbasin GSP could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Direct and In-lieu Recharge Projects

Effects of Project Construction Activities

Wildlife corridors or nursery sites for fish or amphibian species could be impacted during construction by direct loss due to the installation of pumps, pipelines, and other infrastructure into waterways such as the Tuolumne or Merced rivers, and associated riparian corridors that provide cover and forage for birds and terrestrial wildlife.

Construction of water distribution and conveyance infrastructure has the potential to disrupt the dispersal of terrestrial wildlife by creating barriers to movements (e.g., a canal could represent a barrier). Construction of regulating reservoirs has the potential to isolate certain habitats, which could contribute to a loss of migration and dispersal habitat for terrestrial wildlife. The potential for a new regulating reservoir to restrict movement of wildlife is generally related to the size of the new reservoir, with smaller reservoirs typically having a smaller potential to restrict or degrade migratory or movement conditions for wildlife. Movement could be substantially affected or cut off completely if the entire width of a migration corridor is disturbed.

The installation of new above-ground infrastructure pursuant to PMAs implemented under the Turlock Subbasin GSP could affect the ability of wildlife to move between areas that are important for different life history functions, such as reproduction and feeding behaviors. High-intensity lighting could be utilized to facilitate night work. Such lighting can pose a risk to flying birds, including waterfowl and raptors, that would occur in the vicinity of the construction sites for implementation of direct and in-lieu recharge projects. Most of the impacts from construction on movement of wildlife would be temporary. However, there could be a longer-term impact on local and migratory movement of wildlife if existing vegetation within a wildlife migratory corridor is permanently removed.

Implementation of **Mitigation Measures BIO-1 and BIO-2** (to minimize the loss of vegetation and to restore vegetation following installation of PMAs) would reduce the severity of any potentially substantial adverse effects to wildlife corridors or nursery sites. However, since the nature of the impacts cannot be precisely identified at this programmatic level, this impact is potentially **significant and unavoidable**.

Effects of Constructed Features and Operations and Maintenance of those Features

Operation and maintenance of PMA features could also adversely affect wildlife corridors and nursery sites through the loss of vegetation due to operation and maintenance traffic and conversion to disturbed land. Operations and maintenance typically involve fewer workers and affect smaller areas than construction, but take place over a longer time period. Thus, the operational and maintenance impacts would be **potentially significant**.

Direct and in-direct recharge projects PMAs implemented under the Turlock Subbasin GSP are intended to bring the Turlock Subbasin into sustainable conditions. Stabilizing or potentially increasing groundwater elevations could benefit GDEs, such as riparian forests. Since riparian forests are often important wildlife corridors, the operation of direct and in-direct recharge projects PMAs may indirectly benefit wildlife corridor conditions within the study area, although the extent of such a potential benefit is hard to quantify given that groundwater-surface water interactions are extremely complex and the response of riparian vegetation to changes in local groundwater elevation conditions varies depending on the plant species.

Compliance with **Mitigation Measures BIO-1** and **BIO-2** (to avoid or minimize impacts on special-status species and sensitive natural communities) would be required when applicable to a given project, and would also address impacts on wildlife corridors and nursery sites. Implementation of these mitigation measures would be the responsibility of the PMA proponent(s). With implementation of these mitigation measures, the impacts associated with operations and maintenance of direct and in-lieu recharge projects would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

The effect of the construction of ponds established to store water and/or collect runoff as part of conservation management actions on wildlife migration or movement corridors would be similar to those previously described for operations and maintenance direct and in-lieu recharge PMAs.

Construction related to the installation of advanced water metering systems would have minimal effects on wildlife migration or movement corridors. Such efforts would typically involve the removal of existing metering systems and the installation of more advanced water meters (e.g., smart meters), the location of which is often in previously disturbed areas.

In agricultural areas where water efficiency conservation measures would be implemented, such work would not contribute to any loss of wildlife movement or migratory corridors. While certain wildlife species may utilize actively managed farmland, they are not considered to be important wildlife movement or migratory corridors. Furthermore, any disruption to wildlife movement or migratory conditions associated with the installation of drip irrigation would be short in duration. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

The effect of operations and maintenance of ponds established to store water and/or collect runoff as part of conservation PMAs on wildlife migration or movement corridors would be similar to those previously described for operations and maintenance direct and in-lieu recharge PMAs.

Operations of replaced water meters with more advanced features would not have any effect on wildlife migration or movement corridors; periodic maintenance of these more advanced water meters would have minimal effects on any such corridors since they would generally be installed in developed or more disturbed areas not typically associated with important movement corridors for wildlife.

Some conservation management actions could result in fallowing of agricultural fields to save water. Voluntary land use changes of such fallowed farmland could include the placement of conservation easements, habitat restoration, recharge facilities, or construction of renewable energy facilities (e.g., solar facilities). While implementation of habitat restoration actions on fallowed land could contribute to the establishment of additional movement and migration corridors for terrestrial wildlife, any assumptions about the future use of agricultural lands fallowed as part of a conservation management actions is outside the scope of the PEIR.

Compliance with **Mitigation Measures BIO-1** and **BIO-2** (to avoid or minimize impacts on special-status species and sensitive natural communities) would be required when applicable to a given management action, and would also address impacts on wildlife corridors and nursery sites. Implementation of these mitigation measures would be the responsibility of the PMA proponent(s). With implementation of these mitigation measures, the impacts associated with operations and maintenance of conservation management actions would be **less than significant**.

Impact BIO-5: Implementing PMAs under the Turlock Subbasin GSP could conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Direct and In-lieu Recharge Projects

Effects of Project Construction Activities

Cities, counties, and local districts may adopt local policies or ordinances for the conservation of biological resources. These policies or ordinances may mandate the local protection of special-status species, waterways, native trees, or other selected resources. Depending on the specific location and design of the direct and in-lieu recharge PMAs under the Turlock Subbasin GSP, such projects could potentially conflict with local policies and ordinances. For example, implementation of direct and in-lieu recharge projects under the Turlock Subbasin GSP could adversely affect trees (e.g., by removing trees for the installation of water conveyance infrastructure or roadways). The General Plans (see Section 3.5.3) call for the maintenance of open space and minimizing the removal of vegetation in riparian areas, which could occur as a consequence of construction of the direct and in-lieu recharge projects under the Turlock Subbasin GSP. The potential for conflict with local policies or ordinances for the conservation of biological resources would be **potentially significant**. PMAs under this PEIR would comply with General Plan policies and ordinances, and would implement Mitigation Measure BIO-2 for minimizing impacts on sensitive natural communities, including riparian areas and oak woodlands. With implementation of these mitigation measure, the impact would be reduced to a **less than significant** level.

Effects of Constructed Features and Operations and Maintenance of those Features

Ongoing maintenance activities for direct and indirect recharge projects could involve limited amounts of ground disturbance and vegetation management to maintain existing infrastructure. The effects of maintenance of constructed features on biological resources protected by local policies or ordinances would be similar to those described for construction, although at a much smaller magnitude. This impact would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

The potential for the construction of conservation management actions to result in conflicts with existing local policies or ordinances protecting biological resources would be similar to those described for the construction of direct and in-lieu recharge projects. This impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

The potential for operations and maintenance of conservation management actions, such as ponds established to store water and/or collect runoff, to result in conflicts with existing local policies or ordinances protecting biological resources would be similar to those described for the construction of direct and in-lieu recharge projects, although at a much smaller magnitude. This impact would be **less than significant**.

Impact BIO-6: Implementing PMAs under the Turlock Subbasin GSP could conflict with the provisions of an adopted HCP, natural community conservation plan, or other approved local, regional, or state HCP.

The PG&E San Joaquin Valley Operation & Maintenance Habitat Conservation Plan (O&M HCP) (PG&E 2006) covers specific PG&E activities throughout nine counties in the San Joaquin Valley, including Stanislaus and Merced counties. The PG&E O&M HCP overlaps the entire Turlock Subbasin. It complies with the FESA and the CESA, and outlines steps on minimizing, avoiding, and compensating for possible direct, indirect, and cumulative adverse effects on threatened and endangered species and critical habitat that could result from PG&E operation and maintenance activities in the San Joaquin Valley. Part of the study area lies within the PG&E O&M HCP boundaries, but GSP activities are not covered activities under the PG&E O&M HCP, which is applicable only to PG&E facilities. Therefore, implementation of the PMA actions under the GSP would not conflict with implementation of this HCP. **No impact** would occur.

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3.6 Cultural Resources

3.6.1 Introduction

This section identifies and evaluates cultural resources in the context of the Turlock Subbasin Groundwater Sustainability Plan (GSP) and describes the physical and regulatory setting, the criteria used to evaluate the significance of potential impacts, the methods used in evaluating impacts, and the results of the impact assessment. Cultural resources include historic architectural resources, pre-contact Native American and historic-era archaeological resources, and human remains.

No comments specifically addressing cultural resources were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.6.2 Environmental Setting

The pre-contact and ethnographic settings, indigenous resource types, historic setting, and historic-era resource types are described here to allow analysis at a program level of detail. This description does not preclude or replace the need for any supplemental project-level environmental review, if necessary.

Pre-Contact and Ethnographic Setting

Rosenthal et al. (2007) provide a framework for the interpretation of the Central Valley prehistoric record and have divided human history in the region into three basic periods: *Paleo-Indian* [13,550 to 10,550 years before present (BP)], *Archaic* (10,550 to 900 BP), and *Emergent* (900 to 300 BP). The Archaic period is subdivided into three sub-periods: *Lower Archaic* (10,550 to 7550 BP), *Middle Archaic* (7,550 to 2,550 BP), and *Upper Archaic* (2,550 to 900 BP). Economic patterns, stylistic aspects, and regional phases further subdivide cultural patterns into shorter phases. This scheme uses economic and technological types, socio-politics, trade networks, population density, and variations of artifact types to differentiate between cultural periods.

Beginning in the early 16th century, but primarily during the late 19th and early 20th centuries, Native American lifeways and languages (i.e., ethnographic data) were documented throughout California. Whether provided by professional ethnographers or archaeologists, field personnel from government agencies such as the Bureau of Indian Affairs, soldiers, merchants, settlers, or travelers, ethnographic accounts partly illuminate the traditions, beliefs, and cultures of Native American groups during specific points in time. Synthesized narratives such as the Handbook of North American Indians, Volume 8: California (Heizer 1978) categorize Native traditions and practices documented at the time in California; however, the complexity of regional diversity should not be overlooked.

At least six primary language families exist in California, and there may be more than 300 different dialects of approximately 100 languages. The “geolinguistic mosaic of the ethnographic period, with a startling diversity of languages and language families” indicates numerous major population shifts and migrations (Golla 2007:71). Ethnographers have also quantified at least 60 greater Indian cultures and as many as 250 specific tribes throughout the state.

The Turlock Subbasin is situated in an area ethnographically occupied by the Northern Valley Yokuts, a Penutian speaking people (Heizer and Elsasser 1980:15). The traditional territory of the Northern Valley Yokuts encompassed much of the north end of the Southern San Joaquin Valley, including the area extending from the northward bend of the San Joaquin River, northward almost to the Mokelumne River, and from the crest of the Coast Ranges eastward to the foothills of the Sierra Nevada. Ethnographic data regarding Northern Valley Yokuts are sparse. The term *Yokuts* is an English approximation of a Native term for “people.”

Cook (1955) estimated a pre-contact population of more than 25,000 in the general San Joaquin Valley area, while Baumhoff (1963) estimated more than 31,000. Villages were clustered along the rivers, primarily the San Joaquin, on low mounds that kept occupants above the water during floods. Cook (1955:67) estimated that 300 to 400 people may have lived at each village. Structures were largely limited to single-family dwellings made of tule.

The Northern Valley Yokuts relied on acorn and salmon for subsistence. Salmon runs in the spring and fall were intensively exploited. Fishing methods included the use of small dragnets weighted with stone weights and antler-tipped harpoons. Tule rafts were probably also used. Part of their catch was dried to preserve it for the long periods when the salmon were not running. Other fish targeted included white sturgeon, river perch, western suckers, and Sacramento pike. Valley oaks were relatively widely dispersed but rich in yield, providing 300–-500 pounds of acorns per tree annually. Acorns were harvested, pounded into flour, and used to make a thick soup or gruel.

The technology employed by the Northern Valley Yokuts was typical of other Central California groups. Hunting implements included bow and arrow as well as nets and harpoons. Stone tools were widely manufactured. Obsidian was a highly prized resource and had to be traded in from other areas. Basketry was also extensively employed, with some hints of a unique coiling technique. The use of stone mortars and pestles for pounding acorns into flour was a key technology (Wallace 1978:465).

During the contact period, the Northern Valley Yokuts population collapsed, and little historical data were recorded concerning them (Wallace 1978:462). Despite this catastrophic population loss, today’s Yokuts descendants continue to have a strong presence in the Central Valley, including involvement in activities promoting their heritage. The Native American Heritage Commission (NAHC) lists several tribes with members of Yokuts descent, including the North Valley Yokuts Tribe, the Santa Rosa Rancheria Tachi Yokut Tribe, the Tule River Tribe, the Dumna Wo-Wah Tribal Government, the Southern Sierra Miwok Nation, and the Amah Mutsun Tribal Band (NAHC 2022).

Indigenous Resource Types

Indigenous archaeological resources generally found in the San Joaquin Valley include permanent or semi-permanent habitation sites, temporary camps or food processing localities, and isolated artifacts. Archaeological materials include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil (midden) containing heat-affected rocks, artifacts, or shellfish remains; stone milling equipment (e.g., mortars, pestles, handstones, milling slabs); and battered stone tools, such as hammerstones and pitted stones. Native American human remains can also be found at indigenous archaeological sites. Other indigenous archaeological site types that could be in or adjacent to waterways are fish weirs and platforms. Flooding and sediment deposition episodes over millennia have buried many of these archaeological sites, resulting in complex archaeological sites with components both at and below the surface.

Historic Setting

The earliest Euroamerican arrival into the Turlock Subbasin area was by Spanish Lieutenant Gabriel Moraga during the expedition he led into the California interior in search of mission sites in 1806. In 1827, Euroamerican trappers, including Jedidiah Strong Smith, began to enter the region to hunt the fur-bearing animals that inhabited the Central Valley. Settlement of the valley was aided by the issuing of land grants, with Spanish, and later Mexican, governors giving settlers large sections of land to use for farming and raising cattle. Prior to the Gold Rush, the San Joaquin Valley was devoted to grazing and hunting, as immense herds of cattle and some horses roamed the valley (Hoover et al. 2002).

With the resulting influx of population from the Gold Rush, the production of food was needed to support gold miners, and the San Joaquin Valley developed to become an agricultural supplier. Some of the miners, disappointed in the search for gold, turned to farming in the fertile swamp lands in the San Joaquin Valley. Stanislaus County was organized in 1854 from a part of Tuolumne County. The county seat was first located at Adamsville, but was transferred to several other locations until it finally located in Modesto in 1871 (Hoover et al. 2002). Merced County was organized in 1855. The county seat was first located in Snelling, but was renamed to Merced in 1872 (Hoover et al. 2002).

During the late 1850s and 1860s, settlers in the San Joaquin Valley used short, roughly made earthen ditches to divert water from the lower courses of streams running west out of the Sierra Nevada. The great floods of 1862 and 1868 destroyed most of the early ditch systems, but San Joaquin Valley farmers continued to experiment with irrigation. By 1870, farmers had also begun to irrigate bottom lands along the streams in the southern San Joaquin Valley (Caltrans 2000).

Most San Joaquin Valley settlers in the 1850s through the 1870s were not particularly interested in investing time and money in irrigation, preferring cattle raising and dry-farm cultivation. The area was sparsely settled, and cattlemen such as Henry Miller and Charles Lux amassed large land holdings by acquiring swamp- and overflowed-lands, as well as other public lands in the valley, on which they raised livestock. The San Joaquin Valley became the center of California's wheat belt in the 1870s, and relied almost entirely on dry farming; it reached its peak in the early 1890s. Although few wheat farmers were irrigating, some valley land barons, like Miller and Lux, invested in large-scale irrigation of pasturage for their primary business of stock raising (Caltrans 2000).

Agricultural use in the vicinity intensified after the turn of the 20th century. In the first decades of the 20th century, many private enterprise irrigation systems in the San Joaquin Valley, as in Southern California, were acquired by irrigation districts formed by local residents. The most common absorption occurred when local citizens formed an irrigation district covering the area served, and then purchased the commercial canals serving it. After irrigation districts took over in the San Joaquin Valley in the 1910s and 1920s, they typically replaced the wooden headgates, control structures, and diversion works with concrete structures. Many canals remain earth lined, however, although districts in areas with high seepage losses or problems with high groundwater tables installed linings in their originally earth-lined conduits (Caltrans 2000).

The Turlock Irrigation District (TID) was established on June 6, 1887, and became the first irrigation district in California. TID began to irrigate the local agricultural landscape with water from the Tuolumne, Merced, and San Joaquin rivers. Irrigation and canal systems were developed, along with the use of pump houses and diversion pumps. Canals and pump systems were later built on a far grander scale by the Central Valley Project and State Water Project on their aqueduct systems (Caltrans 2000).

Historic-Era Resource Types

Potential historic-era resources include both architectural and archaeological resources. Architectural resources that may be considered historical resources for the purposes of CEQA must be at least 50 years old and meet one or more criteria for listing in the California Register of Historical Resources, as well as retain sufficient integrity. Historic-era architectural resources could include residential, commercial, or industrial buildings; structures such as barns, outbuildings, or bridges; as well as larger districts or landscapes that include multiple contributing components.

Historic-era archaeological resources are also just as varied, and may include the remnants of past use or occupation in an area related to various historic activities, including early exploration, agriculture, mining, industry, and residential occupation. Property types could include mining remains, such as tailings piles and river diversions; water conveyance features, such as ditches, flumes, and dams; and community remains, including foundations, dugouts, and refuse deposits. Landscape features could include fence lines and stone walls. Refuse features are some of the most abundant archaeological features that result from domestic and commercial use of an area and could include hollow-filled features such as refuse pits, privy pits, and wells, as well as sheet refuse artifact scatters.

3.6.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to cultural resources. Implementation of any project and management action (PMA) may be subject to the laws and regulations listed below, as well as other local plans, policies, and ordinances, depending on the project location.

Federal

Cultural resources are considered through the National Historic Preservation Act (NHPA) of 1966, as amended (54 United States Code 306108), and its implementing regulations. Prior to implementing an "undertaking" (e.g., federal funding or issuing a federal permit), Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties (i.e., properties listed in or eligible for listing in the National Register of Historic Places [National Register]) and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on any undertaking that would adversely affect properties eligible for listing in the National Register. Under the NHPA, a property is considered significant if it meets the National Register listing criteria at 36 Code of Federal Regulations (CFR) 60.4, as stated below:

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that:
>
> A) Are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> B) Are associated with the lives of persons significant in our past; or
>
> C) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> D) Have yielded, or may be likely to yield, information important in prehistory or history.

Federal review of projects is normally referred to as the *Section 106 process*. This process is the responsibility of the federal lead agency. The Section 106 review normally involves a four-step procedure, which is described in detail in the implementing regulations (36 CFR Part 800):

1. Identify historic properties in consultation with the State Historic Preservation Officer (SHPO) and interested parties.
2. Assess the effects of the undertaking on historic properties.
3. For adverse effects, consult with the SHPO, other agencies, and interested parties to develop an agreement that addresses the treatment of historic properties and notify the Advisory Council on Historic Preservation.
4. Proceed with the project according to the conditions of the agreement.

State

The State of California consults on implementation of the NHPA of 1966, as amended, and also oversees statewide comprehensive cultural resource surveys and preservation programs. The California Office of Historic Preservation, as an office of the California Department of Parks and Recreation, implements the policies of the NHPA statewide. The Office of Historic Preservation also maintains the California Historical Resources Inventory. The SHPO is an appointed official who implements historic preservation programs within the state's jurisdictions.

California Environmental Quality Act

CEQA, as codified in Public Resources Code (PRC) Section 21000 et seq., is the principal statute governing the environmental review of projects in the state. CEQA requires lead agencies to determine if a project would have a significant effect on historical resources, including archaeological resources. The State CEQA Guidelines define a historical resource as: (1) a resource in the California Register of Historical Resources (California Register); (2) a resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1(g); or (3) any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the lead agency's determination is supported by substantial evidence in light of the whole record. A historical resource is considered significant if it meets one or more of the following criteria:

A) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

B) Is associated with the lives of persons important in our past;

C) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

D) Has yielded, or may be likely to yield, information important in prehistory or history.

CEQA requires lead agencies to determine if a project would have a significant effect on important archaeological resources, either historical resources or unique archaeological resources. If a lead agency determines that an archaeological site is a historical resource, the provisions of PRC Section 21084.1 would apply and State CEQA Guidelines Sections 15064.5(c) and 15126.4 and the limits in PRC Section 21083.2 would not apply. If a lead agency determines that an archaeological site is a historical resource, the provisions of PRC Section 21084.1 and State CEQA Guidelines Section 15064.5 would apply. If an archaeological site does not meet the State CEQA Guidelines criteria for a historical resource, then the site may meet the threshold of PRC Section 21083 regarding unique archaeological resources. A unique archaeological resource is "an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria.

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
- Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person" [PRC Section 21083.2(g)].

The State CEQA Guidelines note that if a resource is neither a unique archaeological resource nor a historical resource, the effects of the project on that resource shall not be considered a significant effect on the environment [State CEQA Guidelines Section 15064.5(c)(4)].

California Public Resources Code Sections 5097.98 and 5097.99

PRC Section 5097.98 (reiterated in State CEQA Guidelines Section 15064.5(e)) identifies steps to follow in the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery. PRC Section 5097.99 prohibits obtaining or possessing any Native American artifacts or human remains that are taken from a Native American grave or cairn (stone burial mound).

California Health and Safety Code Section 7050.5

California Health and Safety Code Section 7050.5 protects human remains by prohibiting the disinterment, disturbance, or removal of human remains from any location other than a dedicated cemetery.

Regional and Local

There are several regional and local plans and ordinances relevant to the study area including the Stanislaus County General Plan, the Merced County General Plan, the City of Turlock General Plan, the City of Modesto General Plan, the City of Ceres General Plan and the City of Hughson General Plan. Regional and local regulations, however, would be superseded by state and federal regulations and thus are not discussed further.

3.6.4 Environmental Impact Analysis

Analysis Methodology

Analyzing environmental impacts on cultural resources focuses on the potential for substantial adverse effects to a significant historic architectural resource, pre-contact or historic-era archaeological resource, or human remains. Impacts on cultural resources from the types of PMAs implemented under the Turlock Subbasin GSP are evaluated in terms of how typical construction and operation could impact resources. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might be taken in the future, consistent with the level of detail appropriate for a program-level analysis.

The approach to assessing cultural resources impacts was qualitative and conservative, assuming that all PMAs are implemented. The impact analysis relies on the use of existing quantitative and qualitative data, including but not limited to existing reports, open access databases, maps, and models. Information regarding example projects similar to the types of PMAs identified in Section 2.2 were also reviewed. Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

Historical Resources

Impacts on historical resources were assessed by identifying the types of projects and activities associated with them that would be implemented under the GSP, such as new construction, demolition, or substantial alteration, which would affect resources that have been identified as historical.

Individual buildings, structures, and districts identified as historical resources under CEQA include those that are significant because of their association with important events, people, or architectural styles or master architects, or for their informational value (California Register Criteria 1, 2, 3, and 4) and that retain sufficient historic integrity to convey their significance. Criterion 4 is typically applied to the evaluation of archaeological resources and not to architectural resources. Historical resources may include both architectural and archaeological resources.

Once a resource has been identified as significant, it must be determined whether the impacts of the project would "cause a substantial adverse change in the significance" of the resource [State CEQA Guidelines Section 15064.5(b)]. A substantial adverse change in the significance of a historical resource means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of [the] historical resource would be materially impaired" [State CEQA Guidelines Section 15064.5(b)(1)].

A historical resource is materially impaired through demolition or alteration of the resource's physical characteristics that convey its historical significance and that justify its inclusion in (or eligibility for inclusion in) the California Register or a qualified local register [State CEQA Guidelines Section 15064.5(b)(2)]. Therefore, material impairment of a historical resource constitutes a significant impact.

Archaeological Resources

The significance of most pre-contact and historic-era archaeological sites is typically assessed relative to California Register Criterion 4. This criterion stresses the importance of the information potential contained within an archaeological site, rather than the significance of the site as a surviving example of a type or its association with an important person or event.

Archaeological resources may qualify as historical resources under the definition provided in State CEQA Guidelines Section 15064.5(a). Alternatively, they may be assessed under CEQA as unique archaeological resources. "Unique archaeological resources" are defined as archaeological artifacts, objects, or sites that contain information needed to answer important scientific research questions (PRC Section 21083.2).

A substantial adverse change in the significance of an archaeological resource is assessed similarly to such changes to other historical resources; that is, a "substantial adverse change" in significance means the "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of [the] historical resource would be materially impaired" [State CEQA Guidelines Section 15064.5(b)(1)].

A historical resource is materially impaired when a project demolishes or materially alters the resource's physical characteristics that convey its historical significance and that justify its inclusion (or eligibility for inclusion) in the California Register or a qualified local register (State CEQA

Guidelines Section 15064.5[b][2]). Therefore, material impairment of archaeological resources that are considered historical resources or unique archaeological resources would be a significant impact.

Human Remains

Human remains, including those buried outside of formal cemeteries, are protected under several state laws, including PRC Section 5097.98 and Health and Safety Code Section 7050.5. For the purposes of this analysis, intentional disturbance, mutilation, or removal of interred human remains would be a significant impact.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A PMA implemented under the Turlock Subbasin GSP would result in a significant impact on cultural resources if it would:

- Cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines Section 15064.5;
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines Section 15064.5; or
- Disturb any human remains, including those interred outside of formal cemeteries.

Impacts and Mitigation Measures

Table 3.6-1 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

TABLE 3.6-1
SUMMARY OF IMPACT CONCLUSIONS—CULTURAL RESOURCES

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
CUL-1: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines Section 15064.5.	SU	SU
CUL-2: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines Section 15064.5.	SU	SU
CUL-3: Implementing PMAs under the Turlock Subbasin GSP could disturb any human remains, including those interred outside of formal cemeteries.	SU	SU

NOTES: SU = Significant and Unavoidable

SOURCE: Data compiled by Environmental Science Associates in 2022

Impact CUL-1: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines Section 15064.5.

State CEQA Guidelines Section 15064.5 requires the lead agency to consider the effects of a project on historical resources. A historical resource is defined as any building, structure, site, or object listed in or determined to be eligible for listing in the California Register, or determined by a lead agency to be significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, or cultural annals of California. The following discussion focuses on architectural and structural resources. Archaeological resources, including those that are potentially historical resources according to State CEQA Guidelines Section 15064.5, are addressed below under Impact 3.6-2.

Effects of Construction Activities

This analysis focuses on the effects of project construction activities of direct recharge projects, in-lieu recharge projects, and conservation PMAs. PMAs implemented under the Turlock Subbasin GSP could include construction activities, as presented in Table 2-4.

Analysis

Construction of projects implemented under the GSP could involve ground disturbance, vibration, and removal of architectural resources (e.g., agricultural outbuildings, irrigation facilities, power poles, utility lines, piping) and vegetation (e.g., trees, stumps). Constructing these projects also has the potential to introduce new visual elements or modify existing visual elements (e.g., tanks, basins, ancillary buildings and structures). However, the exact details, including precise locations, of any such construction activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any historical resources.

Construction of new infrastructure or modifications to existing infrastructure could result in significant impacts on historical architectural resources in several ways:

- Construction could introduce new elements to the historic setting associated with a historical resource, or could physically alter a historical resource.
- Ground-disturbing construction activities could alter existing landscapes.
- Vibration generated during construction work could physically damage or alter a nearby architectural resource that has the potential to qualify as a historical resource.

If construction activities for any of the future projects implemented under the GSP were to result in either a direct impact (e.g., physical modification, damage, or destruction) or an indirect impact (e.g., alteration to setting, including visual) on any architectural resources that qualify as historical resources, as defined in State CEQA Guidelines Section 15064.5, the impact would be **potentially significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

This analysis focuses on the effects of constructed features and operations and maintenance of those features.

Analysis

Constructed features and operations and maintenance for future projects implemented under the GSP could involve ground disturbance, vibration, and modifications to architectural resources (e.g., disturbance to architectural resources could result from vegetation removal or soil/sediment removal within or near the features.) However, the exact details, including precise locations, of any such features and operational activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any architectural resources.

Constructed features and operations of new infrastructure or modifications to existing infrastructure (e.g., wells, water conveyance features, tanks, basins, pump stations) could cause vibration that physically damages or alters nearby architectural resources. This vibration could result in significant impacts on historical resources, if any such architectural resources qualify as historical resources.

If constructed features and operations and maintenance for any of the future projects implemented under the GSP were to result in either a direct impact (e.g., physical modifications, damage, or destruction) or an indirect impact (e.g., alterations to setting, including visual) on any architectural resources that qualify as historical resources as defined in State CEQA Guidelines Section 15064.5, the impact would be **potentially significant**.

Impact Conclusion

Project construction and constructed features, as well as operations and maintenance for projects implemented under the GSP, are the types of activities that have the potential to affect historical (i.e., architectural) resources. However, the exact details, including precise locations, of any such activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any architectural resources. Factors necessary to identify specific impacts on historical resources include the project's design, footprint, and type; the precise location of construction activities and features; and the type and location of operational activities. If any of the future projects implemented under the GSP were to affect architectural resources that qualify as historical resources as defined in State CEQA Guidelines Section 15064.5, the impact would be **potentially significant**. The GSP does not include any general protection measures applicable to this impact.

Compliance with Mitigation Measure CUL-1 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the PMA proponent(s).

Mitigation Measure CUL-1: Conduct Inventory and Significance Evaluation of Architectural Resources.

Before implementation of a project under the GSP, the need for an inventory and significance evaluation of architectural resources in the project area shall be assessed, based on the type of activity conducted and potential for built features to be present or disturbed. The assessment should consist of a review of maps and aerial photos to see if existing buildings, dams, levees, roads, or other built features are in the project area. If so, and the age of these features is either unknown or is known to be older than 45 years, then an inventory and evaluation should be completed by, or under the direct supervision of, a qualified architectural historian, defined as one who meets the U.S. Secretary of the Interior's Professional Qualifications Standards for Historical Architecture or History, and shall include the following:

- Map(s) and verbal description of the project area that delineates both the horizontal and vertical extents of where a project could result in impacts, including both direct and indirect, on cultural resources.
- A records search at the appropriate repository of the California Historical Resources Information System (CHRIS) for the project area and vicinity (typically areas within 0.25 or 0.5 mile, based on setting) to acquire records of previously recorded cultural resources in the project area and vicinity and previous cultural resources studies conducted for the project area and vicinity.
- Background research on the history of the project area and vicinity for all projects determined to need additional historical architecture assessment.

If, after review, features of the built environment are determined to be less than 45 years old, a summary statement of their age and references for this determination will be included in the project area description. No further analysis is necessary.

If historic-era architectural resources are determined to likely be present, an architectural field survey of the project area shall be conducted, unless previous architectural field surveys no more than 5 years old have been conducted for the project area. Any architectural resources identified in the project area during the survey shall be recorded on the appropriate California Department of Parks and Recreation 523 forms.

- If resources are identified in the project area, they shall be evaluated for California Register eligibility (i.e., whether they qualify as historical resources, as defined in State CEQA Guidelines Section 15064.5).
- If California Register-eligible resources are present, an assessment of potential project impacts shall be conducted. This shall include an analysis of whether the project's potential impacts on the historical resource would be consistent with the U.S. Secretary of the Interior's Standards for the Treatment of Historic Properties and applicable guidelines.

If potentially significant impacts on historical resources are identified, an approach for reducing such impacts shall be developed before project implementation and in coordination with interested parties (e.g., historical societies, local communities). Typical measures for reducing impacts include:

- Modifying the project to avoid impacts on historical resources.
- Documentation of historical resources, to the standards of and to be included in the Historic American Buildings Survey, Historic American Engineering Record, or Historic American Landscapes Survey, as appropriate. As described in the above standards, the documentation shall be conducted by a qualified architectural historian, defined above, and shall include large-format photography, measured drawings, written architectural descriptions, and historical narratives. The completed documentation shall be submitted to the U.S. Library of Congress.

- Relocation of historical resources in conformance with the U.S. Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings.
- Monitoring construction-related and operational vibrations at historical resources.
- For historical resources that are landscapes, preservation of the landscape's historic form, features, and details that have evolved over time, in conformance with the U.S. Secretary of the Interior's Guidance for the Treatment of Cultural Landscapes.
- Development and implementation of interpretive programs or displays, and community outreach.

Mitigation Measure CUL-1 would be implemented to reduce the impacts of projects under the GSP. However, because the extent and location of such actions are not known at this time, it is not possible to conclude that the mitigation measure, or equally effective mitigation measures, would reduce significant impacts to a less-than-significant level in all cases. Therefore, this impact would remain **significant and unavoidable**.

Impact CUL-2: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines Section 15064.5.

Archaeological resources can be considered historical resources, according to State CEQA Guidelines Section 15064.5, as well as unique archaeological resources, as defined in PRC Section 21083.2(g). A significant impact could occur if either alternative alignment would cause a substantial adverse change to an archaeological resource through physical demolition, destruction, relocation, or alteration of the resource.

Effects of Construction Activities

This analysis focuses on the effects of project construction activities of direct recharge projects, in-lieu recharge projects, and conservation PMAs. PMAs implemented under the Turlock Subbasin GSP could include construction activities, presented in Table 2-4.

Analysis

Construction of projects implemented under the GPS could involve ground disturbance (e.g., excavation, grading, drilling). However, the exact details, including precise locations, of any such construction activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any archaeological resources.

Construction of new infrastructure or modifications to existing infrastructure for projects implemented under the GSP could partially or completely destroy archaeological resources, resulting in a significant impact.

If construction activities for any of the future projects implemented under the GSP were to result in an impact on any archaeological resources, as defined in State CEQA Guidelines Section 15064.5, the impact would be **potentially significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

This analysis focuses on the effects of constructed features and operations and maintenance of those features.

Analysis

Constructed features and operations for projects implemented under the GSP could involve ground disturbance (e.g., excavation, drilling, grading). However, the exact details, including precise locations, of any such features and operational activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any archaeological resources.

Constructed features and operations associated with new infrastructure or modifications to existing infrastructure (e.g., wells, water conveyance features, tanks, basins, pump stations) could include ground-disturbing activities that could result in significant impacts on archaeological resources through partial or complete destruction.

If constructed features and operations and maintenance for any of the projects implemented under the GSP were to result in an impact on any archaeological resources as defined in State CEQA Guidelines Section 15064.5, the impact would be **potentially significant**.

Impact Conclusion

Project construction and constructed features and operations and maintenance for projects implemented under the GSP are the types of activities that have the potential to affect archaeological resources. However, the exact details, including precise locations, of any such activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any archaeological resources. Factors necessary to identify specific impacts on archaeological resources include the project’s design, footprint, and type; the precise location of construction activities and features; and the type and location of operational activities. If any of the future projects implemented under the GSP were to affect archaeological resources that qualify as historical resources as defined in State CEQA Guidelines Section 15064.5, as well as unique archaeological resources, as defined in PRC Section 21083.2(g), the impact would be **potentially significant**. The GSP does not include any general protection measures applicable to this impact.

Compliance with Mitigation Measure CUL-2 and Mitigation Measure CUL-3 would be required when applicable to a given project. Implementation of these mitigation measures would be the responsibility of the PMA proponent(s).

Mitigation Measure CUL-2: Conduct Inventory and Significance Evaluation of Archaeological Resources.

Before implementation of a project under the GSP that includes ground disturbance, an archaeological records search and sensitivity assessment shall be conducted. The inventory should be completed by, or under the direct supervision of, a qualified archaeologist, defined as one who meets the U.S. Secretary of the Interior's Professional Qualifications Standards for Archeology, and shall include the following:

- Map(s) and verbal description of the project area that delineates both the horizontal and vertical extents of where a project could result in impacts, including both direct and indirect, on cultural resources.
- A records search at the appropriate repository of the CHRIS for the project area and vicinity (typically areas within 0.25 or 0.5 mile, based on setting) to acquire records on previously recorded cultural resources in the project area and vicinity, and previous cultural resources studies conducted for the project area and vicinity.
- Outreach to the California NAHC, including a request of a search of the Sacred Lands File for the project area, to determine if any documented Native American sacred sites could be affected by the project.
- Consultation with California Native American Tribes pursuant to PRC Section 21080.3 to determine whether any indigenous archaeological resource or tribal cultural resources could be affected by the project. Project proponents shall submit a Sacred Lands File & Native American Contacts List Request to the NAHC at the initial stages of project development. Any tribe identified by the NAHC will require notification of the proposed project by the lead agency as soon as practicable during early design.
- Background research on the history, including ethnography and indigenous presence, of the project area and vicinity.
- An archaeological sensitivity analysis of the project area based on mapped geologic formations and soils, previously recorded archaeological resources, previous archaeological studies, and Native American consultation.

If an archaeological survey is not warranted based on the above review, a summary of the assessment and justification of the determination will be prepared. If the CEQA lead agency agrees with the determination, no further study is needed.

If a survey is warranted as a result of archival studies and consultations, an archaeological field survey of the project area will be conducted. If previous archaeological field surveys no more than 10 years old have been conducted for the project area, a new field survey is not necessary. The field survey shall include, at a minimum, a pedestrian survey. If the archaeological sensitivity analysis suggests a high potential for buried archaeological resources in the project area, a subsurface survey may also be conducted. Any archaeological resources identified in the project area during the survey shall be recorded on the appropriate California Department of Parks and Recreation 523 forms.

- If resources are identified in the project area, they shall be evaluated for California Register eligibility (i.e., whether they qualify as historical resources, as defined in State CEQA Guidelines Section 15064.5 or unique archaeological resources, as defined in PRC Section 21083.2). Such evaluation may require archaeological testing (excavation), potentially including laboratory analysis, and consultation with relevant Native American representatives (for indigenous resources).

- If California Register-eligible resources are present, an assessment of potential project impacts shall be conducted. This shall include an analysis of whether the project's potential impacts would materially alter the resource's physical characteristics that convey its historical significance and that justify its eligibility for inclusion in the California Register.

If potentially significant impacts on archaeological resources that qualify as historical resources (per State CEQA Guidelines Section 15064.5) and/or unique archaeological resources (per PRC Section 21083.2) are identified, an approach for reducing such impacts shall be developed, in coordination with interested or consulting parties (e.g., Native American representatives, historical societies, or local communities as appropriate). Typical measures for reducing impacts include:

- Modify the project to avoid impacts on resources.
- Plan parks, green space, or other open space to incorporate the resources.
- Develop and implement a detailed archaeological resources management plan to recover the scientifically consequential information from archaeological resources before any excavation at the resource's location. Treatment for most archaeological resources consists of (but is not necessarily limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the recovery of important scientific data contained in the portion(s) of the resource to be affected by the project.
- Develop and implement interpretive programs or displays, and conduct community outreach.

Mitigation Measure CUL-3: Implement Measures to Protect Archaeological Resources during Project Construction or Operation.

If cultural materials are encountered during construction or operation of any project implemented under the GSP, all activity within 100 feet of the find shall cease and the find shall be flagged for avoidance. The lead agency and a qualified archaeologist, defined as one meeting the U.S. Secretary of the Interior's Professional Qualifications Standards for Archeology, shall be immediately informed of the discovery. The qualified archaeologist shall inspect the discovery and notify the lead agency of their initial assessment. If the qualified archaeologist determines that the resource is or is potentially indigenous in origin, the lead agency shall consult with culturally affiliated California Native American Tribes to assess the find and determine whether it is potentially a tribal cultural resource.

If the lead agency determines, based on recommendations from the qualified archaeologist and culturally affiliated California Native American Tribes, that the resource may qualify as a historical resource (per State CEQA Guidelines Section 15064.5), unique archaeological resource (per PRC Section 21083.2), or tribal cultural resource (per PRC Section 21074), then the resource shall be avoided if feasible. If avoidance is not feasible, the lead agency shall consult with a qualified archaeologist, culturally affiliated California Native American Tribes, and other appropriate interested parties to determine treatment measures to minimize or mitigate any potential impacts on the resource pursuant to PRC

Section 21083.2 and State CEQA Guidelines Section 15126.4. Once treatment measures have been determined, the lead agency shall prepare and implement an archaeological (and/or tribal cultural) resources management plan that outlines the treatment measures for the resource. Treatment measures typically consist of the following steps:

- Modify the project to avoid impacts on resources.
- Plan parks, green space, or other open space to incorporate resources.
- Recover the scientifically consequential information from the archaeological resource before any excavation at the resource's location. This typically consists of (but is not necessarily limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the recovery of important scientific data contained in the portion(s) of the resource to be affected by the project.
- Develop and implement interpretive programs or displays.

If the resource qualifies as a tribal cultural resource (per PRC Section 21074), implement measures for avoiding or reducing impacts such as the following:

- Avoid and preserve the resource in place through measures that include but are not limited to the following:
  - Plan and construct the project to avoid the resource and protect the cultural and natural context.
  - Plan greenspace, parks, or other open space to incorporate the resources with culturally appropriate protection and management criteria.
- Treat the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, through measures that include but are not limited to the following:
  - Protect the cultural character and integrity of the resource.
  - Protect the traditional use of the resource.
  - Protect the confidentiality of the resource.
- Implement permanent conservation easements or other interests in real property, with cultural appropriate management criteria for the purposes of preserving or using the resource or place.

Mitigation Measures CUL-2 and CUL-3 would be implemented to reduce the impacts of projects under the GSP. However, because the extent and location of such actions are not known at this time, it is not possible to conclude that the mitigation measures, or equally effective mitigation measures, would reduce significant impacts to a less-than-significant level in all cases. Therefore, this impact would be **significant and unavoidable**.

Impact CUL-3: Implementing PMAs under the Turlock Subbasin GSP could disturb human remains, including those interred outside of formal cemeteries.

Direct Recharge Projects, In-Lieu Recharge Projects, and Conservation PMAs

Effects of Construction Activities

This analysis focuses on the effects of construction activities of direct recharge projects, in-lieu recharge projects, and conservation PMAs. PMAs implemented under the Turlock Subbasin GSP could include construction activities, presented in Table 2-4.

Analysis

Construction activities for projects implemented under the GSP could involve ground disturbance (e.g., excavation, grading, drilling). However, the exact details, including precise locations, of any such construction activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any human remains, with either known or unknown locations, including any associated with archaeological resources.

Construction of new infrastructure or modifications to existing infrastructure for projects implemented under the GPS could result in significant impacts on human remains through physical damage or destruction.

If construction activities for future projects implemented under the GSP were to disturb or damage any human remains, the impact would be **potentially significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

This analysis focuses on the effects of constructed features and operations and maintenance of those features.

Analysis

Constructed features and operations for projects implemented under the GSP could involve ground disturbance (e.g., excavation, drilling, grading). However, the exact details, including precise locations, of any such features and operational activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any human remains, with either known or unknown locations, including any associated with archaeological resources

Constructed features and operations associated with new infrastructure or modifications to existing infrastructure (e.g., wells, water conveyance features, tanks, basins, pump stations) could include ground-disturbing activities that could result in significant impacts on human remains through partial or complete destruction.

If constructed features and operations and maintenance for any of the projects implemented under the GSP were to result in an impact on any human remains, the impact would be **potentially significant**.

Impact Conclusion

Construction activities and constructed features and operations and maintenance by project proponents for projects implemented under the GSP are the types of activities that have potential to affect human remains. However, the exact details, including precise locations, of any such activities have yet to be determined. Therefore, it is not known whether the projects implemented under the GSP would affect any human remains, either known or unknown, including those associated with archaeological resources. Factors necessary to identify specific impacts on human remains include the project's design, footprint, and type; the precise location of construction activities and features; and the type and location of operational activities. If any of the projects implemented under the GSP were to disturb or damage human remains, the impact would be **potentially significant**. The GSP does not include any general protection measures applicable to this impact.

Compliance with Mitigation Measure CUL-4 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the PMA proponent(s).

> **Mitigation Measure CUL-4: Implement Measures to Protect Human Remains during Project Construction or Operation.**
>
> If human remains are encountered during construction or operation and maintenance of any project implemented under the GSP, all work shall immediately halt within 100 feet of the find, and the lead agency shall contact the appropriate county coroner to evaluate the remains and follow the procedures and protocols set forth in State CEQA Guidelines Section 15064.5(e)(1). If human remains encountered are on or in the tide and submerged lands of California, the lead agency shall also contact the California State Lands Commission. If the coroner determines that the remains are Native American in origin, the appropriate county shall contact the California NAHC, in accordance with California Health and Safety Code Section 7050.5(c) and PRC Section 5097.98. Per PRC Section 5097.98, the project's lead agency shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located is not damaged or disturbed by further development activity until the lead agency has discussed and conferred, as prescribed PRC Section 5097.98, with the most likely descendants and the property owner regarding their recommendations, if applicable, taking into account the possibility of multiple human remains.

Mitigation Measure CUL-4 would be implemented to reduce the impacts of projects under the GSP. However, because the extent and location of such actions are not known at this time, it is not possible to conclude that the mitigation measures, or equally effective measures, would reduce significant impacts to a less-than-significant level in all cases. Therefore, this impact would be **significant and unavoidable**.

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3.7 Energy

3.7.1 Introduction

This section discusses energy resources in the study area and evaluates the changes that could result from the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP). (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2.) As discussed below, potential impacts include substantially inefficient, wasteful, or unnecessary consumption of energy resources, or a conflict with a state or local plan for renewable energy or energy efficiency.

No comments specifically addressing energy resources were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.7.2 Environmental Setting

This section describes energy consumption that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and includes many types of energy resources.

Energy is consumed both directly and indirectly during the construction of projects, and during operations and maintenance of project facilities, such as pumping of water.

State Energy Setting

Total energy usage in California was 7,802 trillion British thermal units in 2019 (the most recent year for which specific data are available), which equates to an average of 200 million British thermal units per capita. These figures place California second among the nation’s 50 states in total energy use and 49th in per capita consumption (EIA 2022).

Electricity

In 2020, California generated a total of 272,576 gigawatt-hours (GWh) of electricity, down 2 percent from 2019’s total generation of 277,932 GWh. Approximately 70 percent of the electrical power needed to meet California’s demand is produced in the state; the balance, approximately 30 percent, is imported from the Pacific Northwest and the Southwest. In 2018, California’s in-state electricity use was derived from natural gas (48 percent), coal (0.17 percent), large hydroelectric resources (9 percent), nuclear sources (9 percent), and renewable resources that include geothermal, biomass, small hydroelectric resources, wind, and solar (33 percent). Of the approximately 63,665 GWh generated by renewable sources in the state, solar-generated electricity made up the highest proportion (46 percent), followed by wind (22 percent), geothermal (18 percent), biomass (9 percent), and small hydroelectric (5 percent) (CEC 2022a).

Wind-Generated Electricity

In 2021, California was the sixth-largest producer of wind energy in the United States. California's wind power potential is widespread, especially along the state's many mountain crests, as well as in coastal areas of Northern California, both onshore and offshore (EIA 2022). Six major *wind resource areas* (particular areas in California that contain a concentration of wind generation projects) and many smaller wind sites have been identified in the state. The PMAs would not be located in one of these wind resource areas. As of December 2021, California had almost 6,300 megawatts (MW) of installed wind capacity (EIA 2022).

Transportation Fuels

Gasoline and diesel, both derived from petroleum (also known as *crude oil*), are the two fuels most commonly used for vehicular travel. Aviation gasoline, a specialized type of fuel used to power aircraft, is also derived from petroleum. California is the nation's second-largest consumer of refined petroleum products and accounts for about 9 percent of U.S. total consumption. In 2020, California was the nation's largest consumer of jet fuel and the second-largest consumer of motor gasoline. The transportation sector uses about 85 percent of the petroleum consumed in the state (EIA 2022).

In 2021, taxable gasoline sales (including aviation gasoline) in California accounted for approximately 13 billion gallons of gasoline (CDTFA 2022a), and taxable diesel fuel sales accounted for approximately 3.1 billion gallons of diesel fuel (CDTFA 2022b).

California is nearly self-sufficient with regard to fuel supplies of gasoline, diesel, and aviation gasoline, obtaining almost all of the fuel needed for meeting local demand from the state's refineries (CEC 2014). Refineries in California often operate at or near maximum capacity because of the high demand for petroleum products. When unplanned refinery outages occur, replacement supplies must be brought in by marine tanker from refineries in Washington State or on the U.S. Gulf Coast. California requires that all motorists use, at a minimum, a specific blend of motor gasoline called California Reformulated Gasoline (CaRFG) as part of an overall program to reduce emissions from motor vehicles. Refineries in several other countries can also supply CaRFG, although it can take several weeks to locate and transport replacement motor gasoline that conforms to California's strict fuel specifications (EIA 2022). As a result, unplanned outages often result in a reduction in supply that causes prices to increase, sometimes dramatically. The severity and duration of these price spikes depend on how quickly the refinery issue can be resolved and how soon supply from alternative sources can reach the affected market (EIA 2015).

Most petroleum supply disruptions or shortages are resolved by the energy industry before they become significant. However, there are instances in which the severity and scope of a disaster requires additional actions by the government to facilitate and coordinate response and recovery efforts (NASEO 2018).

Regional and Local Setting

Pacific Gas and Electric

Pacific Gas and Electric Company (PG&E) provides electricity for approximately 5.2 million customer accounts in a 70,000-square-mile service area in Northern and Central California. PG&E's service area stretches from Eureka in the north to Bakersfield in the south, and from the Pacific Ocean in the west to the Sierra Nevada in the east. Within its service area, PG&E operates 108,000 circuit miles of electric distribution lines and 18,000 circuit miles of interconnected transmission lines (PG&E 2022).

In 2020, electricity consumption in PG&E's service area totaled approximately 78,518 GWh (CEC 2022b). The California Energy Commission (CEC) reported that peak demand in the PG&E service area in 2018 was approximately 11,000 MW. *Peak demand* is the amount of electricity consumed at any given moment, usually integrated over a period of 1 hour. Peak demand is important in evaluating system reliability, identifying congestion points on the electrical grid, and designing required system upgrades.

PG&E's generation portfolio includes fossil fuel–fired plants, hydroelectric facilities, solar photovoltaic facilities, a nuclear power plant, and a natural gas power plant (PG&E 2022). The net operating capacity of these facilities at the end of 2020 was 7,662 MW. In 2019, PG&E generated 29,326 GWh through its own facilities and purchased 24,602 GWh to meet its customers' demand (PG&E 2022).

Turlock Irrigation District

Turlock Irrigation District (TID) owns and operates an electricity generation, transmission, and distribution system that serves approximately 101,000 customer accounts within a 662-square-mile area. TID's service area includes Ceres and Turlock and stretches from the Santa Clara County border in the west to the Tuolumne County border in the east. TID operates 389 miles of transmission lines in Stanislaus and Merced Counties.

In 2020, electricity consumption in TID's service area totaled 2,213 GWh and peak demand in 2018 was 629 MW (CEC 2022b). TID's reported electric generation capacity included 154 MW from district-owned hydroelectric facilities, 521 MW from district-owned natural gas facilities, and 137 MW from one district-owned wind facility (TID 2018).

Merced Irrigation District

Merced Irrigation District (MID) operates electricity transmission and distribution facilities that serve customers spanning 256 square miles in eastern Merced County. MID currently provides power to approximately 11,000 customers in eastern Merced County including Livingston, Atwater, and Merced (MID 2020).

In 2019, electricity consumption in MID's service area totaled 513 GWh (CEC 2022b). MID purchases nearly all its power from TID, which generates its own power and purchases power from others, including PG&E.

3.7.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, and laws, and ordinances pertaining to energy resources. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

National Energy Conservation Policy Act

The National Energy Conservation Policy Act (United States Code Title 42, Section 8201 et seq. [42 U.S.C. 8201 et seq.]) is the underlying authority for federal energy management goals and the foundation of most federal energy requirements. This law established energy efficiency standards for consumer projects and includes, among other elements, energy efficiency standards for new construction.

National Energy Policy Act of 2005

The National Energy Policy Act of 2005 (42 U.S.C. 13201 et seq.) sets energy efficiency standards for equipment and seeks to reduce reliance on nonrenewable energy resources. Incentives are available to reduce current demand on these resources. For example, under the National Energy Policy Act, consumers and businesses can obtain federal tax credits for purchasing fuel-efficient appliances and products, including hybrid vehicles, and for constructing energy-efficient buildings. This law also includes incentives for the production of renewable energy, including wind power.

Energy and Independence Security Act of 2007

The Energy and Independence Security Act of 2007 (42 U.S.C. 17001) set federal energy management requirements in several areas: energy reduction goals for federal buildings; facility management and benchmarking; performance and standards for new buildings and major renovations; high-performance buildings; energy savings performance contracts; metering; procurement of energy-efficient products; reduction in petroleum use, including by setting automobile efficiency standards; and increases in the use of alternative fuels. This law also amended portions of the National Energy Policy Conservation Act, described above.

Corporate Average Fuel Economy Standards

Section 3.9, *Greenhouse Gas Emissions*, details federally established fuel economy standards by the U.S. Environmental Protection Agency and National Highway Traffic Safety Administration (NHTSA). NHTSA’s Corporate Average Fuel Economy standards regulate the distance that vehicles must be able to travel on a gallon of fuel. NHTSA sets Corporate Average Fuel Economy standards for passenger cars and light trucks (referred to collectively as *light-duty vehicles*), and separately sets fuel consumption standards for medium- and heavy-duty trucks and engines. In the course of more than 30 years, this regulatory program has resulted in improved fuel economy throughout the United States’ vehicle fleet (NHTSA 2014, 2019).

State

Warren-Alquist Act

The 1975 Warren-Alquist Act (Public Resources Code Section 25000 et seq.) established the California Energy Resources Conservation and Development Commission, now known as the CEC. The Warren-Alquist Act established a state policy to reduce wasteful, uneconomical, and unnecessary uses of energy by employing a range of measures. This law also was the driving force behind the creation of Appendix F to the State CEQA Guidelines.

State of California Integrated Energy Policy

Public Resources Code Section 25301(a) requires the CEC to develop an integrated energy plan for electricity, natural gas, and transportation fuels at least every 2 years. The plan calls for the state to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the least environmental and energy costs. An overarching goal of the resulting Integrated Energy Policy Report is to achieve the statewide targets for greenhouse gas emissions reduction, while improving overall energy efficiency. See, for example, the CEC's 2021 Integrated Energy Policy Report, which includes the integration of renewable energy, including wind, as a key component (CEC 2022c).

Renewables Portfolio Standard

The State of California adopted standards to increase the percentage that retail sellers of electricity, including investor-owned utilities and community choice aggregators, must provide from renewable resources. The standards are referred to as the *renewables portfolio standard* (RPS). Qualifying renewables under the RPS include bioenergy such as biogas and biomass, small hydroelectric facilities (30 MW or less), wind, solar, and geothermal energy. The California Public Utilities Commission and the CEC jointly implement the RPS. The California Public Utilities Commission has the following responsibilities (CPUC 2022):

- Determine annual procurement targets and enforce compliance.
- Review and approve each investor-owned utility's renewable energy procurement plan.
- Review contracts for RPS-eligible energy.
- Establish the standard terms and conditions used in contracts for eligible renewable energy.

Executive Orders S-14-08 and S-21-09

In November 2008, Governor Arnold Schwarzenegger signed Executive Order S-14-08, which expanded the State of California's RPS to 33 percent renewable power by 2020. In September 2009, Governor Schwarzenegger continued California's commitment to the RPS by signing Executive Order S-21-09, which directed the California Air Resources Board under its Assembly Bill 32 authority to enact regulations to help the state meet its RPS goal of 33 percent renewable energy by 2020.

Senate Bill 350

Senate Bill (SB) 350, known as the Clean Energy and Pollution Reduction Act of 2015, was enacted on October 7, 2015. It provides a new set of objectives in clean energy, clean air, and pollution reduction by 2030. The objectives include the following:

(1) Increase the procurement of electricity from renewable sources from 33 percent to 50 percent by December 31, 2030.

(2) Double retail customers' energy efficiency savings in final end uses of electricity and natural gas through energy efficiency and conservation.

Senate Bill 100 and Executive Order B-55-18

On September 10, 2018, Governor Edmund G. Brown Jr. signed SB 100, establishing that 100 percent of all electricity in California must be obtained from renewable and zero-carbon energy resources by December 31, 2045. SB 100 also created new standards for the RPS goals established by SB 350 in 2015. Specifically, this law increases the percentage of energy that must come from renewable sources, for both investor-owned and publicly-owned utilities, from 50 percent to 60 percent by 2030. Incrementally, these energy providers also must have a renewable energy supply of 33 percent by 2020, 44 percent by 2024, and 52 percent by 2027. The updated RPS goals are considered achievable, because many California energy providers are already meeting or exceeding the RPS goals established by SB 350.

On the same day he signed SB 100, Governor Brown signed Executive Order B-55-18, which identified a new statewide goal to achieve carbon neutrality (net-zero greenhouse gas emissions) by 2045 and maintain net negative emissions thereafter.

Energy-Efficient Building Standards

The Energy Efficiency Standards for Residential and Nonresidential Buildings (California Code of Regulations Title 24, Part 6) include requirements for lighting, insulation, ventilation, and mechanical systems in nonresidential buildings (CEC 2018). These provisions would be relevant to the proposed operations and maintenance buildings for the PMAs implemented under the Turlock Subbasin GSP.

The California Green Building Standards Code, also known as the CALGreen Code (California Code of Regulations Title 24, Part 11), is a statewide regulatory code for all buildings. The CALGreen Code is intended to encourage more sustainable and environmentally friendly building practices, require the use of low-pollution-emitting substances that cause less harm to the environment, conserve natural resources, and promote the use of energy-efficient materials and equipment (CBSC 2019).

Regional and Local

Stanislaus County General Plan

The Conservation/Open Space Element of the Stanislaus County General Plan (2015) contains goals and policies that promote alternative energy resources and energy. The following goal and policy in the Stanislaus County General Plan are relevant to implementation of the PMAs.

Goal Eleven: Conserve resources through promotion of waste reduction, reuse, recycling, composting, ride-sharing programs, and alternative energy sources such as mini-hydroelectric plants, gas and oil exploration, and transformation facilities such as waste-to-energy plants.

- ***Policy Thirty-One*:** New construction by the County shall meet or exceed code requirements for energy conservation.

Merced County General Plan

The Natural Resources Element of the Merced County General Plan (2012) contains goals and policies that promote energy conservation practices and focus on renewable energy production within Merced County. The following goal and policies in the Merced County General Plan are relevant to implementation of the PMAs.

Goal NR-2: Provide adequate and efficient energy supplies by increasing renewable energy production and energy conservation.

- ***Policy NR-2.1: Renewable Energy Use*.** Promote the development and use of renewable energy resources to reduce dependency on petroleum-based energy sources.
- ***Policy NR-2.4: Solar Power*.** Encourage on-site solar power use in residential, commercial, and industrial buildings, and utility-scale solar power projects in rural locations that do not harm agricultural productivity and habitat values consistent with Policies AG-3.11 and LU-2.7.
- ***Policy NR-2.9: Energy Conservation*.** Encourage and maximize energy conservation and identification of alternative energy sources (e.g., wind or solar).
- ***Policy NR-2.11: Energy-Efficiency Focused Design*.** Encourage the use of energy-efficiency design features such as site orientation, light colored building materials, and tree canopies.

City General Plans

Table 3.7-1 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.7-1
CITY GENERAL PLAN POLICIES GOVERNING ENERGY RESOURCES WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Energy Resources
City of Turlock	Chapter 6, City Design: Policy 6.4-c, Chapter 8 Air Quality and Greenhouse Gases, Policy 8.2-r through 8.2-w
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, I. Energy Conservation, Policies 2a through 2o
City of Ceres	Health and Safety Element: Goal 5.E, Policy 5.E.1, Policy 5.E.2, Policy 5.E.5, and Policy 5.E.7
City of Hughson	Conservation and Open Space Element: Goal COS-5, Policy COS-5.1, and Policy COS-5.2

SOURCE: Data compiled by Environmental Science Associates in 2022

3.7.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on energy resources is based on an evaluation of potential changes to existing energy resources from construction and operation of the types of PMAs that would be implemented under the Turlock Subbasin GSP. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes caused by implementation of the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

The impact evaluations involved reviewing the types of PMAs that would be implemented under the Turlock Subbasin GSP to determine whether these actions would have the potential to result in impacts on energy resources. Impacts on energy resources resulting from the types of PMAs implemented under the Turlock Subbasin GSP generally fall into three categories:

- Impacts on energy consumption from construction-related activities.
- Impacts on energy consumption from operations and maintenance of constructed facilities.
- Potential conflict with applicable plans, policies, or regulations adopted by local counties to improve energy efficiency or reduce consumption of fossil fuels.

Direct energy consumption includes consumption of petroleum, natural gas, or electricity for construction vehicles and equipment and/or for the operation and maintenance of facilities. *Indirect energy consumption* includes energy used for extraction of raw materials, manufacturing, and transportation associated with manufacturing. Construction-related energy demands are considered temporary (i.e., would cease once construction is complete), while operational consumption would continue through the life of the facility. Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The assessment of impacts on energy resources used a qualitative and conservative approach, assuming the implementation of all PMAs. The impact analysis relies on existing quantitative and qualitative data, such as existing reports. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 in Chapter 2, *Project Description*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on energy resources if it would:

- Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation; or
- Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

Impacts and Mitigation Measures

Table 3.7-2 summarizes the impact conclusions presented in this section for easy reference. No mitigation is required.

TABLE 3.7-2
SUMMARY OF IMPACT CONCLUSIONS—ENERGY

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
ENE-1: Implementing PMAs under the Turlock Subbasin GSP could result in wasteful, inefficient, or unnecessary consumption of energy resources.	LTS	LTS
ENE-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	LTS	LTS

NOTE: LTS = less than significant

SOURCE: Data compiled by Environmental Science Associates in 2022

Impact ENE-1: Implementing PMAs under the Turlock Subbasin GSP could result in wasteful, inefficient, or unnecessary consumption of energy resources.

Effects of Construction Activities

PMAs implemented under the Turlock Subbasin GSP would include injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications. Implementation of these PMAs under the Turlock Subbasin GSP could include construction activities such as the following:

- Mobilization of equipment and materials.
- Preparation of staging areas.
- Establishment of designated access and haul routes.

- Staging and storage of equipment and materials.
- Preparation of the project site.
- Preparation/use of borrow sites.
- Well drilling.
- Site restoration and/or site demobilization.
- Disposal of excess materials.
- Dewatering, excavation, fill, and placement of materials in water.
- Drainage modification.

Construction for PMAs implemented under the Turlock Subbasin GSP would require the direct and indirect use of energy resources. Direct energy use would involve using petroleum products and electricity to operate construction equipment, such as trucks, earthmoving equipment, and power tools. Indirect energy use would involve consuming energy to extract raw materials, manufacture items, and transport the goods and people necessary for construction activities. Although construction-related energy consumption would be limited to the construction period, these activities would cause irreversible commitments of finite nonrenewable energy resources, such as gasoline and diesel fuel.

Depending on the project or management action, various types of fuel-consuming equipment would be necessary for actions such as the following:

- Movement and placement of large amounts of soils/materials.
- Physical disturbance of vegetation and/or habitat during construction.
- Relocation of utilities for pipeline placement.
- Removal or replacement of recreational structures.
- Dredging, excavation scraping, or scarification to modify existing detention basins or create new recharge basins.
- Transporting materials.
- Transporting construction workers to and from the activity sites.

Construction for PMAs implemented under the Turlock Subbasin GSP would include all feasible control measures to improve equipment efficiency and reduce energy use as required by the San Joaquin Valley Air Pollution Control District. These measures may include best management practices regarding efficiency standards for on-site construction vehicles, exhaust control plans that would reduce unnecessary equipment idling, and other policies that would help reduce construction energy use, and they are consistent with state and local legislation and policies to conserve energy.

Impacts on energy resources resulting from the construction of project or management action features may be temporary. The time to construct PMAs could be as short as a few days (in the case of minor projects) to as long as several years (for major projects, e.g., PMAs requiring construction during certain months of the year). However, increased fuel consumption would still be temporary and would cease at the end of the construction activity, and the project or management action would not have a residual requirement for additional energy input. In addition, construction activities would vary in location and duration. The marginal increases in fossil fuel use that would result from the construction of PMAs are not expected to have appreciable impacts on energy resources.

Therefore, energy use during construction activities for PMAs implemented under the Turlock Subbasin GSP would not be inefficient, wasteful, or unnecessary. This impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

PMAs implemented under the Turlock Subbasin GSP would result in the construction of infrastructure such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

Similar to construction, operations and maintenance activities for the PMAs would require both direct and indirect use of energy resources and irreversible commitments of finite, nonrenewable energy resources. In general, PMAs would be designed to operate as efficiently as feasible. Water would be distributed at the lowest possible pressure to minimize friction losses, which would reduce energy needs for pumping. Pump stations would use high-efficiency pumps employing variable-frequency drives, which reduce energy demand. Should additional energy be required for projects, it may be provided through increases in the procurement of renewable energy.

Operations and maintenance activities for the PMAs would not be expected to result in the inefficient, wasteful, or unnecessary use of energy. Therefore, this impact would be **less than significant**.

Impact ENE-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

Effects of Construction Activities

Implementation of PMAs under the Turlock Subbasin GSP would require both direct and indirect use of energy resources. Such activities would incorporate all feasible control measures to improve equipment efficiency and reduce energy use, as required by the San Joaquin Valley Air Pollution Control District. These measures may include best management practices to meet the efficiency standards for on-site construction vehicles and exhaust control plans to reduce unnecessary equipment idling. The projects would also implement other policies consistent with state and local legislation to help reduce energy use during construction.

Energy standards such as those in the Energy Policy Act of 2005 and Title 24 (the California Building Code) promote strategic planning and building standards intended to reduce the consumption of fossil fuels, increase the use of renewable resources, and enhance energy efficiency. In general, these regulations and policies specify strategies for reducing fuel consumption and increasing fuel efficiency and energy conservation. It is anticipated that construction activities for PMAs implemented under the Turlock Subbasin GSP would conform to applicable state and local plans, policies, and regulations related to energy use.

Construction activities for PMAs implemented under the Turlock Subbasin GSP would require land for development (e.g., establishment of project sites, staging areas, and access and haul routes; site preparation; preparation of borrow sites; and site restoration and demobilization). These activities could occur on undeveloped lands, which are scarce, less expensive, and often sought after by various entities that meet various needs (e.g., restoration, mitigation, housing, and alternative energy), and would have the potential to obstruct development or implementation of other state or local plans for renewable energy or energy efficiency. However, impacts related to the loss of development or implementation of other state or local plans for renewable energy or energy efficiency would be expected to be less than significant, because construction activities for PMAs would be limited to the construction period and would not involve long-term obstruction of undeveloped land.

Therefore, energy use by construction activities for PMAs implemented under the Turlock Subbasin GSP would not likely conflict with any applicable state or local plans, policies, or regulations establishing energy standards. This impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

PMAs implemented under the Turlock Subbasin GSP would result in the construction of infrastructure such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

Similar to construction, operations and maintenance activities for the PMAs would require both direct and indirect use of energy resources and irreversible commitments of finite nonrenewable energy resources. The PMAs would incorporate all feasible control measures to improve equipment efficiency and reduce energy use, as required by local air pollution control or management districts. The projects would also implement other policies consistent with state and local legislation to help reduce energy use during operations and maintenance activities.

Energy standards such as those in the Energy Policy Act of 2005 and Title 24 (the California Building Code) promote strategic planning and building standards intended to reduce the consumption of fossil fuels, increase the use of renewable resources, and enhance energy efficiency. In general, these regulations and policies specify strategies for reducing fuel consumption and increasing fuel efficiency and energy conservation. It is anticipated that operational activities for PMAs would conform to applicable state and local plans, policies, or regulations related to energy use.

PMAs could be located on undeveloped lands, which are scarce, less expensive, and often sought after by various entities that meet various renewable energy needs (e.g., alternative energy sources such as solar or wind farms). However, the constructed infrastructure would not be expected to obstruct a state or local plan for renewable energy because renewable energy projects could be built in other locations throughout the state.

Energy use during the operation of PMAs implemented under the Turlock Subbasin GSP would not likely conflict with applicable state, regional, or local plans, policies, or regulations establishing energy standards. Therefore, this impact would be **less than significant**.

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3.8 Geology, Soils, and Paleontological Resources

3.8.1 Introduction

This section describes the geology, soils, and paleontological resources in the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect geologic, soil, and paleontological resources (see Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2). As discussed below, potential impacts include the area being subject to geologic hazards (i.e., seismic ground shaking, liquefaction, landslides, and expansive soils), and the potential to encounter and disturb significant paleontological resources.

No comments specifically addressing geology, soils, or paleontological resources were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.8.2 Environmental Setting

This section describes the geology, soils, and paleontological resources that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin.

Geologic Setting

Regional

The study area is located within the central portion of the Great Valley geomorphic province[1], just east of the Coast Ranges (CGS 2002). The Great Valley is an elongate lowland approximately 50 miles wide and 400 miles long. It is bounded to the east by the Sierra Nevada Range and to the west by the Coast Ranges. The Great Valley rises from about sea level to approximately 400 feet in elevation at its northern and southern ends. The northern portion of the valley, referred to as the Sacramento Valley, is drained by the Sacramento River, while the southern portion of the valley, referred to as the San Joaquin Valley, is drained by the San Joaquin River. The Great Valley is filled with large volumes of sediments that have been eroded from the Sierra Nevada and Coast Ranges provinces. These sediments are nearly 6 miles deep at the southern end of the Great Valley (Leech 2006).

Local

Geologic mapping indicates that the surficial geology within the Turlock Subbasin includes Holocene-age Alluvium (Q) and Dos Palos Alluvium (Qdp), Pleistocene-age Modesto (Qm), Riverbank (Qr) and Turlock Lake (Qtl) formations, Pleistocene-age North Merced Gravel (QTnm), Pliocene to Pleistocene-age Laguna Formation (Pl), Miocene-age Mehrten Formation

[1] A geomorphic province is an area that possesses similar bedrock, structure, history, and age. California has 11 geomorphic provinces.

(Tm), and Oligocene-age Valley Springs Formation (Tvs) (Wagner et al. 1991). There are also minor outcrops of the Jurassic-age Copper Hill Volcanics (Jch) and Salt Springs and Merced Falls Slates (Jsm) (Wagner et al. 1991).

Faults and Seismicity

The California Earthquake Hazards Zone Application (EQ Zapp) is an interactive map available on the California Geological Survey (CGS) website (CGS 2022). The EQ Zapp allows users to view all available earthquake hazard zone data, including earthquake fault, liquefaction, and earthquake-induced landslide zones. Holocene-active faults are designated Earthquake Fault Zone (EFZ) because they display evidence of surface rupture within the last 11,700 years. The study area is not within an established EFZ as delineated on an EFZ Map.

Surface Fault Rupture

There are no known Holocene-active[2] faults or pre-Holocene[3] faults within the study area (CGS 2010). The nearest known Holocene-active fault is the Cottonwood Arm section of the Ortigalita fault zone, approximately 18 miles southwest of the western border of the Turlock Subbasin (the San Joaquin River). The Arroyo Mocho section of the Greenville fault zone is approximately 24 miles west of the western border of the Turlock Subbasin. The San Joaquin fault is a pre-Holocene fault and is approximately 6.5 miles west of the western border of the Turlock Subbasin.

Ground Shaking

While there are no faults within the Turlock Subbasin, the nearby faults identified above are in proximity to the area, and an earthquake on either of them could generate strong seismic ground shaking within the Turlock Subbasin.

Ground shaking due to fault rupture can cause damage to life and property. The extent of the damage varies by event and is determined by several factors, including (but not limited to): the magnitude and depth of the earthquake, distance from epicenter, duration and intensity of the shaking, underlying soil and rock types, and integrity of structures.

There is a potential for strong seismic ground shaking due to the presence of the nearby Ortigalita fault zone. The 2014 Working Group on California Earthquake Probabilities[4] (WGCEP) concluded that there is a 1.91 percent probability that a magnitude (M_W) 6.7 earthquake or higher could occur on the Ortigalita Fault Zone within the next 30 years (Field et al. 2015).

ShakeMap is a product of the USGS Earthquake Hazards Program; ShakeMap earthquake scenarios represent one realization of a potential future earthquake by assuming a particular magnitude and location. According to the ShakeMap that corresponds with an earthquake

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2 Holocene-active faults show evidence of displacement within the Holocene Epoch, or the last 11,700 years are considered active (CGS 2008).

3 Pre-Holocene faults have not shown evidence of displacement in the last 11,700 years (CGS 2008).

4 Also referred to as WGCEP 2014, this is a working group comprised of seismologists from the U.S. Geological Survey (USGS), California Geological Survey (CGS), Southern California Earthquake Center (SCEC), and California Earthquake Authority (CEA).

planning scenario generated by an estimated 7.1 M_W earthquake along the Ortigalita Fault Zone, the study area would be subjected to modest to strong seismic ground shaking (USGS 2013).

Geologic Hazards

Liquefaction and Lateral Spreading

Liquefaction is a phenomenon in which unconsolidated, water-saturated sediments become unstable due to the effects of strong seismic shaking. During an earthquake, these sediments can behave like a liquid, potentially causing severe damage to overlying structures. Lateral spreading is a variety of minor landslide that occurs when unconsolidated liquefiable material breaks and spreads due to the effects of gravity, usually down gentle slopes. Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore-pressure buildup or liquefaction in a shallow underlying deposit during an earthquake. The occurrence of this phenomenon depends on many complex factors, including the intensity and duration of ground shaking, particle-size distribution, and density of the soil.

The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to ground settlement. Dynamic settlement (i.e., pronounced consolidation and settlement from seismic shaking) may also occur in loose, dry sands above the water table, resulting in the settlement of and possible damage to overlying structures. In general, a relatively high potential for liquefaction exists in loose, sandy soils that are within 50 feet of the ground surface and are saturated (below the groundwater table). Lateral spreading can move blocks of soil, placing strain on buried pipelines that can lead to leaks or pipe failure.

The CGS has not evaluated the Turlock Subbasin for liquefaction potential. As such, no data are available in the EQ Zapp about the liquefaction potential of the area. As discussed above, liquefaction potential exists in areas with loose, sandy soils (e.g., alluvium) saturated by groundwater (generally within 50 feet of the ground surface). Within the Turlock Subbasin, areas mapped as Holocene-age alluvium that are saturated with groundwater (e.g., along the rivers) would be susceptible to liquefaction.

Landslides

Landslides are a type of downslope movement in which rock, soil, and other debris are displaced due to the effects of gravity. The potential for material to detach and move downslope depends on multiple factors, including the type of material, water content, and steepness of terrain. Generally, earthquake-induced landslides occur within deposits of a moderate to high landslide potential, when ground shaking triggers slope failures during or as a result of a nearby earthquake.

The CGS has not evaluated the Turlock Subbasin for landslide potential. As such, no data are available in the EQ Zapp that are associated with landslide potential of the area. Areas within the Turlock Subbasin that are urbanized and have existing developments have a very low landslide potential as there are no steep slopes or hillsides. Based on geologic mapping, no previous or historical landslides have been mapped within the Turlock Subbasin (Wagner et al, 1991); however, this is not a definitive conclusion that landslides could not happen in the area. Although CGS has not mapped the area for landslide potential, areas within the Turlock Subbasin could be susceptible to earthquake-induced landslides.

Subsidence

Land subsidence is the gradual settling or sudden sinking of the earth's surface due to subsurface movement of earth materials. Subsidence in alluvial valley areas is typically associated with groundwater or petroleum withdrawal, and regional ground subsidence or settlement is typically caused by the compaction of alluvial deposits, or other saturated deposits in the subsurface (USGS 1999). The San Joaquin Valley has a history of land subsidence due to groundwater pumping and related compaction of sand and clay layers in valley sediments. The study area has not experienced much land subsidence to date (Sneed et al. 2018).

Soils

Expansive Soils

Expansive soils are soils that possess a "shrink-swell" characteristic, also referred to as linear extensibility. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying; the volume change is reported as a percent change for the whole soil. This property is measured using the coefficient of linear extensibility (COLE) (NRCS 2017). The Natural Resources Conservation Service (NRCS) relies on linear extensibility measurements to determine the shrink-swell potential of soils. If the linear extensibility percent is more than 3 percent (COLE=0.03), shrinking and swelling may cause damage to buildings, roads, and other structures (NRCS 2017). Changes in soil moisture can result from rainfall, landscape irrigation, utility leakage, roof drainage, and/or perched groundwater[5]. Expansive soils are typically very fine-grained and have a high to very high percentage of clay. Structural damage may occur incrementally over a long period of time, usually as a result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils.

The NRCS Web Soil Survey data are generally useful at a large scale (meaning when evaluating an area in more detail). As such, Web Soil Survey expansive soil data are not available at a regional scale. The varying geology of the area is indicative of varying soil conditions across the Turlock Subbasin. As discussed above, expansive soils generally occur in fine-grained clayey sediments, which could be present throughout the Turlock Subbasin.

Paleontological Resources

Paleontological resources are the mineralized (fossilized) remains of prehistoric plants and animals and the mineralized impressions (trace fossils) left as indirect evidence of the forms and activity of such organisms. These resources are located within sedimentary rocks or alluvium and

5 Perched groundwater is a local saturated zone above the water table that typically exists above an impervious layer (such as clay) of limited extent.

are considered to be nonrenewable. Formations that contain vertebrate fossils are considered more sensitive because vertebrate fossils tend to be rare and fragmentary. Formations containing microfossils, plant casts, and invertebrate fossils are more common. A significant fossil deposit is a rock unit or formation that contains significant nonrenewable paleontological resources. This is defined as comprising one or more identifiable vertebrate fossils, large or small, and any associated invertebrate and plant fossils, traces, and other data that provide taphonomic, taxonomic, phylogenetic, ecologic, and stratigraphic information (ichnites and trace fossils generated by vertebrate animals such as trackways or nests and middens), which provide datable material and climatic information. This definition excludes invertebrate or botanical fossils, except when present within a given vertebrate assemblage. However, invertebrate and botanical fossils may be significant as environmental indicators associated with vertebrate fossils.

The Society of Vertebrate Paleontology (SVP) has established standard guidelines that outline professional protocols and practices for conducting paleontological resource assessments and surveys; monitoring and mitigation; data and fossil recovery; sampling procedures; and specimen preparation, identification, analysis, and curation (SVP 2010). Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as provided in its standard guidelines.

The SVP (SVP 2010) defines a significant fossil resource as:

> fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years).

Based on the significance definitions of SVP (2010), all identifiable vertebrate fossils are considered to have significant scientific value. This is because vertebrate fossils are relatively uncommon, and only rarely would a fossil locality yield a statistically significant number of specimens of the same genus. Therefore, every vertebrate fossil found has the potential to provide significant new information on the taxon it represents, its paleoenvironment,[6] and/or its distribution. Furthermore, all geologic units in which vertebrate fossils have previously been found are considered to have high sensitivity. Identifiable plant and invertebrate fossils are considered significant if found in association with vertebrate fossils or if defined as significant by project paleontologists, specialists, or local government agencies.

Paleontological sensitivity is defined as the potential for a geologic formation to produce scientifically significant fossils. This is determined by rock type, past history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its *Standard Procedures for the Assessment and Mitigation of Adverse*

6 A paleoenvironment is the past environment of an area during a given time period.

Impacts to Non-renewable Paleontologic Resources, the SVP (2010) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential:

- **High Potential:** Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources.
- **Low Potential:** Rock units that are poorly represented by fossil specimens in institutional collections or, based on general scientific consensus, only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule.
- **Undetermined Potential:** Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment.
- **No Potential:** Rock units like high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites) that will not preserve fossil resources.

It is important to note that while paleontological potential as defined above can provide a rough idea of whether subsurface fossils may exist, the uniqueness or significance of a fossil locality is unknown until it is identified to a reasonably precise level (Scott and Springer 2003). Therefore, any fossil discovery should be treated as potentially unique or significant until determined otherwise by a professional paleontologist.

Based on geologic mapping, the surficial geology within the Turlock Subbasin includes Holocene-age alluvial deposits (Q and Qdp), Pleistocene-age sedimentary deposits (Qm, Qr, Qtl, QTnm, and Pl), and Miocene (Tm) and Oligocene (Tvs) sedimentary deposits (Wagner et al. 1991). Additionally, there are Jurassic-age igneous and metamorphic geologic units at the eastern border of the Turlock Subbasin. As discussed above, igneous and metamorphic rocks do not preserve fossils due to the intense heat and pressures associated with the formation of those rocks. However, the sedimentary deposits that occur in the Turlock Subbasin are very likely to contain significant paleontological resources.

In general, Holocene-age alluvial deposits have a low potential to contain significant paleontological resources, based on the relatively recent age of the deposits (SVP 2010); the youngest Holocene-age deposits (i.e., younger than 5,000 radiocarbon years) have a particularly low potential. Deposits that date to the middle Holocene (i.e., older than 5,000 radiocarbon years) have a potential that increases as the depth into the deposits increases. For areas that are underlain by Holocene-age alluvium—older, Pleistocene-age deposits are inferred to be present beneath the Holocene deposits. In general, Pleistocene-age sedimentary deposits are considered to have a high potential to contain significant paleontological resources, as is evident by the numerous fossil discoveries throughout California (UCMP 2021a; Sub Terra Consulting 2017).

A search of the University of California Museum of Paleontology (UCMP) fossil locality online database indicates that there are 17 recorded fossil localities collected from the Mehrten Formation at Turlock Lake. Of the 17 recorded fossil sites, at least 167 individual specimens have been collected (including the remains of horses, rhinoceroses, camels, pronghorns, beavers, badgers, other rodents, canids, and amphibians) (Wagner 1976; Biewer et al. 2016; Sankey et al.

2016; Balisi et al. 2018; UCMP 2021b). Additionally, over 100 individual plant specimens have been recovered from the Mehrten Formation at Turlock Lake (UCMP 2022a).

While not abundant in Stanislaus or Merced counties (there is one Riverbank Formation locality and three Modesto Formation localities within Stanislaus County [UCMP 2022b]), there are numerous Riverbank and Modesto Formation localities within California (UCMP 2021c).

Due to the abundance of fossils that have been recovered from the Riverbank, Modesto, and Mehrten formations, these formations are considered to have a high potential to contain significant paleontological resources. Additionally, areas underlain by Holocene-age alluvium have a low potential to contain significant paleontological resources at the surface, but the potential increases in the deeper layers of these deposits.

3.8.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to geology, soils, and paleontological resources. Implementation of any project or management action may be subject to the laws and regulations listed below, as well as other local plans, policies, and ordinances, depending on the project location.

Federal

U.S. Geological Survey Quaternary Faults

The USGS maintains a database of Quaternary fault and fold parameters (USGS 2019). The database is periodically updated to reflect the latest data available and current understanding of fault behaviors. These fault parameters were used to develop the National Seismic Hazard Maps.

U.S. Geological Survey National Seismic Hazard Maps

USGS publishes probabilistic seismic hazard maps for the 48 conterminous states (USGS 2009). These maps depict contour plots of peak ground acceleration and spectral accelerations at selected frequencies for various ground motion return periods. The maps were developed for a reference site condition with an average shear-wave velocity of about 2,500 feet per second in the top 100 feet. Ground motions in the Sacramento–San Joaquin Delta may be as much as two to four times higher than elsewhere as a result of soft soil amplification.

The USGS National Seismic Hazard Maps are updated periodically and have been adopted by many building and highway codes.

U.S. Geological Survey Landslide Hazard Program

The USGS provides information on the causes of ground failure and mitigation strategies to reduce long-term losses from landslide hazards. The information is useful for understanding the nature and scope of ground failures and for improving mitigation strategies.

Federal Regulatory Design Codes for Buildings, Highways, and Other Structures

Federal standards for minimum design regulate the construction of any buildings and other structures (e.g., fish screens) and include the following:

- American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures, ASCE-7-10, 2013
- U.S. Army Corps of Engineers (USACE) (CESPK-ED-G), Geotechnical Levee Practice, SOP EDG-03, 2004
- USACE Engineering and Design, Earthquake Design and Evaluation for Civil Works Projects, ER 1110-2-1806, 2016
- USACE Engineering and Design—Earthquake Design and Evaluation of Concrete Hydraulic Structures, EM 1110-2-6053, 2007
- USACE Engineering and Design—Response Spectra and Seismic Analysis for Concrete Hydraulic Structures, EM 1110-2-6050,1999
- USACE Engineering and Design—Stability Analysis of Concrete Structures, EM 1110-2-2100, 2005
- USACE Engineering and Design—Structural Design and Evaluation of Outlet Works, EM 1110-2-2400, 2003
- USACE Engineering and Design—Time-History Dynamic Analysis of Concrete Hydraulic Structure, EM 1110-2-6051, 2003
- USACE Slope Stability, EM 1110-2-1902, 2003
- U.S. Department of the Interior and USGS Climate Change and Water Resources Management: A Federal Perspective, Circular 1331

These standards establish the minimum design criteria and construction requirements, including design, for concrete and steel structures, levees, buildings, pumping stations, excavation and shoring, grading, and foundations. Standards issued by the state are listed in the following section.

National Earthquake Hazards Reduction Act (U.S. Code Title 42 Section 7704)

In 1977, the U.S. Congress enacted the Earthquake Hazards Reduction Act of 1977 (Public Law 95-124) to "*reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program*." The National Earthquake Hazards Reduction Program was also enacted in 1977, to accomplish the goals of the act. The Earthquake Hazards Reduction Act and National Earthquake Hazards Reduction Program were amended in 1990 to refine the description of agencies' responsibilities, program goals, and objectives. The Earthquake Hazards Reduction Act was amended as the National Earthquake Hazards Reduction Program Act. The four general goals of the National Earthquake Hazards Reduction Program are:

- Develop effective practices and policies to reduce losses of life and property from earthquakes and accelerate their implementation.

- Improve techniques for reducing seismic vulnerabilities of facilities and systems.
- Improve earthquake hazards identification and risk assessment methods, and their use
- Improve the understanding of earthquakes and their effects.

The National Earthquake Hazards Reduction Program Act designates the Federal Emergency Management Agency as the program's lead agency. Other supporting agencies include the National Institutes of Standards and Technology, the National Science Foundation, and USGS.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the State Geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace, because many active faults are complex and consist of more than one branch. There is the potential for ground surface rupture along any of the branches.

California Building Code

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations, Part 2, establishes minimum standards related to structural strength, means of egress to facilities (entering and exiting), and general stability of buildings. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. The California Building Standards Commission administers Title 24, and, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. The provisions of the CBC apply to the construction, alteration, movement, replacement, repair, location, maintenance, and demolition of every building or structure, or any appurtenances connected or attached to such buildings or structures throughout California, and would apply to any structures proposed as part of the Turlock Subbasin GSP PMAs.

Relevant to the project, Chapter 18 of the CBC covers the requirements of geotechnical investigations, including expansive soils (§1803); excavation, grading, and fills (§1804); load-bearing of soils (§1806); as well as foundations (§1808), shallow foundations (§1809), and deep foundations (§1810). Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses mitigation measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions

National Pollutant Discharge Elimination System (NPDES) Construction General Permit

Project construction would disturb 1 acre or more of land surface and could affect the quality of stormwater discharges into waters of the United States; therefore, it would be subject to the NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit regulates construction-related discharges of sediment and other pollutants from sites that disturb 1 or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than 1 acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines. See Section 3.11, *Hydrology and Water Quality*, for additional details.

The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) that includes specific best management practices (BMPs) designed to prevent sediment and pollutants from moving off-site. The BMPs fall into several categories, including erosion control, sediment control, waste management, and good housekeeping. They are intended to protect surface water quality by preventing eroded soil and construction-related pollutants from migrating off-site from the construction area. Routine inspection of all BMPs is required under the Construction General Permit. In addition, the SWPPP must contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, and washing and fueling of vehicles and equipment. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site after construction).

Public Resources Code Section 5097.5 and Section 30244

State requirements for the management of paleontological resources are included in Public Resources Code (PRC) Section 5097.5 and Section 30244. These statutes prohibit the removal of any paleontological site or feature from public lands without permission of the jurisdictional agency, define the removal of paleontological sites or features as a misdemeanor, and require reasonable mitigation of adverse impacts on paleontological resources from developments on public (state, county, city, district) lands.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones, and cities, counties, and other local permitting agencies to regulate certain development projects within these zones. For projects that would locate structures for human occupancy within designated Zones of Required Investigation, the Seismic Hazards Mapping Act requires project applicants to perform a site-specific geotechnical investigation to identify the potential site-specific seismic hazards and corrective measures, as appropriate, prior to receiving building permits. The CGS Guidelines for Evaluating and Mitigating Seismic Hazards (Special Publication 117A) provides guidance for evaluating and mitigating seismic hazards (CGS 2008).

Regional and Local

Merced County General Plan

The 2030 Merced County General Plan (2013) includes the following goals and policies that are applicable to geology, soils, and paleontological resources:

Goal RCR-2: Protect and preserve the cultural, archeological, and historic resources of the County in order to maintain its unique character.

- ***Policy RCR-2.19: Guidelines.*** Establish and adopt mandatory guidelines for use during the environmental review process for private and public projects to identify and protect historical, cultural, archeological, and paleontological resources, and unique geological features.

Goal HS-1: Minimize the loss of life, injury, and property damage of County residents due to seismic and geologic hazards.

- ***Policy HS-1.1: Structural Location and Compliance.*** Require that all new habitable structures be located and designed in compliance with the Alquist-Priolo Special Studies Zone Act and related State earthquake legislation.
- ***Policy HS-1.2: Financial Assistance for Seismic Upgrades Support*** efforts to obtain financial assistance Federal and State agencies in order to implement corrective seismic safety measures required for existing County buildings and structures.
- ***Policy HS-1.4: Ensure Earthquake Resistance Design.*** Require earthquake resistant design for proposed critical structures such as hospitals, fire stations, emergency communication centers, private schools, high occupancy buildings, bridges and freeway overpasses, and dams that are subject to County permitting requirements
- ***Policy HS-1.6: Landslide Areas.*** Prohibit habitable structures on areas of unconsolidated landslide debris or in area vulnerable to landslides.
- ***Policy HS-1.7: Hillside Development Discourage*** construction and grading on slopes in excess of 30 percent.
- ***Policy HS-1.8: Grading Standards.*** Require that the provisions of the International Building Code be used to regulate projects subject to hazards from slope instability.

- ***Policy HS-1.9: Unstable Soils.*** Require and enforce all standards contained in the International Building Code related to construction on unstable soils.

Goal W-2: Ensure the adequate wastewater collection, treatment, and disposal within the County.

- ***Policy PFS-2.10: Consistency with SWRCB OWTS Requirements.*** Revise the County's on-site sewage disposal standards to conform to the SWRCB's Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems, and submit the revised standards for approval as a Local Agency Management Program to maintain local oversight and approval of OWTS.

Goal PFS-3: Ensure the management of stormwater in a safe and environmentally sensitive manner through the provision of adequate storm drainage facilities that protect people, property, and the environment.

- ***Policy PFS-3.1: Stormwater Management Plans.*** Require stormwater management plans for all Urban Communities to reduce flood risk, protect soils from erosion, control stormwater runoff, and minimize impacts on existing drainage features.

Goal NR-3: Facilitate orderly development and extraction of mineral resources while preserving open space, natural resources, and soil resources and avoiding or mitigating significant adverse impacts.

- ***Policy NR-3.1: Soil Protection.*** Protect soil resources from erosion, contamination, and other effects that substantially reduce their value or lead to the creation of hazards.
- ***Policy NR-3.2: Soil Erosion and Contamination.*** Require minimal disturbance of vegetation during construction to improve soil stability, reduce erosion, and improve stormwater quality.

Stanislaus County General Plan

The Stanislaus County General Plan (2015) includes the following goals and policies that are applicable to geology, soils, and paleontological resources:

Goal 1: Prevent loss of life and reduce property damage as a result of natural disasters.

- ***Policy 3*****:** Development should not be allowed in areas that are particularly susceptible to seismic hazard.
- ***Policy 4*****:** Development west of I-5 in areas susceptible to landslides (as identified in this element) shall be permitted only when a geological report is presented with (a) documented evidence that no such potential exists on the site, or (b) identifying the extent of the problem and the mitigation measures necessary to correct the identified problem.
- ***Policy 14*****:** The County will continue to enforce state-mandated structural Health and Safety Codes, including but not limited to the California Building Code, the International Property Maintenance Code, the California Fire Code, the California Plumbing Code, California Electric Code, and Title 24, Part 1-9.

Goal 8: Preserve areas of national, state, regional, and local historical importance.

- ***Policy 24*:** The County will support the preservation of Stanislaus County's cultural legacy of archeological, historical, and paleontological resources for future generations.

Stanislaus and Merced County Well Permitting Ordinances

Well permitting processes have been established by both Stanislaus County and Merced County to implement county-wide groundwater ordinances. The objectives of these ordinances are to control groundwater exports, to mitigate overdraft, and to require proper well construction and abandonment procedures for the protection of groundwater resources.

City General Plans

Table 3.8-1 summarizes the key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.8-1
CITY GENERAL PLAN POLICIES GOVERNING GEOLOGY, SOILS, AND PALEONTOLOGICAL RESOURCES WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Geology, Soils, and Paleontological Resources
City of Turlock	Chapter 10 Safety, Policies 10.2-a, 10.2-b, and 10.2-e through 10.2-h.
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, C. Soils and Geologic Resources, D. Agricultural Resource Policies, and K. Seismic and Geologic Hazards
City of Ceres	Chapter 5 Health and Safety, Policies 5.G.1 and 5.G.5 through 5.G.8.
City of Hughson	Chapter 6 Safety Element, Policies S-1.1 through S-1.4.

3.8.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts related to geology, soils, and paleontological resources focuses on the potential for substantial adverse effects associated with surface fault rupture, seismic ground shaking, liquefaction, landslides, soil erosion, unstable and expansive soils, and the loss of significant paleontological resources. Geologic impacts from the types of PMAs implemented under the Turlock Subbasin GSP are evaluated in terms of how typical construction and operation could cause or exacerbate existing geologic hazards, or how these activities could impact significant paleontological resources. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might be taken in the future consistent with the level of detail appropriate for a program-level analysis.

In determining the extent and implications of geologic hazards and threats to paleontological resources, consideration has been given to the following:

- The location(s) of nearby Holocene-active and pre-Holocene faults.

- Placement of habitable structures within designated EFZs or within areas of high potential for liquefaction, landslides, or unstable or expansive soils.
- The extent to which project activities could increase soil erosion.
- Soil types in the area that may be unstable, expansive, or unsuitable to support the use of septic tanks or alternative wastewater treatment systems.
- A review of available geologic maps, geologic and paleontological scientific literature, and records of past fossil discoveries and localities, to determine the paleontological potential in the area.
- The expected amount and extent of development associated with the GSP (as new developments [and people] would be subject to the aforementioned geologic hazards; new development has the potential to encounter and disturb paleontological resources as well, specifically construction activities).

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational-related activities). Temporary impacts are those that would be temporary in nature (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The impact analysis relies on the use of existing quantitative and qualitative data including but not limited to existing reports, desktop surveys, open access databases, maps, and models. Information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2 was also reviewed.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on geology, soils, or paleontological resources if it would:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42 (CGS 2018).
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Landslides.
- Result in substantial soil erosion or the loss of topsoil.

- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive[7] soil creating substantial direct or indirect risks to life or property.
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of wastewater;
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Issues Not Evaluated Further

Based on the most current mapping, there are no known active faults or EFZs within the Turlock Subbasin. Implementation of PMAs under the Turlock Subbasin GSP would not be affected by any known active faults or EFZs as delineated by the State Geologist. Given the absence of any known active fault or EFZ, there would be no impact under this criterion, and therefore this issue of rupture of a known earthquake fault is not discussed further.

Implementation of PMAs under the Turlock Subbasin GSP would generally consist of the construction of new or modification of existing injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase recharge potential at a site, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, water storage tanks, and irrigation basins to enable surface water deliveries to drip/micro systems. These types of features are not habitable structures that would require the use of septic tanks. There would be **no impact** associated with soils adequate for supporting septic tanks or alternative waste water disposal systems, and therefore this issue is not discussed further.

Impacts and Mitigation Measures

Table 3.8-2 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

[7] Appendix G cites Table 18-1-B of the 1994 Uniform Building Code. However, in California, expansive soils are currently defined in California Building Code (2019) Section 1803.5.3.

TABLE 3.8-2
SUMMARY OF IMPACT CONCLUSIONS—GEOLOGY, SOILS, AND PALEONTOLOGICAL RESOURCES

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
GEO-1: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	LTSM	LTSM
GEO-2: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	LTSM	LTSM
GEO-3: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.	LTSM	LTSM
GEO-4: Implementing PMAs under the Turlock Subbasin GSP could result in substantial soil erosion or the loss of topsoil.	LTS	LTS
GEO-5: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.	LTS	LTS
GEO-6: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on expansive soils, creating substantial direct or indirect risks to life or property.	LTSM	LTSM
GEO-7: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	LTSM	LTSM

NOTES: LTS = less than significant; LTSM = less than significant with mitigation

SOURCE: Data compiled by Environmental Science Associates in 2022

Impact GEO-1: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of those Features

PMAs implemented under the Turlock Subbasin GSP could include activities associated with the construction of new or modification of existing injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase recharge potential at a site, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, water storage tanks, and irrigation basins to enable surface water deliveries to drip/micro systems.

Due to the proximity to the Holocene-active Ortigalita and Greenville fault zones, and the pre-Holocene San Joaquin fault, structures associated with the PMAs implemented under the Turlock Subbasin GSP could be subject to the effects of strong seismic ground shaking in the event of an earthquake on one of the previously mentioned faults. Strong seismic ground shaking could potentially damage new features, resulting in loss, injury, or death. If wells, pipelines, water storage tanks, etc. were damaged during an earthquake due to seismic ground shaking, this would be a **potentially significant** impact.

As required by California law, any new developments would be subject to the seismic design criteria of the CBC, which requires that all structures be constructed to withstand anticipated ground shaking from regional fault sources. Each new development would be required to obtain a site-specific geotechnical report prior to the issuance of individual grading permits; each new development would be required to retain a licensed geotechnical engineer to design new structures to withstand probable seismically induced ground shaking. The CBC standards require all new developments to be designed consistent with a site-specific, design-level geotechnical report, which would be fully compliant with the seismic recommendations of a California-registered professional geotechnical engineer. Adherence to the applicable CBC requirements would ensure that implementing PMAs under the Turlock Subbasin GSP would not directly or indirectly cause substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.

Mitigation Measure GEO-1 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project proponent(s).

> **Mitigation Measure GEO-1: Include Geotechnical Design Recommendations.**
>
> To minimize potential impacts from seismic events and the presence of adverse soil conditions, lead agencies shall ensure that geotechnical design recommendations are included in the design of features and construction specifications. Recommended measures to address adverse conditions shall conform to applicable design codes, guidelines, and standards.

Implementing Mitigation Measures GEO-1 would reduce potentially significant impacts related to the potential exposure to people and structures to risk of loss, injury, or death due to a fault rupture to a **less-than-significant** level.

Impact GEO-2: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of those Features

Based on the available data from geologic maps and groundwater data, there are areas of—at the very least—moderate liquefaction potential. Construction of new features and/or modification of existing features associated with the PMAs implemented under the Turlock Subbasin GSP could be subject to the damaging effects of liquefaction in the event of an earthquake on one of the previously mentioned faults.

California law requires that all new structures be constructed to withstand any anticipated seismic-related ground failures, including liquefaction, due to ground shaking from regional fault sources. For each PMA, a site-specific geotechnical report would be required prior to the issuance of individual grading permits; each new feature would be required to retain a licensed geotechnical engineer to investigate and evaluate each PMA site and design new features to withstand probable seismic-related ground failures, such as liquefaction. The CBC standards require all new developments to be designed consistent with a site-specific, design-level geotechnical report, which would be fully compliant with the seismic recommendations of a California-registered professional geotechnical engineer. Liquefaction hazards can generally be addressed through site preparation measures or foundation design measures, such as the removal and replacement of liquefiable soils, densification of these soils, or specific foundation design recommendations. Implementation of these measures in accordance with building code requirements can effectively reduce the hazard to minimize any potential for substantive damage.

Mitigation Measure GEO-2 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project proponent(s).

Mitigation Measure GEO-2: Conduct Geotechnical Investigation and Report.

A PMA geotechnical investigation shall be performed and a geotechnical report prepared for any PMA that would result in potentially significant grading activities. The geotechnical report shall include a quantitative analysis to determine whether excavation or fill placement would result in a potential for damage due to soil subsidence during and/or after construction. Project designs shall incorporate measures to reduce the potential damage to a less-than-significant level. Measures shall include but not be limited to:

- Removal and recompaction of existing soils susceptible to subsidence.
- Ground improvement (such as densification by compaction or grouting, soil cementation).
- Reinforcement of structural components to resist deformation due to subsidence.

The assessment of subsidence for specific projects shall analyze the individual PMA potential for and severity of cyclic seismic loading. A geotechnical investigation shall also be performed by an appropriately licensed professional engineer and/or geologist to determine the presence and thickness of potentially liquefiable sands that could result in loss of bearing value during seismic shaking events. Project designs shall incorporate measures to mitigate potential damage to a less-than-significant level. Measures shall include but not be limited to:

- Ground improvement (such as grouting or soil cementation).
- Surcharge loading by the placement of fill, excavation, soil mixing with non-liquefiable finer-grained materials, and replacement of liquefiable materials at shallow depths.
- Reinforcement of structural components to resist deformation due to liquefaction.
- An analysis of individual PMAs' probable and credible seismic acceleration values, conducted in accordance with current applicable standards of care, shall be performed to provide for a suitable project design. Geotechnical investigations shall be performed and geotechnical reports shall be prepared in the responsible care of

California-licensed geotechnical professionals including professional civil engineers, certified geotechnical engineers, professional geologists, certified engineering geologists, and certified hydrogeologists, all of whom practice within the current standards of care for such work

Compliance with all applicable CBC requirements and Mitigation Measure GEO-2 would ensure that implementing PMAs under the Turlock Subbasin GSP would not directly or indirectly cause substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking. Therefore, impacts would be **less than significant**.

Impact GEO-3: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of those Features

Areas within the Turlock Subbasin that are urbanized and have existing developments have a very low landslide potential as there are no steep slopes or hillsides. Based on geologic mapping, no previous or historical landslides have been mapped within the Turlock Subbasin; however, this is not a definitive conclusion that landslides could not happen in the area. Although CGS has not mapped the area for landslide potential, areas within the Turlock Subbasin could be susceptible to earthquake-induced landslides. If construction of new or modification of existing features associated with the PMAs implemented under the Turlock Subbasin GSP would be proposed within areas of high landslide potential, this could be a **potentially significant** impact.

Mitigation Measure GEO-2 would reduce any potential hazard associated with earthquake-induced landslides.

Compliance with CBC requirements and Mitigation Measure GEO-2, would reduce or avoid impacts related to landslides. Implementing PMAs under the Turlock Subbasin GSP would not directly or indirectly result in adverse effects related to landslides, and the impact would be **less than significant**.

Impact GEO-4: Implementing PMAs under the Turlock Subbasin GSP could result in substantial soil erosion or the loss of topsoil.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of those Features

Construction activities associated with implementing PMAs under the Turlock Subbasin GSP could include ground-disturbing activities such as the mobilization of equipment and materials; preparation of staging areas; staging and storage of equipment and materials; preparation of project sites; preparation/use of borrow sites; well drilling; site restoration and/or site demobilization; disposal of excess materials; dewatering, excavation, fill, and placement of materials in water; and drainage modifications. Land that is fallowed or idled is more susceptible to soil erosion due to the reduced vegetative cover to secure the soil and prevent soils from being blown or washed away (as discussed in Section 3.4, *Air Quality*). These ground-disturbing activities are some examples of activities that could contribute to substantial soil erosion or the loss of topsoil.

PMAs that would require the disturbance of 1 or more acres during construction would be subject to the requirements of the NPDES General Permit for Stormwater Discharge Associated with Construction and Land Disturbance Activities (Construction General Permit). The NPDES permit requires the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP), which would include Best Management Practices (BMPs) designed to control and reduce soil erosion. The BMPs may include dewatering procedures, stormwater runoff quality control measures, watering for dust control, and the construction of silt fences. Additionally, Mitigation Measures AIR-2: Minimize dust from fallowed lands, would be required when applicable to a given project that potentially creates significant dust from fallowing lands (i.e., removing vegetation and irrigation causing dust). Compliance with this independently enforceable existing requirement and implementation of these soil and erosion control measures would ensure that impacts related to erosion and soil loss would be **less than significant**.

Impact GEO-5: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of those Features

As discussed above, implementation of PMAs under the Turlock Subbasin GSP could be subject to the potential effects of unstable soils. Any new features that are proposed in areas determined to be susceptible to geotechnical hazards (e.g., liquefaction or landslide) would be subject to the damaging effects of these hazards. Also discussed above is the requirement that subjects all PMAs to the building standards of the CBC. Mitigation Measure GEO-2 would include an analysis of potential unstable soil conditions at a site, if applicable. If unstable soil conditions are determined to be present at a given site, the geotechnical report specific to that site would include site-specific design requirements to implement to reduce or avoid adverse effects associated with unstable soils.

Compliance with CBC requirements, including implementation of recommendations provided in site-specific geotechnical reports, would reduce or avoid impacts related to unstable soils. Implementing PMAs under the Turlock Subbasin GSP would not directly or indirectly result in adverse effects related to unstable soils, and the impact would be **less than significant.**

Impact GEO-6: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on expansive soils, creating substantial direct or indirect risks to life or property.

Effects of Construction Activities, Constructed Features and Operations and Maintenance of those Features

As discussed, the soil conditions throughout the Turlock Subbasin vary widely. Soil expansion generally occurs in fine-grained clayey sediments, which could be present within the Turlock Subbasin area. If features associated with the implementation of PMAs under the Turlock Subbasin GSP are constructed within areas susceptible to soil expansion, the structures would be at risk of the damaging effects of expansive soils. This would be a **potentially significant impact**.

Mitigation Measure GEO-3 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project proponent(s).

Mitigation Measure GEO-3: Conduct Expansive Clay Investigation.

In areas where expansive clays exist, a licensed professional engineer or geologist shall perform a hydrogeological/geotechnical investigation to identify and quantify the potential for expansion, particularly differential expansion of clayey soils caused by leakage and saturation beneath new improvements. Measures could include, but are not limited to, removing and recompacting problematic expansive soils, stabilizing soils, and/or reinforcing the constructed improvements to resist deformation from the expansion of subsurface soils.

Implementing Mitigation Measures GEO-3 would reduce potentially significant impacts related to PMAs being located on expansive soils, creating substantial direct or indirect risks to life or property, to a **less-than-significant** level.

Impact GEO-7: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of those Features

A review of the available geologic maps, scientific literature, and institutional records has indicated geologic units with a high potential to contain significant paleontological resources occur within the Turlock Subbasin. In general, Holocene-age alluvial deposits have a low potential to contain significant paleontological resources at the surface; however, the potential increases in the deeper layers of those deposits. Additionally, the Pleistocene-age Modesto and Riverbank formations, and the Miocene-age Mehrten Formation, are considered to have a high potential to contain significant paleontological resources.

The addition of new features or the modification of existing features associated with PMAs implemented under the Turlock Subbasin GSP would require grading and excavation during the construction phases of future developments. Paleontological resources may be encountered in deep excavations (generally, approximately 6 or more feet below ground surface, depending on site-specific information) into previously undisturbed Holocene-age alluvium (where Pleistocene-age sediments are present). Excavations at any depth in previously undisturbed deposits of the Modesto, Riverbank, and Mehrten formations have the potential to encounter significant paleontological resources. If significant paleontological resources are encountered and inadvertently destroyed during construction of new developments, that would constitute a **potentially significant impact**.

To ensure that potential impacts on significant paleontological resources are less than significant Mitigation Measure GEO-4: Determination of Paleontological Potential would be required to ensure that each PMA undergoes individual CEQA analysis and be assigned a paleontological sensitivity specific to each site based on site-specific project information (i.e., the extent of ground disturbance and potential geologic units that would be encountered). Based on the project-specific details, individual paleontological resource assessment reports will be prepared and include appropriate mitigation to be implemented to reduce potential impacts on significant paleontological resources.

Mitigation Measure GEO-04: Determination of Paleontological Potential.

Prior to issuance of a grading permit for any PMA that requires ground disturbance (i.e., excavation, grading, trenching, etc.) in previously undisturbed deposits of Holocene-age alluvium and/or the Modesto, Riverbank, or Mehrten formations, the PMA will undergo a CEQA-level analysis to determine the potential for a project to encounter significant paleontological resources, based on a review of site-specific geology and the extent of ground disturbance associated with each project. The analysis shall include, but would not be limited to: (1) a paleontological records search, (2) geologic map review, and (3) peer-reviewed scientific literature review. If it is determined that a site has the potential to disturb or destroy significant paleontological resources, a professional paleontologist (meeting the SVP standards) will be retained to recommend appropriate mitigation to reduce or avoid significant impacts on paleontological resources, based on project-specific information. Such measures could include, but would not be limited to: (1) preconstruction worker awareness training, (2) paleontological resource monitoring, and (3) salvage of significant paleontological resources.

Implementation of Mitigation Measure GEO-4 would ensure that a thorough analysis of the potential to encounter significant paleontological resources is performed in accordance with SVP standard guidelines. If it is determined that the potential exists for a project to encounter and destroy significant paleontological resources, the appropriate steps will be followed to ensure that a professional paleontologist is retained to prepare a paleontological resource management plan (or similar), which will include appropriate mitigation recommendations to avoid a potentially significant impact. Compliance with Mitigation Measure GEO-4 will reduce impacts to **less than significant**.

3.9 Greenhouse Gases

3.9.1 Introduction

This section describes and evaluates the potential for the construction and operation for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to result in significant impacts on greenhouse gas (GHG) emissions and global climate change. The section describes the existing regional and local conditions, and the regulatory framework governing GHG emissions; presents the significance criteria used to evaluate the impacts of the GHG emissions from implementation of the Turlock Subbasin GSP; and presents the results of the impact assessment, including any significant impacts and associated feasible mitigation measures. The Turlock Subbasin GSP is also evaluated for consistency with plans and policies of the State of California Climate Change Scoping Plan Update (CARB 2017).

No comments specifically addressing GHGs were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.9.2 Environmental Setting

Gases that trap heat in the atmosphere are referred to as greenhouse gases because they capture heat radiated from the sun as it is reflected back into the atmosphere, much like a greenhouse does. The accumulation of GHGs in the atmosphere contributes to global climate change. Climate change, which is discussed in more detail below, refers to any significant changes in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from:

- Natural factors, such as changes in the sun’s intensity or slow changes in the Earth’s orbit around the sun.
- Natural processes within the climate system (e.g., changes in ocean circulation, reduction in sunlight from the addition of GHG and other gases to the atmosphere from volcanic eruptions).
- Human activities that change the atmosphere’s composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification).

The primary effect of human activities has been a rise in the average global tropospheric temperature of 0.2 degree Celsius (°C) per decade, determined from meteorological measurements worldwide between 1990 and 2005. Climate change modeling using 2000 emissions rates shows that further warming will likely occur, which would induce further changes in the global climate system during the current century (IPCC 2007).

Greenhouse Gases

The primary GHGs, or climate pollutants, are carbon dioxide (CO_2), black carbon, methane (CH_4), nitrous oxide (N_2O), ozone, and water vapor.

While the primary GHGs are naturally occurring, CO_2, CH_4, and N_2O are also emitted from human activities, accelerating the rate at which these compounds occur within the Earth's atmosphere. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing associated with agricultural practices and landfills. N_2O is a by-product of various industrial processes. Black carbon (fine particulate matter from incomplete combustion) has emerged as a major contributor to global climate change, possibly second only to CO_2. Black carbon is produced naturally and by human activities from the incomplete combustion of fossil fuels, biofuels, and biomass (Center for Climate and Energy Solutions 2010). Other GHGs include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, which are generated in certain industrial processes. GHGs are typically reported in "carbon dioxide-equivalent" measures (CO_2e).[1]

Effects of Climate Change

The scientific community's understanding of the fundamental processes responsible for global climate change has improved over the past decade, and its predictive capabilities are advancing. However, significant scientific uncertainties remain, for example, in the predictions of local effects of climate change; occurrence, frequency, and magnitude of extreme weather events; effects of aerosols; changes in clouds; shifts in the intensity and distribution of precipitation; and changes in oceanic circulation. Because of the complexity of the Earth's climate system and inability to accurately model it, the uncertainty surrounding climate change may never be completely eliminated. Nonetheless, the *Fifth Assessment Report*, *Summary for Policy Makers*[2] of the Intergovernmental Panel on Climate Change (IPCC) states that, "it is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forces [*sic*] together" (IPCC 2014). A report from the National Academy of Sciences concluded that 97 to 98 percent of the climate researchers most actively publishing in the field support the tenets of the IPCC in that climate change is very likely caused by human (i.e., anthropogenic) activity (Anderegg et al. 2010).

The Fourth California Climate Change Assessment (Fourth Assessment), published in 2018, finds that the potential impacts in California due to global climate change include: loss in snowpack, sea level rise, more extreme heat days per year, more high ozone days, more extreme forest fires, more severe droughts punctuated by extreme precipitation events, increased erosion of California's coastlines and sea water intrusion into the Sacramento and San Joaquin Deltas and associated levee systems, and increased pest infestation (OPR 2018a).

The Fourth Assessment's findings are consistent with climate change studies published by the California Natural Resources Agency (CNRA) since 2009, starting with the *California Climate Adaptation Strategy* as a response to the Governor's Executive Order (EO) S-13-2008 (CNRA

[1] Because of the differential heat absorption potential of various GHGs, GHG emissions are frequently measured in "carbon dioxide-equivalents," which present a weighted average based on each gas's heat absorption (or "global warming") potential.

[2] The IPCC is currently in the process of preparing the Sixth Assessment Report which has yet to be published at the time of this PEIR.

2009). In 2014, the CNRA rebranded the first update of the 2009 adaptation strategy as the *Safeguarding California Plan* (CNRA 2014). The 2018 update to *Safeguarding California* identifies hundreds of ongoing actions and next steps that state agencies are taking to safeguard Californians from climate impacts within a framework of 81 policy principles and recommendations (CNRA 2018a). In 2016, the CNRA released *Safeguarding California: Implementation Action Plans* in accordance with EO B-30-15, identifying a lead agency to lead adaptation efforts in each sector. In accordance with the 2009 *California Climate Adaptation Strategy*, the California Energy Commission (CEC) was directed to develop a website on climate change scenarios and impacts that would be beneficial for local decision makers. The website, known as Cal-Adapt, became operational in 2011.[3] The information provided on the Cal-Adapt website represents a projection of potential future climate scenarios comprised of local average values for temperature, sea level rise, snowpack, and other data representative of a variety of models and scenarios, including potential social and economic factors.

Below is a summary of some of the potential effects that could be experienced in California as a result of global warming and climate change.

Temperature Increase

The primary effect of adding GHGs to the atmosphere has been a rise in the average global temperature. The impact of human activities on global temperature is readily apparent in the observational record. Since 1895, the contiguous U.S. has experienced an average temperature increase of 1.5 degrees Fahrenheit (°F) per century. The last 5-year period (2014–2018) is the warmest on record for the contiguous U.S. (NOAA 2019), while the 20 warmest years have occurred over the past 22-year period (Climate Central 2019).

The Fourth Assessment indicates that average temperatures in California could rise by 5.6°F to 8.8°F by the end of the century, depending on the global trajectory of GHG emissions (OPR 2018a). With climate change, extreme heat conditions and heat waves are predicted to affect larger areas, last longer, and have higher temperatures. Heat waves, defined as three or more days with temperatures above 90°F, are projected to occur more frequently by the end of the century. Extreme heat days and heat waves can negatively impact human health. Heat-related illness includes a spectrum of illnesses ranging from heat cramps to severe heat exhaustion and life-threatening heat stroke (CalEPA and CDPH 2013).

Wildfires

The expected hotter and drier conditions expected with climate change will make forests more susceptible to extreme wildfires. A recent study found that if GHG emissions continue to rise, the frequency of extreme wildfires burning over approximately 25,000 acres in California would increase by nearly 50 percent, and the average area burned statewide each year would increase by 77 percent, by the year 2100. In the areas with the highest fire risk, the cost of wildfire insurance is

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[3] The Cal-Adapt website address is: http://cal-adapt.org.

estimated to rise by 18 percent by 2055 and the fraction of property insured would decrease (Westerling 2018).

Air Quality

Higher temperatures, conducive to air pollution formation, could worsen air quality in California and make it more difficult for the state to achieve air quality standards. Climate change may increase the concentration of ground-level ozone in particular, which can cause breathing problems; aggravate lung diseases such as asthma, emphysema, and chronic bronchitis; and cause chronic obstructive pulmonary disease. Emissions from wildfires can lead to excessive levels of particulate matter, ozone, and volatile organic compounds (Kenward et al. 2013). Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state (CalEPA and CDPH 2013).

Water Supply and Water Quality

The overall effects of global climate change on future water supplies in California are uncertain. Studies indicate considerable variability in predicting precise impacts of climate change on hydrology and water resources in California. Increasing uncertainty in the timing and intensity of precipitation will challenge the operational flexibility of California's water management systems. Warmer, wetter winters would increase the amount of runoff available for groundwater recharge; however, this additional runoff would occur at a time when some basins are either being recharged at their maximum capacity or are already full. Conversely, reductions in spring runoff and higher evapotranspiration because of higher temperatures could reduce the amount of water available for recharge (CNRA 2014).

Climate change could alter water quality in various ways, including through higher winter stream flows that reduce pollutant concentrations (through dilution) or increase erosion of land surfaces and stream channels, leading to higher sediment, chemical, and nutrient loads in rivers. Water temperature increases and decreased water flows can result in increasing concentrations of pollutants and salinity. Increases in water temperature alone can lead to adverse changes in water quality, even in the absence of changes in precipitation.

Sea Level Rise

Climate change could potentially affect the amount of snowfall, rainfall, and snowpack; the intensity and frequency of storms; flood hydrographs (flash floods, rain-on-snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for saltwater intrusion (CNRA 2014).

Agriculture

California has a massive agricultural industry that represents 11.3 percent of total U.S. agricultural revenue. Higher CO_2 levels can stimulate plant production and increase plant water-use efficiency. However, a changing climate presents significant risks to agriculture due to "*potential changes to water quality and availability; changing precipitations patterns; extreme weather events including drought, severe storms, and floods; heat stress; decreased chill hours; shifts in* *pollinator lifecycles; increased risks from weeds, pest and disease; and disruptions to the transportation and energy infrastructure supporting agricultural production*" (CNRA 2014).

Ecosystems and Wildlife

Increases in global temperatures and the potential resulting changes in weather patterns could have ecological effects on global and local scales. With climate change, ecosystems and wildlife will be challenged by the spread of invasive species, barriers to species migration or movement in response to changing climatic conditions, direct impacts on species health, and mismatches in timing between seasonal life-cycle events such as species migration and food availability (CNRA 2014).

Public Health

Global climate change will also result in more extreme heat events (OPR 2018a). These extreme heat events increase the risk of death from dehydration, heart attack, stroke, and respiratory distress, especially with people who are ill, children, the elderly, and the poor, who may lack access to air conditioning and medical assistance. A warming planet will bring more severe weather events, worsening wildfires and droughts, cause a decline in air quality, and result in rising sea levels and increases in allergens and in vector-borne diseases, all of which present significant health and wellbeing risks for California populations (CNRA 2018a).

Emissions Inventories

An emissions inventory that identifies and quantifies the primary human-generated sources and sinks of GHGs is a well-recognized and useful tool for addressing human society's contributions to climate change. This section summarizes the latest information on global, United States, California, and local GHG emission inventories.

Global Emissions

Global emissions estimates are based on country inventories developed as part of programs of the United Nations Framework Convention on Climate Change. Worldwide man-made emissions of GHGs were approximately 49 billion metric tons (MT) CO_2e in 2010, including ongoing emissions from industrial and agricultural sources and emissions from land use changes (e.g., deforestation). Emissions of CO_2 from fossil fuel use and industrial processes account for 65 percent of this total CO_2e, while CO_2 emissions from all sources account for 76 percent of the total CO_2e. Methane emissions account for 16 percent and N_2O emissions for 6.2 percent. Worldwide emissions of GHGs in 1970 were 27 billion MT of CO_2e per year (IPCC 2014), indicating that emissions have almost doubled in a span of 40 years. The IPCC is currently working on its *Sixth Assessment Report* with an updated inventory in press (IPCC 2021).

U.S. Emissions

In 2019, the United States emitted about 6,558 million metric tons (MMT) of CO_2e, with 92 percent of those emissions coming from fossil fuel combustion. Of the major sectors nationwide, transportation accounts for the highest amount of GHG emissions (approximately

29 percent), followed by electricity (25 percent), industry (23 percent), agriculture (10 percent), commercial buildings (7 percent), and residential buildings (6 percent). Between 1990 and 2019, total U.S. GHG emissions rose by 1.8 percent, but emissions have generally decreased since peaking in 2005. Since 1990, U.S. emissions have increased at an average annual rate of 0.1 percent (USEPA 2021).

State of California Emissions

The California Air Resources Board (CARB) compiles GHG inventories for the State of California. Based on the 2019 GHG inventory data (i.e., the latest year for which data are available from CARB) published by CARB in 2021, California emitted 418.2 MMT CO_2e, including emissions from imported electrical power (CARB 2021). Between 2000 and 2019, the gross domestic product of California grew by approximately 63 percent. Despite the economic growth, CARB's 2019 statewide inventory indicated that California's net GHG emissions in 2019 were just 13 MMT CO2e below 1990 levels, which is the 2020 GHG reduction target codified in California Health and Safety Code (HSC), Division 25.5, also known as the Global Warming Solutions Act of 2006 (AB 32). **Table 3.9-1** identifies and quantifies statewide anthropogenic GHG emissions and sinks (e.g., carbon sequestration due to forest growth) in 1990 and 2019. As shown in the table, the transportation sector is the largest contributor to statewide GHG emissions, at approximately 40 percent in 2019. Data in this table reflect CARB adjusting statewide emissions to account for updates to global warming potential of GHGs other than CO_2 as determined by IPCC.

TABLE 3.9-1
STATE OF CALIFORNIA GREENHOUSE GAS EMISSIONS

Category	Total 1990 Emissions using IPCC SAR (MMT CO_2e)	Percent of Total 1990 Emissions SAR/AR4	Total 2019 Emissions using IPCC AR4 (MMT CO_2e)	Percent of Total 2019 Emissions
Transportation	150.7	35%/35%	166	40%
Electric Power	110.6	26%/26%	59	14%
Commercial Fuel Use	14.4	3%/3%	16	4%
Residential	29.7	7%/7%	27	6%
Industrial	103.0	24%/24%	97	23%
Recycling and Waste[a]	–	–	8.5	2%
High GWP/Non-Specified[b]	1.3	<1%/<1%	33	5%
Agriculture/Forestry	23.6	6%/5%	33	8%
Forestry Sinks	-6.7		-- [c]	--
Net Total (IPCC SAR)	**426.6**	**100%[e]**	--	--
Net Total (IPCC AR4)[d]	**431**	**100%**	**418.2**	**100%**

NOTES:
IPCC = Intergovernmental Panel on Climate Change; SAR = Second Assessment Report; AR4 = Fourth Assessment Report.
[a] Included in other categories for the 1990 emissions inventory.
[b] High global warming potential (GWP) gases are not specifically called out in the 1990 emissions inventory.
[c] Revised methodology under development (not reported for 2019).
[d] CARB revised the state's 1990 level GHG emissions using GWPs from the IPCC AR4.
[e] Values may not total to 100% due to rounding.

SOURCES: CARB 2007, 2021.

Stanislaus County Emissions

Stanislaus County prepared a GHG emissions inventory in 2013 that established the county's baseline GHG emissions for 2005 to be 6,044,113 MT of CO2e (ICF 2013). This inventory established the baseline emissions from various sectors within the county. The primary emissions sectors include on-road transportation (23 percent), building energy-electricity (23 percent), agriculture-livestock (18 percent), building energy-natural gas (16 percent), agriculture-other (6 percent), high global warming potential (GWP) refrigerants (6 percent), and off-road transportation (2 percent). All other sectors (waste generation, wastewater treatments, and water treatment and conveyance) contributed less than 1 percent of the county's total emissions. Excluded from this inventory were 642,576 MT CO2e from stationary sources and 16,225 MT CO2e from landfills, both of which the state regulates separately.

Merced County Emissions

Merced County is currently developing a Climate Action Plan (CAP), which is a strategy for how it will reduce its greenhouse gas emissions in accordance with statewide targets. A 2008 inventory established the baseline emissions from various sectors within the county contributing to the total county-wide emissions of 423,010 MT CO2e/year. The primary emissions sectors include commercial/industrial sources (35 percent), transportation (34 percent), residential (25 percent), government (4 percent), and solid waste (2 percent)

3.9.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to GHGs. Implementation of any PMA may be subject to the laws and regulations listed below, as well as other local plans, policies, and ordinances, depending on the project location.

Federal

U.S. Environmental Protection Agency "Endangerment" and "Cause or Contribute" Findings

The U.S. Supreme Court held that the United States Environmental Protection Agency (USEPA) must consider the regulation of motor vehicle GHG emissions. In *Massachusetts v. Environmental Protection Agency* et al., 12 states and cities, including California, together with several environmental organizations sued to require the USEPA to regulate GHGs as pollutants under the Clean Air Act (CAA) (127 S. Ct. 1438 (2007)). The Supreme Court ruled that GHGs fit within the CAA's definition of a pollutant, and the USEPA had the authority to regulate GHGs.

On December 7, 2009, the USEPA Administrator signed two distinct findings regarding GHGs under Section 202(a) of the CAA:

- **Endangerment Finding:** The current and projected concentrations of the six key GHGs—CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—in the atmosphere threaten the public health and welfare of current and future generations.

- **Cause or Contribute Finding:** The combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

These findings did not, by themselves, impose any requirements on industry or other entities. However, these actions were a prerequisite for implementing GHG emissions standards for vehicles.

Vehicle Emissions Standards

In 1975, Congress enacted the Energy Policy and Conservation Act, which established the first fuel economy standards for on-road motor vehicles in the United States. Pursuant to the act, the USEPA and National Highway Traffic Safety Administration (NHTSA) are responsible for establishing additional vehicle standards. In August 2012, standards were adopted for model years 2017 through 2025 for passenger cars and light-duty trucks. By 2025, vehicles are required to achieve both 54.5 miles per gallon (mpg) (if GHG reductions are achieved exclusively through fuel economy improvements) and 163 grams of CO_2 per mile. According to the USEPA, a model year 2025 vehicle would emit one-half of the GHG emissions from a model year 2010 vehicle (USEPA 2012). Notably, the State of California harmonized its vehicle efficiency standards through 2025 with the federal standards (see Advanced Clean Cars program below).

In January 2017, USEPA issued its Mid-Term Evaluation of the GHG emissions standards, finding that it would be practical and feasible for automakers to meet the model years 2022–2025 standards through a number of existing technologies.

In August 2018, the USEPA revised its 2017 determination, and issued a proposed rule that maintains the 2020 Corporate Average Fuel Economy (CAFE) and CO_2 standards for model years 2021 through 2026.[4] The estimated CAFE and CO_2 standards for model year 2020 are 43.7 mpg and 204 grams of CO_2 per mile for passenger cars and 31.3 mpg and 284 grams of CO_2 per mile for light trucks, projecting an overall industry average of 37 mpg, as compared to 46.7 mpg under the standards issued in 2012. On February 7, 2019, the State of California, joined by 16 other states and the District of Columbia, filed a petition challenging the USEPA's proposed rule to revise the vehicle emissions standards, arguing that the USEPA had reached erroneous conclusions about the feasibility of meeting the existing standards.[5] In August 2020, a decision was made by the Second Circuit Court of Appeals to vacate the rule, and the USEPA's existing CAFE standards will remain unchanged.

State

California has promulgated a series of executive orders, laws, and regulations to reduce both the level of GHGs in the atmosphere and emissions of GHGs from commercial and private activities within the state. The major components of California's climate protection initiative are summarized below.

4 Federal Register. Vol. 83, No. 165. August 24, 2018. Proposed Rules.

5 Amicus brief, 2019. USCA Case #18-1114, Doc#1772455_filed February 14, 2019. Available: http://climatecasechart.com/case/california-v-epa-4/. Accessed April 17, 2019.

California Environmental Quality Act and Senate Bill 97

Under CEQA, lead agencies are required to disclose the reasonably foreseeable adverse environmental effects of projects they are considering for approval. GHG emissions adversely affect the environment because they contribute to global climate change. In turn, global climate change will raise sea levels, alter rainfall and snowfall, and affect habitat, among other effects.

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is a prominent environmental issue requiring analysis under CEQA. This bill directed the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the CNRA guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA, no later than July 1, 2009. The CNRA was required to certify or adopt those guidelines by January 1, 2010. On December 30, 2009, the CNRA adopted amendments to the State CEQA Guidelines, as required by SB 97. The State CEQA Guidelines amendments provide guidance to public agencies regarding the analysis and mitigation of the effects of GHG emissions in CEQA documents. The amendments became effective March 18, 2010.

State CEQA Guidelines

The State CEQA Guidelines are found in the California Code of Regulations (CCR), Public Resources Code, Division 13, starting with Section 15000. The current State CEQA Guidelines Section 15064.4 specifically addresses the significance of GHG emissions, requiring a lead agency to make a "good-faith effort" to "describe, calculate, or estimate" GHG emissions in CEQA environmental documents (CNRA 2018b). Section 15064.4 further states that the analysis of GHG impacts should include consideration of: (1) the extent to which the project may increase or reduce GHG emissions; (2) whether the project GHG emissions would exceed a threshold of significance that the lead agency determines applies to the project; and (3) the extent to which the project would comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions (see, e.g., Section 15183.5(b))."

The State CEQA Guidelines also state that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program (including plans or regulations for the reduction of GHG emissions) that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located (State CEQA Guidelines Section 15064(h)(3)).

The State CEQA Guidelines do not require or recommend a specific analytical methodology or provide quantitative criteria for determining the significance of GHG emissions, nor do they set a numerical threshold of significance for GHG emissions. Section 15064.7(c) clarifies that "*when adopting or using thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence.*"

When GHG emissions are found to be significant, State CEQA Guidelines Section 15126.4(c) includes the following direction on measures to mitigate GHG emissions:

> *"Consistent with Section 15126.4(a), lead agencies shall consider feasible means, supported by substantial evidence and subject to monitoring or reporting, of mitigating the significant effects of greenhouse gas emissions. Measures to mitigate the significant effects of greenhouse gas emissions may include, among others:*
>
> *(1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;*
>
> *(2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures;*
>
> *(3) Off-site measures, including offsets that are not otherwise required, to mitigate a project's emissions;*
>
> *(4) Measures that sequester greenhouse gases; and*
>
> *(5) In the case of the adoption of a plan, such as a general plan, long range development plan, or plans for the reduction of greenhouse gas emissions, mitigation may include the identification of specific measures that may be implemented on a project-by project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions."*

State of California Executive Orders

Executive Order S-3-05. In 2005, in recognition of California's vulnerability to the effects of climate change, then-Governor Arnold Schwarzenegger issued EO S-3-05, which established a series of target dates by which statewide emissions of GHGs would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

Executive Order S-1-07. EO S-1-07, which was signed by then-Governor Schwarzenegger in 2007, proclaims that the transportation sector is the main source of GHG emissions in California, generating more than 40 percent of statewide emissions. It established a low carbon fuel standard (LCFS) with a goal to reduce the carbon intensity of transportation fuels sold in California by at least 10 percent by 2020.

In September 2018, CARB extended the LCFS program to 2030, making significant changes in the design and implementation of the program, including a doubling of the carbon intensity reduction to 20 percent by 2030.

Executive Orders S-14-08 and S-21-09. In November 2008, then-Governor Schwarzenegger signed EO S-14-08, which expands the state's Renewable Portfolio Standard (RPS) to 33 percent renewable power by 2020. In September 2009, then-Governor Schwarzenegger continued California's commitment to the RPS by signing EO S-21-09, which directs CARB under its

AB 32 authority to enact regulations to help the state meet its RPS goal of 33 percent renewable energy by 2020.

Executive Order S-13-08. Governor Schwarzenegger signed EO S-13-08 on November 14, 2008. The order called on state agencies to develop California's first strategy to identify and prepare for expected climate impacts. As a result, the *2009 California Climate Adaptation Strategy (CAS)* report was developed to summarize the best-known science on climate change impacts in the state to assess vulnerability and outline possible solutions that can be implemented within and across state agencies to promote resiliency. The state has also developed an Adaptation Planning Guide (CalEMA and CNRA 2012) to provide a decision-making framework intended for use by local and regional stakeholders to aid in the interpretation of climate science and to develop a systematic rationale for reducing risks caused or exacerbated by climate change. The state's third major assessment on climate change explores local and statewide vulnerabilities to climate change, highlighting opportunities for taking concrete actions to reduce climate-change impacts.

Executive Order B-16-12. In March 2012, Governor Jerry Brown issued an executive order establishing a goal of 1.5 million zero emission vehicles (ZEVs) on California roads by 2025. In addition to the ZEV goal, EO B-16-12 stipulated that by 2015 all major cities in California will have adequate infrastructure and be "zero-emission vehicle ready"; that by 2020 the state will have established adequate infrastructure to support 1 million ZEVs; and that by 2050, virtually all personal transportation in the state will be based on ZEVs, and that GHG emissions from the transportation sector will be reduced by 80 percent below 1990 levels.

Executive Order B-30-15. Governor Brown signed EO B-30-15 on April 29, 2015, which directed the following:

- Established a new interim statewide reduction target to reduce GHG emissions to 40 percent below 1990 levels by 2030.
- Ordered all state agencies with jurisdiction over sources of GHG emissions to implement measures to achieve reductions of GHG emissions to meet the 2030 and 2050 reduction targets.
- Directed CARB to update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent.

Executive Order B-48-18. On January 26, 2018, Governor Brown issued an executive order establishing a goal of 5 million ZEVs on California roads by 2030.

Executive Order B-55-18. On September 10, 2018, Governor Brown signed EO B-55-18, committing California to total, economy-wide carbon neutrality by 2045. EO B-55-18 directs CARB to work with relevant state agencies to develop a framework for accounting that tracks progress toward this goal. Assembly Bill 1395 to implement this neutrality goal is currently under consideration in the State Senate.

State of California Policy and Legislation

Assembly Bill 1493. In 2002, then-Governor Gray Davis signed AB 1493. AB 1493 required that CARB develop and adopt, by January 1, 2005, regulations that achieve *"the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty trucks and other vehicles determined by CARB to be vehicles whose primary use is noncommercial personal transportation in the State."*

To meet the requirements of AB 1493, in 2004 CARB approved amendments to the California Code of Regulations, adding GHG emissions standards to California's existing standards for motor vehicle emissions. All mobile sources were required to comply with these regulations as they are phased in from 2009 through 2016.

Because the Pavley standards (named for the bill's author, State Senator Fran Pavley) would impose stricter standards than those under the CAA, California applied to the USEPA for a waiver under the CAA. In 2008, the USEPA denied the application. In 2009, however, the USEPA granted the waiver. The waiver has been extended consistently since 2009; however, in 2018, the USEPA and NHTSA indicated their intent to revoke California's waiver and prohibit future state emissions standards enacted under the CAA. On May 12, 2021, the NHTSA published a notice of proposed rulemaking in the Federal Register, proposing to repeal key portions of the rule attempting to revoke the waiver.

Senate Bills 1078 and 107. SB 1078 (Chapter 516, Statutes of 2002) required retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010.

California Health and Safety Code, Division 25.5 – California Global Warming Solutions Act of 2006 – California Global Warming Solutions Act (Assembly Bill 32 and Senate Bill 32). In September 2006, then-Governor Arnold Schwarzenegger signed the California Global Warming Solutions Act (AB 32). AB 32 established regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions, and established a cap on statewide GHG emissions. AB 32 required that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction would be accomplished by enforcing a statewide cap on GHG emissions to be phased in starting in 2012. To effectively implement the cap, AB 32 directed CARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specified that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then CARB should develop new regulations to control vehicle GHG emissions under the authorization of AB 32.

In 2016, SB 32 and its companion bill AB 197 amended HSC Division 25.5 and established a new climate pollution reduction target of 40 percent below 1990 levels by 2030, and included provisions to ensure that the benefits of state climate policies reach into disadvantaged communities.

Climate Change Scoping Plan. A specific requirement of AB 32 was to prepare a Climate Change Scoping Plan for achieving the maximum technologically feasible and cost-effective GHG emissions reduction by 2020. CARB developed and approved the initial Scoping Plan in 2008, outlining the regulations, market-based approaches, voluntary measures, policies, and other emissions reduction programs needed to meet the 2020 statewide GHG emissions limit and initiate the transformations needed to achieve the state's long-range climate objectives (CARB 2008).

CARB approved the First Update to the Scoping Plan in May 2014, which built upon the initial Scoping Plan with new strategies and recommendations. CARB approved the 2017 Climate Change Scoping Plan Update (2017 Scoping Plan Update) in December 2017. The 2017 Scoping Plan Update outlines the proposed framework of action for achieving the 2030 GHG target of 40 percent reduction in GHG emissions relative to 1990 levels (CARB 2017). The 2017 Scoping Plan Update identifies key sectors of the state's implementation strategy, which includes improvements in low carbon energy, industry, transportation sustainability, natural and working lands, waste management, and water. Through a combination of data synthesis and modeling, CARB determined that the target statewide 2030 emissions limit is 260 MMT CO_2e, and that further commitments will be needed to achieve an additional reduction of 50 MMT CO_2e beyond current policies and programs. The cornerstone of the 2017 Scoping Plan Update is an expansion of the Cap-and-Trade Program to meet the aggressive 2030 GHG emissions goal and ensure achievement of the 2030 limit set forth by EO B-30-15.

The 2017 Scoping Plan Update's strategy for meeting the state's 2030 GHG target incorporates the full range of legislative actions and state-developed plans that have relevance to the year 2030, including the following, described elsewhere in this section:

- Extending the low carbon fuel standard beyond 2020 and increasing the carbon intensity reduction requirement to at least 18 percent by 2030.
- SB 350, which increases RPS to 50 percent and requires a doubling of energy efficiency for existing buildings by 2030.
- The 2016 Mobile Source Strategy to reduce emissions from mobile sources, including an 80 percent reduction in smog-forming emissions and a 45 percent reduction in diesel particulate matter from 2016 levels in the South Coast Air Basin, a 45 percent reduction in GHG emissions, and a 50 percent reduction in the consumption of petroleum-based fuels.
- The Sustainable Freight Action Plan to improve freight efficiency and transition to zero-emissions freight handling technologies (described in more detail below).
- SB 1383, which requires a 50 percent reduction in anthropogenic black carbon and a 40 percent reduction in hydrofluorocarbon and methane emissions below 2013 levels by 2030.
- Assembly Bill 398, which extends the State Cap-and-Trade Program through 2030.

In the 2017 Scoping Plan Update, CARB recommends statewide targets of no more than 6 metric tons CO_2e per capita by 2030 and no more than 2 metric tons CO_2e per capita by 2050. CARB acknowledges that because the statewide per capita targets are based on the statewide GHG emissions inventory that includes all emissions sectors in the state, it is appropriate for local jurisdictions to derive evidence-based local per-capita goals based on local emissions sectors and growth projections.

To demonstrate how a local jurisdiction can achieve its long-term GHG goals at the community plan level, CARB recommends developing a geographically specific GHG reduction plan (i.e., climate action plan) consistent with the requirements of CEQA Section 15183.5(b). A so-called "CEQA-qualified" GHG reduction plan, once adopted, can provide local governments with a streamlining tool for project-level environmental review of GHG emissions, provided there are adequate performance metrics for determining project consistency with the plan. Absent conformity with such a plan, CARB recommends "*that projects incorporate design features and GHG reduction measures, to the degree feasible, to minimize GHG emissions. Achieving no net additional increase in GHG emissions, resulting in no contribution to GHG impacts, is an appropriate overall objective for new development"* (CARB 2017).[6] While acknowledging that recent land use development projects in California have demonstrated the feasibility to achieve zero net additional GHG emissions (e.g., Newhall Ranch Resource Management and Development Plan), the 2017 Scoping Plan Update states that "*Achieving net zero increases in GHG emissions, resulting in no contribution to GHG impacts, may not be feasible or appropriate for every project, however, and the inability of a project to mitigate its GHG emissions to net zero does not imply the project results in a substantial contribution to the cumulatively significant environmental impact of climate change under CEQA. Lead agencies have the discretion to develop evidence-based numeric thresholds (mass emissions, per capita, or per service population) consistent with this Scoping Plan, the State's long-term GHG goals, and climate change science…To the degree a project relies on GHG mitigation measures, CARB recommends that lead agencies prioritize on-site design features that reduce emissions, especially from VMT, and direct investments in GHG reductions within the project's region that contribute potential air quality, health, and economic co-benefits locally*" (CARB 2017).[7]

Cap-and-Trade Program. Initially authorized by AB 32 and extended through the year 2030 with the passage of Assembly Bill 398 (2017), the California Cap-and-Trade Program is a core strategy that the state is using to meet its GHG reduction targets for 2020 and 2030, and ultimately achieve an 80 percent reduction from 1990 levels by 2050. CARB designed and adopted the California Cap-and-Trade Program to reduce GHG emissions from "covered entities"[8] (e.g., electricity generation, petroleum refining, cement production, and large industrial facilities that emit more than 25,000 metric tons CO_2e per year), setting a firm cap on statewide GHG emissions and employing market mechanisms to achieve reductions.[9] Under the Cap-and-Trade Program, an overall limit is established for GHG emissions from capped sectors. The statewide cap for GHG emissions from the capped sectors commenced in 2013. The cap declines over time. Facilities subject to the cap can trade permits to emit GHGs.[10]

Up to 8 percent of a covered entity's compliance obligation can be met using carbon offset credits, which are created through the development of projects (such as renewable energy

6 At pages 100 - 101.

7 At page 102.

8 "Covered Entity" means an entity within California that has one or more of the processes or operations and has a compliance obligation as specified in subarticle 7 of the Cap-and-Trade Regulation; and that has emitted, produced, imported, manufactured, or delivered in 2008 or any subsequent year more than the applicable threshold level specified in Section 95812 (a) of the Regulation.

9 17 CCR §§ 95800 to 96023.

10 See generally 17 CCR §§ 95811, 95812.

generation or carbon sequestration projects) that achieve a reduction of emissions or an increase in the removal of carbon from the atmosphere from activities not otherwise regulated, covered under the cap, or resulting from government incentives. Offsets are verified reductions of emissions whose ownership can be transferred to others. As required by AB 32, any reduction of GHG emissions used for compliance purposes must be real, permanent, quantifiable, verifiable, enforceable, and additional. Offsets used to meet regulatory requirements must be quantified according to CARB-adopted methodologies, and CARB must adopt a regulation to verify and enforce the reductions. The criteria developed will ensure that the reductions are quantified accurately and are not double-counted within the system (CARB 2008).

If California's direct regulatory measures reduce GHG emissions more than expected, then the Cap-and-Trade Program will be responsible for relatively fewer emissions reductions. If California's direct regulatory measures reduce GHG emissions less than expected, then the Cap-and-Trade Program will require relatively more emissions reductions. In other words, the state can adaptively manage the Cap-and-Trade Program to ensure achievement of California's 2020 and 2030 GHG emissions reduction mandates, depending on whether other regulatory measures are more or less effective than anticipated.

Senate Bill 375. Signed into law on October 1, 2008, SB 375 supplements GHG reductions from new vehicle technology and fuel standards with reductions from more efficient land use patterns and improved transportation. Under the law, CARB approved GHG reduction targets in February 2011 for California's 18 federally designated regional planning bodies, known as Metropolitan Planning Organizations (MPOs). CARB may update the targets every 4 years and must update them every 8 years. MPOs in turn must demonstrate how their plans, policies, and transportation investments meet the targets set by CARB through the Sustainable Communities Strategy (CARB 2018).

Senate Bill X 1-2. Senate Bill X 1-2, signed by Governor Brown in April 2011, enacted the California Renewable Energy Resources Act. The law obligates all California electricity providers, including investor-owned and publicly owned utilities, to obtain at least 33 percent of their energy from renewable resources by the year 2020.

Advanced Clean Cars Program. In January 2012, pursuant to Recommended Measures T-1 and T-4 of the Scoping Plan, CARB approved the Advanced Clean Cars Program, a new emissions-control program for model years 2017 through 2025.The program combines the control of smog, soot, and GHGs with requirements for greater numbers of zero-emissions vehicles. By 2025, when the rules will be fully implemented, the new automobiles will emit 34 percent fewer global warming gases and 75 percent fewer smog-forming emissions.

The program also requires car manufacturers to offer for sale an increasing number of ZEVs each year, including battery electric, fuel cell, and plug-in hybrid electric vehicles. In December 2012, CARB adopted regulations allowing car manufacturers to comply with California's GHG emissions requirements for model years 2017–2025 through compliance with the USEPA GHG requirements for those same model years.

Senate Bill 743. In 2013, Governor Brown signed SB 743, which added Public Resources Code Section 21099 to CEQA, to change the way that transportation impacts are analyzed under CEQA to better align local environmental review with statewide objectives to reduce GHG emissions, encourage infill mixed-use development in designated priority development areas, reduce regional sprawl development, and reduce vehicle miles traveled (VMT) in California (California Legislative Information 2013).

As required under SB 743, OPR developed potential metrics to measure transportation impacts that may include, but are not limited to, total VMT, VMT per capita, automobile trip generation rates, or automobile trips generated. The new VMT metric is intended to replace the use of automobile delay and level of service (LOS) as the metric to analyze transportation impacts under CEQA. In its 2018 *Technical Advisory on Evaluating Transportation Impacts in CEQA*, OPR recommends different thresholds of significance for projects depending on land use types. For example, residential and office space projects must demonstrate a VMT level that is 15 percent less than that of existing development to determine whether the mobile-source GHG emissions associated with the project are consistent with statewide GHG reduction targets. With respect to retail land uses, any net increase of VMT may be sufficient to indicate a significant transportation impact (OPR 2018b).

Mobile Source Strategy (2016). Implementing CARB's Mobile Source Strategy includes measures to reduce total light-duty VMT by 15 percent from the business-as-usual in 2050. The Mobile Source Strategy includes an expansion of the Advanced Clean Cars Program (which further increases the stringency of GHG emissions for all light-duty vehicles, and 4.2 million zero-emissions and plug-in hybrid light-duty vehicles by 2030). It also calls for more stringent GHG requirements for light-duty vehicles beyond 2025, as well as GHG reductions from medium-duty and heavy-duty vehicles and increased deployment of zero-emissions trucks primarily for class 3 – 7 "last-mile" delivery trucks in California. Statewide, the Mobile Source Strategy would result in a 45 percent reduction in GHG emissions, and a 50 percent reduction in the consumption of petroleum-based fuels by 2030/2031.

California Sustainable Freight Action Plan (2016). The California Sustainable Freight Action Plan includes strategies to improve freight efficiency and transition to zero-emissions freight handling technologies. It includes goals to achieve a 25 percent improvement of freight system efficiency by 2030, and to deploy over 100,000 freight vehicles and equipment capable of zero-emissions operation by 2030, and maximize near-zero-emissions freight vehicles and equipment powered by renewable energy by 2030 (Caltrans et al. 2016).

Senate Bill 350. The Clean Energy and Pollution Reduction Act of 2015 or SB 350 (Chapter 547, Statutes of 2015) was approved by Governor Brown on October 7, 2015. SB 350 increased the standards of the California RPS program by requiring that the amount of electricity generated and sold to retail customers per year from eligible renewable energy resources be increased from 33 percent to 50 percent by December 31, 2030. The act requires the State Energy Resources Conservation and Development Commission to establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings in existing electricity and natural gas final end uses of retail customers by January 1, 2030.

Senate Bill 100. On September 10, 2018, Governor Brown signed SB 100, establishing that 100 percent of all electricity in California must be obtained from renewable and zero-carbon energy resources by December 31, 2045. SB 100 also creates new standards for the RPS goals that were established by SB 350 in 2015. Specifically, the bill increases required energy from renewable sources for both investor-owned utilities and publicly owned utilities from 50 percent to 60 percent by 2030. Incrementally, these energy providers must also have a renewable energy supply of 33 percent by 2020, 44 percent by 2024, and 52 percent by 2027. The updated RPS goals are considered achievable, since many California energy providers are already meeting or exceeding the RPS goals established by SB 350.

SB 1383 (Short-lived Climate Pollutants). Senate Bill 1383, passed in 2016, requires statewide reductions in short-lived climate pollutants (SLCPs) across various industry sectors. The SLCPs covered under AB 1383 include methane, fluorinated gases, and black carbon – all GHGs with a much higher warming impact than CO_2 and with the potential for detrimental effects on human health. SB 1383 requires CARB to adopt a strategy to reduce methane by 40 percent, hydrofluorocarbon gases by 40 percent, and anthropogenic black carbon by 50 percent below 2013 levels by 2030. The methane emission reduction goals include a 75 percent reduction in the level of statewide disposal of organic waste from 2014 levels by 2025.

California Assembly Bill 341. AB 341, which became law in 2011, established a new statewide goal of 75 percent recycling through source reduction, recycling, and composting by 2020, and changed the way that the state measures progress toward the 75 percent recycling goal, focusing on source reduction, recycling, and composting. AB 341 also requires all businesses and public entities that generate 4 cubic yards or more of waste per week to have a recycling program in place. The purpose of the law is to reduce GHG emissions by diverting commercial solid waste to recycling efforts and expand the opportunity for additional recycling services and recycling manufacturing facilities in California (CalRecycle 2018).

California Assembly Bill 1826. AB 1826, known as the Commercial Organic Waste Recycling Law, became effective on January 1, 2016, and required businesses and multi-family complexes (with 5 units or more) that generate specified amounts of organic waste (compost) to arrange for organics collection services. The law phased in the requirements on businesses with full implementation realized in 2019:

- ***First Tier*:** Commencing in April 2016, the first tier of affected businesses included those that generate 8 or more cubic yards of organic materials per week.
- ***Second Tier*:** In January 2017, the affected businesses expanded to include those that generate 4 or more cubic yards of organic materials per week.
- ***Third Tier*:** In January 2019, the affected businesses are further expanded to include those that generate 4 or more cubic yards of commercial solid waste per week.

State of California Building Codes

California Building and Energy Efficiency Standards (Title 24). The CEC first adopted Energy Efficiency Standards for Residential and Nonresidential Buildings (CCR, Title 24, Part 6) in 1978 in response to a legislative mandate to reduce energy consumption in the state. Although not originally intended to reduce GHG emissions, increased energy efficiency and reduced consumption of electricity, natural gas, and other fuels would result in fewer GHG emissions from residential and nonresidential buildings subject to the standards. The standards are updated periodically (typically every 3 years) to allow for the consideration and inclusion of new energy efficiency technologies and methods (CEC 2015).

The current Title 24, Part 6 standards (2019 standards) were made effective on January 1, 2020.

California Green Buildings Standards Code (CALGreen). Part 11 of the Title 24 Building Energy Efficiency Standards is referred to as the California Green Building Standards (CALGreen) Code. CALGreen is intended to encourage more sustainable and environmentally friendly building practices, require low-pollution emitting substances that cause less harm to the environment, conserve natural resources, and promote the use of energy-efficient materials and equipment. Since 2011, the CALGreen Code is mandatory for all new residential and non-residential buildings constructed in the state. Such mandatory measures include energy efficiency, water conservation, material conservation, planning and design, and overall environmental quality.

The CALGreen Code was most recently updated in 2019 to include new mandatory measures for residential and non-residential uses; the new measures took effect on January 1, 2020 (California Building Standards Commission 2020).

Regional and Local

San Joaquin Valley Air Pollution Control District

The San Joaquin Valley Air Pollution Control District's (SJVAPCD's) 2009 GHG guidance streamlines CEQA review by pre-quantifying emissions reductions that would be achieved through the implementation of Best Performance Standards (BPS). A project is considered to have a less-than-significant cumulative impact on climate change if it meets any of the following conditions:

(1) Comply with an approved GHG reduction plan.

(2) Achieve a score of at least 29 using any combination of approved operational BPS.

(3) Reduce operational GHG emissions by at least 29 percent over business-as-usual (BAU) conditions (demonstrated quantitatively).

Stanislaus County General Plan

The *Stanislaus County General Plan 2015* Conservation/Open Space Element (Stanislaus County 2016) identifies water conservation-related goals and policies that would contribute to reduced

GHG emissions by conserving water resources and reducing related energy use for water supply/distribution activities. The following goals and policies apply to the PMAs implemented under the Turlock Subbasin GSP:

Goal Six: Improve air quality.

- ***Policy Nineteen*****:** The County will strive to accurately determine and fairly mitigate the local and regional air quality impacts of proposed projects.
- ***Policy Twenty*****:** The County shall strive to reduce motor vehicle emissions by reducing vehicle trips and vehicle miles traveled and increasing average vehicle ridership.

Merced County General Plan

The following policies from the Merced County General Plan (2013) are relevant to GHG emissions generated by PMAs implemented under the Turlock Subbasin GSP:

- ***Policy AQ-1.1*****:** Energy Consumption Reduction Encourage new residential, commercial, and industrial development to reduce air quality impacts from energy consumption.
- ***Policy AQ-1.2*****:** Business Energy Reduction Strategies Encourage all businesses to: replace high mileage fleet vehicles with more efficient and/or alternative fuel vehicles; increase the energy efficiency of facilities; transition toward the use of renewable energy instead of non-renewable energy sources; adopt purchasing practices that promote emissions reductions and reusable materials; and increase recycling.
- ***Policy AQ-1.5*****:** Climate Action Plan Prepare a Climate Action Plan that includes an inventory of 1990 and 2010 greenhouse gas emissions, determines project air quality impacts using analysis methods and significance thresholds recommended by the SJVAPC, and identify strategies to achieve State emission reduction targets.
- ***Policy AQ-1.7*****:** Heat Island Effect Reduction Require increased tree canopy and reflective surface materials in order to reduce the heat island effect (i.e., increased temperatures due to heat radiation off paved surfaces and rooftops).
- ***Policy AQ-1.8*****:** Climate Change Adaptation Prepare appropriate strategies to adapt to climate change based on peer-reviewed scientific findings of the potential impacts.
- ***Policy AQ-1.9*****:** Interagency Coordination Coordinate with cities, regional, State, and Federal agencies and organizations to collaborate on a comprehensive approach to planning for climate change.
- ***Policy AQ-1.10*****:** Public Awareness Increase public awareness about climate change and encourage county residents and businesses to become involved in activities and lifestyle changes that will aid in reduction of greenhouse gas emissions.
- ***Policy AQ-1.11*****:** Truck-Related Development Discourage development that causes significant increases in truck traffic on roads that are not capable of accommodating truck traffic due to pavement section deficiency or other capacity limitations, unless adequate mitigation through fees or improvements in required as part of the permit approval.
- ***Policy AQ-2.5*****:** Innovative Mitigation Measures Encourage innovative mitigation measures and project redesign to reduce air quality impacts by coordinating with the San

Joaquin Valley Air Pollution Control District, project applicants, and other interested parties.

- ***Policy AQ-2.7*:** Air District Best Performance Standards Require the County to use the Best Performance Standards adopted by SJVAPCD during the development review and decision-making process to ensure new projects meet the targets set by the district.
- ***Policy AQ-3.2*:** Clean Fleet Vehicles Require vehicle replacement practices that prioritize the replacement of older higher emission vehicles and the purchasing of the lowest emission technology vehicles, consistent with cost-effective management of the program.
- ***Policy AQ-3.3*:** Teleconferencing Use teleconferencing in lieu of employee travel to conferences and meetings when feasible.
- ***Policy AQ-3.5*:** Purchasing Preferences Institute environmentally-responsible purchasing, including giving preference to products that reduce or eliminate indirect greenhouse gas emissions and promote recycling.
- ***Policy AQ-4.1*:** Decrease Vehicle Miles Traveled Require diverse, higher-density land uses (e.g., mixed-use and infill development) to decrease vehicle miles traveled.
- ***Policy AQ-4.3*:** Public Transport Use Incentives Prepare incentives and programs to encourage use of public transit and decrease vehicle miles traveled.
- ***Policy AQ-4.4*:** Transportation Alternatives Require employers and developers to provide employees and residents with attractive, affordable transportation alternatives, such as transit stops, van pool pick-up and drop-off locations, and biking paths/storage.
- ***Policy AQ-4.5*:** Public Education and Awareness Support programs that educate the public regarding the impact of individual transportation, lifestyle, and land use decisions on air quality.
- ***Policy AQ-4.6*:** Non-Motorized Transportation Encourage non-motorized transportation corridors within and between communities.

City General Plans

Table 3.9-2 summarizes the key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs. Refer also to Section 3.4, Air Quality for related policies.

TABLE 3.9-2
CITY GENERAL PLAN POLICIES GOVERNING GREENHOUSE GAS EMISSIONS WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Greenhouse Gas Emissions
City of Turlock	Chapter 8, Air Quality and Greenhouse Gases, Guiding Policies 8.2-a, 8.2-b, 8.2-f
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, H. Air Quality, Policies 2a through 2aaa
City of Ceres	Health and Safety, Goal 5.E, Policy 5.E.G
City of Hughson	None applicable

3.9.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on GHG emissions focuses on the potential for construction-related emissions or emissions from operations and maintenance (O&M) activities to exceed thresholds established by the SJVAPCD. PMAs to be implemented under the Turlock Subbasin GSP are evaluated in terms of how typical construction and operation could impact existing efforts to reduce GHG emissions. However, the precise locations and extent of activities and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable emissions from implementation of the types of PMAs and mitigation measures that might be taken in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational-related activities). Temporary impacts are those that would be temporary in nature (e.g., construction-related activities). Impacts were evaluated separately for direct and in-lieu recharge projects and water conservation management actions. While the impact conclusions reached may be the same, this approach facilitates a discussion of any potential differences.

Significance determinations assume that the PMAs implemented under the Turlock Subbasin GSP will comply with relevant federal, state, and local ordinances and regulations described in the *Regulatory Setting* section. Thresholds of significance used to evaluate impacts are based on Appendix G of the State CEQA Guidelines.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A PMA implemented under the Turlock Subbasin GSP would result in a significant impact on GHGs if it would:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

Impacts and Mitigation Measures

Table 3.9-3 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

TABLE 3.9-3
SUMMARY OF IMPACT CONCLUSIONS—GREENHOUSE GASES

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
GHG-1: Implementing PMAs under the Turlock Subbasin GSP could generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.		
Direct Recharge Projects	LTSM	LTS
In-lieu Recharge Projects	LTSM	LTS
Conservation Management Actions	LTS	LTS
GHG-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.	LTS	LTS

NOTES: LTS = less than significant; LTSM = less than significant with mitigation

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact GHG-1: Implementing PMAs under the Turlock Subbasin GSP could generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.

GHG emissions and global climate change represent cumulative impacts of human activities and development projects locally, regionally, statewide, nationally, and worldwide. GHG emissions from all of these sources cumulatively contribute to the significant adverse environmental impacts of global climate change. No single project could generate enough GHG emissions to noticeably change the global average temperature; instead, the combination of GHG emissions from past, present, and future projects around the world have contributed and will continue to contribute to global climate change and its associated environmental impacts.

The SJVAPCD's GHG guidance is intended to streamline CEQA review by pre-quantifying emissions reductions that would be achieved through the implementation of BPS. A project would have a less-than-significant cumulative impact on climate change if it meets any of the following conditions:

(1) Comply with an approved GHG reduction plan;

(2) Achieve a score of at least 29 using any combination of approved operational BPS; or

(3) Reduce operational GHG emissions by at least 29 percent over BAU conditions (demonstrated quantitatively).

Because Stanislaus and Merced counties currently have no adopted GHG reduction plan, Option 1 (listed above) cannot be applied. Options 2 and 3 both require projects to achieve GHG reductions consistent with the goals of AB 32, which is to reduce statewide GHG emissions to 1990 levels by 2020 (equivalent to a 29 percent reduction over BAU conditions).

However, since publication of SJVAPCD's GHG guidance in 2009, the California Supreme Court has considered the CEQA issue of determining the significance of GHG emissions, in its decision in *Center for Biological Diversity v. CDFW and Newhall Land and Farming (Center for Biological Diversity v. Department of Fish & Wildlife (2015) 62 Cal.4th 204)*. In the *Newhall* decision, the court questioned a common CEQA approach to GHG analyses for development projects that compared project emissions to the reductions from BAU that would be needed statewide to reduce emissions to 1990 levels by 2020, as required by AB 32. The court upheld the BAU method as valid in theory, but concluded that the method was applied improperly in the case of the Newhall project: The project's target was incorrectly deemed consistent with the statewide emissions target of 29 percent below BAU for the year 2020. In other words, the court said that the percent-below-BAU target developed by the AB 32 Scoping Plan is intended as a measure of the GHG reduction effort required by the state as a whole, and it cannot necessarily be applied to the impacts of a specific project in a specific location.

The California Supreme Court provided some guidance for evaluating the cumulative significance of a proposed land use project's GHG emissions, but noted that none of the approaches could be guaranteed to satisfy CEQA for a particular project. The court's suggested "pathways to compliance" include:

- Use a geographically specific GHG emissions reduction plan (e.g., climate action plan) that outlines how the jurisdiction will reduce emissions consistent with state reduction targets, to provide the basis for streamlining project-level CEQA analysis, as described in State CEQA Guidelines Section 15183.5.
- Use the Scoping Plan's BAU reduction goal, but provide substantial evidence to bridge the gap between the statewide goal and the project's emissions reductions.
- Assess consistency with AB 32's goal in whole or part by looking to comply with regulatory programs designed to reduce GHG emissions from particular activities. As an example, the court points out that projects consistent with a Senate Bill 375 Sustainable Communities Strategy may need to reevaluate GHG emissions from cars and light trucks.
- Rely on existing numerical thresholds of significance for GHG emissions, such as those developed by an air district.

In light of the *Newhall* decision and the reliance of SJVAPCD's GHG guidance on the statewide percentage reduction of GHG emissions by 2020, an assessment of a proposed project's potential GHG emissions impacts under CEQA could consider two approaches:

(1) Does the proposed project include reasonably feasible measures (i.e., BPS) to reduce GHG emissions?

(2) Although not strictly applicable to projects within the San Joaquin Valley Air Basin (SJVAB), would the proposed project's emissions exceed the Bay Area Air Quality Management District's (BAAQMD) GHG mass emissions (or "bright line") threshold of 1,100 metric tons of carbon dioxide equivalent (CO2e) per year?

Because the proposed PMAs implemented under the Turlock Subbasin GSP are currently unspecified, a quantitative approach to assessing GHG emissions is not possible. Further, because PMAs implemented under the Turlock Subbasin GSP would not be land use development projects, the application of the BAAQMD's bright line threshold would not be appropriate.

Consequently, the impact analysis with respect to whether PMAs implemented under the Turlock Subbasin GSP could generate GHG emissions that may have a significant impact on the environment is assessed by considering whether the PMAs would include reasonably feasible measures (i.e., BPS) to reduce GHG emissions.

Direct Recharge Projects

Effects of Construction Activities

GHG emissions associated with construction of PMAs may be generated from the following general construction activities: (1) ground disturbance from grading, excavation, etc.; (2) vehicle trips from workers traveling to and from the construction areas; (3) trips associated with the delivery of construction supplies to, and hauling debris from, the construction areas; and (4) fuel combustion by on-site construction equipment. PMAs implemented under the Turlock Subbasin GSP could include construction activities, presented in Table 2-4.

Therefore, construction activities for PMAs implemented under the Turlock Subbasin GSP would cause temporary increases in GHG emissions. The SJVAPCD identifies BPS as an approach that would help project proponents, lead agencies, and the public by proactively identifying effective, feasible GHG emissions reduction measures. Emissions reductions achieved through implementation of BPS would negate the need for project-specific quantification of GHG emissions (SJVAPCD 2009).

BPS are defined as the most effective, achieved in-practice means of reducing or limiting GHG emissions from a GHG emissions source. For traditional stationary source projects, BPS include equipment type, equipment design, and O&M practices for the identified service, operation, or emissions unit class and category. Projects implementing BPS may be determined to have a less-than-significant individual and cumulative impact on global climate change and would not require project-specific quantification of GHG emissions.

As discussed in Section 1.3 of this PEIR, a number of different counties, cities, and special districts could design and implement PMAs under the Turlock Subbasin GSP. Section 2.3.4 identifies “borrow sites” where areas from which earthen materials would be removed for use in construction. Sites nearest to the construction areas are usually preferred. Using borrow sites near construction areas reduces the potential costs and would also reduce GHG emissions associated with soil transport and would therefore represent an example of a BPS. However, given the absence of detail with respect to potential BPS specific to emissions reductions during construction, and given the fact that direct recharge projects may involve the excavation and transport of large amounts of material over relatively short work windows using multiple pieces of off-road equipment and on-road haul trucks, worker vehicle trips, and vendor trips, the construction-related emissions impact with respect to GHG emissions is **potentially significant**. Consequently, Mitigation Measure GHG-1 is identified to require the implementation of a menu of BPS measures to minimize GHG emissions associated with construction activities.

Mitigation Measure GHG-1: Implement BPS for all construction projects under the Turlock Subbasin GSP.

For all construction projects associated with PMAs, the PMA proponent shall implement the following measures, as applicable, to minimize GHG emissions to the extent practicable:

- The contractor shall ensure that line power is used instead of diesel generators at all construction sites where line power is feasible.
- The contractor shall ensure that the operation of any stationary, compression-ignition engines as part of construction, complies with Section 93115, Title 17, California Code of Regulations, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements as well as emission standards.
- Fixed temporary sources of air emissions (such as portable pumps, compressors, generators) shall be electrically powered unless the contractor submits documentation and receives approval from the Engineer that the use of such equipment is not practical, feasible, or available. All portable engines and equipment units used as part of construction shall be properly registered with the CARB or otherwise permitted by the appropriate local air district, as required.
- The contractor shall implement standard air emissions controls such as:
  - Use local sources of construction materials, including use of localized "borrow" sites, when economically feasible.
  - Minimize the use of diesel generators where possible.
  - Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes as required by the California Airborne Toxics Control Measure (ATCM) Title 13, Section 2485 of California Code of Regulations. Clear signage shall be provided for construction workers at all access points.
  - Minimize the idling time of diesel-powered construction equipment to 5 minutes.
  - Follow applicable regulations for fuel, fuel additives, and emissions standards for stationary, diesel-fueled engines.
  - Perform regular low-emissions tune-ups on all construction equipment, particularly haul trucks and earthwork equipment.
- The contractor shall implement the following measures to reduce GHG emissions from fuel combustion:
  - On-road and off-road vehicle tire pressures shall be maintained to manufacturer's specifications. Tires shall be checked and re-inflated at regular intervals.
  - Construction equipment engines shall be maintained to manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
  - Demolition debris shall be recycled for reuse to the extent feasible.

With implementation of Mitigation Measure GHG-1, construction-related GHG emissions from direct recharge projects would be minimized to the extent practicable and would be consistent with guidance prepared by the SJVAPCD with respect to addressing GHG emissions in CEQA documents, and the resultant impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Once constructed, direct recharge projects would require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips. In general, these emissions from O&M vehicle trips would not result in substantive GHG emissions.

Additionally, direct recharge projects may require the routine maintenance and testing of emergency backup generators. Such generators, if necessary, would require a permit from SJVAPCD, which would limit their operation to 52 hours per year. These occasional engine operations would not be substantial and would not generate substantive GHG emissions. Therefore, this operational impact would be **less than significant**.

In-lieu Recharge Projects

Effects of Construction Activities

Similar to direct recharge projects, in-lieu recharge projects could require storage of surface water in storage reservoirs that would need to be constructed and, therefore, require substantial excavation and earth movement. In-lieu projects could also require the construction of water conveyance and delivery infrastructure for later that would involve substantial excavation and earth movement. Consequently, in-lieu recharge projects would have the same potential for potentially significant GHG impacts, and Mitigation Measure GHG-1 would also apply to these projects. With implementation of Mitigation Measure GHG-1, construction-related GHG emissions would be minimized to the extent practicable and would be consistent with guidance prepared by SJVAPCD for addressing GHG emissions in CEQA documents; the resultant impacts would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Analysis

Similar to direct recharge projects, in-lieu recharge projects could require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and result in a minor increase in motor vehicle trips. In general, these emissions from O&M vehicle trips would not generate substantive GHG emissions.

In-lieu recharge projects could also require the routine maintenance and testing of emergency backup generators. Such generators, if necessary, would require a permit from SJVAPCD, which would limit their operation to 52 hours per year. These occasional engine operations would not be substantial and would not generate substantive GHG emissions. Therefore, this operational impact would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Water management and conservation actions would have a limited potential to generate construction emissions. While some conservation PMAs may require replacement of infrastructure, they would probably not result in the excavation or movement of substantial amounts of soil or other materials. While earthwork might be needed for environmental easement habitat enhancement or protection, these activities would be unlikely to require operation of substantial amounts of off-road construction equipment. Therefore, the construction-related emissions associated with water management and conservation actions would be **less than significant** with respect to GHG emissions.

Effects of Constructed Features and Operations and Maintenance of Those Features

While water management and conservation actions could require O&M activities to inspect project features and/or evaluate program effectiveness, these activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips (likely even fewer than recharge projects). These emissions from O&M vehicle trips would not generate substantive GHG emissions and would predominantly occur in vehicles subject to California's CAFE standards for fuel efficiency, and would have a **less than significant** GHG impact.

Impact GHG-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

Effects of Construction Activities

As noted earlier, CARB's 2017 Scoping Plan Update describes how the state plans to achieve the 2030 GHG emissions reduction goal for California of 40 percent below 1990 levels by 2030 as mandated by SB 32. Actions in the *2017 Scoping Plan Update* pertinent to PMA construction relate to emissions controls imposed in the future, including the future implementation of Phase 2 controls to reduce GHG emissions in new heavy-duty vehicles beyond 2018, and the continued implementation of diesel controls to reduce black carbon emissions from heavy-duty on-road engines as well as off-road engines. These actions would be implemented by CARB as new standards and policies. Heavy-duty vehicles used during project construction would comply with all applicable emissions standards. By implementing Mitigation Measure GHG-1, thereby reducing construction-related GHGs to the extent feasible, PMAs implemented under the Turlock Subbasin GSP would be consistent with CARB's 2017 Scoping Plan Update. This impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Direct and in-lieu recharge projects, as well as some conservation management actions, could require O&M activities to inspect features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips. These emissions from O&M vehicle trips would not generate substantive GHG emissions and would predominantly occur in vehicles subject to California’s CAFE standards for fuel efficiency. Actions in the *2017 Scoping Plan Update* pertinent to PMA O&M relate to emissions controls imposed in the future, including future implementation of Phase 2 controls to reduce GHG emissions in new heavy-duty vehicles beyond 2018, and the continued implementation of diesel controls to reduce black carbon emissions from heavy-duty on-road engines as well as off-road engines. These actions would be implemented by CARB as new standards and policies. O&M activities of PMAs implemented under the Turlock Subbasin GSP would be consistent with CARB’s *2017 Scoping Plan Update*. This impact would be **less than significant**.

3.10 Hazards and Hazardous Materials

3.10.1 Introduction

This section describes the hazards and hazardous materials in and characteristics of the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect hazards and hazardous materials. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2.)

No comments specifically addressing hazards and hazardous materials were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.10.2 Environmental Setting

This section describes the different hazards and hazardous materials that may be present within the Turlock Subbasin that could result in impacts with implementation of PMAs under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin, referred to herein as the *study area*.

Hazardous Materials Sites

A review of the State Water Resources Control Board (State Water Board) GeoTracker online database and the California Department of Toxic Substances Control (DTSC) EnviroStor online database reveals the presence of numerous recorded hazardous materials sites within the boundaries of the Turlock Subbasin (State Water Board 2022; DTSC 2022). The types of sites vary; they include Cleanup Program sites, Leaking Underground Storage Tank Cleanup sites, Land Disposal sites, DTSC Cleanup sites, and Permitted Underground Storage Tanks. The databases distinguish between sites that are open (currently under remediation) and those that are closed (remediation is complete). Both open and closed sites are located within the Turlock Subbasin (State Water Board 2022; DTSC 2022).

Both the State Water Board and DTSC are responsible for managing different portions of what is commonly referred to as the *Cortese List*, which is referenced in Government Code Section 65962.5. The list compiles a variety of hazardous materials sites that meet certain criteria. Sites on the Cortese List are associated with specific parcels or addresses.

Schools

Table 3.10-1 identifies the 40 schools located within the study area.

TABLE 3.10-1
SCHOOLS WITHIN THE TURLOCK SUBBASIN STUDY AREA

• Balico Elementary School	• Hilmar High School
• Blaker-Kinser Jr. High School	• Hilmar Middle School
• Bret Harte Elementary School	• Hughson Christian School
• California State University, Stanislaus	• Hughson High School
• Carroll Fowler Elementary	• John F. Kennedy School
• Central Valley Christian Academy	• John H. Pittman High School
• Crowell Elementary School	• Julien Elementary School
• Delhi High School	• Lebright School
• Denair Elementary School	• Lucas Elementary Dual Language Academy
• Denair Middle School	• M. Robert Adkinson School
• Dennis Earl Elementary School	• Mae Hensley Jr. High School
• Don Pedro School	• Sandra T. Medeiros Elementary School
• Dutcher Middle School	• Schendel School
• El Capitan School	• Shackelford Elementary School
• Elim Elementary School	• Tuolumne Elementary School
• Emilie J. Ross Middle School	• Turlock High School
• Evelyn Hanshaw Elementary School	• Turlock Junior High School
• Evelyn Hanshaw Middle School	• Virginia Parks Elementary School
• Harmony Elementary School	• Walnut Elementary Education Center
• Hickman Charter School	• Walter M. Brown Elementary

SOURCE: Data compiled by Environmental Science Associates in 2022

Airports

There are three airports in the study area, one in Stanislaus County and two in Merced County: the Modesto City-County Airport (Stanislaus County) and the Merced-Castle Airport and Turlock Municipal Airport (Merced County). The Modesto City-County Airport is regulated under the Stanislaus County Airport Land Use Compatibility Plan (ALUCP) and the Merced-Castle Airport and Turlock Municipal Airport are regulated under the Merced County ALUCP. Both ALUCPs include noise and safety hazard contours to indicate areas around each airport where a noise or safety hazard exists (Stanislaus County ALUC 2018; Merced County ALUC 2012).

Emergency Response and Evacuation Plans

In Stanislaus County, the Stanislaus County Emergency Operations Plan (EOP) (Stanislaus County 2021) and Local Hazard Mitigation Plan (Stanislaus County 2017) are the two documents used to establish emergency procedures. In Merced County, the Merced County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) (Merced County 2021) and the Merced County EOP (Merced County 2017) are the guiding documents for emergency procedures.

These documents do not delineate the specific roads or highways that would be used during an emergency evacuation. However, the Stanislaus County EOP and Merced County MJHMP mention that the major roads and highways in the counties are likely to be used as evacuation routes in the event of an emergency evacuation. The major highways that run through both counties are State Routes 33, 59, 99, 108, 120, 132, 140, 165, and 219 and Interstate 5 (Stanislaus County 2021; Merced County 2021). Major roads and highways are discussed further in Section 3.17, *Transportation.*

Wildfire

The California Department of Forestry and Fire Protection (CAL FIRE) Forest Resource Assessment Program publishes Very High Fire Hazard Severity Zone (VHFHSZ) maps for every county in California, which depict the areas where VHFHSZ zones occur. In 2008, CAL FIRE determined, through a local review process, that Stanislaus and Merced counties have no VHFHSZs; thus, areas within the boundaries of the Turlock Subbasin are not within a VHFHSZ (CAL FIRE 2008). Although there are no VHFHSZs in Stanislaus or Merced counties, there are areas of moderate fire hazard severity zones throughout both counties (CAL FIRE 2007a, 2007b). See Section 3.20, *Wildfire*, for additional discussion of wildfire in the study area.

3.10.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to hazards and hazardous materials. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

The primary federal agencies with responsibility for hazardous materials management are the U.S. Environmental Protection Agency, U.S. Occupational Safety and Health Administration, and U.S. Department of Transportation. **Table 3.10-2** summarizes applicable federal laws and regulations and identifies responsible agencies.

State and local agencies often have either parallel or more stringent rules than federal agencies. In most cases, state law mirrors or overlaps federal law, and enforcement of these laws is the responsibility of the state or of a local agency to which enforcement powers are delegated. For these reasons, the requirements of the law and its enforcement are discussed in either the “State” or “Regional and Local” regulatory section.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is an operating mode of the U.S. Department of Transportation. The FAA’s mission is to help ensure aviation safety, support national security, and promote an efficient airspace. In the context of hazardous materials, the FAA ensures and promotes the safe transportation of dangerous goods in air commerce through activities that include regulatory oversight of dangerous goods carried by the flying public or transported on aircraft.

TABLE 3.10-2
FEDERAL LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Law or Responsible Federal Agency	Description
Hazardous Materials Management	Community Right-to-Know Act of 1986 (also known as Title III of the Superfund Amendments and Reauthorization Act)	This law imposes requirements to ensure that hazardous materials are handled, used, stored, and disposed of properly, and to prevent or mitigate injury to human health or the environment in the event that such materials are accidentally released.
Hazardous Waste Handling	Resource Conservation and Recovery Act of 1976	Under the RCRA, the U.S. Environmental Protection Agency regulates the generation, transportation, treatment, storage, and disposal of hazardous waste from "cradle to grave."
	Hazardous and Solid Waste Act	This law amended the RCRA in 1984, affirming and extending the "cradle to grave" system of regulating hazardous wastes. The amendments specifically prohibit the use of certain techniques for the disposal of some hazardous wastes.
Hazardous Materials Transportation	U.S. Department of Transportation	The U.S. Department of Transportation has regulatory responsibility for the safe transportation of hazardous materials. Departmental regulations govern all means of transportation except packages shipped by mail (CFR Title 49).
	U.S. Postal Service	U.S. Postal Service regulations govern the transportation of hazardous materials shipped by mail.
Occupational Safety	Occupational Safety and Health Act of 1970	The U.S. Occupational Safety and Health Administration sets standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries (29 CFR 1910).

NOTES: CFR = Code of Federal Regulations; RCRA = Resource Conservation and Recovery Act

SOURCE: Data compiled by Environmental Science Associates in 2022

State

The primary state agencies with responsibility for hazardous materials management in the region include DTSC and the regional water quality control boards (both part of the California Environmental Protection Agency) and the California Occupational Safety and Health Administration, California Department of Public Health, California Highway Patrol, and California Department of Transportation. **Table 3.10-3** summarizes state laws and regulations and identifies responsible agencies.

TABLE 3.10-3
STATE LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Law or Responsible State Agency	Description
Hazardous Materials Management	Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program); CUPA (Health and Safety Code Sections 25404 et seq.)	In January 1996, CalEPA adopted regulations that implemented a Unified Program at the local level. The agency responsible for implementing the Unified Program is called the Certified Unified Program Agency. For Stanislaus County, the CUPA is the Department of Environmental Resources; for Merced County, the CUPA is the Merced County Department of Public Health, Division of Environmental Health.
	California Fire Code	The California Fire Code regulates the storage and handling of hazardous materials, including the requirement for secondary containment, separation of incompatible materials, and preparation of spill response procedures.

TABLE 3.10-3 (CONTINUED)
STATE LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Law or Responsible State Agency	Description
Hazardous Waste Handling	California Hazardous Materials Release Response Plan and Inventory Law of 1985; CUPA	This law, also known as the Business Plan Act, requires that businesses that store hazardous materials on-site prepare a hazardous materials business plan and submit it to the local CUPA.
	California Hazardous Waste Control Act; DTSC	Under the California Hazardous Waste Control Act (California Health and Safety Code Section 25100 et seq.), DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste in California. The hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; dictate the management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills. DTSC is also the administering agency for the California Hazardous Substance Account Act (California Health and Safety Code Section 25300 et seq.), also known as the State Superfund law, providing for the investigation and remediation of hazardous substances pursuant to state law.
Hazardous Materials Transportation	Titles 13, 22, and 26 of the California Code of Regulations	These provisions regulate the transportation of hazardous waste originating in and passing through the state, imposing requirements for shipping, containers, and labeling.
	California Highway Patrol and California Department of Transportation	These state agencies have primary responsibility for enforcing federal and state regulations and responding to hazardous materials transportation emergencies.
Occupational Safety	Cal/OSHA	Cal/OSHA has primary responsibility for developing and enforcing workplace safety regulations in California. Because California has a federally approved OSHA program, it is required to adopt regulations that are at least as stringent as those found in Title 29 of the Code of Federal Regulations. Cal/OSHA standards are generally more stringent than federal regulations.
	Cal/OSHA regulations (CCR Title 8)	These regulations govern the use of hazardous materials in the workplace. They require employee safety training, safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and preparation of emergency action and fire prevention plans.
Construction Storm Water General Permit (Construction General Permit; Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ)	Regional Water Board	Dischargers for projects disturbing one or more acres of soil, or for projects disturbing less than one acre that are part of a larger common plan of development that in total disturbs one or more acres, must obtain coverage under the NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit). Construction activity subject to this permit includes clearing, grading, grubbing, and other disturbances to the ground such as excavation and stockpiling, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of a facility. The Construction General Permit requires the development and implementation of a storm water pollution prevention plan that includes specific BMPs designed to prevent sediment and pollutants from contacting stormwater from moving off-site into receiving waters. The BMPs fall into several categories—erosion control, sediment control, waste management, and good housekeeping—and are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area.
Municipal Separate Storm Sewer System(MS4) Permit, NPDES No. CAS612008 and Order No. R2-2015-0049	Regional Water Boards	The MS4 permit requires permittees to reduce pollutants and runoff flows from new development and redevelopment using BMPs to the maximum extent practical. The MS4 permit requires specific design concepts for LID/post-construction BMPs in the early stages of a project during the entitlement and CEQA process and the development plan review process.

Classification	Law or Responsible State Agency	Description
Underground Infrastructure	California Government Code Sections 4216 through 4216.9	Government Code Chapter 3.1, Protection of Underground Infrastructure (Sections 4216 through 4216.9), requires an excavator to contact a regional notification center (e.g., Underground Services Alert or Dig Alert) at least two days prior to excavation of any subsurface installations. Any utility provider seeking to begin a project that could damage underground infrastructure can call Underground Service Alert, the applicable regional notification center. Underground Service Alert will notify the utilities that may have buried lines within 1,000 feet of the project. Representatives of the utilities are then notified and must mark the specific location of their facilities within the work area before the start of project activities in the area.

NOTES: BMP = best management practice; Cal/OSHA = California Occupational Safety and Health Administration; CalEPA = California Environmental Protection Agency; CCR = California Code of Regulations; CEQA = California Environmental Quality Act; Construction General Permit = General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities; CUPA = Certified Unified Program Agency; DTSC = California Department of Toxic Substances Control; LID = Low Impact Development; MS4 = Municipal Separate Storm Sewer System; NPDES = National Pollutant Discharge Elimination System; OSHA = U.S. Occupational Safety and Health Administration; Regional Water Board = regional water quality control boards

SOURCE: Data compiled by Environmental Science Associates in 2022

Regional and Local

Stanislaus County General Plan

The following goals and policies in the Safety Element of the Stanislaus County General Plan (2015) related to hazards and hazardous materials are relevant to implementation of the PMAs.

Goal One: Prevent loss of life and reduce property damage as a result of natural disasters.

- ***Policy One*:** The County will adopt (and implement as necessary) plans inclusive of the Multi-Jurisdictional Hazard Mitigation Plan, to minimize the impacts of a natural and man-made disasters.
- ***Policy Three*:** Development should not be allowed in areas that are particularly susceptible to seismic hazard.

Goal Two: Minimize the effects of hazardous conditions that might cause loss of life and property.

- ***Policy Seven*:** Adequate fire and sheriff protection shall be provided.

Merced County General Plan

The following goals and policies in the Merced County General Plan (2012) related to hazards and hazardous materials are relevant to implementation of the PMAs.

Public Facilities and Services Element

Goal PFS-4: Ensure the safe and efficient disposal and recycling of solid and hazardous waste generated in the County.

- ***Policy PFS-4.3: Spill Site Development (RDR).*** Prohibit development on sites identified by Federal, State, or local agencies as spill sites or hazardous waste areas unless approved cleanup occurs prior to development.

Goal PFS-6: Ensure the provision of timely and adequate law enforcement through proper management and staffing of the Sheriff Department in Merced County.

- ***Policy PFS-6.2: Sheriff Department Response Time Standards (SO).*** Strive to achieve and maintain appropriate Sheriff Department response times for all call priority levels to provide adequate law enforcement services for all County residents.

Goal PFS-7: Provide adequate fire and emergency medical facilities and services to protect County residents from injury and loss of life, and to protect property from fire.

- ***Policy PFS-7.1: Fire Staffing and Response Time Standards (SO).*** Strive to maintain fire department staffing levels and response times consistent with National Fire Protection Association standards.
- ***Policy PFS-7.6: Emergency Medical Service Staffing and Response Time Standards (SO).*** Strive to achieve and maintain optimum staffing levels and appropriate response times to provide adequate emergency medical services for all County residents.
- ***Policy PFS-7.8: Fire Station Locations (SO).*** Strive to locate new fire stations in areas that ensure the minimum response times to service calls.

Natural Resources Element

Goal NR-1: Preserve and protect, through coordination with the public and private sectors, the biological resources of the County.

- ***Policy NR-1.16: Hazardous Waste Residual Repository Location (RDR).*** Require new hazardous waste residual repositories (e.g., contaminated soil facilities) to be located at least a mile from significant wetlands, designated sensitive species habitat, and State and Federal wildlife refuges and management areas.

Health and Safety Element

Goal HS-2: Minimize the possibility of loss of life, injury, or damage to property as a result of flood hazards.

- ***Policy HS-2.2: Countywide Flood Emergency Plan (RDR/MPSP).*** Coordinate with the cities in Merced County to develop a Countywide flood emergency plan that is consistent with city general plans.
- ***Policy HS-2.18: Public Awareness Programs (PI).*** Prepare public awareness programs to inform the general public and potentially affected property owners of flood hazards, potential dam failure inundation, and evacuation plans.

Goal HS-4: Promote the safe operation of airports and the safety of Merced County residents by requiring that any new development within the airport area of influence be consistent with the requirements of the Merced County Airport Land Use Commission’s compatibility plan and compliant with Federal Aviation Administration regulations.

- ***Policy HS-4.2: Compliance with FAA Regulations (RDR).*** Require that development within the airport approach and departure zones is in compliance with Part 77 of the Federal Aviation Administration Regulations (FAA regulations that address objects affecting navigable airspace).

Goal HS-5: Protect Merced County residents, visitors, and property through providing for the safe use, storage, transport, and disposal of hazardous materials and wastes.

- ***Policy HS-5.1: Compliance with Safety Standards (RDR).*** Require that hazardous materials are used, stored, transported, and disposed of in a safe manner, in compliance with local, State, and Federal safety standards.
- ***Policy HS-5.2: Hazardous Material and Waste Transport (IGC).*** Coordinate with the California Highway Patrol to establish procedures for the movement of hazardous wastes and explosives within the County.
- ***Policy HS-5.3: Incompatible Land Uses (RDR).*** Prohibit incompatible land uses near properties that produce or store hazardous waste.
- ***Policy HS-5.4: Contamination Prevention (RDR).*** Require new development and redevelopment proposals that have suspected or historic contamination to address hazards concerns and protect soils, surface water, and groundwater from hazardous materials contamination by conducting Phase I Environmental Site Assessments (ESA) according to the American Society for Testing and Materials (ASTM) standards and applicable Department of Toxic Substances Control (DTSC) remediation guidelines. Also, complete additional Phase II Environmental Site Assessments and soil investigations, and any identified or needed remediation when preliminary studies determine such studies are recommended.
- ***Policy HS-5.5: Household Hazardous Waste (PI).*** Continue to administer educational programs to inform the public about household hazardous waste and the proper methods of disposal.
- ***Policy HS-5.6: Hazardous Waste Residual Repositories (RDR/MPSP).*** Prohibit hazardous waste residual repositories (as defined by the Merced County Hazardous Waste Management Plan) to be located in significant wetland and threatened species habitats or adjacent to State and Federal wildlife refuges or management areas.

Goal HS-7: Protect residents, employees, and visitors from the harmful and annoying effects of exposure to excessive noise.

- ***Policy HS-7.1: Noise Standards for New Land Uses (RDR).*** Require new development projects to meet the standards shown in Tables HS-1 and HS-2, at the property line of the proposed use, through either project design or other noise mitigation techniques.
- ***Policy HS-7.10: Aircraft Noise (RDR).*** Prohibit new noise-sensitive development within the projected future 60 dB Ldn noise contours of any public or private airports.

City General Plans

Table 3.10-4 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.10-4
CITY GENERAL PLAN POLICIES GOVERNING HAZARDS AND HAZARDOUS MATERIALS WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Hazards and Hazardous Materials
City of Turlock	Chapter 10, Safety: Policies 10.1-a through 10.1-i and 10.0-l through 10.0-n
City of Modesto	Chapter 6, Community Facilities and Services, I. Hazardous Materials Management, Policies VI.M.1 through VI.M.6; Chapter 7, Environmental Resources, Open Space and Conservation, M. Fire Hazards, Policy c
City of Ceres	Chapter 5: Policies 5.I.1 through 5.I.12 and 5.J.2
City of Hughson	Chapter 6, Safety Element: Policies COS-6.1 and 6.2; Policies S-3.1 through S-3.3; and Policies S-4.1 and S-4.2

SOURCE: Data compiled by Environmental Science Associates in 2022

3.10.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts related to hazards and hazardous materials focuses on the potential for a project to use, store, dispose of, or transport hazardous materials, or to be located on a hazardous materials site—as well as the potential to accidentally release (or spill) hazardous materials in the process or to produce hazardous emissions near a school. The analysis also focuses on the potential for a project to conflict with an established airport land use compatibility plan or emergency response/evacuation plan, or to expose people or structures to wildland fires.

Hazards and hazardous materials impacts from PMAs implemented under the Turlock Subbasin GSP have been evaluated in terms of how typical project construction and operation could affect people or the environment through the use of hazardous materials or hazards created by the project. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

The following factors were considered when determining the extent and implications of potential hazards and hazardous materials impacts:

- The presence and location of existing hazardous materials sites, and extent of contamination associated with these sites.
- The types of hazardous materials that may be used in the process of constructing or operating a project.
- The locations of all schools within the boundaries of the Turlock Subbasin.
- The locations of all airports within the boundaries of the Turlock Subbasin.
- Any evacuation routes that are delineated in an emergency response or evacuation plan.
- The presence of any mapped fire hazard severity zones.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop surveys, open-access databases, and maps. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2, *Project Description*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact related to hazards and hazardous materials if it would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, result in a safety hazard or excessive noise for people residing or working in the area;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.

Impacts and Mitigation Measures

Table 3.10-5 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the activities, location, and potentially significant impacts of the individual project or management action. Implementation of the mitigation measures would be the responsibility of the project's or management action's proponent(s).

TABLE 3.10-5
SUMMARY OF IMPACT CONCLUSIONS—HAZARDS AND HAZARDOUS MATERIALS

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
HAZ-1: Implementing PMAs under the Turlock Subbasin GSP could create a significant hazard to the public or the environment through the routine transport, use, disposal, or accidental release of hazardous materials.	LTS	LTS
HAZ-2: Implementing PMAs under the Turlock Subbasin GSP could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	LTS	LTS
HAZ-3: PMAs implemented under the Turlock Subbasin GSP could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could create a significant hazard to the public or the environment.	LTSM	LTS
HAZ-4: PMAs implemented under the Turlock Subbasin GSP that could be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, could result in a safety hazard or excessive noise for people residing or working in the area.	LTS	LTS
HAZ-5: Implementing PMAs under the Turlock Subbasin GSP could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	LTSM	LTS
HAZ-6: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.	LTS	LTS

NOTES: LTS = less than significant; LTSM = less than significant with mitigation incorporated

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact HAZ-1: Implementing PMAs under the Turlock Subbasin GSP could create a significant hazard to the public or the environment through the routine transport, use, disposal, or accidental release of hazardous materials.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of Those Features

Implementation of PMAs under the Turlock Subbasin GSP could include construction of new features or modification of existing features including injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site’s recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins to enable surface water deliveries to drip/micro systems.

Depending on the type of project or management action, the construction equipment and materials used could include fuels, oils and lubricants, solvents and cleaners, cements and adhesives, paints and thinners, degreasers, cement and concrete, and asphalt mixtures. The routine use or an accidental spill of hazardous materials could result in inadvertent releases, which could adversely affect construction workers, the public, and the environment.

Construction activities would be required to comply with numerous regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of safely to protect workers, and to reduce the potential for a release of fuels or other hazardous materials into the environment, including stormwater and downstream receiving water bodies. Contractors must prepare and implement hazardous materials business plans, which would require that hazardous materials used for construction be used properly and stored in appropriate containers with secondary containment to contain potential releases. The California Fire Code also mandates the safe storage and handling of hazardous materials.

As discussed in Section 3.8, *Geology, Soils, and Paleontology*, and Section 3.11, *Hydrology and Water Quality*, construction contractors would be required to prepare a storm water pollution prevention plan (SWPPP) for construction activities according to the requirements of the National Pollutant Discharge Elimination System General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities. The SWPPP would list the hazardous materials (including petroleum products) proposed for use during construction; describe measures for spill prevention, equipment inspections, and equipment and fuel storage; identify protocols for responding immediately to spills; and describe best management practices for controlling site runoff.

In addition, the U.S. Department of Transportation, California Department of Transportation, and California Highway Patrol would regulate transportation of hazardous materials. Together, federal and state agencies determine driver-training requirements, load labeling procedures, and container specifications designed to minimize the risk of an accidental release.

Finally, in the event of a spill that releases hazardous materials at a construction site, a coordinated response would occur at the federal, state, and local levels. This response would include the Stanislaus County Department of Environmental Resources and the Merced County Department of Public Health, Division of Environmental Health, which are the local hazardous materials response teams. In the event of a hazardous materials spill, these county departments and the police departments would be simultaneously notified and sent to the scene to respond and assess the situation.

As described above, the required compliance with the numerous laws and regulations governing transportation, use, handling, and disposal of hazardous materials would limit the potential for implementation of the PMAs under the Turlock Subbasin GSP to create hazardous conditions due to the use or accidental release of hazardous materials. Therefore, this impact would be **less than significant**.

Impact HAZ-2: Implementing PMAs under the Turlock Subbasin GSP could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.

Effects of Construction Activities

As discussed in Section 3.10.2, *Environmental Setting,* 40 schools are located within the Turlock Subbasin (Table 3.10-1). Construction activities for PMAs implemented under the Turlock

Subbasin GSP would include the handling of hazardous materials, as discussed previously in Impact 3.10-1. Routes to specific construction sites would depend on the locations of the PMAs but could pass near schools. The accidental release or spill of hazardous materials being transported near a school could expose schoolchildren, school staff, and workers to hazardous materials. Further, the prolonged use of construction equipment could produce hazardous emissions.

As discussed previously in Impact 3.10-1, numerous regulations govern the transportation, use, storage, and disposal of hazardous materials during construction activities. The required compliance with these regulations would prevent exposure of nearby schools to hazardous materials. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Operations and maintenance of PMAs implemented under the Turlock Subbasin GSP are anticipated to require only minimal use of chemicals, such as cleaning solutions, paints and thinners, motor fuel, or disinfectants. Few of the chemicals would be considered hazardous materials (e.g., bleach and cleaners) and anticipated volumes would be small (less than 5 gallons). Because the quantities would be small, this impact related to the use of hazardous materials near schools during operations would be **less than significant**.

Impact HAZ-3: PMAs implemented under the Turlock Subbasin GSP could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could create a significant hazard to the public or the environment.

Effects of Construction Activities

As discussed in Section 3.10.2, *Environmental Setting*, numerous hazardous materials sites exist within the boundaries of the Turlock Subbasin. Additional sites may be discovered in the future, particularly for properties with past industrial or commercial uses. The construction of new features or modification of existing features for PMAs implemented under the Turlock Subbasin GSP could involve excavating soils, some of which may have chemical concentrations exceeding regulatory action levels. If the type of project or management action involves excavating soils or extracting groundwater from a site with existing contamination, and the contaminated materials are handled improperly, construction workers, the public, and the environment could be exposed to hazardous materials.

As discussed in Impact HAZ-1, numerous regulations govern the transportation, use, storage, and disposal of hazardous materials during construction activities. The required compliance with these regulations would reduce the exposure to hazardous materials. However, this impact would be **potentially significant**.

Mitigation Measures HAZ-1, HAZ-2, and HAZ-3 would be required when applicable to a given project. Implementation of these mitigation measures would be the responsibility of the project proponent(s).

Mitigation Measure HAZ-1: Conduct Phase I Assessment.

Before the start of any construction requiring ground-disturbing activities on industrial and commercial properties, as well as listed active hazardous materials cleanup sites, the project applicant shall complete a Phase I environmental site assessment for that property in accordance with American Society for Testing and Materials Standard E1527 for those active hazardous materials sites to ascertain their current status. Any recommended follow-up sampling (i.e., Phase II activities) set forth in the Phase I assessment shall be implemented before construction. The results of Phase II studies, if necessary, shall be submitted to the local overseeing agency and any required remediation or further delineation of identified contamination shall be completed before the start of construction.

Mitigation Measure HAZ-2: Prepare and Implement Site-Specific Health and Safety Plan.

For those properties for which the Phase I assessment identifies hazardous materials issues, before the start of ground-disturbing activities, including grading, trenching, or excavation, or structure demolition, the project applicant for the specific work proposed shall require that the construction contractor(s) retain a qualified professional to prepare a site-specific health and safety plan in accordance with federal Occupational Safety and Health Administration regulations (Code of Federal Regulations Title 29, Section 1910.120) and California Occupational Safety and Health Administration regulations (California Code of Regulations Title 8, Section 5192).

The construction contractor shall implement the health and safety plan to protect construction workers, the public, and the environment during all ground-disturbing and structure demolition activities. The plan shall designate a site health and safety officer, summarize the anticipated risks, describe personal protective equipment and decontamination procedures, and identify the procedures to follow if evidence of potential soil or groundwater contamination is encountered.

Mitigation Measure HAZ-3: Develop and Implement Soil and Groundwater Management Plan.

In support of the health and safety plan described in Mitigation Measure HAZ-2, the project applicant shall require that its contractor(s) develop and implement a soil and groundwater management plan for the management of soil and groundwater before any ground-disturbing activity. The soil and groundwater management plan shall describe the hazardous materials that may be encountered; the roles and responsibilities of on-site workers and supervisors; training for site workers on recognizing and responding to encounters of hazardous materials; and protocols for handling, removing, transporting, and disposing of all excavated soil and dewatering effluent in a safe, appropriate, and lawful manner.

Implementing Mitigation Measures HAZ-1, HAZ-2, and HAZ-3 would reduce potentially significant impacts from the location of a project or management action on a listed hazardous materials site and/or a site previously used for commercial or industrial uses to a **less-than-significant** level.

Effects of Constructed Features and Operations and Maintenance of those Features

Contaminated materials associated with constructed PMAs being implemented under the Turlock Basin GSP would have already been removed and/or treated, and people and the environment would not be exposed to hazardous materials. Therefore, this impact would be **less than significant**.

Impact HAZ-4: PMAs implemented under the Turlock Subbasin GSP that could be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, could result in a safety hazard or excessive noise for people residing or working in the area.

Effects of Construction Activities

There are three airports within the Turlock Subbasin study area: the Modesto City-County Airport in Stanislaus County and the Merced-Castle Airport and Turlock Municipal Airport in Merced County. The safety and noise hazard zones for these airports are delineated in the Stanislaus County ALUCP and the Merced County ALUCP. Because the locations of future PMAs have not been determined at the time of this analysis, the potential exists for development of future PMAs to be proposed within one or more of these hazard zones. Should future PMAs be proposed within safety or noise hazard zones, they could result in a safety hazard or excessive noise for people residing or working in the area. As a result, a potentially significant impact could occur if ALUCP guidelines are not followed.

As discussed in Section 3.10.3, *Regulatory Setting*, the FAA regulates all civil aviation in the country. One responsibility of the FAA is to regulate transportation safety and develop and carry out programs for controlling aircraft noise and other environmental effects of civil aviation. Compliance with FAA regulations is applicable to safety and noise impacts because they are related to civil aviation and the environment.

With the required compliance with applicable ALUCPs and FAA regulations, implementation of future PMAs under the Turlock Subbasin GSP would have a **less-than-significant** impact relative to the potential exposure of people residing or working within the Turlock Subbasin to excessive airport or airstrip noise.

Effects of Constructed Features and Operations and Maintenance of those Features

Adherence to the applicable ALUCP guidelines and FAA regulations would be required during the construction of structures and buildings for PMAs implemented under the Turlock Subbasin GSP. Adherence to these guidelines and regulations, which would restrict development in these sensitive areas, would address any safety or noise impacts. Because safety and noise impacts would be avoided and/or addressed during construction, PMAs implemented within the boundaries of the Turlock Subbasin would not be located within a safety or noise hazard zone. This impact would be **less than significant**.

Impact HAZ-5: Implementing PMAs under the Turlock Subbasin GSP could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Effects of Constructed Activities

According to the Stanislaus County EOP and the Merced County MJHMP, the major arterial highways that run through both counties would likely be used as evacuation routes in the event of an emergency.

As discussed previously, implementation of PMAs under the Turlock Subbasin GSP could involve construction of new features or modification of existing features. Construction activities may require the closure of one or more roads to divert traffic away from an active construction site for a project or management action. Road closures or road work during construction would be temporary. However, if future PMAs would require the closure of main roads and/or major arterial highways (which would likely be used during an emergency evacuation), this could lead to traffic congestion and could otherwise impair or interfere with an emergency response/evacuation plan. This impact would be **potentially significant**.

To ensure that impacts related to future traffic obstructions would be reduced to a less-than-significant level, implementation of Mitigation Measure TRANS-1, Prepare and Implement a Construction Traffic Management Plan, would be required. Mitigation Measure TRANS-1 would require the project's or management action's proponent(s) (or their contractors) to prepare and implement a construction traffic management plan, which would reduce potential interference with local emergency response plans, reduce potential traffic safety hazards, and ensure adequate access for emergency responders.

> **Mitigation Measure TRANS-1: Prepare and Implement a Construction Traffic Management Plan**. (See Section 3.17, *Transportation*, for a full description of this mitigation measure.)

Implementing this mitigation measure would reduce the potentially significant temporary construction impact related to a conflict with an emergency response or evacuation plan to a **less-than-significant** level.

Effects of Constructed Features and Operations and Maintenance of Those Features

Once features associated with the PMAs implemented under the Turlock Subbasin GSP are constructed, temporary traffic obstructions would stop, and routine operations and maintenance for the PMAs would not likely restrict or interfere with the flow of emergency vehicles or evacuation. The impact of operation of the PMAs related to impairing or interfering with an emergency response or evacuation plan would be **less than significant**.

Impact HAZ-6: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.

Effects of Construction Activities

As discussed in Section 3.10.3, *Environmental Setting*, CAL FIRE has determined through an internal review process that there are no VHFHSZs in Stanislaus and Merced counties. However, the available Forest Resource Assessment Program maps for both counties indicate that there are scattered areas of moderate fire hazard.

Construction activities for PMAs implemented under the Turlock Subbasin GSP, including the use of construction equipment and the possible temporary on-site storage of fuels and/or other flammable construction chemicals, could pose an increased fire risk, resulting in injury to workers or the public. However, contractors would be required to comply with regulations for hazardous materials storage and fire protection, which would minimize the potential for fire creation. Because there are no mapped VHFHSZs within the boundaries of the Turlock Subbasin, and because compliance with fire hazard safety protocols during construction would be required, impacts related to wildland fire would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

As discussed above, there are no VHFHSZs within the boundaries of the Turlock Subbasin. Thus, features for the PMAs implemented under the Turlock Subbasin GSP would be constructed outside of one of these zones, and any operational activities would take place outside of these zones. Depending on the type of project or management action, operational activities may require the storage of flammable substances, which could lead to fire ignition if such substances were stored and handled improperly. However, like construction activities, operational activities would be subject to hazardous materials storage requirements and fire protection regulations. Given compliance with these requirements, impacts related to wildland fires would be **less than significant**.

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3.11 Hydrology and Water Quality

3.11.1 Introduction

This section describes the hydrology and water quality in and characteristics of the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect hydrologic resources. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2.)

No comments specifically addressing hydrology and water quality were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.11.2 Environmental Setting

This section describes the hydrologic resources that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and includes a range of hydrologic resources.

Topography and Climate

The study area encompasses the Turlock Subbasin, which lies in the San Joaquin Valley between the Tuolumne and Merced rivers and is bounded on the west by the San Joaquin River and on the east by the Sierra Nevada foothills. The subbasin's topography is varied, with ground surface elevations sloping to the southwest, from more than 450 feet mean sea level (msl) in the foothills to less than 50 feet msl in the east along the San Joaquin River. The western Turlock Subbasin lies within the San Joaquin Valley and is generally flat, with a relatively uniform slope of about 9 feet per mile; elevations range from about 30 feet msl near the San Joaquin River to about 200 feet msl near the center of the subbasin.

The ground surface of the eastern half of the Turlock Subbasin represents the transition from the relatively flat San Joaquin Valley into the foothills of the Sierra Nevada. This area is characterized by hummocky topography consisting of irregular hills and intervening depressions. The eastern subbasin is dissected by numerous small drainages and by Dry Creek, the largest internal drainageway and tributary to the Merced River (described in more detail below). Ground surface elevations in the eastern subbasin range from less than 200 feet msl along the Tuolumne and Merced rivers to more than 450 feet along the subbasin's eastern boundary.

The Turlock Subbasin experiences a Mediterranean climate and seasonal precipitation patterns, with most precipitation occurring between November and March. Average annual precipitation varies widely across the subbasin: Precipitation averages an estimated 11 inches per year in the southwest corner of the Turlock Subbasin, and increases farther east, to 15 inches per year in the Sierra Nevada foothills along the subbasin's eastern boundary (DWR 2006). Summers in the study area are typically hot and dry, and streamflow generally follows the precipitation pattern, with higher flows in the winter months and lower flows in the summer and early fall. Sierra

Nevada snowmelt contributes substantially to flows during the spring. **Table 3.11-1** presents average monthly climatic data for the Turlock Subbasin (City of Turlock 2021).

TABLE 3.11-1
SUMMARY OF CLIMATE DATA FOR THE TURLOCK SUBBASIN

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average ETo (inches)[a]	1.2	2.1	3.6	5.2	6.8	8.1	8.4	7.3	5.4	3.6	1.8	1.2	54.6
Average Max Temp (°F)[b]	54.3	61.1	66.8	72.9	80.3	88.7	94.4	92.5	87.0	77.2	64.1	54.0	74.4
Average Min Temp (°F)[b]	38.9	42.2	45.1	49.0	53.7	59.3	63.1	61.5	58.4	52.1	43.3	38.4	50.3
Average Rainfall, Inches[b]	2.3	2.0	1.9	1.1	0.4	0.1	0.0	0.0	0.2	0.6	1.3	2.1	12.0

NOTES:

°F = degrees Fahrenheit; ETo = evapotranspiration rate from a reference surface, not short of water; Max Temp = maximum temperature; Min Temp = minimum temperature

a Source: DWR 2020, as cited in City of Turlock 2021.
b Source: WRCC 2021, as cited in City of Turlock 2021.

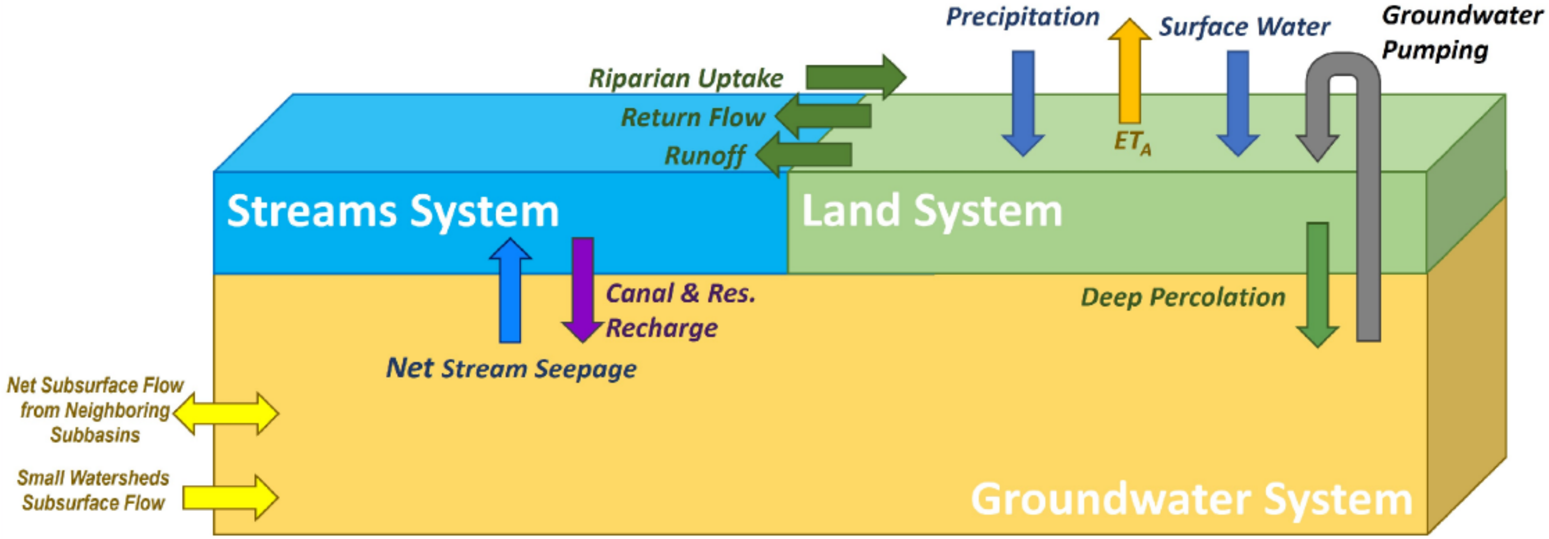
SOURCE: City of Turlock 2021: Table 3-1.

Hydrologic Resources

Hydrologic resources in the Turlock Subbasin consist of a mix of surface water and groundwater affected by inflows and outflows through the land surface. The two primary sources of water used in the Turlock Subbasin originate as surface water from the Tuolumne River and local subbasin groundwater. Surface water from the Merced River and stormwater provide additional sources, as does the reuse of municipal and industrial wastewater. No sources of imported water are available in the Turlock Subbasin.

Figure 3.11-1 presents a conceptual diagram illustrating the main components of the water budget and the interconnectivity of stream, surface, and groundwater components of the natural and human-related hydrologic systems applicable to the Turlock Subbasin. Local hydrology plays an integral role in in the overall sustainability of the subbasin and the implementation of PMAs, as the magnitude of historical flows to the aquifer changes by water year type. In wet years, precipitation meets more of the water demand, and the greater availability of surface water reduces the need for groundwater. However, in dry years, more groundwater is pumped to meet the demand not met by surface water or precipitation. This leads to an increase in groundwater storage in wet years and a decrease in dry years (Todd Groundwater 2022a).

The following text describes the physical attributes of surface water and groundwater sources in the Turlock Subbasin and identifies the uses of those sources, as presented in Chapters 2 and 4 of the Turlock Subbasin GSP. For a more complete discussion refer directly to the Turlock Subbasin GSP (Todd Groundwater 2022a) and the Turlock Subbasin Annual Report for Water Year 2021 (Todd Groundwater 2022b). For a more detailed discussion of agricultural water management in the Subbasin, refer to the Turlock Irrigation District Agricultural Water Management Plan (TID 2021) and the Merced Irrigation District Agricultural Water Management Plan (MID 2021).



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SOURCE: Turlock Subbasin Groundwater Sustainability Plan, Chapter 5 (Figure 5-1)

Figure 3.11-1
Water Budget Diagram

ESA

Surface Water

The study area lies within the San Joaquin River Hydrologic Region (Hydrologic Unit Code 8). The region is south of the Sacramento River Hydrologic Region and north of the Tulare Lake Hydrologic Region. **Figure 3.11-2** shows the boundaries of the Hydrologic Unit Code 8 watersheds that coincide with the study area. These watersheds include the Lower San Joaquin River, the Upper Merced, and the Upper Tuolumne.

For purposes of the PEIR, *surface waters* are defined as both naturally occurring streams, lakes, wetlands, and ponds, and water bodies modified or developed by humans, including reservoirs, irrigation canals, and ditches. Surface water supplies in the Turlock Subbasin are illustrated in **Figure 3.11-3**, which shows the Tuolumne River on the north; the Merced River on the south; and several internal drainageways and elements of surface water infrastructure, including the primary canals used for conveying surface water. **Figure 3.11-4** presents the aquatic resource areas across the study area based on the National Wetlands Inventory. Both the Tuolumne and Merced rivers are tributaries to the San Joaquin River, which flows north to the Sacramento–San Joaquin Delta (Delta). Select surface water bodies are described in more detail below.

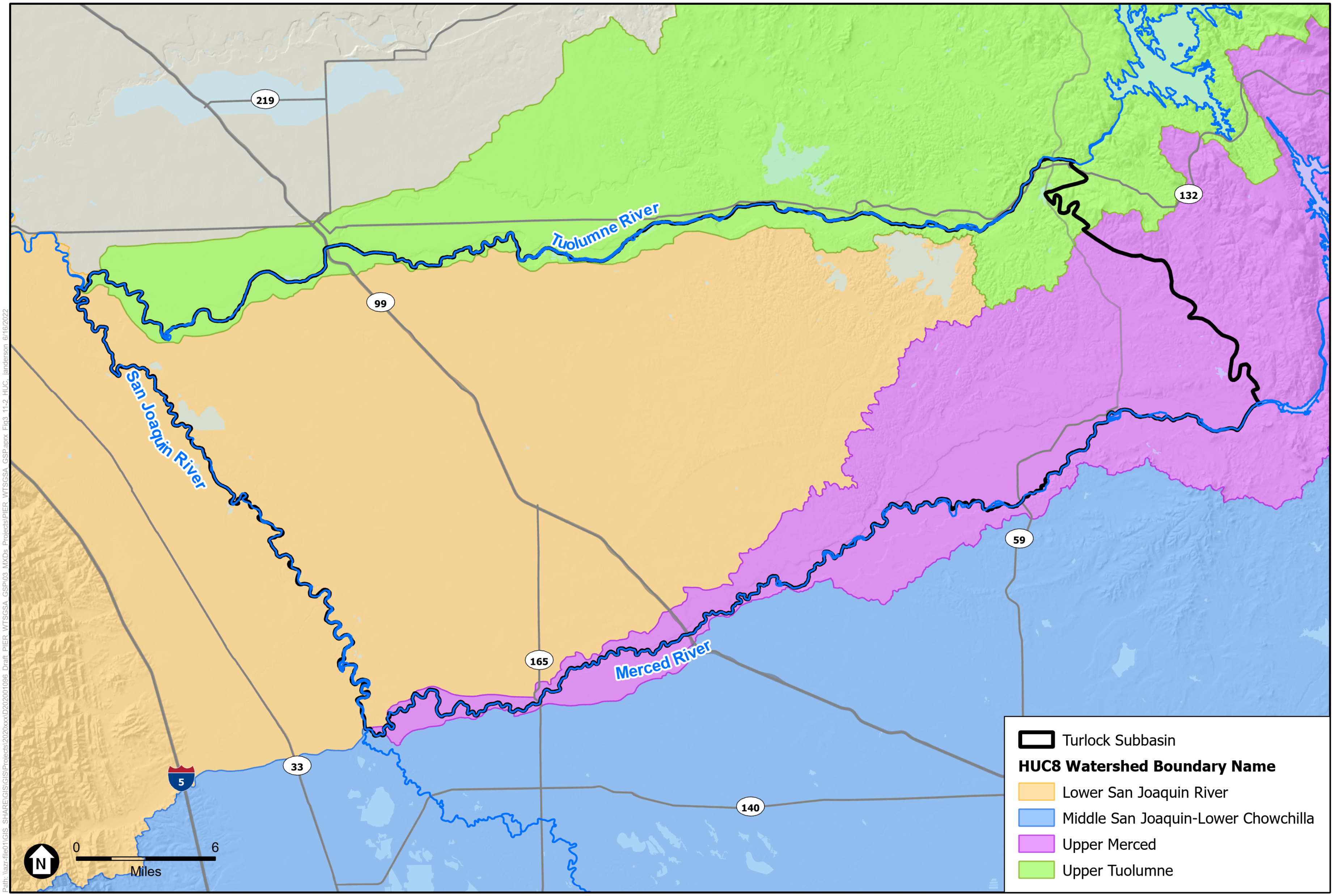
San Joaquin River

The San Joaquin River is the principal river in the region, running through Stanislaus County from south to north; all other streams in the area are tributaries to the San Joaquin. The San Joaquin River is the primary drainage for the northern San Joaquin Valley and flows north into the Delta and San Francisco Bay. Streamflow on the San Joaquin River from 1960 to 2004 ranged from less than 100 cubic feet per second (cfs) upstream of the Merced River to more than 40,000 cfs downstream of the Stanislaus River. The San Joaquin River basin has average annual runoff of approximately 4 million acre-feet (Todd Groundwater 2022a).

Tuolumne River

The Tuolumne and Stanislaus rivers originate in the Sierra Nevada and are tributaries to the San Joaquin River. The Tuolumne River drains a watershed of approximately 1,635 square miles and flows to the confluence with the San Joaquin River near Grayson (Burow et al. 2004). Typical average monthly streamflow in the Tuolumne River ranges from 100 cfs to 400 cfs during low streamflow to more than 1,000 cfs—and sometimes more than 10,000 cfs—during high streamflow (Phillips et al. 2015; Todd Groundwater 2022a).

The Tuolumne River provides the largest supply of surface water in the Turlock Subbasin, which is used primarily for irrigated agriculture. Turlock Irrigation District (TID) diverts water from Don Pedro Reservoir into the TID Upper Main Canal at La Grange Diversion Dam in accordance with pre- and post-1914 flow and storage water rights (TID 2021). Diversions flow through the Upper Main Canal to Turlock Lake for temporary storage and irrigation deliveries. Water released from Turlock Lake flows throughout the western subbasin through a network of canals and drains, as illustrated in Figure 3.11-2. TID presently covers a service area of 197,261 gross acres, with approximately 157,800 acres that could be served by active TID irrigation service connections (TID 2021). TID operates approximately 241 miles of canals, of which more than 90 percent (222 miles) are fully or partially lined (Todd Groundwater 2022a).

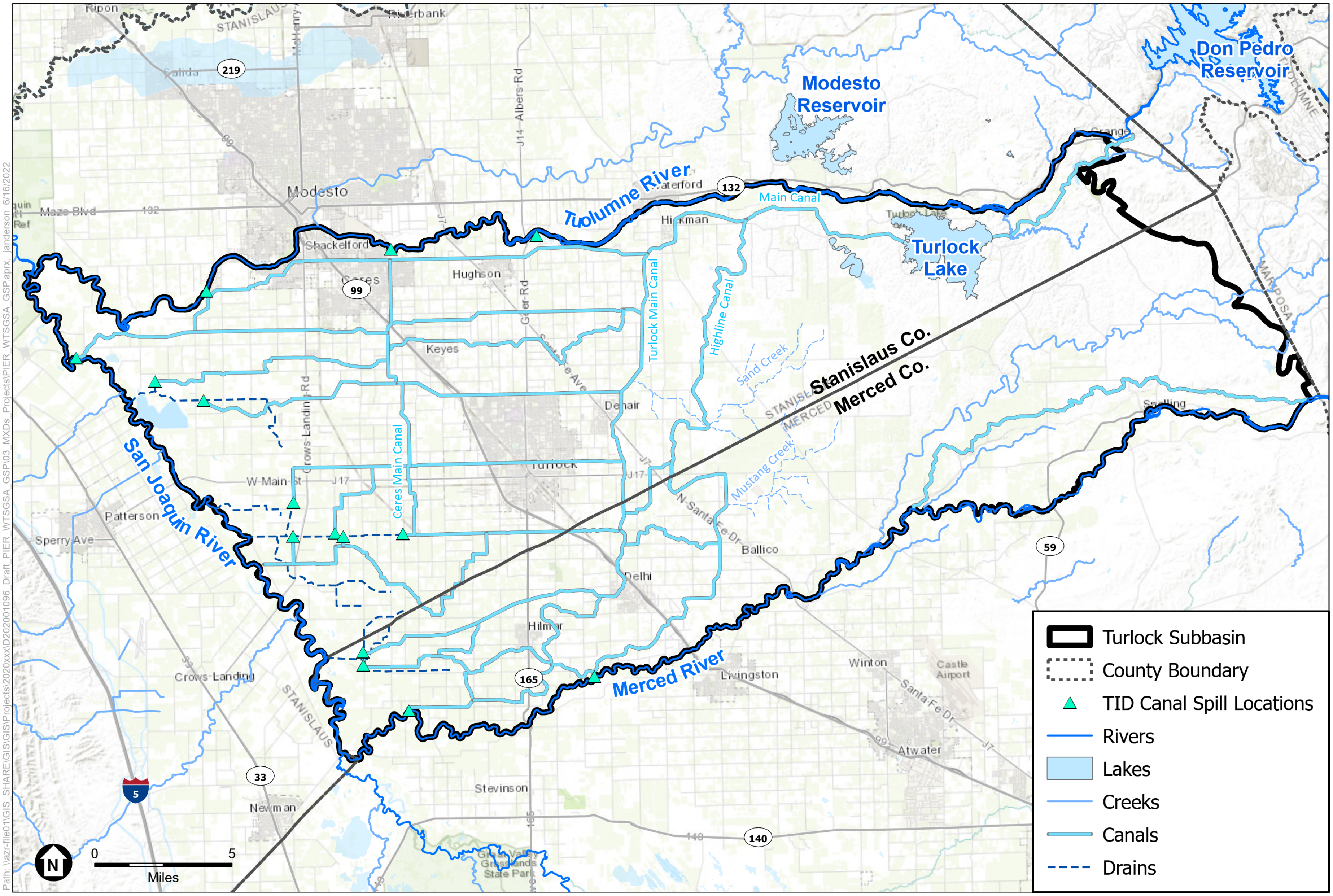


SOURCE: NHD,2021; ESA, 2022

Turlock Subbasin PEIR

Figure 3.11-2
Turlock Subbasin Watershed Boundaries

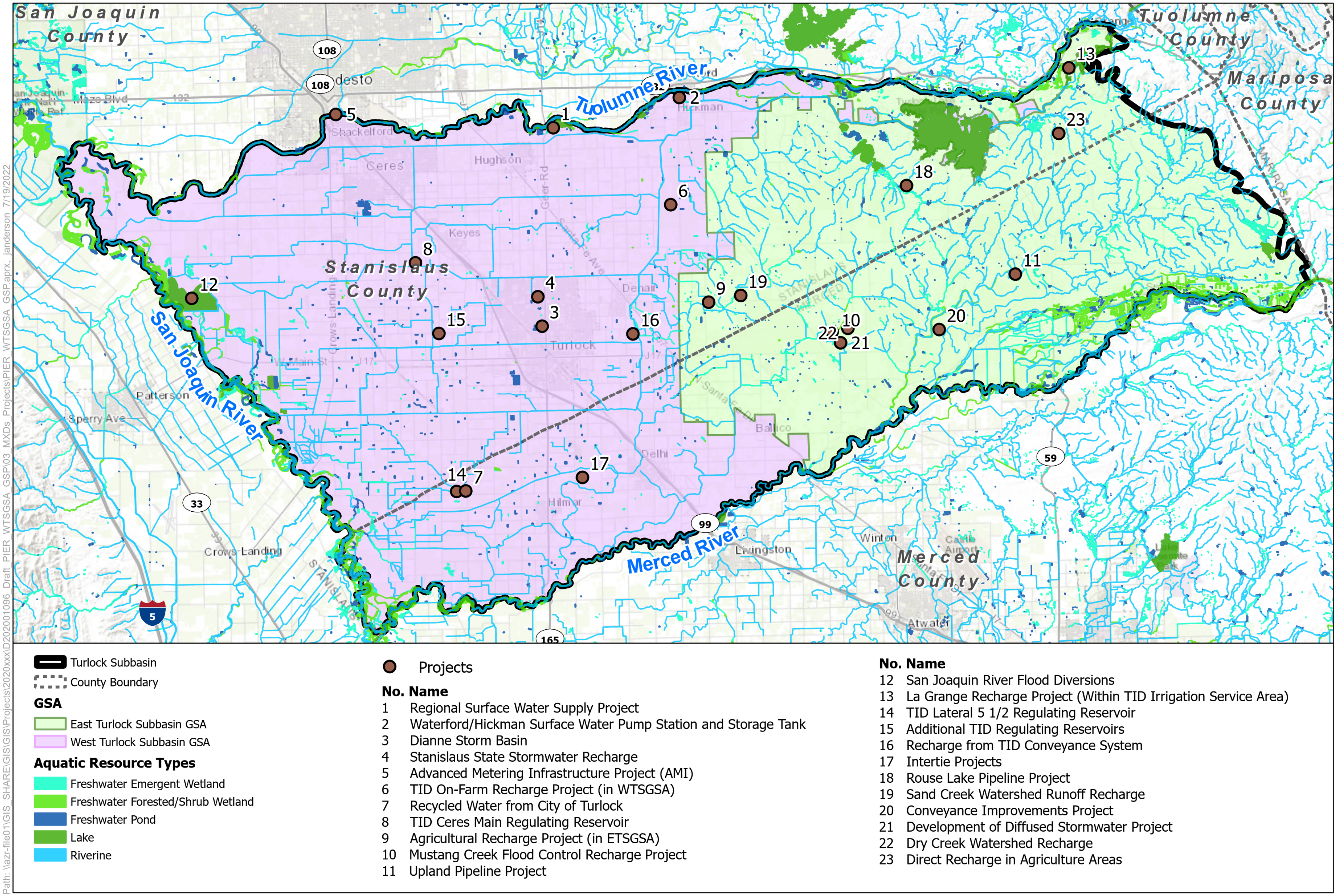
ESA



SOURCE: ESA, 2021; Todd Groundwater, 2021.

Figure 3.11-3
Surface Water Conveyance System

ESA



SOURCE: ESA, 2021; Todd Groundwater, 2021; NWI, 2021.

Figure 3.11-4
Aquatic Resources in the Turlock Subbasin

ESA

TID's conjunctive management program is designed to encourage irrigators to use surface water supplies during periods of normal and above normal surface water availability. Surface water from the Tuolumne River, applied within the TID service area via flood irrigation, is the primary source of groundwater recharge within the Subbasin. During below normal years, groundwater is pumped into TID canals to supplement surface water supplies through the use of rented and drainage wells. More groundwater is used during dry periods when less surface water is available (TID 2021)

Sustained use of surface water for irrigation is a key component of TID's conjunctive management of surface and groundwater supplies. During the period from 1991 to 2019, surface water from the Tuolomne River supplied, on average, 80 percent of the water used by lands that received deliveries from TID. Groundwater supplied 18 percent of average annual demand, while the remaining 2 percent came from other sources. These surface water and groundwater averages shifted to 84 and 14 percent, respectively, during normal and wetter years, 75 and 23 percent, respectively, during dry years. The percent sourced from other supplies remain the same. From 2015 through 2019, average releases from Turlock Lake totaled about 423,620 acre-feet per year (AFY) (TID 2021).

Merced River

The Merced River, forming the Turlock Subbasin's southern boundary, serves as an additional source of surface water supply. The Merced River drains a watershed of about 1,076 square miles to its confluence with the San Joaquin River near Newman (Burow et al. 2004). According to Merced Irrigation District (MID), streamflow on the Merced River ranges from less than 50 cfs in dry years to about 5,000 cfs in wetter years (Todd Groundwater 2022a).

MID diverts and delivers water from the Merced River, the main source of MID's surface water supply, to lands in both the Turlock Subbasin and adjacent subbasins, primarily for agricultural irrigation. Agricultural lands within the MID service area are irrigated with surface water supplies from the District, groundwaters supplies from the District, groundwater from privately owned wells, and recirculated tailwater (MID 2021). MID's service area covers about 164,317 gross acres in portions of the Turlock and Merced subbasins, with only about 3 percent of this area located in the Turlock Subbasin (about 5,500 acres) (Todd Groundwater 2022a).

MID diverts water from Lake McClure by New Exchequer Dam on the Merced River and holds diversion rights on the Merced River that date back to 1857. MID's distribution system includes approximately 860 miles of conveyance facilities. Most of the surface water is used in the Merced Subbasin, and therefore, most of the conveyance facilities are south of the Merced River. Water is diverted from the Merced River into the Turlock Subbasin via the Northside Canal. In addition to its customers, MID delivers river water to certain parcels with riparian rights where the natural watercourse has been incorporated into the MID distribution system (Todd Groundwater 2022a).

From 2016 through 2020, MID diverted an average of 469,684 AFY from the river, with an average of 30,479 AFY of additional surface water from tributary inflows (MID 2021). Like TID, MID manages surface water and groundwater conjunctively throughout its service area, incorporating wells and groundwater recharge projects into its operations to supplement the surface water supply. However, MID does not pump groundwater from the Turlock Subbasin (Todd Groundwater 2022a).

Other Surface Water Bodies

Smaller creeks and streams in the Turlock Subbasin provide local surface water supply, primarily for agricultural uses such as livestock watering in the eastern Turlock Subbasin. Specifically, local landowners use surface water along three drainageways: Dry Creek, Rouse Lake, and Mustang Creek. Runoff from Sand Creek and Peaslee Creek are also used, but to a lesser extent.

Dry Creek, a tributary to the Merced River, has the largest local watershed, consisting of about 77,000 acres extending east outside of the groundwater basin. Minor surface water impoundment and detention structures have been constructed along Dry Creek to accommodate local land use water demands. As described in the Turlock Subbasin GSP, some of these structures may also provide groundwater recharge (both coincidentally and intentionally) via return flows.

The area tributary to Rouse Lake is another internal watershed in the Turlock Subbasin (covering more than 10,000 acres) that is used for local supply. Several small impoundments have been constructed along tributary watercourses above Rouse Lake to meet local water demands. Other important watersheds include Mustang Creek (13,750 acres to its confluence with the TID Highline Canal), Sand Creek (13,300 acres to its confluence with the TID Main Canal), and Peaslee Creek (5,400 acres, located northeast of Turlock Lake).

Mustang Creek has two floodwater detention structures to prevent property damage and alleviate flood risks. Peaslee Creek has one or more impoundments within its watershed to control stormwater runoff that might otherwise damage crops or infrastructure (Todd Groundwater 2022a).

Groundwater

For purposes of this PEIR, *groundwater* is defined as water in the aquifer systems within the Turlock Subbasin (i.e., the study area, Groundwater Basin 5-022.03) that is extracted for agricultural irrigation and potable water supply, among other beneficial uses. As described in Chapter 2, the Turlock Subbasin lies between the Tuolumne and Merced rivers and is bounded on the west by the San Joaquin River and on the east by crystalline basement rock of the Sierra Nevada foothills. The northern, western, and southern boundaries are shared with the Modesto, Delta-Mendota, and Merced groundwater subbasins, respectively (DWR 2006).

Three principal aquifers were defined in the Turlock Subbasin for the GSP and future management of groundwater under SGMA. The Corcoran Clay, underlying the western Subbasin, is the primary aquitard in the Subbasin and is used to separate and define the three principal aquifers: the Western Upper Principal Aquifer is the unconfined aquifer above the Corcoran Clay, the Western Lower Principal Aquifer is the confined aquifer below the Corcoran Clay, and the Eastern Principal Aquifer is the unconfined to semi-confined aquifer east of the Corcoran Clay (Todd Groundwater 2022a).

According to the Turlock Subbasin GSP, the estimated average specific yield of the subbasin is 10.1 percent. Groundwater flow is primarily to the southwest, following the regional dip of basement rock and sedimentary units. Based on recent groundwater measurements, a paired groundwater mound and depression appear beneath the city of Turlock and to its east, respectively. No faults have been identified that affect the movement of fresh groundwater (DWR 2006; Todd Groundwater 2022a).

Table 3.11-2 presents the beneficial uses of groundwater in the Turlock Subbasin as presented in the Turlock Subbasin GSP. Average pumping volumes were estimated using a regional integrated surface water–groundwater model (California Central Valley Groundwater–Surface Water Simulation Model [C2VSim]-Turlock/Modesto model, or C2VSim-TM) that has been revised with local data and applied to develop the Turlock Subbasin's water budget as presented in the Turlock Subbasin GSP. Environmental uses of groundwater in the Turlock Subbasin include groundwater-dependent ecosystems in areas where groundwater is sufficiently high to reach the rooting zone (Todd Groundwater 2022a).

TABLE 3.11-2
BENEFICIAL USES OF GROUNDWATER IN THE TURLOCK SUBBASIN

Beneficial User	Beneficial Uses	Average Annual Pumping, Water Years 1991–2015	
		AFY	%
Agricultural	Irrigation and non-irrigation agricultural supply	351,000	86%
Municipal and Industrial/Urban Communities	Drinking water and other municipal and industrial uses, including landscape irrigation	39,000	9%
Domestic Well/Small Water Systems	Drinking water and other indoor water uses	20,000	5%

NOTE: AFY = acre-feet per year

SOURCE: Todd Groundwater 2022a: Chapter 2.

Agricultural Users

Irrigated agriculture is the largest beneficial use of groundwater in the Turlock Subbasin, covering about 70 percent of the subbasin (Table 3.11-2). About 37 percent of the irrigated acreage occurs in the eastern subbasin, where groundwater represents most of the agricultural supply. Even though surface water is available in the western subbasin, groundwater is used as a supplemental supply, especially during drought periods when less surface water is available. As mentioned above, TID uses groundwater to supplement surface water deliveries to local growers as part of its conjunctive-use program. Accordingly, most of the agricultural lands in the subbasin are partially or entirely reliant on groundwater.

Urban and Industrial Users

Most of the urban communities within the Turlock Subbasin also rely on groundwater for almost all of their water supply. The cities of Turlock and Ceres account for most of the urban production in the subbasin, but numerous other communities also rely on groundwater for their drinking water supply, including Hilmar, Delhi, Keyes, Denair, Hughson, and Hickman. In addition, the City of Modesto operates water supply wells within the Turlock Subbasin as part of its South Modesto service area.

In addition to using groundwater for its drinking water supply, the City of Turlock pumps groundwater for landscape irrigation and other local uses. In certain areas of the western subbasin, the City of Turlock uses shallow, poor-quality groundwater for some nonpotable uses. Pumping in these areas has occurred historically to control high water levels. By putting this water to beneficial use, Turlock has obtained a previously unused water supply. Small amounts of stormwater are also detained locally for groundwater recharge and/or supplied to TID to be discharged to the canal system and conveyed to the river system. Given the canals weren't initially designed to convey large amounts of stormwater, capacity limitations exist, particularly to the west as the canals become smaller (TID, pers. comm., 2022). Recycled water provides a small supplemental nonpotable water supply to the City of Turlock.

In addition to the larger urban communities, several small community water supply systems throughout the Turlock Subbasin are operated by their respective communities and regulated by local county environmental health agencies. Although they represent a very small percentage of overall groundwater pumping in the subbasin, these systems are solely reliant on groundwater resources (Todd Groundwater 2022a).

Production and Domestic Wells

Groundwater is extracted through agricultural, public, municipal, and industrial production wells. According to the California Department of Water Resources' (DWR's) 2018 basin prioritization report, there are about 7,000 production wells in the Turlock Subbasin. The highest density of production wells is in the western subbasin and east-northeast of Delhi in the Eastern Principal Aquifer, generally coinciding with municipalities and urban centers.

Turlock Subbasin residents who live outside of the public water systems rely on private domestic groundwater wells for local water supply. About 869 wells were tabulated from DWR records as of 2018. Domestic wells are present throughout the subbasin, with the greatest density occurring in the west-central subbasin. During the drought of record (2014–2016), about 165 domestic wells in the Turlock Subbasin were reported to have failed, as documented by Stanislaus and Merced counties, likely because of declining water levels that contributed to insufficient well capacity, complete dewatering, or structural failure. Water quality has also been a constraint on potable water, with high salinity and nitrate concentrations presenting ongoing challenges for management and long-term sustainability of water resources (Todd Groundwater 2022a, 2022b). As part of the Central Valley Water Board's Nitrate Control Program, the Valley Water Collaborative was formed to address nitrate contamination in groundwater in private domestic wells used for drinking water (Central Valley Salinity Coalition and CV-Salts 2022). Qualifying applicants residing in the Turlock Subbasin can apply for replacement water or water treatment systems for nitrate contamination (Valley Water Collaborative 2022). The CV-SALTS initiative is described in more detail in Section 3.11.3.

Recycled Water

Recycled water provides a small but additional supplemental water supply in the Turlock Subbasin, for both urban and agricultural use. The City of Turlock uses recycled water as a nonpotable water supply for industrial cooling water and landscape irrigation of a sports field in the city. In 2015, Turlock used about 1,105 AFY of recycled water. The City of Modesto operates a tertiary wastewater treatment plant in the Turlock Subbasin that treats wastewater from various sources (including Ceres and Turlock) to provide water for reuse. Currently, treated water from the Modesto treatment plant is used for farmland irrigation with a portion of the water delivered to Del Puerto Water District (in the adjacent Delta-Mendota Subbasin) (Todd Groundwater 2022a). TID in the future will have access to an estimated 2,000 AFY of recycled water for a supplemental agricultural supply, provided through the Regional Surface Water Supply Project (Project No. 1) (TID, pers. comm., 2022).

Surface Water-Groundwater Interactions

The GSP regulations define *interconnected surface water* as “surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted” (California Code of Regulations Title 23, Section 351[o]).

Under these conditions, groundwater and surface water are in hydraulic communication. The interaction can be characterized in two primary ways: If the groundwater surface is higher than the stage of the river, then the groundwater flows into the river channel as base flow. This condition is referred to as a *gaining stream*. Alternatively, if the groundwater surface is lower than the stage of the river, the river will recharge the groundwater system, a condition referred to as a *losing stream*. Although this recharge is beneficial to the groundwater system, it reduces water in the river (i.e., streamflow depletion) and can affect beneficial uses of surface water (Winter et al. 1998). If groundwater levels decline significantly below the river channel, the two systems can become disconnected, resulting in loss of base flow. Given the varying conditions of the river stage and groundwater levels—both seasonally and over time—groundwater/surface water interaction is dynamic and can alternate between losing and gaining conditions along various river reaches (Todd Groundwater 2022a; Winter et al. 1998).

The Turlock Subbasin is bounded by the Tuolumne River on the north, the San Joaquin River on the west, and the Merced River on the south. Previous studies indicated that all three river boundaries of the Turlock Subbasin were net gaining streams through the 1960s. By the 2000s, simulations indicated that the Merced River had become a net losing river due to declines in groundwater levels. At that time, the Stanislaus River, the Tuolomne River, and certain reaches of the San Joaquin River were the only rivers remaining in the San Joaquin Valley with consistent net gaining conditions (The Nature Conservancy 2016). Although these surficial boundaries do not represent the extent of the subbasin’s aquifers in the subsurface, they do represent important institutional boundaries and authorities for groundwater management. Further, rivers often represent a groundwater divide in local unconfined aquifers. For practical purposes, DWR also considers basin boundaries, such as the rivers bounding the Turlock Subbasin, to be groundwater divides (DWR 2003). Before development in the Turlock Subbasin, the primary sources of groundwater recharge included deep percolation from precipitation, surface runoff and subsurface inflows from the eastern foothills, and seepage along the Tuolumne and Merced rivers. In addition, the Turlock Subbasin contains two closed basins, Sand Creek and Mustang Creek, along with smaller sub-watersheds truncated by TID’s Highline Canal. Sand Creek and Mustang Creek ancestrally recharged flows of surface water into groundwater. These two small watersheds terminate into their distal fan sands in the areas of Denair and Ballico, respectively. These drainageways provide areas of groundwater recharge from precipitation within the subbasin (Todd Groundwater 2022a).

Since development, irrigation return flows (including recharge of applied surface water in the western Turlock Subbasin) are the primary source of recharge to the subbasin. Pumping for municipal, domestic, agricultural, and drainage purposes is the primary source of discharge (Burow et al. 2004; TGBA 2008). The previous upward hydraulic gradients in the western subbasin from the confined aquifer appear to have been reversed in some areas as a result of pumping beneath the Corcoran Clay, including areas on the west side of the San Joaquin River (Burow et al. 2004; Todd Groundwater 2022a).

Other current sources of recharge include precipitation, underflow from the foothills, leakage from Turlock Lake, seepage along certain reaches of the Tuolumne and Merced rivers, subsurface inflow from adjacent subbasins, leakage from unlined canals, and various areas of managed aquifer recharge. Additional current sources of groundwater discharge include contributions of base flow to certain reaches along the Merced, Tuolumne, and San Joaquin rivers; subsurface outflow to adjacent subbasins (which varies); and consumption by groundwater-dependent ecosystems, where present. For a more complete discussion of inflows and outflows in the Turlock Subbasin, see the analysis of historical, current, and future projected water budgets in Chapter 5 of the Turlock Subbasin GSP (Todd Groundwater 2022a) and the Turlock Subbasin Annual Report for Water Year 2021 (Todd Groundwater 2022b).

As discussed in Chapter 4 of the Turlock Subbasin GSP, the potential for groundwater recharge across the subbasin, based on soil permeability, is highest along the Tuolumne and Merced rivers and some small drainageways in the subbasin. Potential areas of natural recharge in the eastern subbasin are indicated along small drainageways and along Dry Creek. Large areas of relatively low recharge potential are noted in clay-rich soils in the western subbasin. Based on the contours, groundwater in the northern subbasin flows away from the Tuolumne River into the eastern subbasin and toward the Tuolumne River in the western subbasin. With only a few clustered data points near the Merced River, it is difficult to use the data to estimate interaction between the groundwater system and the river at this time period.

To assist with the development of the Turlock Subbasin GSP, a groundwater–surface water numerical model was developed for the Turlock Subbasin. A regional groundwater–surface water model developed by DWR (C2VSim) was selected and updated through water year 2015 specifically to assist Central Valley agencies with a regional modeling tool to support GSP development. Dynamic conditions of losing/gaining reaches were evaluated over the historical, current, and projected water budget study periods that were selected for the GSP. Estimates for the location, quantity, and timing of depletions of those systems were also developed as required by the GSP regulations (California Code of Regulations Title 14, Section 354.16[f]). Additional details regarding the model and its application for quantifying the benefits of PMAs are presented in Chapters 4 and 5 of the Turlock Subbasin GSP.

Water Quality

For both surface water and groundwater, water quality is affected by surrounding agricultural land uses and other activities. Surface water quality and groundwater quality specific to the study area are discussed in more detail below.

Surface Water Quality

Water quality degradation of surface waters occurs through nonpoint- and point-source discharges of pollutants. *Nonpoint-source pollution* is defined as not having a discrete or discernible source and is generated by land runoff, precipitation, atmospheric deposition, seepage, and hydrologic modification. Nonpoint-source pollution includes runoff containing pesticides, insecticides, and herbicides from agricultural areas and residential areas; acid drainage from inactive mines; bacteria and nutrients from septic systems and livestock; volatile organic compounds and toxic chemicals from urban runoff and industrial discharges; sediment from poor road construction, improperly managed construction sites, and agricultural areas; and deposition of pollutants from the atmosphere and modification of hydrologic flow patterns.

In comparison, *point-source pollution* is generated by identifiable, confined, and discrete sources, such as smokestacks, sewers, pipes or culverts, or ditches. These pollutant sources are regulated by the U.S. Environmental Protection Agency (USEPA) and the State Water Resources Control Board (State Water Board) through the California regional water quality control boards (regional water boards). Point sources discharge many of the same pollutants as point sources: municipal (bacteria and nutrients), agricultural (pesticides, herbicides, and insecticides), and industrial pollutants (volatile organic compounds and other toxic effluent).

Sediment is considered a major pollutant according to USEPA and the State Water Board, and it is a key total maximum daily load (TMDL) constituent that determines impairment and Clean Water Act (CWA) Section 303(d) listings of impaired water bodies in a number of watersheds and river basins. High sediment loads are detrimental to beneficial water uses and aquatic habitat used by plant, amphibian, and fish communities. Erosion is influenced by a variety of factors, such as geology and soil characteristics, topography, climate, and land use practices. Sedimentation results from erosion and the transport of eroded fine materials to a watercourse or water body and could result in increased turbidity, and in elevated levels of total dissolved solids (TDS) and total suspended solids. Erosion and sedimentation are natural phenomena but are greatly influenced by land management practices and land disturbance activities.

Surface water quality in the study area is highly influenced by agricultural return flows during the dry season. These return flows may transport pesticides, nutrients, and sediment from agricultural areas into local streams. and eventually the south Delta. In addition, many pesticides are applied during the dormant spray season, typically November to January, and can be transported to water bodies during rainfall events.

The 2020-2022 California Integrated Report (Clean Water Act Section 303(d) list and 305(b) Report) was approved by the U.S. EPA May 11, 2022 and presents the list of impaired water bodies (State Water Board 2022). The following lists the constituents for surface waters in the study area.

- San Joaquin River from Merced River to Tuolomne River: alpha-BHC (benzene hexachloride or alpha-HCH), dichlorodiphenyldichloroethylene (DDE), dichlorodiphenyltrichloroethane (DDT), electrical conductivity, Group A pesticides, mercury, specific conductivity, water temperature, TDS, and toxicity;
- Tuolomne River from Don Pedro Reservoir to San Joaquin River: Group A pesticides, mercury, temperature, and toxicity;
- Lower Merced River from McSwain Reservoir to San Joaquin River: Group A pesticides, mercury, dissolved oxygen, temperature, and toxicity.

Mustang Creek Chlorpyrifos, cis-permethrin, copper, diazinon, indicator bacteria, nitrate/nitrite, dissolved oxygen, simazine, TDS, and toxicity. Groundwater Quality

Groundwater pollution or contamination is caused by all of the following sources:

- Naturally occurring or synthesized chemicals that are discharged onto the land surface and percolate through to the groundwater resources below.
- Naturally occurring pollutants in the aquifer system.
- Flows that seep through improperly sealed well casings into groundwater reservoirs.
- Contaminant discharge or leak sites, such as leaking underground storage tanks, failed underground pipelines, waste disposal sites, chemical handling facilities and other contaminated facilities.

Unintended backflow into wells can also occur when plumbing and pumping systems are not properly protected against backflow. Many of the sources of groundwater pollution and their toxic constituents are similar to those associated with surface water pollution. The most common groundwater pollutants are generated by nonpoint sources of salt, nitrite, pesticides, industrial effluent, and pathogens. Recent long drought periods in California have resulted in overdraft of groundwater aquifers as water needs have increased in areas with limited surface water flow. Overpumping can result in the concentration of mineral salts in the depleted aquifer, which could make the groundwater source unusable for drinking water and other beneficial uses.

Groundwater quality in the Turlock Subbasin is characterized primarily by the sodium-calcium bicarbonate type, with sodium bicarbonate and sodium chloride types at the western margin and a small area in the north-central portion. TDS values range from 100 to 8,300 milligrams per liter (mg/L), with a typical range of 200–500 mg/L. The California Department of Public Health, which monitors Title 22 water quality standards, reports TDS values in 71 wells ranging from 100 to 930 mg/L, with an average value of 335 mg/L. Electrical conductivity values range from 168 to 1,000 micromhos per centimeter (µmhos/cm), with a typical range of 244–707 µmhos/cm. Impairments. There are localized areas of hard groundwater, nitrate, chloride, boron, and 1,2-dibromo-3-chloropropane or DBCP. Some sodium chloride–type water with high TDS values is found along the west side of the subbasin. Two wells in the city of Turlock have been closed, one for nitrate and one for carbon tetrachloride (DWR 2006).

Flood Control and Flood Management Facilities

Flood risks in the Sacramento–San Joaquin Valley are among the highest in the nation and are directly related to the wide variations in precipitation inherent to the region. Dams on the Tuolumne and Stanislaus rivers help to regulate the rivers and reduce the risk of flooding in the area. An extensive network of levees also exists along the rivers, including along the San Joaquin River, to protect surrounding buildings and agricultural operations. Despite these measures to control flood flows, major flooding occurs along the San Joaquin River, and along portions of the Tuolumne River, Stanislaus River, and tributaries. **Figure 3.11-5** presents the 100-year flood zone within the study area.

Water Rights

California water right law is discussed in detail in Section 3.11.3, *Regulatory Setting* (State Water Board 2020).

3.11.3 Regulatory Setting

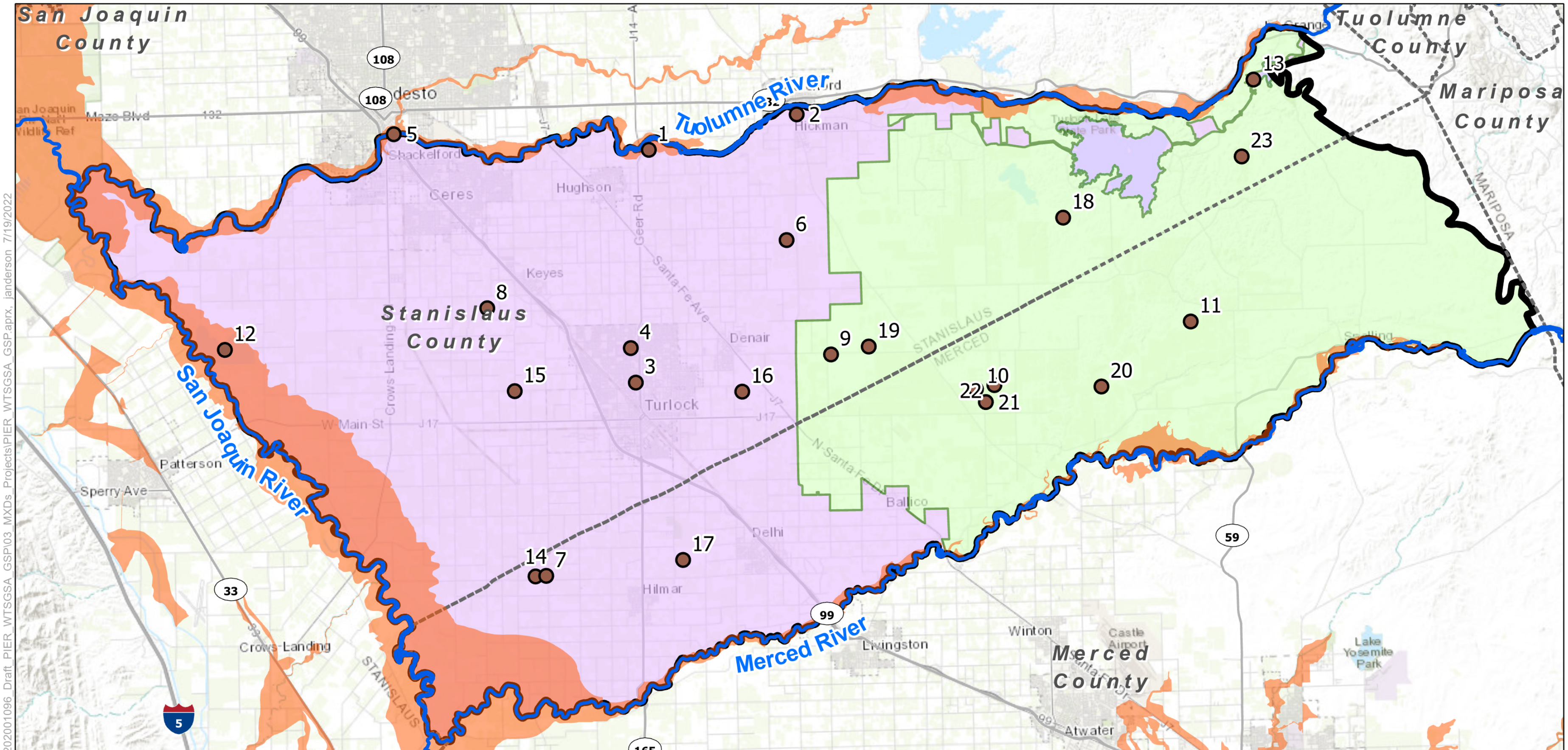
This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to hydrology and water quality. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

Federal Emergency Management Agency–Related Laws and Regulations

FEMA establishes and maintains minimum federal standards for floodplain management in the United States and its territories. The agency has a major role in managing and regulating floodplains. FEMA establishes minimum requirements for local communities' management of *floodplain areas*, which are defined as lowland and relatively flat areas adjoining inland and coastal waters that are subject to flooding.

FEMA also helps develop the Flood Insurance Rate Maps, which delineate the Special Flood Hazard Areas and the risk premium zones applicable to the community for flood insurance purposes. A *Special Flood Hazard Area* is defined as the area that will be inundated by the flood event having a 1 percent chance of being equaled or exceeded in any given year. The 1 percent annual chance flood is also referred to as the *base flood* or the *100-year flood* (FEMA 2020).



Turlock Subbasin
County Boundary
Rivers

GSA

East Turlock Subbasin GSA

West Turlock Subbasin GSA

Projects

S_FLD_HAZ_AR.Selection

FLD_ZONE

100-year Flood Zone

No. Name

1 Regional Surface Water Supply Project
2 Waterford/Hickman Surface Water Pump Station and Storage Tank
3 Denair Storm Basin
4 Stanislaus State Stormwater Recharge
5 Advanced Metering Infrastructure Project (AMI)
6 TID On-Farm Recharge Project (in WTSGSA)
7 Recycled Water from City of Turlock
8 TID Ceres Main Regulating Reservoir
9 Agricultural Recharge Project (in ETSGSA)
10 Mustang Creek Flood Control Recharge Project
11 Upland Pipeline Project
12 San Joaquin River Flood Diversions
13 La Grange Recharge Project (Within TID Irrigation Service Area)
14 TID Lateral 5 1/2 Regulating Reservoir
15 Additional TID Regulating Reservoirs
16 Recharge from TID Conveyance System
17 Intertie Projects
18 Rouse Lake Pipeline Project
19 Sand Creek Watershed Runoff Recharge
20 Conveyance Improvements Project
21 Development of Diffused Stormwater Project
22 Dry Creek Watershed Recharge
23 Direct Recharge in Agriculture Areas

Path: \\azr-file01\GIS_SHARE\GIS\GIS\Projects\2020xxx\D202001096_Draft_PIER_WTSGSA_GSP\03_MXDs_Projects\PIER_WTSGSA_GSP.aprx, janderson 7/19/2022

SOURCE: ESA, 2021; Todd Groundwater, 2021; FEMA, 2020.

Figure 3.11-5
FEMA Flood Zones

ESA

Floodplain Management Regulations

As described above, FEMA requires local communities to adopt and enforce floodplain management regulations that meet or exceed federal regulations for Special Flood Hazard Areas to be eligible to participate in the National Flood Insurance Program. Special Flood Hazard Areas are subject to floodplain management regulations, including building limitations, and the mandatory purchase of flood insurance.

Federal floodplain regulations are set forth primarily in Code of Federal Regulations Title 44, Part 60.3 (40 CFR 60.3), and in 44 CFR 65.12. These regulations are intended to address the need for effective floodplain management; they provide assurance that the cumulative effects of floodplain encroachment will not cause a rise of more than 1 foot in the water surface elevation after the floodplain has been identified on the Flood Insurance Rate Map. Local flood ordinances can set a more stringent standard.

The absence of a detailed study or floodway delineation places the burden on the proponent of a project to perform an appropriate engineering analysis to prepare hydrologic and hydraulic analyses consistent with FEMA standards. These analyses are then used to evaluate the proposed project "with all other existing and anticipated development" (44 CFR 60.3). Defining future anticipated development is difficult. The purpose of this requirement is to avoid inequitable encroachments into the floodplain.

Projects that would cause an increase in water surface elevations are subject to the provisions of 44 CFR 65.12, "Revision of Flood Insurance Rate Maps to Reflect Base Flood Elevations Caused by Proposed Encroachments." Under this regulation, the project proponent must either (1) demonstrate that the project would not affect the base flood elevation (i.e., elevate the surface water level from a flood with a 1 percent chance of equaling or exceeding that level in any given year), as identified on the Flood Insurance Rate Map; or (2) obtain a Conditional Letter of Map Revision before the project receives a permit for construction. If the project would not affect the base flood elevation, it can be approved by the floodplain administrator for the community without receiving FEMA approvals or a Conditional Letter of Map Revision. However, the floodplain administrator can require a Conditional Letter of Map Revision if the project is believed to be sufficiently complex to warrant FEMA's review.

The minimum federal regulatory requirement related to encroachments into the floodway is defined by 44 CFR 60.3(d)(3):

> *Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.*

This regulation applies only to encroachments into the floodway. When such an encroachment may occur, the appropriate FEMA effective hydraulic model for the area should be used to evaluate the impacts of and mitigation options for the encroachment. A *FEMA effective hydraulic* *model* is a computer model that has met the requirements of National Flood Insurance Program regulations and is authorized for use in mapping flood hazards.

Clean Water Act

The CWA is the primary federal law that protects the quality of the nation's surface waters, including lakes, rivers, and wetlands. It consists of the Federal Water Pollution Control Act of 1972 and subsequent amendments. The following are the key sections of the CWA pertaining to water quality regulation, as discussed in more detail below:

- Section 303—listing of impaired water bodies.
- Section 401—water quality certification.
- Section 402—National Pollutant Discharge Elimination System (NPDES) permits for stormwater discharge, including the State Water Board's municipal stormwater permitting system and General Permit for Storm Water Discharges Associated with Construction Activities (Construction General Permit).
- Section 404—discharge of dredged and fill materials into waters of the United States.

Section 303

CWA Section 303(d) requires states to develop lists of water bodies that do not attain water quality objectives after point-source dischargers (municipalities and industries) have implemented the required levels of treatment. Section 303(d) requires that the state develop a TMDL for each listed pollutant. The *TMDL* is the amount of the pollutant that the water body can receive and still comply with water quality objectives, and a plan to reduce loading of a specific pollutant from various sources to achieve compliance. USEPA must either approve a TMDL prepared by the state or disapprove the state's TMDL and issue its own. NPDES permit limits for listed pollutants must be consistent with the waste load allocation prescribed in the TMDL. It is anticipated that the problems that led a given pollutant to be placed on the Section 303(d) list will have been remediated after implementation of the TMDL.

Section 401

Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification for the discharge. The certification must be obtained from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over the affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require approval by a federal agency, such as issuance of a Section 404 permit) must also comply with CWA Section 401.

To obtain water quality certification, potential impacts must be evaluated in light of water quality standards and CWA Section 404 criteria governing the discharge of dredged and fill materials into waters of the United States. The federal government delegates authority for water pollution control under CWA Section 401 to the states (and in California, ultimately to the regional water boards).

Section 402

CWA Section 402 establishes the NPDES permit program to regulate discharges of pollutants into waters of the United States. An NPDES permit sets specific discharge limits for point sources that discharge pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. The NPDES program controls two types of nonpoint-source discharges: discharges caused by general construction activities and the general quality of stormwater in municipal stormwater systems. The goal of the NPDES nonpoint-source regulations is to improve the quality of stormwater discharged to receiving waters to the maximum extent practicable. Regional water boards in California are responsible for implementing the NPDES permit system (see the discussion of state regulations below).

Section 404

CWA Section 404 prohibits the discharge of fill material into waters of the United States, including many wetlands, except as permitted under separate regulations by the U.S. Army Corps of Engineers (USACE) and USEPA. Under Section 404, to discharge dredged or fill material into waters of the United States, including wetlands that come within the definition of that term, projects must receive authorization from the Secretary of the Army, acting through USACE. *Waters of the United States* are generally defined as "…waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; territorial seas and tributaries to such waters."

Wild and Scenic Rivers Act

In 1968, Congress enacted the Wild and Scenic Rivers Act to designate and preserve certain rivers in a free-flowing condition for the enjoyment of present and future generations. Designated wild and scenic rivers have outstanding natural, cultural, and recreational values. Protections for these water bodies are administered by federal or state agencies. The Tuolumne River above Don Pedro Dam is designated as a Wild and Scenic River, but the river below the dam is not so designated.

Federal Antidegradation Policy

The Federal Antidegradation Policy was enacted to protect high-quality water resources of national importance. The policy directs states to develop and adopt statewide antidegradation policies that include protecting existing instream water uses and maintaining a level of water quality necessary to protect those existing uses and the water quality of high-quality waters. In USEPA's CWA regulations regarding water quality standards (40 CFR 131.12[a][3]), the criteria for requiring an antidegradation standard include the following conditions:

- Existing instream water uses and a level of water quality necessary to maintain those uses shall be maintained and protected.
- Water quality will be maintained and protected in waters that exceed water quality levels necessary for supporting fish, wildlife, and recreational activities, and water quality, unless the state deems that water quality levels can be lowered to accommodate important economic or social development. In these cases, water quality levels can only be lowered to levels that support all existing uses.

- Where high-quality waters constitute an outstanding national resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

State

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) established the State Water Board and divided the state into nine regions, each overseen by a regional water board. The State Water Board holds authority over statewide water resources allocation and water quality protection. The State Water Board allocates water rights, adjudicates water right disputes, develops statewide water protection plans, establishes water quality standards, and guides the nine regional water boards. The regional water boards have primary responsibility for coordinating and controlling water quality within their respective jurisdictional boundaries. Under the Porter-Cologne Act, *water quality objectives* are limits or levels of water quality constituents or characteristics established for the protection of beneficial uses.

The Porter-Cologne Act requires the regional water boards to establish water quality objectives, while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Designated beneficial uses, together with the corresponding water quality objectives, and an antidegradation policy also constitute water quality standards under the federal CWA. The water quality objectives provide requirements for water quality control. The Turlock Subbasin is located within the jurisdiction of the Central Valley Regional Water Board.

For purposes of the PMAs implemented under the Turlock Subbasin GSP, should USACE determine that only nonfederal waters are present in the area of a project or management action, no federal CWA permit would be required. However, regardless of federal jurisdiction, a permit, or waste discharge requirements (WDRs), would be required for impacts on any waters of the state. The WDRs would be issued by the Central Valley Regional Water Board. Under the Porter-Cologne Act, discharges to all waters of the state, including all wetlands and other waters of the state (including but not limited to isolated wetlands), are subject to state regulation.

A discharger whose project would disturb 1 or more acres of soil, or would disturb less than 1 acre but would be part of a larger common plan of development that in total would disturb 1 or more acres, must obtain coverage under the Construction General Permit (Order No. 2009-009-DWQ). Construction activity subject to this permit includes clearing, grading, grubbing, and disturbances to the ground such as stockpiling or excavation; however, it does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a storm water pollution prevention plan.

Limited Threat General Order No. R5-2022-0006 applies to discharges of limited-threat wastewater to waters of the United States for clean or relatively pollutant-free wastewaters that pose little or no threat to water quality, such as well development water, construction dewatering, pipeline/well testing, and water supply systems.

Water Quality Control Plans

Under the Porter-Cologne Act, waters of the state fall under jurisdiction of the State Water Board and the nine regional water boards. *Waters of the state* means any surface water or groundwater, including saline waters, within the boundaries of the state (Water Code Section 13050[e]). The State Water Board and regional water boards have been delegated federal authority to implement the requirements of the federal CWA in California—including issuing NPDES permits—under the Porter-Cologne Act.

However, the requirements of the Porter-Cologne Act are even broader than those of the CWA. The Porter-Cologne Act requires the regional water boards to prepare and periodically update water quality control plans, also known as *basin plans*. Each basin plan establishes water quality objectives sufficient to ensure that the designated beneficial uses of surface water and groundwater are reasonably protected, and identifies actions to control nonpoint and point sources of pollution.

Any person who discharges or proposes to discharge any waste that could affect the quality of the waters of the state must file a “report of waste discharge” with the appropriate regional water board. *Waste* includes any and all waste substances associated with human habitation, of human or animal origin, or from any producing, manufacturing, or processing operation (Water Code Section 13050[d]). Upon receipt of a report of waste discharge, the regional water board may issue *waste discharge requirements*, which are designed to ensure compliance with applicable water quality objectives and other requirements of the basin plan.

A public review process is conducted every 3 years to identify and prioritize the actions needed to address water quality concerns and maintain the effectiveness of the basin plan. Amendments to basin plans may include site-specific water quality objectives for a single constituent, basin-wide control programs for a suite of potential pollutants, and/or policy recommendations and strategies for addressing emerging contaminants and/or climate change.

Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin

The applicable water quality control plan, or basin plan, in the Turlock Subbasin is *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board, Central Valley Region: The Sacramento River Basin and the San Joaquin River Basin* (Basin Plan) (Central Valley Regional Water Board 2019). The Basin Plan covers the entire area included in the Sacramento and San Joaquin River drainage basins. The Turlock Subbasin’s boundaries coincide with several subareas of the Lower San Joaquin River, including the East Valley Floor, Merced River, and Tuolumne River subareas. **Table 3.11-3** presents beneficial uses for water bodies within and near the Turlock Subbasin.

The Basin Plan defines the following water quality objectives for surface waters and groundwaters within the Turlock Subbasin (Central Valley Regional Water Board 2019):

- *Inland surface waters:* Bacteria, biostimulatory substances, chemical constituents, cryptosporidium and giardia, color, dissolved oxygen, floating material, mercury, methylmercury, oil and gas, pH, pesticides, radioactivity, salinity, sediment, settleable material, suspended material, tastes and odors, temperature, toxicity, and turbidity.
- *Groundwater:* Bacteria, chemical constituents, radioactivity, taste and odors, and toxicity.

TABLE 3.11-3
BENEFICIAL USES FOR SURFACE WATER BODIES WITHIN AND NEAR THE TURLOCK SUBBASIN

			AGRICULTURE		INDUSTRY			RECREATION			FRESHWATER HABITAT		MIGRATION		SPAWNING			
		MUN	AGR		PROC	IND	POW	REC-1		REC-2	WARM	COLD	MIGR		SPWN		WILD	NAV
Water Bodies	**HUC No.**	**Municipal and Domestic Supply**	**Irrigation**	**Stock Watering**	**Process**	**Service Supply**	**Power**	**Contact**	**Canoeing and Rafting**	**Other Non-contact**	**Warm**	**Cold**	**Warm**	**Cold**	**Warm**	**Cold**	**Wildlife Habitat**	**Navigation**
Tuolumne River																		
New Don Pedro Reservoir to San Joaquin River	535	P	E	E				E	E	E	E	E		E	E	E	E	
Merced River																		
McSwain Reservoir to San Joaquin River	535	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	
San Joaquin River																		
Mouth of Merced River to Vernalis	535/541	P	E	E	E			E	E	E	E		E	E	E		E	
Other Lakes and Reservoirs in the San Joaquin River Basin		E					E	E		E	E	E				E	E	

NOTES:

AGR = agricultural supply; COLD = cold freshwater habitat; HUC = hydrologic unit code; IND = industrial service supply; MUN = municipal and domestic supply; NAV = navigation; POW = power; PROC = industrial process supply; REC-1 = water contact recreation; REC-2 = non-contact water recreation; SPWN = spawning, reproduction, and/or early development; WARM = warm freshwater habitat; WILD= wildlife habitat.

Beneficial Use Status: E = existing beneficial uses; L = existing limited beneficial uses; P = potential

SOURCE: Central Valley Regional Water Board 2019: Table 2-1.

Water quality concerns are defined as existing or potential water quality problems (i.e., impairments of beneficial uses or degradations of water quality) associated with typical basin discharge activities that include agricultural irrigation and associated support activities, municipal and industrial point-source discharges, and runoff from residential and industrial areas. See the Basin Plan for additional information regarding implementation.

Irrigated Lands Regulatory Program

The Irrigated Lands Regulatory Program was created to address discharges of waste (e.g., sediments, pesticides, nitrates) from commercially irrigated lands regardless of water supply source. *Commercial irrigated lands* are irrigated lands that have one or more of the following characteristics (Central Valley Regional Water Board 2020):

- The landowner or operator holds a current Operator Identification Number/Permit Number for pesticide use reporting.
- The crop is sold to a third party, including but not limited to an industry cooperative, a harvest crew/company, or a direct marketing location, such as a farmers' market.
- The landowner or operator files federal taxes using Internal Revenue Service Form 1040, Schedule F, Profit or Loss from Farming.

At high enough concentrations, these pollutants can harm aquatic life or make water unusable for drinking water or agricultural uses. The goals of the Irrigated Lands Regulatory Program are to protect surface water and groundwater and to reduce the impacts of irrigated agricultural discharges on waters of the state.

California Antidegradation Policy

In 1968, as required under the federal antidegradation policy described previously, the State Water Board adopted a nondegradation policy aimed at maintaining high quality for waters in California (Resolution 68-16). The policy applies to the disposal of waste to high-quality surface water and groundwater. This policy requires that the quality of existing high-quality water be maintained unless the State finds that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in policies as of the date on which such policies became effective. The Antidegradation Policy also requires best practicable treatment or control (BPTC) of discharges to high-quality waters to assure that pollution or nuisance will not occur, and that the highest water quality consistent with maximum benefit to the people of the state will be maintained (State Water Board 2018).

California Fish and Game Code Section 1602 (Lake and Streambed Alteration)

The California Department of Fish and Wildlife (CDFW) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. Fish and Game Code Section 1602 states that an entity must notify CDFW before substantially diverting or obstructing the natural flow of, or substantially changing or using any material from the bed, channel, or bank of any river, stream, or lake, or depositing or disposing of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. If CDFW determines that the proposed activity may substantially adversely affect an existing fish or wildlife resource, CDFW will issue a Lake or Streambed Alteration Agreement for that activity, that includes reasonable measures necessary to protect the resource, and the entity must conduct the activity in accordance with the agreement.

Safe Drinking Water Act

As mandated by the Safe Drinking Water Act (Public Law 93-523), enacted in 1974, USEPA regulates contaminants of concern to the domestic water supply. *Contaminants of concern* are defined as those that pose a public health threat or alter the aesthetic acceptability of the water. These types of contaminants are regulated by USEPA's primary and secondary maximum contaminant levels (MCLs). MCLs and the process for setting these standards are reviewed triennially. Amendments to the Safe Drinking Water Act enacted in 1986 established an accelerated schedule for setting drinking water MCLs.

USEPA has delegated responsibility for California's drinking water program to the California Department of Public Health, which is accountable to USEPA for implementing the program and for adopting standards and regulations at least as stringent as those developed by USEPA. Title 22 of the California Code of Regulations (Article 16, Section 64449) defines *secondary drinking water standards*, which are established primarily for reasons of consumer acceptance (i.e., taste) rather than for health issues.

Sustainable Groundwater Management Act

In 2014, Governor Edmund G. Brown Jr. signed into law the Sustainable Groundwater Management Act (SGMA) to establish a statewide goal for achieving long-term groundwater sustainability by 2042. The SGMA emphasizes local management and requires local and regional authorities to form groundwater sustainability agencies (GSAs) (DWR 2021).

The purpose of the SGMA is to quantify the water stored in groundwater basins to ensure that annual withdrawals are sustainable. The SGMA's goals are to develop regulations to revise groundwater basin boundaries, adopt regulations for evaluating and implementing GSPs, identify basins subject to critical conditions and overdraft, identify water available for groundwater replenishment, and document best practices for sustainable groundwater management.

The State Water Board and DWR oversee implementation of the SGMA. DWR acts as a facilitator and evaluator, assisting with groundwater data management, supporting local GSAs with GSP development, and evaluating GSPs once they are developed. The State Water Board is authorized to enforce the SGMA and ensure that basins comply with the law's requirements (Downing 2018). The Turlock Subbasin GSP was developed to comply with the SGMA.

California Water Rights

California has a dual system for water rights: Both the riparian doctrine and the prior-appropriation doctrine apply. Riparian rights result from the ownership of land contiguous to a surface water source and are normally senior in priority to most appropriative rights. Owners with riparian water rights may use natural flows directly for beneficial purposes on adjoining lands without a permit from the State Water Board.

The State Water Board oversees water rights and water quality functions in California. It issues permits and licenses for appropriating water from surface and subterranean streams that flow through known and definite channels. The California courts primarily have jurisdiction over the use of infiltrating groundwater, riparian use of surface waters, and the appropriative use of surface waters from diversions begun before 1914. Some PMAs permitted under the Turlock Subbasin GSP would need additional approval from the State Water Board for new or modified appropriative surface water rights.

Central Valley Flood Protection Board

The Central Valley Flood Protection Board (CVFPB) is the state regulatory agency responsible for ensuring that appropriate standards are met for the construction, maintenance, and protection of the Central Valley's flood control system to protect life, property, and wildlife habitat in the valley from the effects of flooding. The San Joaquin River within the Turlock Subbasin is located in the Sacramento–San Joaquin Drainage District, under the jurisdiction of the CVFPB.

In general, the CVFPB requires a permit for proposed work that is located within the State Plan of Flood Control, within 300 feet of a Designated Floodway adopted by the CVFPB, or within 30 feet of the banks of a CVFPB-designated Regulated Stream (CVFPB 2017). To address flood risks, the Central Valley Flood Protection Act of 2008 directed DWR to prepare the Central Valley Flood Protection Plan for adoption by the CVFPB. The plan lays out a strategy to prioritize the state's investment in flood management over the next three decades, as well as strategies to promote multi-benefit projects and to integrate and improve ecosystem functions associated with flood risk reduction projects. The Central Valley Flood Protection Plan also incorporates information about systemwide and regional flood management needs, advancements in the best available science, and new policy considerations.

Central Valley Salinity Coalition

In 2006, the Central Valley Regional Water Board initiated the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) as a cooperative effort among regulators, permittees, environmental interests, and other parties interested in Central Valley water quality. regulates nitrate discharges to groundwater from human activities. Compliance with past regulations proved difficult, thus the CV-SALTS initiative proposed the Nitrate Control Program as part of a package of regulatory improvements. The Central Valley Regional Water Board adopted the new requirements in May 2018. The Turlock Subbasin is an active Priority 1 basin for nitrate management where a formal contractual agreement among permittees is required to provide safe drinking water and to manage nitrate. (Central Valley Salinity Coalition and CV-Salts 2022).

Regional and Local

The Turlock Subbasin GSP summarizes general plans, groundwater ordinances, and information from other land use planning activities that were compiled for review and consideration during GSP preparation. In general, the general plans accommodate population growth in the Turlock Subbasin, while preserving other beneficial uses of water by agriculture and the environment, which could ultimately increase water demands. However, most of the plans recognize the need for water conservation, alternative water supplies, resource management, and in some cases, sustainable groundwater management. These include:

- Stanislaus County General Plan (2015), community plans
- 2030 Merced County General Plan (2013) and community plans for Delhi and Hilmar
- Stanislaus and Merced County's groundwater ordinances
- City of Turlock General Plan
- City of Modesto General Plan (for portions of the Turlock Subbasin)
- City of Ceres General Plan (2018)
- Tuolumne River Regional Park Master Plan
- City of Hughson General Plan

See Chapter 2, Section 2.6 of the Turlock Subbasin GSP for a summary of those plans and well permitting programs being implemented in the Turlock Subbasin. Note that these plans are updated regularly.

Stanislaus County General Plan

The following goals and policies in the Conservation/Open Space Element of the Stanislaus County General Plan (2015) are relevant to implementation of the PMAs.

Goal Two: Conserve water resources and protect water quality in the County.

- ***Policy Five*:** Protect groundwater aquifers and recharge areas, particularly those critical for the replenishment of reservoirs and aquifers.
- ***Policy Six*:** Preserve natural vegetation to protect waterways from bank erosion and siltation.
- ***Policy Seven*:** New development that does not derive domestic water from pre-existing domestic and public water supply systems shall be required to have a documented water supply that does not adversely impact Stanislaus County water resources.
- ***Policy Eight*:** The county shall support efforts to develop and implement water management strategies.
- ***Policy Nine*:** The County will investigate additional sources of water for domestic use.

Goal Five: Reserve, as open space, lands subject to natural disaster in order to minimize loss of life and property of residents of Stanislaus County.

- ***Policy Sixteen*****:** Discourage development on lands that are subject to flooding, landslide, faulting, or any natural disaster to minimize loss of life and property.
- ***Policy Seventeen*****:** Develop a plan to minimize the impacts of a disaster.

Stanislaus County Code

Chapter 9.37 of the Stanislaus County Code presents the groundwater ordinance, adopted by the Stanislaus County Board of Supervisors in 2014 to address sustainable groundwater management and export of groundwater from the County. The groundwater ordinance codifies requirements, prohibitions, and exemptions that assure sustainable groundwater extraction from new wells through review and processing of well permit applications.

Merced County General Plan

The following goals and policies in the Stanislaus County General Plan are relevant to implementation of the PMAs.

Water Supply

Goal W-1: Ensure a reliable water supply sufficient to meet the existing and future needs of the County.

- ***Policy W-1.1: Countywide Water Supply.*** Ensure that continued supplies of surface and groundwater are available to serve existing and future uses by supporting water districts and agencies in groundwater management and water supply planning; requiring that new development have demonstrated long-term water supply; and assisting both urban and agricultural water districts in efforts to use water efficiently.
- ***Policy W-1.2: Demonstrating Sufficient Water Supply for New Development.*** Require all new development within the adopted service area of a water purveyor to demonstrate adequate quantity and quality of water will be available prior to issuing building permits.
- ***Policy W-1.3: Agricultural Water Study.*** In cooperation with local water agencies and districts, maintain the detailed General Plan study of countywide water use and needs for agriculture with periodic updates and with information that can be widely shared and publicized.
- ***Policy W-1.4: Groundwater Recharge Projects.*** Support implementation of groundwater recharge projects consistent with adopted Integrated Regional Water Management Plans to minimize overdraft of groundwater and ensure the long-term availability of groundwater.
- ***Policy W-1.5: New Well Guidelines.*** Coordinate with the cities and special districts in developing County-wide guidelines regarding the location and construction of new water wells.
- ***Policy W-1.6: Surface Water Storage.*** Support water agencies in the exploration of additional surface water storage opportunities.

- ***Policy W-1.7: Water Sufficiency Requirement.*** Require new developments to prepare a detailed source water sufficiency study and water supply assessment per Title 22 and SB [Senate Bill] 610, consistent with any Integrated Regional Water Management Plan or similar water management plan. This shall include studying the effect of new development on the water supply of existing users, with public input.
- ***Policy W-1.8: Single User Well Consolidation.*** Encourage consolidation of single user wells into local water districts (with management plans) where feasible.
- ***Policy W-1.9: Water Supply Research and Protection.*** Encourage investment into water quality improvement techniques such as desalinization plants and desalinization plants and the treatment of urban runoff. Encourage improvements to the drainage systems in the County, including the efforts of the San Joaquin River Flood Control Association, and completion of the San Luis Drain Project or, if it is determined that the San Luis Drain cannot be completed as designed, the removal and elimination of the drain in Merced County.
- ***Policy W-1.10: Groundwater Overdraft Protection.*** Where a water supply source is nearby and accessible, encourage large water consumers to use available surface irrigation water (secondary water) for school athletic fields, sports complexes, and large landscape areas.

Water Quality

Goal W-2: Protect the quality of surface and groundwater resources to meet the needs of all users.

- ***Policy W-2.1: Water Resource Protection.*** Ensure that land uses and development on or near water resources will not impair the quality or productive capacity of these water resources.
- ***Policy W-2.2: Development Regulations to Protect Water Quality.*** Prepare updated development regulations, such as best management practices, that prevent adverse effects on water resources from construction and development activities.
- ***Policy W-2.3: Natural Drainage Channels.*** Encourage the use of natural channels for drainage and flood control to benefit water quality and other natural resource values.
- ***Policy W-2.4: Agricultural and Urban Practices to Minimize Water Contamination.*** Encourage agriculture and urban practices to comply with the requirements of the Regional Water Quality Control Board for irrigated lands and confined animal facilities, which mandate agricultural practices that minimize erosion and the generation of contaminated runoff to ground or surface waters by providing assistance and incentives.
- ***Policy W-2.5: Septic Tank Regulation.*** Enforce septic tank and onsite system regulations of the Regional Water Quality Control Board to protect the water quality of surface water bodies and groundwater quality.
- ***Policy W-2.6: Wellhead Protection Program.*** Enforce the wellhead protection program to protect the quality of existing and future groundwater supplies by monitoring the construction, deepening, and destruction of all wells within the County.
- ***Policy W-2.7: NPDES Enforcement.*** Monitor and enforce provisions of the U.S. Environmental Protection Agency National Pollution Discharge Elimination System (NPDES) program to control non-point source water pollution.

- ***Policy W-2.8: Water Contamination Protection.*** Coordinate with the State Water Resources Control Board, Regional Water Quality Control Board, and other responsible agencies to ensure that sources of water contamination (including boron, salt, selenium and other trace element concentrations) do not enter agricultural or domestic water supplies, and will be reduced where water quality is already affected.

Water Reuse and Conservation

Goal W-3: Maximize the efficient use and reuse of water supplies through water conservation, water recycling, and public education.

- ***Policy W-3.1: Water Availability and Conservation.*** Support efforts of water agencies and districts to prevent the depletion of groundwater resources and promote the conservation and reuse of water.
- ***Policy W-3.2: Landscape Water Efficiency.*** Ensure the conservation of water in urban areas through the implementation of the State Model Water Efficient Landscape Ordinance as implemented in Section 18.38 (Landscaping Standards) of the County Zoning Ordinance.
- ***Policy W-3.3: Water System Rehabilitation.*** Encourage the rehabilitation of irrigation systems and other water delivery systems to reduce lost water and increase the efficient use and availability of water.
- ***Policy W-3.4: High Water Use Processing Activities.*** Prohibit any processing activities with high water use practices near areas where groundwater overdraft problems exist, unless the facility uses water recycling and conservation techniques that minimize affects *[sic]* of water use to the groundwater table.
- ***Policy W-3.5: Educational Programs.*** Support the development of educational programs by water districts and public agencies, including the Model Water Efficient Landscape Standards adopted by the State Department of Water Resources, to increase public awareness of efficiently conserving, using, reusing, and managing water resources.
- ***Policy W-3.6: New Construction.*** Promote efficient water conveyance systems in new construction, including systems for the recycling of greywater.
- ***Policy W-3.7: Existing Development Retrofits.*** Enforce the retrofitting of existing development with water-conserving devices as required by state law.
- ***Policy W-3.8: Water Reuse Programs.*** Encourage water reuse programs to conserve raw or potable water supplies (such as the capture of rainwater) consistent with State Department of Public Health guidelines.
- ***Policy W-3.9: Water Reuse Treatment.*** Encourage water reuse/recycling through the treatment and distribution of tertiary treated wastewater.
- ***Policy W-3.10: Domestic Greywater Use.*** Encourage the use of domestic greywater for landscape irrigation purposes.
- ***Policy W-3.11: Composting Toilets.*** Explore the feasibility of reducing wastewater through the use of dry/composting toilets in new construction.
- ***Policy W-3.12: Water Conservation Information.*** Provide information on water conservation measures to the general public and coordinate with conservation efforts of

the University of California, Cooperative Extension, local Resource Conservation Districts, the Natural Resource Conservation Service, and irrigation districts.

- ***Policy W-3.13: Agricultural Water Reuse.*** Promote and facilitate using reclaimed wastewater for agricultural irrigation, in accordance with Title 22 and guidelines published by the State Department of Public Health.
- ***Policy W-3.14: Agricultural Water Conservation.*** Encourage farmers to use irrigation methods which conserve water in areas where flood irrigation is used for groundwater recharge.
- ***Policy W-3.15: Agricultural Water Efficiency.*** Coordinate with the Farm Bureau and agricultural irrigation districts to promote protection of water resources in agricultural areas by encouraging programs that assist producers to use water efficiently in agricultural operations and by promoting technology for efficient water use in agriculture.

Watershed Management

Goal W-4: Enhance and protect County watersheds through responsible water and land use management practices that address water bodies, open spaces, soils, recreation, habitat, vegetation, groundwater recharge, and development

- ***Policy W-4.1: Water Resource Protection and Replenishment.*** Protect watersheds, aquifer recharge areas, and areas susceptible to ground and surface water contamination by identifying such areas, and implementing requirements for their protection such as:
  a) Implement zoning and development regulations to protect water resources, including aquifer recharge areas and areas susceptible to ground and surface water contamination;
  b) For new development, and when adopting new Community Plans, require community drainage systems that incorporate on-site infiltration and contaminant control measures that are compatible with the County SWMP [Storm Water Management Plan] and NPDES regulations for post-construction runoff conditions; and
  c) Cooperate with other agencies and entities with responsibilities for water quality and watershed protection.
- ***Policy W-4.2: Watershed Program Funding.*** Support efforts to obtain grant funding for locally-sponsored watershed programs, planning efforts, and projects that enhance and protect the watersheds of the County.

Storm Drainage and Flood Control

Goal PFS-3: Ensure the management of stormwater in a safe and environmentally sensitive manner through the provision of adequate storm drainage facilities that protect people, property, and the environment.

- ***Policy PFS-3.1: Stormwater Management Plans.*** Require stormwater management plans for all Urban Communities to reduce flood risk, protect soils from erosion, control stormwater runoff, and minimize impacts on existing drainage facilities.
- ***Policy PFS-3.2: Stormwater Facilities in New Development.*** Require that new development in unincorporated communities includes adequate stormwater drainage systems. This includes adequate capture, transport, and detention/retention of stormwater.

- ***Policy PFS-3.3: Community Drainage Systems.*** Encourage development of community drainage systems rather than individual project-level systems, in order to use land more efficiently and project people, property and the environment in a more comprehensive manner.
- ***Policy PFS-3.4: Agency Coordination.*** Coordinate with the U.S. Army Corps of Engineers and other appropriate agencies to develop stormwater detention/retention facilities and recharge facilities that enhance flood protection and improve groundwater recharge.
- ***Policy PFS-3.5: Pre-Development Storm Flows.*** Require on-site detention/retention facilities and velocity reducers when necessary to maintain pre-development storm flows and velocities in natural drainage systems.
- ***Policy PFS-3.6: Retention/Detention Facility.*** Encourage stormwater detention/retention project designs that minimize drainage concentrations and impervious coverage, avoid floodplain areas, are visually unobtrusive and, where feasible, provide a natural watercourse appearance and a secondary use, such as recreation.

Flood Hazards

Goal HS-2: Minimize the possibility of loss of life, injury, or damage to property as a result of flood hazards.

- ***Policy HS-2.6: Flood Risk Consideration.*** Prohibit new development in existing undeveloped areas (i.e., area devoted to agriculture or open space that is not designated for development) protected by a State flood control project without appropriately considering significant known flooding risks and taking reasonable and feasible action to mitigate the potential property damage to the new development resulting from a flood.
- ***Policy HS-2.7: Finding of Flood Protection for New Development (RDR).*** The County shall not enter into a development agreement, approve any building permit or entitlement, or approve a tentative or parcel map unless it finds one of the following:
  a) The flood control facilities provides 200-year level of protection in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan;
  b) Conditions imposed on the development will protect the property at a 200-year level of protection in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan; or
  c) The local flood management agency has made "adequate progress" on the construction of a flood protection system which will result in protection equal or greater than the 200-year flood event in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan.
- ***Policy HS-2.8: Floodwater Diversion.*** Require new flood control projects or developments within areas subject to 100- and 200-year frequency floods are done in a manner that will not cause floodwaters to be diverted onto adjacent property or increase flood hazards to property located elsewhere.

Merced County Code

Chapters 9.27 and 9.28 of the Merced County code present ordinances relating to groundwater mining and export and wells ordinance, respectively, that seek to protect the safety, health and welfare of all citizens. The purpose of the ordinance is to prohibit the unsustainable extraction/conveyance of groundwater outside of a basin.

City General Plans

Table 3.11-4 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.11-4
CITY GENERAL PLAN POLICIES GOVERNING HYDROLOGY AND WATER QUALITY WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Hydrology and Water Quality
City of Turlock	Chapter 3, New Growth and Infrastructure: Guiding Policies 3.3-a, 3.3-b, 3.3-c, 3.3-d, 3.3-e, 3.3-f, 3.3-g, and 3.3-h
City of Modesto	Chapter 6, Community Facilities and Services, A. Water, Goals VI.A through VI.C and all associated policies; Chapter 7, Environmental Resources, Open Space and Conservation, L. Flooding Hazards, N. Miscellaneous Issues/Erosion
City of Ceres	Chapter 4, Agriculture and Natural Resources: Goal 4.F, Policies 4.F.1 through 4.F.11
City of Hughson	Chapter 4, Conservation and Open Space Element: Goal COS-6, Policy COS-6.1, Policy COS-6.2, and Policy COS-6.3

SOURCE: Data compiled by Environmental Science Associates in 2022

3.11.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on hydrology and water quality focuses on the potential for substantial adverse effects on the quantity and quality of hydrologic resources as a result of implementation of PMAs under the Turlock Subbasin GSP. Impacts have been evaluated in terms of how construction activities, construction features, and operations and maintenance (O&M) of those features resulting from PMAs could affect existing hydrology and water quality. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes caused by the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts were evaluated separately for direct and in-lieu recharge projects and water conservation management actions. Although the impact conclusions reached may be the same, this approach facilitates a discussion of any potential differences.

The assessment of hydrology and water quality impacts used a qualitative and conservative approach, assuming that all PMAs would be implemented. The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop (versus field) surveys, open-access databases, maps, and models. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2, *Project Description*. The significance determinations assume that the PMAs implemented under the Turlock Subbasin GSP would comply with the relevant federal, state, and local ordinances and regulations described in Section 3.11.3, *Regulatory Setting*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on hydrology and water quality if it would:

- Release pollutants into surface and/or groundwater that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan;
- Result in a substantial decrease of groundwater supplies or interfere substantially with groundwater recharge such that the project may conflict with or obstruct implementation of a sustainable groundwater management plan;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
  - Result in substantial erosion or siltation on- or off-site;
  - Result in flooding on- or offsite;
  - Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
  - Impede or redirect flood flows; or
- In a flood hazard, tsunami, or seiche zones, risk the release of pollutants due to project inundation.

In addition, an impact would be significant if a project or management action implemented under the Turlock Subbasin GSP would result in:

- Substantial alteration of groundwater-surface water interactions;
- A conflict with existing water rights (beneficial use and/or point of diversion); or
- Substantial alteration of groundwater conditions in neighboring subbasins.

Issues Not Evaluated Further

As described in Section 2.1.1 in Chapter 2, *Project Description*, the objectives of the Turlock Subbasin GSP are to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. The objectives of the Turlock Subbasin GSP are met through implementation of the PMAs, purposefully selected to help the basin achieve the sustainability goal by 2042 and avoid undesirable results over the remainder of the 50-year planning horizon. Therefore, it is not anticipated that construction or operation of the types of PMAs implemented under the Turlock Subbasin GSP would result in decreased groundwater supplies or interfere with groundwater recharge such that it would conflict with or obstruct implementation of a sustainable groundwater management plan (i.e., the Turlock Subbasin GSP). Therefore, this issue is not evaluated further.

Additionally, the Turlock Subbasin is not located in a tsunami or seiche zone; therefore, there is no risk to the release of pollutants due to project inundation in these zones, and this issue is not discussed further. However, areas of the Turlock Subbasin are located within the flood zone. Therefore, only potential risks related to the release of pollutants due to project inundation in a flood zone are discussed.

Impacts and Mitigation Measures

Table 3.11-5 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the activities, location, and potentially significant impacts of the individual project or management action. Implementation of the mitigation measures would be the responsibility of the project's or management action's proponent(s).

TABLE 3.11-5
SUMMARY OF IMPACT CONCLUSIONS—HYDROLOGY AND WATER QUALITY

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
HYD-1: Implementing PMAs under the Turlock Subbasin GSP could result in a release of pollutants into surface water and/or groundwater, including in a flood zone as a result of project inundation, that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan.	LTSM	LTS
HYD-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on- or off-site; result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or impede or redirect flood flows.	LTS	LTSM
HYD-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of groundwater–surface water interactions.	LTS	LTS
HYD-4: Implementing PMAs under the Turlock Subbasin GSP could result in conflicts with existing water rights (beneficial use and/or point of diversion).	LTS	LTS
HYD-5: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration to groundwater conditions in adjacent basins.	LTS	LTSM

NOTES: LTS = less than significant; LTSM = less than significant with mitigation incorporated

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact HYD-1: Implementing PMAs under the Turlock Subbasin GSP could result in a release of pollutants, including in a flood zone as a result of project inundation, into surface water and/or groundwater that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan.

The following text discusses the potential for implementation of PMAs under the Turlock Subbasin GSP to result in a release of pollutants into surface water or groundwater that could violate water quality standards or waste discharge requirements (e.g., NPDES), substantially degrade water quality, or obstruct implementation of the applicable water quality control plan (e.g., the Basin Plan for the Central Valley Region). It also addresses PMAs located in a flood zone and the potential for pollutants to be released as a result of project inundation.

Effects of Construction Activities

Implementation of PMAs under the Turlock Subbasin GSP could require construction activities that would result in temporary impacts on water quality. As presented in Table 2-4 in Chapter 2, *Project Description*, both direct and indirect recharge projects could result in the modification of existing features or the construction of new features including injection wells, recharge basins, pump stations, pipelines, French drains, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins. In addition, agricultural land could be used for recharge during the non-irrigation season.

Temporary construction-related effects on water quality may result from the movement and placement of soil/materials during construction; the release and exposure of sediments and turbidity in water; the release and exposure of construction-related contaminants; and dredging, excavation scraping, or scarification to modify existing detention basins or create new recharge basins. Construction within existing waterways or basins (e.g., canal interties or detention basins) could temporarily alter water quality by disturbing sediments and/or could cause the resuspension of sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides) associated with legacy or contemporary activities such as farming, mining or watershed urbanization.

Construction work could also introduce pollutants into affected waterways from equipment leaks or maintenance (e.g., oils, lubricants, hydraulic fluids), handling of fuels and other hazardous materials, and construction materials handling (e.g., soil and cover materials, concrete). In addition, inundation could release pollutants in flood hazard zones (see Figure 3.11-5 for the FEMA flood zone). For example, dredging, excavation scraping, or scarification to modify existing detention basins or create new recharge basins could expose and release contaminated sediments, resulting in water quality impacts on receiving waters.

Localized degradation of groundwater quality could result from temporary, short-term construction activities such as creating new recharge infrastructure (e.g., recharge basins, storm drain basins, French drains), or from O&M activities such as vegetation control. If hazardous materials were discharged to the land surface or surface waters during this work, they could travel to underlying aquifers. If the discharge volume were large enough, the hazardous materials could degrade local groundwater quality to a sufficient degree to impair its continued use. See Section 3.10, *Hazards and Hazardous Materials*, for more information regarding hazardous materials.

In addition, construction activities for some direct and in-lieu recharge projects could include temporary dewatering, excavation, and fill and placement of materials in water. Groundwater extracted during dewatering operations may contain elevated levels of suspended sediment, turbidity, or other constituents (e.g., metals, construction materials) that could degrade water quality if discharged into surface waters.

Conservation management actions would seek to achieve groundwater sustainability through water conservation, land repurposing and fallowing, and pumping reduction. In some cases, these actions could result in the modification of existing features or the construction of new features, including recharge basins and ponds, check dams, wells, and pipelines. For these actions, the same impact mechanisms as for direct and in-lieu recharge projects are anticipated (i.e., movement and placement of soil/materials during construction).

The Construction Stormwater Discharge General NPDES Permit and/or NPDES discharge permits would apply for construction of features resulting from the implementation of PMAs. Construction activities unique to management actions, including earthmoving for enhancement or protection of environmental easement habitat, would also be subject to these permits.

As described in Section 3.1, *Approach to the Environmental Analysis*, the analysis assumes that proponents of PMAs would comply with applicable federal, state, and local regulations and ordinances. The federal CWA prohibits any stormwater discharge from a construction project unless the discharge occurs in compliance with an NPDES permit. The State Water Board and regional water boards are the NPDES permitting authorities in California. The State Water Board has adopted the Construction General Permit (Order 2009-0009-DWQ) for construction sites where 1 or more acres of soil would be disturbed. The Construction General Permit requires, among other actions, the implementation of mandatory best management practices, including pollution/ sediment/spill control plans, training, sampling, and monitoring for nonvisible pollutants.

In addition, the regional water boards may require projects to obtain an NPDES permit or waste discharge requirements before they discharge clean or relatively pollutant-free wastewaters that pose little or no threat to the quality of the receiving water (e.g., to discharge groundwater pumped during dewatering into surface waters). The NPDES discharge permit may require that groundwater removed during construction be treated before it is discharged to surface waters. Adherence to regulations may be enough to reduce impacts on water quality to less than significant in some cases. Additionally, the Central Valley Regional Water Board requires proponents of PMAs to comply with water quality objectives in the Basin Plan.

Because the potential exists for adverse impacts on water quality to result from construction of direct and indirect recharge projects, this impact would be **potentially significant.** Once specific characteristics (e.g., features to be constructed) and locations (proximity to a surface water body, location within the flood zone) of the direct and in-lieu recharge projects are known, proponents of PMAs would identify the relevant potential water quality impacts of constructing the project. For projects located in the flood zone, proponents of PMAs would need to conform to FEMA regulations for all structures.

Compliance with Mitigation Measure HYD-1 would be required when applicable to a given project. Implementation of this measure would be the responsibility of the project's or management action's proponent.

Mitigation Measure HYD-1: Implement Water Quality Protection Measures during Construction of New Features or Modification of Existing Features.

Implementation of all typical construction mitigation measures shall be required for construction of new features. Typical mitigation measures include the following construction-related best management practices (BMPs) that would be implemented under project-specific Storm Water Pollution Prevention Plans (SWPPPs):

- Soil stabilization, sediment control, wind erosion control, tracking control, non-stormwater management, and waste management/materials pollution control shall be implemented. For example:
  - Gravel bags, silt fences, etc., shall be placed along the edge of all work areas to contain particulates before contact with receiving waters.
  - All concrete washing and spoils dumping shall occur in a designated location.
- Construction stockpiles shall be covered to prevent blowoff or runoff during weather events.
- Severe-weather-event erosion control materials and devices shall be stored on-site for use as needed.
- Regular and post-storm inspections to deploy and adapt BMPs to minimize stormwater pollutant discharges.

Other BMPs shall be applied as determined necessary by the regulating entity (city, county).

For any construction activities with the potential to cause in-water sediment disturbance associated with construction (e.g., in a river, canal, or other conveyance feature):

- BMPs shall be applied to avoid or reduce temporary increases in suspended sediment. These BMPs may include but are not limited to silt curtains, cofferdams, the use of environmental dredges, erosion control on all inward slopes, and various bank stabilization techniques, including revegetation. All construction sites will include preparation of a SWPPP and BMPs designed to capture spills and prevent erosion to the water body. Turbidity shall be monitored upstream and downstream of construction sites as a measure of the impact.
- Bank stabilization BMPs shall be applied as needed for any in-channel disturbance. For example:
  - A 100-foot vegetative or engineered buffer shall be maintained between the construction zone and the surface water body.
  - Native and annual grasses or other vegetative cover shall be established on construction sites immediately upon completion of work causing a disturbance, to reduce the potential for erosion close to a waterway or water body.

Compliance with Mitigation Measure HYD-1, in addition to incorporation of NPDES permit requirements into project designs and plans, would reduce impacts from construction activities on the water quality of the study area to a **less-than-significant** level.

Effects of Constructed Features and Operations and Maintenance of Those Features

The effects of constructed features and O&M of those features for direct and in-lieu recharge projects would be minimal because the overall objective of these projects is to deliver water to existing beneficial users. There does exist the potential for recharge to mobilize contaminants in the soil profile and vadose soil that may eventually end up in the groundwater aquifer. Examples of those projects with managed aquifer recharge, agricultural managed aquifer recharge, use of dry wells and injection well components. These in-lieu recharge projects that mobilize contaminant in the soil profile and vadose soil would be required to adhere to the appropriate regulation under the State Water Board's Waste Discharge Requirements (WDR) Program.

Several elements of direct and in-lieu recharge projects would avoid and minimize water quality impacts in the study area. For example, routine O&M of features resulting from direct recharge projects would include removing sediment within or near intakes, removing accumulated silt and vegetation from recharge basins, and conducting regular water quality testing for groundwater wells. Similarly, for in-lieu recharge projects, routine O&M of features would include clearing debris from surface water conveyance features and conducting regular water quality testing for water storage tanks. Routine O&M activities would be similar to the activities described for construction; however, the level of activity would be less intense during the O&M phase than during construction, so the degree of temporary changes to water quality would be much less.

For conservation management actions that propose construction of new features, O&M of those features would involve activities similar to those described for direct and in-lieu recharge projects. For example, construction of wells as part of the pumping reduction program would involve water quality testing of groundwater.

Note that degraded water quality is one of the sustainability indicators that would be monitored as part of the Turlock Subbasin GSP's implementation activities (see Chapter 7 of the Turlock Subbasin GSP). *Undesirable results* for degraded water quality are defined as significant and unreasonable adverse impacts on groundwater quality caused by PMAs such that beneficial uses are affected and well owners experience an increase in operational costs. Therefore, for direct recharge projects that would involve well construction, water quality testing would be conducted to ensure that water quality objectives, including those described in the Basin Plan, are met.

Once the specific characteristics and locations of the direct and in-lieu recharge projects are known, proponents of PMAs would identify the relevant potential water quality impacts of operating the project and determine the appropriate monitoring. For direct recharge projects that may mobilize containments and present water quality issues, projects should be evaluated and consultation with the State Water Board's Waste Discharge Requirements (WDR) Permitting Program recommended to determine whether issuance of WDRs or a waiver of WDRs is needed. For pollutants stored on-site, proponents of PMAs would be required to comply with NPDES permit requirements. With such compliance, impacts from O&M of constructed features on the water quality of the study area would be **less than significant**.

Impact HYD-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on- or off-site; result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or impede or redirect flood flows.

Direct and In-Lieu Recharge Projects

Effects of Construction Activities

Implementation of PMAs under the Turlock Subbasin GSP could require construction activities that would temporarily alter drainage patterns. This could increase the rate and amount of surface runoff in a manner that would exceed the capacity of existing or planned stormwater drainage systems, result in flooding, or impede or redirect flood flows.

As presented in Table 2-4 in Chapter 2, *Project Description*, both direct and indirect recharge projects could require site preparation, demobilization, and restoration; dewatering of excavation and fill to create new facilities; and stockpiling of construction materials that could create physical barriers to surface runoff. The actual alterations of drainage patterns would depend on the type of feature (e.g., injection wells, recharge basins, pump stations, pipelines, French drains, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs and irrigation basins) and the hydrologic and hydraulic factors of the existing site versus the new site (e.g., changing of runoff amounts or rates).

Construction of features that involve compacting soils could increase their *imperviousness* (inability to be penetrated by water), which would reduce infiltration rates and cause an associated increase in the amount and rate of surface runoff. In addition, grading activities could change the slope of the land across which drainage flows, which could change the direction, rate, and amount of surface runoff from a construction site. Many factors affect the rate and amount of surface runoff: topography, the amount and intensity of precipitation, the amount of evaporation, the roughness and permeability of the substrate, and the amount of precipitation and imported water that infiltrates into groundwater. A construction-related change in the amount or rate of surface runoff would likely only have relatively localized effects on-site and immediately downstream, or downslope, of the site. In addition, although many construction-related impacts on surface runoff would be temporary, it is reasonable to expect that construction activities for direct and indirect recharge projects could occur over several years, which could result in changes to surface runoff that would persist throughout project construction.

Implementation of direct and indirect recharge projects under the Turlock Subbasin GSP could temporarily alter drainage patterns. However, these changes would not be expected to change surface runoff in a manner that could result in substantial erosion on- or off-site, create or increase on- or off-site flooding, exceed existing or planned stormwater drainage systems, and/or impede or redirect flood flows. Once the specific characteristics and locations of the direct and in--lieu recharge projects are known, proponents of PMAs may conduct drainage or hydraulic and hydrology studies to identify the relevant changes to drainage patterns from construction activities. Any changes would likely have relatively localized effects on-site and immediately downstream (or downslope) of the site. In addition, PMAs that would require disturbing 1 or more acres during construction would be subject to the requirements of the NPDES Construction General Permit. The NPDES permit requires the preparation and implementation of a storm water pollution prevention plan, which would include BMPs designed to control and reduce soil erosion. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

Implementation of PMAs under the Turlock Subbasin GSP could permanently alter drainage patterns. Many of the long-term effects of direct and in-lieu recharge projects on drainage patterns and flood flows are expected to be beneficial or neutral, because the objective of these projects is to enhance regional groundwater sustainability, thereby improving on existing conditions. For example, installing regulating reservoirs to capture and store operational fluctuations in canal deliveries would permanently alter drainage patterns in that area. However, the resulting O&M of the reservoir would reduce water loss to the system, resulting in more conservative use of existing water deliveries.

Features associated with direct and in-lieu recharge projects could cause the imperviousness of soils to increase, which would reduce infiltration rates and result in an associated increase in the amount and rate of surface runoff. For example, projects that add concrete or impervious surfaces could limit recharge in those areas. However, the effects of construction may ultimately increase recharge rates. For example, in developing a recharge pond, excavation may occur below hardpan layer, allowing recharge. As another example, on-farm recharge or recharge basins not located in the drainages would enhance recharge.

The actual alterations of drainage patterns would depend on the facilities and hydrologic and hydraulic factors. The changes in drainage patterns could persist after construction, depending on project designs. For example, there could be permanent changes to land cover as a result of construction, such as increases in the amount of concrete or compacted surfaces (e.g., for fish screens) or vegetation removal. As mentioned above, the rate and amount of surface runoff are determined by multiple factors: topography, the amount and intensity of precipitation, the amount of evaporation in the watershed, and the amount of precipitation and imported water that infiltrates into groundwater. However, these projects would not be expected to appreciably impede or redirect flood flows once construction is complete. Projects would be designed consistent with existing regulatory requirements.

Additionally, some projects propose to use flood flows for direct on-farm recharge or for delivery to existing customers in lieu of groundwater. Redirecting these flood flows could reduce the overall flood risk. The purposeful impediment and redirection of flood flows would reduce the potential for downstream flooding, thereby reducing erosion and siltation.

Implementing direct and in-direct recharge projects under the Turlock Subbasin GSP could permanently alter drainage patterns, runoff rates, and runoff timing. These changes could change surface runoff in a manner that could result in substantial erosion on- or off-site, create or increase on- or off-site flooding, exceed existing or planned stormwater drainage systems, and/or impede or redirect flood flows. This impact would be **potentially significant**.

Compliance with Mitigation Measure HYD-2 would be required when applicable to a given project. Implementation of this measure would be the responsibility of the project's or management action's proponent.

Mitigation Measure HYD-2: Minimize Adverse Surface Runoff Impacts.

To minimize adverse impacts from surface runoff, the proponent of a project or management action implemented under the Turlock Subbasin GSP shall do all of the following, as applicable:

- Prepare a drainage or hydrology and hydraulic study assessing the need for and provide a basis for the design of drainage-related mitigation measures, such as new on-site drainage systems or new cross drainage facilities. The study shall be prepared in accordance with the applicable standards of FEMA, USACE, DWR, the CVFPB, and the local cities. Subsequent mitigation measures shall be designed in accordance with the final study and with the applicable standards of FEMA, USACE, DWR, and the CVFPB. The study shall identify potential increases in flood risks, including those that may result from new facilities.
- Provide cross drainage, replacement drainage paths and facilities, and enlarged flow paths to reroute drainage around, under, or over the facilities for the project or management action, and to restore the function of any affected existing drainage or flow paths and facilities.
- For areas that would be flooded as a result of the project, or where existing flooding would be increased in magnitude, frequency, or duration, purchase a flowage easement and/or property at fair market value.
- Provide a long-term sediment removal program at in-river structures.

Compliance with Mitigation Measure HYD-2 would reduce impacts from constructed features and operations features and relevant changes to drainage patterns. Therefore, implementing this mitigation measure would reduce this impact to a **less-than-significant** level.

Conservation Management Actions

Effects of Construction Activities

Conservation management actions would seek to achieve groundwater sustainability through water conservation, land fallowing, and pumping reduction. In some cases, these actions could result in the modification of existing features or the construction of new features, including recharge basins and ponds, wells, and pipelines. Construction of these features could temporarily change drainage patterns in a manner similar to the direct and indirect recharge projects. This could result in an increased rate and amount of surface runoff in a manner that would exceed the capacity of existing or planned stormwater drainage systems, result in flooding, or impede or redirect flood flows. However, any changes would likely have relatively localized effects on-site and immediately downstream (or downslope) of the site. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

For conservation management actions that propose construction of new features, O&M of those features would include activities similar to those described for direct and in-lieu recharge projects. Construction of those features would permanently alter drainage patterns. For example, construction of recharge basins or ponds would result in permanent changes to the drainage in that area. O&M of those features is not expected to change surface runoff in a manner that could result in substantial erosion on- or off-site, create or increase on- or off-site flooding, exceed existing or planned stormwater drainage systems, and/or impede or redirect flood flows.

Additionally, land fallowing activities could result in land use changes that would permanently alter the existing drainage patterns. For example, irrigated fields converted to non-irrigated use would no longer receive applied water, and instead solar facilities could be installed, changing the conditions of the land. See Section 3.12, *Land Use and Planning*, for more information regarding land use and planning in the study area.

Any changes would likely have relatively localized effects on-site and immediately downstream (or downslope) of the site. Therefore, this impact would be **less than significant**.

Impact HYD-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of groundwater–surface water interactions.

An evaluation of whether implementing PMAs under the Turlock Subbasin GSP could result in an alteration of groundwater–surface water interactions relied upon the Turlock Subbasin GSP's analysis of interconnected surface water (GSP Chapter 4) and the water budgets (GSP Chapter 5). Briefly, this analysis considered conditions along the three river boundaries of the Turlock Subbasin: the Tuolumne River on the north, the Merced River on the south, and the San Joaquin River on the west. The Tuolumne and Merced rivers drain the Sierra Nevada and are tributaries to the larger San Joaquin River. In the Turlock Subbasin, each of the subbasin's three river boundaries have been characterized as interconnected surface water (Phillips et al. 2015; Todd Groundwater 2022a).

As discussed in Section 3.11.2, *Environmental Setting*, groundwater–surface water interactions are dynamic and can alternate between losing and gaining stream conditions along various river reaches, both seasonally and over time. Only if groundwater levels decline substantially below the river channel could the two systems become disconnected, resulting in loss of base flow and altering instream flow conditions (Todd Groundwater, pers. comm., 2022). In general, without the implementation of PMAs, the streams are expected to lose more to the groundwater system because of lower average groundwater levels. Specifically, the projected groundwater pumping and resulting lowering of groundwater levels in the eastern Turlock Subbasin is projected to induce more stream seepage from the adjoining Merced and Tuolumne River reaches than under historical conditions. In certain reaches, the model forecasts a change from gaining stream reaches to losing stream reaches more frequently, at times potentially resulting in the loss of hydraulic connection between the stream and the groundwater system. The additional subsurface inflows and stream seepage are projected to contribute to groundwater storage in the East Turlock Subbasin (ETS) GSA, altering the instream flow conditions of both the Merced and Tuolumne rivers (Todd Groundwater 2022a).

The intent of the PMAs is to bring the Turlock Subbasin into sustainable conditions and avoid undesirable results, including the loss of hydraulic connectivity between the river and the groundwater system. Therefore, it is reasonable to assume that the construction and operations of PMAs geographically located in areas of interconnected surface water have the potential to alter groundwater–surface water interactions. The impact evaluation also considers wetland areas where groundwater–surface water interactions are important (see Figure 3.11-4).[1] Ultimately, the impact determination relies on the primary recharge mechanism (direct versus in-lieu recharge) and the extent to which implementation would change the existing conditions. These topics are each discussed in more detail below. See Section 3.5, *Biological Resources,* for more information regarding aquatic species habitat.

Direct and In-Lieu Recharge Projects

Effects of Construction Activities

Construction activities required for the implementation of direct and in-direct recharge projects would result in short-term, temporary impacts. As described above, these activities would be necessary to modify existing features or create new features: injection wells, recharge basins, pipelines, French drains, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins. Impacts associated with construction of these features include dredging, scraping, or scarification for development of recharge opportunities, and drilling for wells.

Project designs may incorporate adjusted construction timing to avoid the need for dewatering. For example, temporary diversions of surface water to accommodate construction in the water distribution and conveyance systems may be timed to occur during the dry season, when water is not flowing through the system. If water were to be turned off or diverted for construction, canal seepage would be temporarily interrupted. However, this effect is considered temporary and negligible in the context of subbasin-scale interactions. Given their short-term duration, construction activities would not be likely to result in alterations to groundwater–surface water interactions beyond the typical range of seasonal variability. Therefore, this impact would be **less than significant**.

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1 In wetland areas, groundwater–surface water interactions can be of three types: wetlands losing water to the underlying aquifer, wetlands gaining water from the underlying aquifer, and wetlands gaining water from the aquifers in some locations and losing in others (DWR 2006; Winter et al. 1998).

Effects of Constructed Features and Operations and Maintenance of Those Features

As stated above, PMAs implemented under the Turlock Subbasin GSP are intended to bring the Turlock Subbasin into sustainable conditions and avoid a disconnect between the groundwater and surface water systems. Therefore, operations of direct and in-lieu recharge projects are anticipated to provide neutral or beneficial effects to the study area. For example, direct recharge projects in the eastern subbasin that would convey surface water through irrigation canals to induce additional seepage would enhance groundwater levels. As another example, in-lieu recharge projects that would deliver surface water to agricultural users would temporarily eliminate the need for pumping, thereby inducing no stream seepage and allowing the groundwater system to recharge.

As described in the Turlock Subbasin GSP (Chapter 5), without these projects, the expected amount of groundwater pumping and resulting lower groundwater levels in the ETS GSA would induce more stream seepage from the adjoining Merced and Tuolumne River reaches than under historical conditions. Thus, operations of direct and indirect projects would avoid the potential loss of hydraulic connection between the stream and groundwater systems.

Once the specific characteristics and locations of the direct and in-lieu recharge projects are known, proponents of the PMAs would evaluate the potential for project operations to alter groundwater–surface water interactions, based on the proximity of the constructed features to the three river boundaries and/or aquatic resources mapped in Figure 3.11-4. If a direct or in-lieu recharge project would occur in one of these interconnected areas, its proponent would further consider that area’s losing versus gaining streamflow conditions and evaluate the potential for the project to reduce interactions between groundwater and surface water. Assuming that implementation of PMAs would reduce the potential for a disconnect between the stream and groundwater systems, this impact would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Conservation management actions would seek to achieve groundwater sustainability through water conservation, land fallowing, and pumping reduction. In some cases, these actions could result in the modification of existing features or the construction of new features, including recharge basins and ponds, wells, and pipelines. Impacts associated with construction of these features include dredging, scraping, or scarification for development of recharge opportunities, and drilling for wells.

Similar to the discussion above, given their short-term duration, construction activities would not be likely to result in alterations to groundwater–surface water interactions beyond the typical range of seasonal variability. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

As stated above, PMAs implemented under the Turlock Subbasin GSP are intended to bring the Turlock Subbasin into sustainable conditions and avoid a disconnect between the groundwater and surface water systems. Therefore, it is reasonable to assume that operations of features constructed as part of conservation management actions would provide neutral or beneficial effects to the study area by helping to reduce reliance on groundwater.

Conservation management actions would also promote land use and irrigation efficiency changes that could alter groundwater–surface water interactions. For example, fallowing land during dry years could result in the loss of on-farm recharge. However, during a dry year, the loss of on-farm recharge would presumably be negligible compared to the demand for water to irrigate the field that would otherwise occur. As another example, reducing water use through more efficient irrigation practices (moving from flood irrigation to drip systems) would reduce on-farm recharge. However, conserving water should be more beneficial to the groundwater system as a whole.

Once the specific characteristics and locations of the conservation management actions are known, proponents of the PMAs would evaluate the potential for operations to alter groundwater–surface water interactions, based on the proximity of any constructed features to the three river boundaries and/or aquatic resources mapped in Figure 3.11-4. If a conservation management action would occur in one of these interconnected areas, areas, its proponent would further consider that area's losing versus gaining streamflow conditions and evaluate the potential for the action to reduce interactions between groundwater and surface water.

Overall, O&M for programs and actions to conserve water are anticipated to benefit the Turlock Subbasin and reduce the potential for a disconnect between the stream and groundwater systems. Therefore, the impact would be **less than significant**.

Impact HYD-4: Implementing PMAs under the Turlock Subbasin GSP could result in conflicts with existing water rights (beneficial uses and/or point of diversion).

Direct and In-Lieu Recharge Projects

Effects of Construction Activities

Construction activities for direct and in-direct recharge projects implemented under the Turlock Subbasin GSP are not anticipated to result in conflicts with existing water rights. A *water right* is a legal entitlement that authorizes a party to divert water from a specified source and put it to beneficial, non-wasteful use (State Water Board 2020). Typically, water rights conflicts in the study area arise among local entities over the rights to access water resources. However, these conflicts are not anticipated to occur during construction activities. Any water necessary for construction (e.g., dust control) would be sourced from existing supplies and would be used temporarily; therefore, construction of direct and in-lieu recharge projects is not expected to result in conflicts among other water right holders. This impact would be **less than significant.**

Effects of Constructed Features and Operations and Maintenance of Those Features

O&M of features constructed for direct and in-lieu recharge projects under the Turlock Subbasin GSP may result in conflicts with existing water rights. As described in the GSP, some types of PMAs would divert surface water through existing water rights. Other types of PMAs propose to improve or construct conveyance and delivery infrastructure to deliver excess flows, particularly during flood flow events, and otherwise within the purview of existing water rights. Under these assumptions, no long-term, permanent conflicts with existing water rights would occur.

However, short-term, temporary conflicts may arise after construction, during O&M of the PMAs' features, particularly during below-average hydrologic years when excess flows are not available to support implementation of the PMAs. The benefits of these projects are expected to accrue in wet and above-normal hydrologic years, when excess flows would be available for use. Once the specific characteristics and locations of the direct and in-lieu recharge projects are known, proponents would evaluate the potential for conflicts through design. They would then mediate those conflicts through permitting to determine the sources and reliability of available water before implementation. The evaluation would include consideration of the range of beneficial users (e.g., agricultural, municipal and industrial, domestic) and uses (irrigation and non-irrigation agricultural supply, drinking water, indoor water uses, landscape irrigation), as shown in Table 3.11-2. Additionally, any change in existing water rights (e.g., changing a license place of use or applying for a new urgency permit to divert flood flows) would involve a determination by the State Water Board that no other legal user of water is injured by the change. Therefore, this impact would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Conservation management actions would seek to achieve groundwater sustainability through water conservation, land fallowing, pumping reduction, and well meter installation. In some cases, these actions could result in the modification of existing features or the construction of new features, including recharge basins and ponds, wells, and pipelines. As described previously for direct and in-lieu recharge projects, construction activities for conservation management actions are not anticipated to conflict with existing water rights. The water necessary for construction would be secured by the proponent as part of the design of the conservation management action. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

O&M of the features constructed for conservation management actions under the Turlock Subbasin GSP may result in conflicts with existing water rights for the same reasons as described above for direct and in-lieu recharge projects. Additionally, because conservation management actions would promote the fallowing of lands during dry hydrologic years to reduce demands for surface water and groundwater, implementation of conservation management action would be subject to California Water Rights. As described in Chapter 8 of the Turlock Subbasin GSP, voluntary conservation and/or land fallowing programs would be further developed in a targeted and proportional manner, consistent with conditions observed in the subbasin and within the respective jurisdictional boundaries.

In addition, water transfers may occur or continue occurring during the implementation of PMAs under the Turlock Subbasin GSP. In addition, each member of the Turlock Subbasin GSAs has independent legal authority to implement water transfer programs in its own jurisdiction under existing law.

It is the established policy of the State of California "to facilitate the voluntary transfer of water and water rights where consistent with the public welfare" (California Water Code Section 109[a]). "The Legislature hereby finds and declares that voluntary water transfers between water users can result in a more efficient use of water, benefitting both the buyer and the seller" (California Water Code Section 475).

Under the SGMA, the WTS GSA and ETS GSA have authority to "authorize temporary and permanent transfers of groundwater extraction allocations within the [GSAs'] boundaries, if the total quantity of groundwater extracted in any water year is consistent with the provisions of the [GSP]" (California Water Code Section 10726.4[a][3]). The GSAs also have authority to "provide for a program of voluntary fallowing of agricultural lands or validate an existing program" (California Water Code Section 10726.2[c]).

Once the specific characteristics and locations of the conservation management actions are known, proponents would determine any potential conflicts and mediate as necessary. The evaluation would include consideration of the range of beneficial users (e.g., agricultural, municipal and industrial, domestic) and uses (irrigation and non-irrigation agricultural supply, drinking water, indoor water uses, landscape irrigation), as shown in Table 3.11-2, including water transfers. Therefore, this impact would be **less than significant**.

Impact HYD-5: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of groundwater conditions in adjacent subbasins.

Inflows to the groundwater system include recharge from stream seepage (109,400 AFY), seepage from conveyance canals and Turlock Lake (85,400 AFY), boundary inflows from the Sierra Nevada foothills, and subsurface inflows from the neighboring subbasins of Merced, Delta--Mendota, and Modesto (110,300 AFY combined) (see Figure 3.11-1). As summarized above, under the projected conditions and without the implementation of PMAs, the streams are expected to lose more to the groundwater system because of lower average groundwater levels. Although an average groundwater storage decline of 7,600 AFY would be significantly less than the historical depletion (63,900 AFY), this effect would come at the expense of additional seepage from the stream system, as well as inducement of additional subsurface flows from the neighboring subbasins (Todd Groundwater 2022a).

Because the intent of the PMAs is to bring the Turlock Subbasin into sustainable conditions and avoid undesirable results, construction and operations of PMAs may have the potential to alter groundwater conditions in adjacent subbasins. These topics are discussed in more detail below.

Direct and In-Lieu Recharge Projects

Effects of Construction Activities

The northern, western, and southern boundaries of the Turlock Subbasin are shared with the Modesto, Delta-Mendota, and Merced groundwater subbasins, respectively (DWR 2006). The impacts of construction activities for the PMAs would be short term and temporary. As described above, activities necessary to implement direct and in-lieu recharge projects would include modifying existing features and constructing new features such as injection wells, recharge basins, pipelines, French drains, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins. Impacts associated with construction of these features include dredging, scraping, or scarification for development of recharge opportunities, and drilling for wells.

Given their short-term, temporary duration, construction activities for direct and in-lieu recharge projects would not be likely to result in significant impacts on groundwater conditions or to result in changes to net subsurface flow to and from neighboring subbasins. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

The objective of the direct and in-lieu recharge projects implemented under the Turlock Subbasin GSP is to recharge the groundwater system. Constructed features that would have the potential to alter groundwater conditions in neighboring basins include injection wells, recharge basins, dry wells, and regulating reservoirs. Particularly if these features were to be constructed along the northern, western, and southern boundaries of the Turlock Subbasin, the long-term operational effects of the constructed features could be observed in the neighboring subbasins along the shared boundaries. For example, installing aquifer storage and recovery or injection wells has the potential to result in benefits to the aquifer, thereby resulting in neutral or potentially beneficial results for shared aquifers. The increased reliance on surface water that would result from in-lieu recharge projects may cause long-term changes to the groundwater budget by reducing the need for groundwater pumping. Notably, these neighboring basins are also implementing PMAs under their respective GSPs. This impact would be **potentially significant**.

Compliance with Mitigation Measure HYD-3 would be required when applicable to a given project. Implementation of this measure would be the responsibility of the project’s or management action’s proponent.

Mitigation Measure HYD-3: Minimize Adverse Groundwater Changes.

Proponents of PMAs geographically located adjacent to the neighboring groundwater basins shall review the GSPs as part of their project planning and design to determine the extent of localized changes in groundwater conditions.

Once the specific characteristics and locations of the direct and in-lieu recharge projects are known, proponents of PMAs shall confirm that their operations would not affect groundwater conditions in neighboring basins, by conducting modeling and/or considering groundwater monitoring wells within the project or management action footprint. Criteria to consider may include the location of the project relative to neighboring groundwater basins, depth to groundwater in the project area, potential for the constructed features to reach the aquifer and/or alter net subsurface flow from neighboring basins, and similar projects occurring in those neighboring basins that may complement the project. An expansive groundwater monitoring network that supports implementation of the Turlock Subbasin GSP also provides opportunities to assess groundwater conditions at the project's site. Models developed as part of the GSP's implementation may also be consulted.

Compliance with Mitigation Measure HYD-3 would reduce impacts from constructed features and operations features and relevant changes to adjacent subbasins. Therefore, implementing this mitigation measure would reduce this impact to a **less-than-significant** level.

Conservation Management Actions

Effects of Construction Activities

Conservation management actions would seek to achieve groundwater sustainability through water conservation, land fallowing, and pumping reduction. In some cases, these actions could result in the modification of existing features or the construction of new features, including recharge basins and ponds, wells, and pipelines. As discussed above for construction of direct and in-lieu recharge projects, construction activities for conservation management actions would not be likely to result in alteration of groundwater conditions in adjacent subbasins. The impacts of construction would be short term and temporary impacts and are not anticipated to result in changes to the net subsurface flow to/from neighboring subbasins. This impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

The objective of the conservation management actions is to incentivize conservation through land fallowing and pumping reduction programs. Some actions would result in constructed features, including wells, recharge basins, or ponds, while others consist of programs that would modify groundwater use (pumping reduction programs). As discussed above for direct and in-lieu recharge projects, these management actions could have neutral or potentially beneficial effects on neighboring subbasins. However, land fallowing programs and management actions that would result in non-irrigation land uses would have the potential to reduce on-farm recharge, instream return flows, and subsequently interconnected groundwater. Additionally, converting irrigation practices from flood to drip would reduce water use, but could reduce recharge potential along these shared boundaries. This impact would be **potentially significant**.

Mitigation: Implement Mitigation Measure HYD-3.

Conservation management actions near the shared subbasin boundaries shall consider a water budget analysis and/or modeling to quantify potential impacts, in addition to the other recommendations described in Mitigation Measure HYD-3 above.

Compliance with Mitigation Measure HYD-3 would reduce impacts from constructed features and operations features and relevant changes to adjacent subbasins. Therefore, implementing this mitigation measure would reduce this impact to a **less-than-significant** level. An evaluation of the potential impacts at the program-level requires an understanding of the existing condition, how the land is currently being irrigated as well as the water year type.

3.12 Land Use and Planning

3.12.1 Introduction

This section describes the existing land use and planning characteristics of the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect existing land uses. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan,* in Chapter 2.) As discussed below, potential impacts include division of an existing community or a conflict with an existing land use plan, policy, or regulation.

No comments specifically addressing land use and planning were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.12.2 Environmental Setting

This section describes existing land uses that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and includes many types of land uses. Also, the extent to which PMAs that would be implemented under the GSP would include any particular action is yet to be determined; therefore, this section presents a general discussion of land use in the Turlock Subbasin.

As shown in **Table 3.12-1**, land use in the Turlock Subbasin is primarily agricultural (70 percent), with some urban areas (13 percent), and the remaining land consists of non-irrigated agriculture, undeveloped land, and surface water (collectively 17 percent).

TABLE 3.12-1
EXISTING LAND USES IN THE TURLOCK SUBBASIN

Land Cover and Description	Area (acres)	Percent of Study Area
Developed: Urban and Built-Up Land, Rural Residential Land	45,261	13
Other Land: Non-irrigated agriculture, undeveloped land, surface water	59,187	17
Agricultural: Grazing Land, Farmland of Local Importance, Farmland of Local Potential, Prime Farmland, Farmland of Statewide Importance, Semi-Agricultural and Rural Commercial Land, Unique Farmland	243,712	70

NOTE: Area was estimated by multiplying the percent of study area by the total area of the Turlock Subbasin (348,160 acres).
SOURCE: Todd Groundwater 2022.

Cities and Communities

Cities and communities support residential, commercial, industrial, and public uses (e.g., utilities, transportation facilities, and levees), recreation (e.g., golf courses), open space, and other lands (e.g., cemeteries and parking lots). Residential, commercial, and industrial development in the Turlock Subbasin occurs mainly in several incorporated and unincorporated communities.

Among the cities and communities within the subbasin are Bystrom, Bret Harte, Ceres, Hughson, Hickman, Keyes, Hatch, Turlock, Denair, Hilmar, Irwin, Delhi, Ballico, and Cortez.

Natural Habitat

Natural habitats include aquatic habitats, orchards/croplands, developed/ruderal, nonnative annual grassland, and riparian woodland. These habitats are described in more detail in Section 3.5, *Biological Resources.*

Agricultural Land

Agricultural uses in the Turlock Subbasin include farmlands that support a wide variety of planted orchards or row crops or are left as fallow lands. Common crops within the subbasin include almond, English walnut, and olive orchards. Alfalfa and other hay crops are also present. Agricultural resources in the Turlock Subbasin are described in more detail in Section 3.3, *Agriculture and Forestry Resources*.

Open Space

Several types of open space areas are scattered throughout the Turlock Subbasin, including national wildlife refuges and wildlife areas, trail systems, state recreation areas (SRAs), preserves, and ecological reserves. In addition, regional open space is provided in areas adjacent to the Tuolumne, Merced, and San Joaquin rivers, and the Turlock Lake SRA, located within and adjacent to the subbasin.

Recreation

The Turlock Subbasin provides extensive opportunities for water- and land-oriented recreation. Rivers within the subbasin (e.g., the Tuolumne, Merced, and San Joaquin rivers) and the Turlock Lake SRA located in the northeast corner for the subbasin are available for public access and are used for a wide range of recreational opportunities. Much of the Turlock Subbasin is privately owned, which reduces the availability of land-based recreation. However, land-based recreational activities within the subbasin generally include pedestrian trail walking, bicycling, horseback riding, camping, and the use of sports fields. Public access facilities include state parks, county parks, campgrounds, hunting clubs, and fishing areas, as described in Section 3.16, *Recreation*.

3.12.3 Regulatory Setting

There are no applicable federal or state regulations pertaining to land use. This section discusses regional and local plans, policies, regulations, laws, and ordinances pertaining to land use and planning. Implementation of any project or management action may be subject to the regulations listed below, as well as other local plans, policies, and ordinances, depending on the project location.

Stanislaus County General Plan

The Land Use Element of the Stanislaus County General Plan (2015) contains land use and planning goals and policies intended to promote preservation, guide development of lands, and reduce environmental impacts. The following goals and policies in the Stanislaus County General Plan are relevant to implementation of the PMAs.

Goal One: Provide for diverse land use needs by designating patterns which are responsive to the physical characteristics of the land as well as to environmental, economic and social concerns of the residents of Stanislaus County.

- ***Policy One*****:** Land will be designated and zoned for agricultural, residential, commercial, industrial, or historical uses when such designations are consistent with other adopted goals and policies of the General Plan.
- ***Policy Two*****:** Land designated Agriculture shall be restricted to uses that are compatible with agricultural practices, including natural resources management, open space, outdoor recreation, and enjoyment of scenic beauty.
- ***Policy Six*****:** Preserve and encourage upgrading of existing unincorporated urban communities.
- ***Policy Seven*****:** Riparian habitat along the rivers and natural waterways of Stanislaus County shall, to the extent possible, be protected.

Goal Two: Ensure compatibility between land uses.

- ***Policy Fourteen*****:** Uses shall not be permitted to intrude into or be located adjacent to an agricultural area if they are detrimental to continued agricultural usage of the surrounding area.
- ***Policy Fifteen*****:** Uses should not be permitted to intrude into, or be located adjacent to, areas that are identified as existing and/or potential sites for solid waste facilities if such uses would not be compatible.

Goal Three: Foster stable economic growth through appropriate land use policies.

- ***Policy Seventeen*****:** Agriculture, as the primary industry of the County, shall be promoted and protected.
- ***Policy Twenty-Nine*****:** Support the development of a built environment that is responsive to decreasing air and water pollution, reducing the consumption of natural resources and energy, increasing the reliability of local water supplies, and reduces vehicle miles traveled by facilitating alternative modes of transportation, and promoting active living (integration of physical activities, such as biking and walking, into everyday routines) opportunities.

The Agricultural Element of the Stanislaus County General Plan (2015) promotes and protects local agricultural through the adoption of policies. The following policy is relevant to the implementation of the PMAs.

Policy 1.9: The County shall continue to protect agricultural resources by limiting the circumstances under which agricultural operations may be deemed to constitute a nuisance.

- ***Implementation Measure***: The County shall continue to implement the Right-to-Farm ordinance.
  - Stanislaus County Ordinance Code, Section 9.32.010, Chapter 9. A local ordinance that protects the rights of farmers to carry on their "normal" agricultural practices with a decreased risk of nuisance lawsuits.

Merced County General Plan

The Land Use Element of the Merced County General Plan (2012) contains land use and planning goals and policies that promote preservation and guide development of lands and reduce environmental impacts. The following goals and policies identified in the Stanislaus County General Plan are relevant to implementation of the PMAs.

Goal LU-1: Create a countywide land use pattern that enhances the integrity of both urban and rural areas by focusing urban growth towards existing or suitably located new communities.

- ***Policy LU-1.1: Countywide Development.*** Direct urban development to areas within adopted urban boundaries of cities, Urban Communities, and Highway Interchange Centers in order to preserve productive agriculture, limit urban sprawl, and protect natural resources.
- ***Policy LU-1.7: Compact Development.*** Promote compact development in urban communities that supports pedestrian activity and transit ridership.
- ***Policy LU-1.8: Innovative Development.*** Promote flexibility and innovation through the use of planned unit developments, development agreements, Community Plans, Specific Plans, mixed-use projects, and other innovative development and planning techniques.
- ***Policy LU-1.10: Orderly Community Growth.*** Require the orderly, well planned, and balanced growth of unincorporated communities consistent with the limits imposed by local infrastructure, services, public facilities, and their ability to assimilate growth.

Goal LU-5.A: Preserve and enhance the character of Merced County by focusing future unincorporated development towards Urban Communities.

- ***Policy LU-5.A.5: Smart Growth.*** Promote the principles of smart growth in Community Plans for each Urban Community, including:
  a) creating walkable neighborhoods;
  b) providing a mix of residential densities;
  c) creating a strong sense of place;
  d) mixing land uses;
  e) directing growth toward existing communities;
  f) building compactly;
  g) discouraging sprawl;

h) encouraging infill;

i) preserving open space; and

j) creating a range of housing opportunities and choices.

Goal LU-7: Ensure that development in county/city fringe areas is well planned and adequately serviced by necessary public facilities and infrastructure.

- ***Policy LU-7.1: Infill Development Focus*.** Encourage infill development to occur in cities in order to maximize the use of land within existing urbanized areas, minimize the conversion of productive agricultural land, and minimize environmental impacts associated with new development.

The Agricultural Element provides the policy context for Merced County to achieve its vision for the protection, preservation, and expansion of productive agriculture. The following goal and policy are relevant to the implementation of the PMAs.

Goal AG-3: Minimize conflicts between productive agricultural areas and urban land uses, and discourage the parcelization and conversion of large agricultural holdings into rural residential parcels or urban uses.

- ***Policy AG-3.1: Right-to-Farm Ordinance.*** Continue to implement the Right-to-Farm Ordinance to define and limit instances where agricultural operations may be considered a nuisance to surrounding residential or urban development.

City General Plans

Table 3.12-2 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.12-2
CITY GENERAL PLAN POLICIES GOVERNING LAND USE AND PLANNING WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Land Use and Planning
City of Turlock	Chapter 2, Land Use and Economic Development: Policies 2.5-a through 2.5-c; Policies 2.6a through 2.6d; and Policies 2.9-a through 2.9-f
City of Modesto	Chapter 3, Community Development Policies, C. Land Use Goals and Policies
City of Ceres	Chapter 2, Land Use and Community Design: Goal 2.A, Policies 2.A.1, 2.A.3, and 2.A.4; Goal 2.D, Policies 2.D.1 through 2.D.4
City of Hughson	Land Use Element: Goal LU-1, Policies LU-1.1 through LU-1.3; Goal LU-2, Policies LU-2.1 through 2.4

SOURCE: Data compiled by Environmental Science Associates in 2022

3.12.4 Impacts and Mitigation Measures

Analysis Methodology

Land use and planning impacts from PMAs implemented under the Turlock Subbasin GSP have been evaluated by determining how typical construction and operation of project components could affect the potential for land use conflicts and division of established communities. The analysis also considers the potential impacts of actions required for such projects to comply with applicable land use plans. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The assessment of land use impacts used a qualitative and conservative approach, assuming that all PMAs would be implemented. The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop review, open-access databases, maps, and models. The Turlock Subbasin GSP is the primary source of data for this analysis (available at https://turlockgroundwater.org/gsp). Additional data typical for a land use and planning impact analysis were obtained from readily available land use planning documents and local public agencies' land use maps, plans, policies, and zoning codes.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on land use and planning if it would:

- Physically divide an established community; or
- Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

For this impact analysis, PMAs implemented under the Turlock Subbasin GSP would result in a significant impact related to physical division of an established community if they would directly or indirectly disrupt the existing development pattern, divide an existing incorporated or unincorporated community, or isolate such a community from other existing development.

Impacts and Mitigation Measures

Table 3.12-3 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the activities, location, and potentially significant impacts of the individual project or management action. Implementation of the mitigation measures would be the responsibility of the project's or management action's proponent(s).

TABLE 3.12-3
SUMMARY OF IMPACT CONCLUSIONS—LAND USE AND PLANNING

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
LU-1: Implementing PMAs under the Turlock Subbasin GSP could conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.	LTS	SU
LU-2: Implementing PMAs under the Turlock Subbasin GSP could physically divide an established community	LTS	LTS

NOTES: LTS = less than significant; NI = no impact; SU = significant and unavoidable

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact LU-1: Implementing PMAs under the Turlock Subbasin GSP could conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.

Effects of Construction Activities

Construction of PMAs implemented under the Turlock Subbasin GSP could involve mobilizing equipment and materials, preparing staging areas, installing temporary construction offices, staging and storing equipment and materials, parking vehicles, using designated access and haul routes, clear vegetation and structures, preparing borrow sites, restoring and demobilizing from project sites, and removing excess materials. Proponents of PMAs would be required to comply with applicable city and county general plans and other local policies and ordinances. Potential temporary conflicts with adjacent land uses, policies, and regulations caused by construction-related dust, noise, and traffic are addressed in those sections of this PEIR (Section 3.4, *Air Quality*; Section 3.14, *Noise*; and Section 3.17, *Transportation*, respectively). Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of Those Features

The majority of constructed facilities for PMAs implemented under the Turlock Subbasin GSP would not conflict with a land use plan, policy, or regulation adopted to avoid or mitigate environmental effects. Also, constructed facilities for the PMAs could support land use plans, policies, or regulations if the plans, policies, and regulations include goals for groundwater recharge and water conservation.

Some PMAs implemented under the Turlock Subbasin GSP would result in management measures that could result in land use changes in an effort to decrease groundwater demand. For example, management actions that promote land conversion from agricultural irrigation could promote land repurposing to nonagricultural uses, such as open space, solar, restoration, commercial development, solar, etc., and may conflict with an existing land use plan, policy, or regulation. Other PMAs could result in new long-term or permanent features that could conflict with land use plans, policies, or regulations adopted to avoid or mitigate environmental effects (e.g., fallowing of agricultural lands). As described in Section 3.3, construction and operation impacts from land repurposing (e.g., construction of solar or commercial developments) is speculative at this time, beyond the scope of this Draft PEIR, and not evaluated further. (For more detailed impacts related to agriculture and forestry resources, see Section 3.3.)

Therefore, constructed facilities and operations associated with PMAs implemented under the Turlock Subbasin GSP could result in a conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect. In these limited instances, compliance with required permits and approvals would reduce these impacts to a less-than-significant level. However, if there is no jurisdiction by the agency and no requirement to obtain a permit, land use policy conflicts could occur. Because the potential exists for adverse changes to land use and planning with the implementation of PMAs, this impact would be **significant and unavoidable**.

Impact LU-2: Implementing PMAs under the Turlock Subbasin GSP could physically divide an established community.

Effects of Construction Activities

Construction activities for PMAs implemented under the Turlock Subbasin GSP could include the construction activities presented in Table 2-4 in Chapter 2, *Project Description*.

The implementation of PMAs under the Turlock Subbasin GSP could result in the construction of new infrastructure (e.g., regulating reservoirs, pipelines, injection wells) or expansion of existing infrastructure (e.g., canals, pipelines, recharge basins). Some of these projects could be constructed in areas between communities and developed services. For example, locating a regulating reservoir outside of a community may require road closures to facilitate construction, which could temporarily physically divide the community.

Construction activities for PMAs implemented under the Turlock Subbasin GSP could result in temporary physical division of the community; however, these activities are expected to take place on the periphery of a community, rather than through the community, and would be temporary.

Implementation of PMAs under the Turlock Subbasin GSP could result in the temporary physical division of an established community; however, these activities would be temporary. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

PMAs implemented under the Turlock Subbasin GSP (e.g., injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, pump stations, pipelines, water storage tanks, and irrigation basins to enable surface water deliveries to drip/microsystems) would not physically divide an established community. They would not result in permanent division of established communities, isolate industry from communities with services, or disrupt development patterns that would adversely affect the accessibility of the area. Therefore, this impact would be **less than significant.**

3.13 Mineral Resources

3.13.1 Introduction

This section describes the mineral resources in and characteristics of the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect mineral resources. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan,* in Chapter 2.) As discussed below, potential impacts include the potential loss of availability of mineral resources that have been deemed important by the state or a mineral resource recovery site delineated in a local general plan, specific plan, or other land use plan.

No comments specifically addressing mineral resources were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.13.2 Environmental Setting

This section describes the mineral resources that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and the areas within the subbasin that include important mineral resources.

Mineral Resources Data System

The Mineral Resources Data System (MRDS) is administered by the U.S. Geological Survey (USGS). The MRDS provides data describing mineral resources, including deposit name, location, commodity, deposit description, production status, and references, that can be used to confirm the presence or absence of existing surface mines, closed mines, occurrences/prospects, and unknown or undefined mineral resources.

The MRDS data indicate that there are several mineral resource recovery sites within the Turlock Subbasin; these sites are mostly concentrated along the Tuolumne and Merced rivers (USGS 2022).

California Geological Survey

The California Geological Survey (CGS) maps and regulates the locations of potential mineral resources in California consistent with the Surface Mining and Reclamation Act (SMARA). To protect these potential mineral resources, CGS has classified the regional significance of mineral resources into mineral resource zones (MRZs) and mapped them (Higgins 1993; Clinkenbeard 1999a, 1999b). **Table 3.13-1** provides summary descriptions of the respective MRZ categories.

TABLE 3.13-1
DESCRIPTIONS OF CALIFORNIA MINERAL LAND CLASSIFICATION SYSTEM CATEGORIES

Mineral Resource Zone Category	Category Description	
MRZ-1	*Areas of No Mineral Resource Significance*	
MRZ-2	Demonstrated Reserves	*Areas of Identified Mineral Resource Significance*
MRZ-3	Known Mineral Occurrence	*Areas of Undetermined Mineral Resource Significance*
MRZ-4	No Known Mineral Occurrence	*Areas of Unknown Mineral Resource Significance*

NOTE: MRZ = Mineral Resource Zone

SOURCE: California Geological Survey n.d.

California Geologic Energy Management Division

The California Geologic Energy Management Division (CalGEM) provides oversight of the oil, natural gas, and geothermal industries, and regulates the drilling, operation, and permanent closure of energy resource wells. CalGEM's online mapping application, Well Finder was reviewed to determine the presence of any oil, gas, or geothermal resources within the Turlock Subbasin (CalGEM 2022).

The Well Finder application does not display sites when the application is zoomed out to a regional context. Well Finder data suggest that several sites located throughout the Turlock Subbasin may contain oil, natural gas, and geothermal resources.

3.13.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, and laws, and ordinances pertaining to mineral resources. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

No federal laws, regulations, or policies related to mineral resources apply to the PMAs that would be implemented under the Turlock Subbasin GSP.

State

Surface Mining and Reclamation Act of 1975

SMARA (Public Resources Code Sections 2710–2796) and its implementing regulations (California Code of Regulations Title 14, Section 3500 et seq.) establish a comprehensive state policy for conducting surface mining operations and for reclaiming mined lands to a usable condition that is readily adaptable for alternative land uses. SMARA encourages the production, conservation, and protection of the state's mineral resources and recognizes that "the state's mineral resources are vital, finite, and important natural resources and the responsible protection and development of these mineral resources is vital to a sustainable California" (Public Resources Code Section 2711). Under SMARA, the term *minerals* includes "any naturally occurring chemical element or compound, or groups of elements and compounds, formed from inorganic processes and organic substances, including, but not limited to, coal, peat, and bituminous rock, but excluding geothermal resources, natural gas, and petroleum" (California Code of Regulations Section 3501).

Regional and Local

Stanislaus County General Plan

The Conservation/Open Space Element of the Stanislaus County General Plan (2015) contains the following goals and policies related to mineral resources that are relevant to implementation of the PMAs:

Goal 9: Manage extractive mineral resources to endure an adequate supply without degradation of the environment.

- ***Policy 26*****:** Surface mining in areas classified by the State Division of Mines and Geology as having significant deposits of extractive mineral resources shall be encouraged.
- ***Policy 27*****:** The County shall emphasize the conservation and development of lands having significant deposits of extractive mineral resources by not permitting uses that threaten the potential to extract the minerals.
- ***Policy 28*****:** Lands used for the extraction mineral resources shall be reclaimed as required by the Surface Mining and Reclamation Act of 1975 (SMARA) to minimize undesirable impacts.

2030 Merced County General Plan

The 2030 Merced County General Plan (2013) indicates that Merced County is rich in nonfuel mineral and soil resources. Although there are few operational hard rock mines, the county's primary mineral resource is sand and gravel. The 2030 Merced County General Plan contains the following goals and policies related to mineral resources that are relevant to implementation of the PMAs:

Goal NR-3: Facilitate orderly development and extraction of mineral resources while preserving open space, natural resources, and soil resources and avoiding or mitigating significant adverse impacts.

- ***Policy NR-3.4*****: *New Development Compatibility (RDR).*** Ensure that new development is compatible with existing and potential surface mining areas and operations as identified on the Mineral Resource Zone Maps prepared by the State Division of Mines and Geology and other mineral resource areas identified by the County. The County shall:
    a. Require development applicants near identified mineral resources to prepare a statement that specifies why the County should permit the proposed land use and describe how the benefits of the proposed use would clearly outweigh the impacts that may limit the potential to extract mineral resources in that area.

b. Require new incompatible land uses adjacent to existing mining operations to provide a buffer between the development and adjacent mining operations adequate to mitigate significant impacts to mineral land uses. The buffer distance shall be based on an evaluation of noise, aesthetics, drainage, operating conditions, biological resources, topography, lighting, traffic, operating hours, and air quality.

c. Require written notification to be sent to mining operators and subject landowners of land use entitlement applications for potentially incompatible land uses in areas where mining operations are currently taking place.

- ***Policy NR-3.5: Mineral Resource Protection (RDR).*** Require areas identified with mineral deposits on either the State Mine Land Classification Maps provided by the State Mining and Geology Board's Classification Report, or site-specific information, remain protected for possible future mineral extraction. Impose conditions upon new incompatible land uses in areas surrounding identified mineral deposits for the purpose of mitigating significant land use conflicts prior to approving a use that would otherwise be incompatible with mineral extraction. The identified mineral deposit may be determined by the classification maps, Classification Report, separate County maps, or on a site-specific basis.
- ***Policy NR-3.6: Buffers between Mining Operations and Adjacent Uses (RDR).*** Require operators of new mines to provide buffers or physical barriers between the mining operation and any existing nearby incompatible land uses when a significant impact is identified during the development review process.
- ***Policy NR-3.14: Sand and Gravel Extraction Control (RDR).*** Ensure that strict control is maintained on sand and gravel extractions in streambed channels and within areas designated as having sensitive habitat and open space resources.

City General Plans

Table 3.13-2 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.13-2
CITY GENERAL PLAN POLICIES GOVERNING MINERAL RESOURCES WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Mineral Resources
City of Turlock	Chapter 7, Conservation: Policies 7.6-a and 7.6-b
City of Modesto	Not applicable
City of Ceres	Not applicable
City of Hughson	Not applicable

SOURCE: Data compiled by Environmental Science Associates in 2022

3.13.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on mineral resources focuses on the potential for substantial adverse effects on a mineral resource that has local or state importance, or a mineral resource recovery site included in a local general plan, specific plan, or other land use plan.

Mineral resource impacts from the types of PMAs implemented under the Turlock Subbasin GSP have been evaluated in terms of how typical construction and operation could affect existing mineral resources. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes caused by the types of PMAs that might be occur in the future, consistent with the level of detail appropriate for a program-level analysis.

The following factors were considered when determining the extent and implications of potential impacts to mineral resources, consideration has been given to the following:

- The presence of existing mineral resources in the area, as reported by CGS or USGS, or as reported in the general plans for Stanislaus or Merced counties.
- Potential construction or operational activities that would result in the loss of availability of a mineral resource.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop surveys, open-access databases, maps, and models. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2, *Project Description*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on mineral resources if it would:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

Impacts and Mitigation Measures

Table 3.13-3 summarizes the impact conclusion presented in this section for easy reference. No mitigation is required.

TABLE 3.13-3
SUMMARY OF IMPACT CONCLUSION—MINERAL RESOURCES

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
MIN-1: Implementing PMAs under the Turlock Subbasin GSP would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.	LTS	LTS

NOTE: LTS = less than significant

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact MIN-1: Implementing PMAs under the Turlock Subbasin GSP could result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of Those Features

Mineral resource mapping and the general plans for Stanislaus and Merced counties indicate that known mineral resources are present throughout Stanislaus and Merced counties, including within the boundaries of the Turlock Subbasin.

Implementation of PMAs under the Turlock Subbasin GSP could occur in areas where mineral resources are known to occur. PMAs would include construction of new or modification of existing features such as injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, water storage tanks, and irrigation basins to enable surface water deliveries to drip/micro systems. If a project or management action were to be proposed in an area with mineral resources, implementation activities could result in the loss of availability of a known mineral resource. Among the activities with the potential to affect mineral resources are excavations, grading, or establishment of borrow sites in or around mineral resource recovery sites. Additionally, road closures or operations of constructed features could restrict access to important mineral resources. If one or more of the PMAs were to result in the loss of availability of a known mineral resource or locally important mineral resource recovery site, this could result in a potentially significant impact.

However, the Stanislaus and Merced County general plans include goals and policies designed to protect significant mineral resources, and to ensure that mineral resources are not lost or destroyed as a result of PMAs proposed in designated MRZs. Additionally, SMARA regulates surface mining operations to minimize adverse environmental impacts and ensure that mined lands are reclaimed to a usable condition. SMARA also encourages the production, conservation, and protection of the state's mineral resources.

Compliance with SMARA and with the goals and policies of the Stanislaus and Merced County general plans that protect mineral resources would be required before the construction of PMAs in MRZs. All features associated with PMAs under the Turlock Subbasin GSP would be subject to these state and local requirements. With compliance with these state and local requirements, implementation of the PMAs under the Turlock Subbasin GSP would not result in the loss of availability of known mineral resources. As a result, impacts on mineral resources would be **less than significant**.

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3.14 Noise and Vibration

3.14.1 Introduction

This section describes and evaluates the potential for the construction and operation of the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to result in significant noise and vibration impacts. The section describes the existing regional conditions of the Stanislaus County and Merced County areas; summarizes the applicable regulations related to noise and vibration; identifies criteria used to determine impact significance; provides an analysis of the potential noise and vibration impacts associated with the construction and operations and maintenance (O&M) activities; and identifies feasible mitigation measures that could mitigate potentially significant impacts.

No comments specifically addressing noise or vibration were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.14.2 Environmental Setting

This section describes relevant metrics used in the assessment of noise and vibration impacts, as well as provides a generalized description of the regional noise environments within Stanislaus and Merced counties.

Noise Background

Sound is characterized by various parameters that describe the rate of oscillation (frequency) of sound waves, the distance between successive troughs or crests in the wave, the speed that the sound wave travels, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound, and the decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called “A-weighting,” expressed as “dBA.” The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. An increase of 10 dBA in the level of a continuous noise represents a perceived doubling of loudness. The noise levels presented herein are expressed in terms of dBA, unless otherwise indicated. **Table 3.14-1** shows some representative noise sources and their corresponding noise levels in dBA (Caltrans 2013).

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity in a specified location for a generalized land use type. Some general guidelines are as follows: sleep disturbance can occur at noise levels above 35 dBA; interference with human speech begins at about 60 dBA (FICON 1992). Hearing damage can result from prolonged exposure to noise levels in excess of 85 to 90 dBA as an 8-hour time weighted average (NIOSH 2018).

TABLE 3.14-1
TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

Common Outdoor Activities	Decibels (dBA)	Common Indoor Activities
	110	Rock Band
Jet Flyover at 1,000 feet		
	100	
Gas Lawnmower at 3 feet		
	90	
Diesel Truck at 50 feet at 50 mph		Food Blender at 3 feet
Near Freeway Auto Traffic	80	Garbage Disposal at 3 feet
Noisy Urban Area, Daytime		
Gas Lawnmower at 100 feet	70	Vacuum Cleaner at 10 feet
		Normal Speech at 3 feet
Commercial Area Heavy Traffic at 300 feet	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher in Next Room
Quiet Urban Nighttime	40	Theater, Large Conference Room Background
	30	Library
Quiet Rural Nighttime		Bedroom at Night
	20	
		Broadcast/recording studio
	10	

SOURCE: Caltrans 2013, Table 2-5.

Attenuation of Noise

Noise from line sources, such as roadway traffic, attenuates (lessens) at a rate of 3.0 to 4.5 dBA per doubling of distance from the source, based on the inverse square law and the equation for cylindrical spreading of noise waves over hard and soft surfaces.

Noise from point sources, including stationary mobile sources such as idling vehicles or on-site construction equipment, attenuates at a rate of 6.0 to 7.5 dBA per doubling of distance from the source, based on the inverse square law and the equations for spherical spreading of noise waves over hard and soft surfaces. For this analysis, it is assumed that noise from line and point sources to a distance of 200 feet attenuates at rates of between 3.0 and 6.0 dBA per doubling of distance, and the noise from line and point sources at a distance greater than 200 feet attenuates at a rate of 4.5 to 7.5 dBA per doubling of distance, to account for the absorption of noise waves due to ground surfaces such as soft dirt, grass, bushes, and intervening structures (Caltrans 2013).

Noise Descriptors

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given period of time. Community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic. What makes community noise variable throughout a day, besides the slowly changing background noise, is the addition of short-duration, single-event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual. These successive additions of sound to the community noise environment change the community noise level from instant to instant, requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise effects. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The L_{eq}, or equivalent sound level, is used to describe noise over a specified period of time in terms of a single numerical value; the L_{eq} of a time-varying signal and that of a steady signal are the same if they deliver the same acoustic energy over a given time. The L_{eq} may also be referred to as the average sound level.

L_{max}: The maximum, instantaneous noise level experienced during a given period of time.

L_{90}: The level of noise exceeded 90 percent of the time is sometimes conservatively considered as the background ambient noise level for the purposes of assessing conformity with noise ordinance standards with respect to noise from stationary equipment or entertainment venues.

L_{dn}: Also termed the day-night average noise level (DNL), the L_{dn} is the average A-weighted noise level during a 24-hour day, obtained after an addition of 10 dB to measured noise levels between the hours of 10 PM to 7 AM to account for greater nighttime noise sensitivity.

CNEL: CNEL, or Community Noise Equivalent Level, is the average A-weighted noise level during a 24-hour day that is obtained after an addition of 5 dB to measured noise levels between the hours of 7 PM to 10 PM and after an addition of 10 dB to noise levels between the hours of 10 PM to 7 AM to account for greater noise sensitivity in the evening and nighttime, respectively.

Health Effects of Environmental Noise

The World Health Organization (WHO) is perhaps the best source of current knowledge regarding the health effects of noise impacts because European nations have continued to study noise and its health effects, while the United States Environmental Protection Agency (USEPA) all but eliminated its noise investigation and control program in the 1970s. According to WHO, sleep disturbance can occur when continuous indoor noise levels exceed 30 dBA or when intermittent interior noise levels (such as from traffic) reach 45 dBA, particularly if background noise is low. With a bedroom window slightly open (a reduction from outside to inside of 15 dB), the WHO criteria suggest that exterior continuous (ambient) nighttime noise levels should be 45 dBA or below, and short-term events should not generate noise in excess of 60 dBA. WHO also notes that maintaining noise levels within the recommended levels during the first part of the night is believed to be effective for the ability of people to initially fall asleep (WHO 1999).

Other potential health effects of high noise levels identified by WHO include decreased performance for complex cognitive tasks, such as reading, attention span, problem solving, and memorization; physiological effects such as hypertension and heart disease (after many years of constant exposure, often of workers, to high noise levels); and hearing impairment (again, generally after long-term occupational exposure, although shorter term exposure to very high noise levels, for example, exposure several times a year to concert noise at 100 dBA, can also damage hearing). Finally, noise can cause annoyance and can trigger emotional reactions like anger, depression, and anxiety. WHO reports that, during daytime hours, few people are seriously annoyed by activities with noise levels below 55 dBA or moderately annoyed with noise levels below 50 dBA.

Vehicle traffic and continuous sources of machinery and mechanical noise contribute to ambient noise levels. Short-term noise sources, such as truck backup beepers, the crashing of material being loaded or unloaded, and car doors slamming, contribute very little to 24-hour noise levels but are capable of causing sleep disturbance and annoyance. The importance of noise to receptors depends on both time and context. For example, long-term high noise levels from large traffic volumes can make conversation at a normal voice level difficult or impossible, while short-term peak noise levels, if they occur at night, can disturb sleep.

Vibration Descriptors

Vibration is an oscillatory motion through a solid medium in which the motion’s amplitude can be described in terms of displacement, velocity, or acceleration. Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe physical vibration impacts on buildings and structures. Another useful vibration descriptor is known as vibration decibels or VdBs. VdBs are generally used when evaluating human response to vibration, as opposed to damage to structures (for which PPV is the more commonly used descriptor). Vibration decibels are established relative to a reference quantity, typically 1×10^{-6} inches per second and are based on the root mean square velocity amplitude (FTA 2018).

Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors to vibration include people (especially residents, the elderly, and sick people), structures (especially older masonry structures), and vibration-sensitive equipment.

The background vibration velocity levels in residential areas are typically 50 VdB or lower, and the threshold of perception for humans is approximately 65 VdB. A vibration level of 85 VdB in a residence can result in strong annoyance (FTA 2018).

Existing Noise and Vibration Environment

Sources of noise in the Turlock Subbasin include traffic on State Routes (SR) 59, 99, 132, and 165; local roads; railroad operations; aircraft operations; commercial uses; and agricultural operations. In more remote locations, background noise levels in the absence of the above-described sources are caused by distant traffic, wind in the trees, running water, birds, and distant industrial or other stationary noise sources.

Both Stanislaus County and Merced counties have a noise element in their general plans that provides noise contour maps for highways within their jurisdictions and also contains noise measurements conducted at various locations throughout each county. Because the Turlock Subbasin extends through a variety of developed and undeveloped land use areas, noise levels at various potential PMA locations can vary greatly. For example, both the Dianne storm basin and the Stanislaus State Stormwater Recharge projects would be located within the City of Turlock where urbanized noise levels can be quite elevated, particularly within proximity of SR 99 where daytime noise levels of 75 dBA can occur (Stanislaus County 2005). Conversely, in more remote locations to the east, such as the Town of Snelling, average daytime noise levels of 44 dBA have been recorded (Merced County 2013).

3.14.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to noise and vibration. Implementation of any project or management action may be subject to the laws and regulations listed below, as well as other local plans, policies, and ordinances, depending on the project location.

Federal

Federal Aviation Administration

The Federal Aviation Administration (FAA) develops noise exposure maps that use average annual CNEL noise contours around an airport as the primary noise descriptor. The FAA states that all land uses are considered compatible when aircraft noise effects are less than 65 dB CNEL.

State

State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are collectively known as the California Noise Insulation Standards and are found in Title 24 of the California Code of Regulations.

The 2016 California Building Code (CBC) included the most recent update to the sound transmission standards (CBC, Title 24, Part 2 of the California Code of Regulations) and requires that walls and floor/ceiling assemblies separating dwelling units from each other, or from public or service areas, have a Sound Transmission Class (STC) of at least 50, meaning they can reduce noise by a minimum of 50 dB.[1] The CBC (Section 1207.4, Allowable Interior Noise Levels) also specifies a maximum interior noise limit of 45 dBA (L_{dn} or CNEL) in habitable rooms, and requires that common interior walls and floor/ceiling assemblies meet a minimum STC rating of 50 for airborne noise.

Regional and Local

Merced County

2030 Merced County General Plan

The following goals and policies from the county's 2030 General Plan, Health and Safety Element: Noise, are relevant to the assessment of noise effects associated with the project.

> **Goal HS-7:** Protect residents, employees, and visitors from the harmful and annoying effects of exposure to excessive noise.

- ***Policy HS-7.1: Noise Standards for New Land Uses (RDR).*** Require new development projects to meet the standards shown in Tables HS-1 [3.14-2] and HS-2 [3,14-3], at the property line of the proposed use, through either project design or other noise mitigation techniques.
- ***Policy HS-7.4: New Noise Generating Uses.*** Require new commercial and industrial uses to minimize encroachment on incompatible noise sensitive land uses. Also consider the potential for encroachment by residential and other noise sensitive land uses on adjacent lands which could significantly impact the viability of the commercial or industrial areas.
- ***Policy HS-7.5: Noise Generating Activities.*** Limit noise generating activities, such as construction, to hours of normal business operation.
- ***Policy HS-7.7: Noise Impacted Residential Area Monitoring.*** Consider any existing residential area "noise impacted" if the exposure to exterior noise exceeds the standards shown in Table HS-2. Identify and evaluate potential noise impacted areas and identify possible means to correct the identified noise/land use incompatibilities.
- ***Policy HS-7.8: Project Design.*** Require land use projects to comply with adopted noise standards through proper site and building design, such as building orientation, setbacks, natural barriers (e.g., earthen berms, vegetation), and building construction practices. Only consider the use of soundwalls after all design-related noise mitigation measures have been evaluated or integrated into the project or found infeasible.
- ***Policy HS-7.9: Transportation Project Construction/Improvements.*** Require transportation project proponents to prepare all acoustical analysis for all roadway and railway construction projects in accordance with Policy HS-7.2. Consider noise mitigation measures to reduce traffic and/or rail noise levels to comply with Table HS-1 standards if pre-project noise levels already exceed the noise standards of Table HS-1 and the increase is significant. The County defines a significant increase as follows:

[1] State Building Code section 1207.2.

Pre-Project Noise Environment (L_{dn})	Significant Increase
Less than 60 dB	5+ dB
60 - 65 dB	3+ dB
Greater than 65 dB	1.5+ dB

TABLE 3.14-2
NOISE STANDARDS FOR NEW USES AFFECTED BY TRAFFIC, RAILROAD, AND AIRPORT NOISE

New Land Use	Sensitive[1] Outdoor Area – Ldn	Sensitive Interior[2] Area – Ldn	Notes
All Residential	65	45	3
Transient Lodging	65	45	3,4
Hospitals & Nursing Homes	65	45	3,4,5
Theaters & Auditoriums	--	35	4
Churches, Meeting Halls, Schools, Libraries, etc.	65 65	40 40	4 4
Office Buildings	65	45	4
Commercial Buildings	--	50	4
Playground, Parks, etc.	70	--	
Industry	65	50	4

NOTES:
1 Sensitive Outdoor Areas include primary outdoor activity areas associated with any given land use at which noise-sensitivity exists and the location at which the County's exterior noise level standards are applied.
2 Sensitive Interior Areas includes any interior area associated with any given land use at which noise- sensitivity exists and the location at which the County's interior noise level standards are applied. Examples of sensitive interior spaces include, but are not limited to, all habitable rooms of residential and transient lodging facilities, hospital rooms, classrooms, library interiors, offices, worship spaces, theaters. Interior noise level standards are applied within noise-sensitive areas of the various land uses with windows and doors in the closed positions.
3 Railroad warning horn usage shall not be included in the computation of Ldn.
4 Only the interior noise level standard shall apply if there are no sensitive exterior spaces proposed for these uses.
5 Since hospitals are often noise-generating uses, the exterior noise level standards are applicable only to clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

SOURCE: Merced County, *2030 Merced County General Plan*, Health and Safety Element: Noise (adopted December 10, 2013; amended July 12, 2016), Table HS-1, p. HS-10.

- ***Policy HS-7.12: New Project Noise Mitigation Requirements.*** Require new projects to include appropriate noise mitigation measures to reduce noise levels in compliance with the Table HS-2 standards within sensitive areas. If a project includes the creation of new non-transportation noise sources, require the noise generation of those sources to be mitigated so they do not exceed the interior and exterior noise level standards of Table HS-2 at existing noise-sensitive areas in the project vicinity. However, if a noise-generating use is proposed adjacent to lands zoned for residential uses, then the noise generating use shall be responsible for mitigating its noise generation to a state of compliance with the standards shown in Table HS-2 at the property line of the generating use in anticipation of the future residential development.

- ***Policy HS-7.13: Noise Exemptions.*** Support the exemption of the following noise sources from the standards in this element:

  a) Emergency warning devices and equipment operated in conjunction with emergency situations, such as sirens and generators which are activated during power outages.

The routine testing of such warning devices and equipment shall also be exempt provided such testing occurs during daytime hours.

b) Activities at schools, parks, or playgrounds, provided such activities occur during daytime hours.

c) Activities associated with County-permitted temporary events and festivals.

TABLE 3.14-3
NON-TRANSPORTATION NOISE STANDARDS MEDIAN (L_{50}) / MAXIMUM (L_{MAX})[1]

Outdoor Area[2]			Interior[3]	
Receiving Land Use	**Daytime**	**Nighttime**	**Day or Night**	**Notes**
All Residential	55 / 75	50 / 70	35 / 55	
Transient Lodging	55 / 75	--	35 / 55	4
Hospitals & Nursing Homes	55 / 75	--	35 / 55	5,6
Theaters & Auditoriums	--	--	30 / 50	6
Churches, Meeting Halls, Schools, Libraries, etc.	55 / 75	--	35 / 60	6
Office Buildings	60 / 75	--	45 / 65	6
Commercial Buildings	55 / 75	--	45 / 65	6
Playground, Parks, etc.	65 / 75	--	--	6
Industry	60 / 80	--	50 / 70	6

NOTES:

1 These standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards in this table, then the noise level standards shall be increased at 5 dB increments to encompass the ambient.

2 Sensitive Outdoor Areas include primary outdoor activity areas associated with any given land use at which noise-sensitivity exists and the location at which the County's exterior noise level standards are applied.

3 Sensitive Interior Areas includes any interior area associated with any given land use at which noise- sensitivity exists and the location at which the County's interior noise level standards are applied. Examples of sensitive interior spaces include, but are not limited to, all habitable rooms of residential and transient lodging facilities, hospital rooms, classrooms, library interiors, offices, worship spaces, theaters. Interior noise level standards are applied within noise-sensitive areas of the various land uses with windows and doors in the closed positions.

4 Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.

5 Since hospitals are often noise-generating uses, the exterior noise level standards are applicable only to clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

6 The outdoor activity areas of these uses (if any) are not typically used during nighttime hours.

7 Where median (L50) noise level data is not available for a particular noise source, average (Leq) values may be substituted for the standards of this table provided the noise source operates for at least 30 minutes. If the source operates less than 30 minutes the maximum noise level standards shown shall apply.

SOURCE: Merced County, *2030 Merced County General Plan*, Health and Safety Element: Noise (adopted December 10, 2013; amended July 12, 2016), Table HS-2, p. HS-11.

Merced County Code - Chapter 10.60 Noise Control

Noise generated by the project and experienced at nearby residential properties would be subject to the Merced County Code noise limits. The following text presents the Merced County Code noise level limits as defined in County Code Chapter 10.60 Noise Control.

A. No person shall cause, suffer, allow, or permit the operation of any sound source on private property in such a manner as to create a sound level that results in any of the following, when measured at or within the real property line of the receiving property:

1. Exceeds the background sound level by at least ten (10) dBA during daytime hours (seven a.m. to ten p.m.) and by at least five dBA during nighttime hours (ten p.m. to

seven a.m.). The background sound level for purposes of this section shall be determined as set forth in Section 10.60.060; or

2. Exceeds sixty-five (65) dBA Ldn on residential real property or seventy (70) dBA Ldn on nonresidential real property; or
3. Exceeds seventy-five (75) dBA Lmax on residential real property or eighty (80) dBA Lmax on nonresidential real property.

B. The following are exempt from the sound level limits of Section 10.60.030(A):

1. Noise from emergency signaling devices;
2. Noise from an exterior burglar alarm of any building provided such burglar alarm shall terminate its operation within five minutes of its activation;
3. Noise from domestic power tools, lawn mowers, and agricultural equipment when operated between seven a.m. and eight p.m. on weekdays and between eight a.m. and eight p.m. on weekends and legal holidays, provided they generate less than eighty-five (85) dBA at or within any real property line of a residential property;
4. Sound from church bells and chimes when a part of a religious observance or service; Noise from construction activity, provided that all construction in or adjacent to urban areas shall be limited to the daytime hours between seven a.m. and six p.m., and all construction equipment shall be properly muffled and maintained.

C. When the source being analyzed is a stereo system with low frequency signals as part of its output, the stereo shall not cause a C-weighted level of ten (10) dB or greater above the C-weighted ambient level at a distance of ten (10) feet from the source, or the complainant's real property line, whichever is greater. (Ord. 1869 § 2, 2009; Ord. 1726 § 1, 2004).

Certain additional activities are exempt from the above noise. Section 10.60.050 (2) specifically exempts noise sources associated with agricultural activities or agricultural operations on agricultural property.

Stanislaus County General Plan

The following Goals and Policies from the County's General Plan Noise Element are relevant to the assessment of noise effects associated with the proposed project.

Goal One: Prevent the encroachment of incompatible land uses near known noise-producing industries, railroads, airports, and other sources to protect the economic base of the County.

- ***Policy One***: It is the policy of Stanislaus County to utilize the noise exposure information contained within the General Plan to identify existing and potential noise conflicts through the Land Use Planning and Project Review processes.
- ***Implementation Measure 1***: Areas within Stanislaus County shall be designated as noise-impacted if exposed to existing or projected future noise levels exterior to buildings exceeding the standards in Figure IV-2 or the performance standards described by Table IV-2. Maps showing existing and projected future noise exposures exceeding 60 Ldn or CNEL for the major noise sources are depicted in Figure IV-1, and Table IV-1.

Goal Two: Protect the citizens of Stanislaus County from the harmful effects of exposure to excessive noise.

- ***Policy Two*****:** It is the policy of Stanislaus County to develop and implement effective measures to abate and avoid excessive noise exposure in the unincorporated areas of the County by requiring that effective noise mitigation measures be incorporated into the design of new noise generating and new noise sensitive land uses.

- ***Implementation Measure 2*****:** New development of industrial, commercial, or other noise generating land uses will not be permitted if resulting noise levels will exceed 60 L_{dn} (or CNEL) in noise-sensitive areas. Additionally, the development of new noise-generating land uses, which are not preempted from local noise regulation, will not be permitted if resulting noise levels will exceed the performance standards contained within Table IV-2 [Table 3.14-4] in areas containing residential or other noise sensitive land uses.

  Each of the noise level standards specified in Table IV-2 shall be reduced by five (5) dBA for pure tone noises, noise consisting primarily of speech or music, or for recurring impulsive noises. The standards in Table IV-2 should be applied at a residential or other noise-sensitive land use and not on the property of a noise-generating land use. Where measured ambient noise levels exceed the standards, the standards shall be increased to the ambient levels.

TABLE 3.14-4
MAXIMUM ALLOWABLE NOISE EXPOSURE – STATIONARY SOURCES

	7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
Hourly Leq, dBA	55	45
Maximum level, dBA	75	65

SOURCE: Stanislaus County, *Stanislaus County General Plan 2005* (adopted August 23, 2016), Table IV-2, p. IV-11.

- ***Implementation Measure 3*****:** Prior to the approval of a proposed development of noise-sensitive land uses in a noise- impacted area, or the development of industrial, commercial or other noise-generating land use in an area containing noise-sensitive land uses, an acoustical analysis shall be required. Where required, an acoustical analysis shall:

  a) Be the responsibility of the applicant.

  b) Be prepared by a qualified acoustical consultant experienced in the fields of environmental noise assessment and architectural acoustics.

  c) Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions.

  d) Include estimated noise levels in terms of L_{dn} (or CNEL) and the standards of Table IV-2 (if applicable) for existing and projected future (10-20 years hence) conditions, with a comparison made to the adopted polices of the Noise Element.

  e) Include recommendations for appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element.

  f) Include estimates of noise exposure after the prescribed mitigation measures have been implemented. If compliance with the adopted standards and policies of the Noise Element will not be achieved, a rationale for acceptance of the project must be provided.

- ***Implementation Measure 4*: Projects which go through the CEQA review process require an acoustical analysis shall include a monitoring program to specifically implement the recommended mitigation to noise impacts associated with the project.
- ***Implementation Measure 5*: Noise level criteria applied to land uses other than noise sensitive uses shall be consistent with the recommendations of Figure IV-2: Normally Accepted Community Noise Environments.
- ***Policy Three*: It is the objective of Stanislaus County to protect areas of the County where noise-sensitive land uses are located.
- ***Implementation Measure 1*: Require the evaluation of mitigation measures for projects that would cause the L_{dn} at noise- sensitive uses to increase by 3 dBA or more and exceed the normally acceptable@level, cause the L_{dn} at noise-sensitive uses to increase 5 dBA or more and remain normally acceptable, or cause new noise levels to exceed the noise ordinance limits (after adoption).

Stanislaus County Code

Section 10.46.050 of the Stanislaus County Code establishes exterior noise level standards to be enforced within the county. It limits the exterior noise level when measured at any property situated in either the incorporated or unincorporated area of the county to exceed the noise level standards as set forth below in **Table 3.14-5**. The exterior noise level standards set forth in Table 3.14-5 shall be reduced by 5 dB(A) for pure tone noises, noises consisting primarily of speech or music, or reoccurring impulsive noise. In the event the measured ambient noise level exceeds the applicable noise level standard, the ambient noise level shall become the applicable exterior noise level standard.

TABLE 3.14-5
MAXIMUM ALLOWABLE NOISE EXPOSURE – STATIONARY SOURCES

Designated Noise Zone	Maximum A-Weighted Sound Level as Measured on a Sound Level Meter (L_{max})	
	7:00 a.m.—9:59 p.m.	10:00 p.m.—6:59 a.m.
Noise Sensitive	45	45
Residential	50	45
Commercial	60	55
Industrial	75	75

NOTES:
Noise Sensitive. Any public or private school, hospital, church, convalescent home, cemetery, sensitive wildlife habitat, or public library regardless of its location within any land use zoning district.
Residential. All parcels located within a residential land use zoning district.
Commercial. All parcels located within a commercial or highway frontage land use zoning district.
Industrial. All parcels located within an industrial land use zoning district.
SOURCE: Stanislaus County Code Section 10.46.050 2005

Certain activities are exempt from the stationary source standards presented in Table 3.14-5. Section 10.46.080 (H) specifically exempts agricultural operations. "Agricultural operations" are defined as the cultivation and tillage of the soil; dairying; the production, irrigation, frost protection, cultivation, growing, harvesting and processing of any agricultural commodity, including viticulture, horticulture, timber or apiculture; the raising of livestock, fur bearing animals, fish or poultry; and any commercial agricultural practices performed as incident to or in conjunction with such operations, including preparation for market, delivery to storage or to market, or to carriers for transportation to market.

The ordinance further restricts exterior noise levels, which shall not exceed the following cumulative duration allowance standards in **Table 3.14-6**.

TABLE 3.14-6
CUMULATIVE DURATION ALLOWANCE STANDARDS

Cumulative Duration	Allowance Decibels
Equal to or greater than 30 minutes per hour	Table 3.14-5 plus 0 dB
Equal to or greater than 15 minutes per hour	Table 3.14-5 plus 5 dB
Equal to or greater than 5 minutes per hour	Table 3.14-5 plus 10 dB
Equal to or greater than 1 minute per hour	Table 3.14-5 plus 15 dB
Less than 1 minute per hour	Table 3.14-5 plus 20 dB

SOURCE: Stanislaus County Code Section 10.46.050 2005

City General Plans

Table 3.14-7 summarizes the key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.14-7
CITY GENERAL PLAN POLICIES GOVERNING NOISE WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Noise
City of Turlock	Chapter 9, Noise, Guiding Policies 9.4-a, 9.4-b, 9.4-c, Implementing Policies 9.4-d through 9.4-j.
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, G. Noise, Policies 3a through 3n.
City of Ceres	Chapter 5, Health and Safety, Goal 5.L, Policies 5.L.1 through 5.L.11.
City of Hughson	Chapter 7, Noise Element, Goal N-1, Policies N-1.1 through N-1.5.

City Municipal Codes

Table 3.14-8 summarizes the key ordinances identified in the city municipal code within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.14-8
CITY MUNICIPAL CODE SECTIONS GOVERNING NOISE

Municipal Code	Sections Governing Noise
City of Turlock	Chapter 5-28 (Noise Standards) – 110 (Prohibited Acts) (g) construction and demolition.
City of Modesto	Title 4, Chapter 9 (Noise Regulations)
City of Ceres	Title 9 Chapter 4 (Noise)
City of Hughson	Chapter 9.30 (Regulation of Noise).

3.14.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts for noise and vibration focuses on the potential for construction-related noise or vibration levels from O&M activities to exceed thresholds established by the general plan noise elements or county codes for Merced or Stanislaus County. PMAs implemented under the Turlock Subbasin GSP are evaluated in terms of how typical construction and operation could affect existing noise and vibration conditions. However, the precise locations and extent of activities and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable noise sources from implementation of the types of PMAs and mitigation measures that might be taken in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational-related activities). Temporary impacts are those that would be temporary in nature (e.g., construction-related activities). Impacts were evaluated separately for direct and in-lieu recharge projects and water conservation management actions. While the impact conclusions reached may be the same, this approach facilitates a discussion of any potential differences.

Significance determinations assume that the PMAs implemented under the Turlock Subbasin GSP will comply with relevant federal, state, and local ordinances and regulations described in Section 3.14.3, *Regulatory Setting.* Thresholds of significance used to evaluate impacts are based on Appendix G of the State CEQA Guidelines. Additional thresholds are proposed for potential issues identified as relevant to the Turlock Subbasin.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. PMAs implemented under the Turlock Subbasin GSP would result in a significant impact for noise or vibration if they could:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

- Generate excessive groundborne vibration or groundborne noise levels; or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels.

Issues Not Evaluated Further

The criteria listed above that are not applicable to actions associated with the project are identified below, along with the supporting rationale as to why further consideration is unnecessary and a no-impact determination is appropriate.

- ***Criterion 3: For a project in the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels.*** The closest airports are Modesto City-County Airport north of the Tuolumne River, just north of the northern project footprint, and Castle Air Force Base, approximately 5 miles south of the study area. The Turlock Subbasin GSP would not locate a new noise-sensitive land use or a new place of employment and, therefore, would not result in exposure of people residing or working in the project area to excessive noise levels. While construction workers may be located within the 65 to 70 CNEL contour of Modesto City-County Airport that extends approximately 500 feet south of the Tuolumne River (Stanislaus County 2014), the temporary exposure of workers to such a noise level would not be considered excessive. Consequently, there would be no impact associated with exposing people near an airport or private airstrip to excessive noise levels.

Impacts and Mitigation Measures

Table 3.14-9 summarizes the impact conclusions presented in this section for easy reference.

TABLE 3.14-9
SUMMARY OF IMPACT CONCLUSIONS—NOISE

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
NOI-1: Implementing PMAs under the Turlock Subbasin GSP could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	LTSM	LTS
NOI-2: Implementing PMAs under the Turlock Subbasin GSP could generate excessive groundborne vibration or groundborne noise levels.	LTSM	LTS

NOTES: LTS = less than significant; LTSM = less than significant with mitigation

SOURCE: Data compiled by Environmental Science Associates in 2022.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

Impact NOI-1: Implementing PMAs under the Turlock Subbasin GSP could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Direct and In-Lieu Recharge Projects

Effects of Construction Activities

Many of the PMAs implemented under the Turlock Subbasin GSP could include direct and in-lieu recharge projects which require construction activities that could include the mobilization of substantial off-road equipment and materials, removal of substantial soil quantities from borrow sites or off-site locations, and well drilling that would generate temporary construction noise that could impact noise-sensitive land uses if they are located near the construction area. Additionally, impact- or vibratory-pile driving may be required for some phases of construction, such as for the installation of sheet piles, which can generate relatively high levels of noise.

Table 3.14-10 shows typical noise levels produced by various types of construction equipment that are identified in Section 2.3.3 (in Chapter 2) as likely to be involved with construction of PMAs that would occur at reference distances of 50 feet and 100 feet from the source. Noise levels at and near the construction site would fluctuate depending on the particular type, number, and duration of uses of various pieces of construction equipment at any given time.

TABLE 3.14-10
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, L_{max} at 50 feet)	Noise Level (dBA, L_{eq} at 100 feet)
Dump Truck	77	71
Crane	81	75
Forklift (Gradall)	83	77
Front End Loader	80	74
Grader	85	79
Scraper	84	78
Excavator	81	75
Diesel Generator	81	75
Dozer	82	76
Tractor	84	78
Backhoe	78	72
Auger Drill Rig	84	78
Pumps	81	75
Concrete Pumper	81	75
Concrete Truck	79	73
Compactor	83	77
Off-highway Truck	85	79
Dredge (Diesel-powered)	81	75
Impact and Vibratory Pile Drivers	101	95

SOURCE: FTA 2018.

Daytime Construction

Without specific information with respect to the locations of equipment operations and the proximity to noise-sensitive receptors, a project-level analysis is not feasible. However, noise levels may be estimated for some of the noisiest construction phases and buffer distances estimated, beyond which a significant noise impact would be unlikely to occur. This estimated distance analysis is based on the general assessment approach of the Federal Transit Administration (FTA), which recommends assessing the two noisiest pieces of construction equipment operating concurrently at the center of a given project site (FTA 2018).

The noisiest construction phases would likely involve pile driving (either impact or vibratory), well drilling, and dredging. Additionally, noise from a "typical" construction scenario is estimated assuming standard excavation and grading. Table 3.14-9 presents the estimated resultant noise levels at distances of 50, 200, 500, and 1,200 feet.

Neither Merced nor Stanislaus County establish a quantitative noise standard applicable to construction activities in their General Plan Noise Elements or County Codes. Merced County Policy HS-7.5 limits construction activity to normal business hours, while the Merced County Code exempts construction from the sound level limits of Section 10.60.030(A), provided that all construction in or adjacent to urban areas be limited to the daytime hours between 7:00 a.m. and 6:00 p.m., and that all construction equipment be properly muffled and maintained.

Neither the City of Turlock, the City of Ceres, nor the City of Hughson General Plan Noise Elements establish noise standards for construction activities. Neither the City of Ceres nor the Hughson municipal codes establish quantitative noise standards for construction activities, but they do restrict construction noise, generally to between the hours of 7:00 a.m. and 8:00 p.m. (City of Ceres) on weekdays and 7:00 a.m. and 10:00 p.m. (City of Hughson) on weekdays, with shorter time windows on weekends and holidays.

Only the City of Turlock has established quantitative noise standards specific to construction activities. Section 5-28-110 of the city code restricts construction activities so as not to exceed 75 dBA during weekdays at residential land uses from mobile construction equipment where "technically and economically feasible."

In lieu of a specified criterion for assessing the magnitude of a construction noise impact applicable in local regulations other than within the City of Turlock, the table below also compares resultant noise levels to construction noise impact criteria developed by the FTA. While the FTA's *Transit Noise and Vibration Impact Assessment Manual*[2] was developed for determining significant noise and vibration impacts for transit projects and is not a regulation, it is one of the few federal sources that suggest both a methodology and criteria for assessing construction noise impacts. The FTA noise impact criteria used to assess construction noise impacts on residential uses is 90 dBA during daytime hours and 80 dBA during nighttime hours. These criteria are absolute contribution values from construction activity and are independent of existing background noise levels. If the FTA criteria are exceeded, there could be adverse community reaction. As indicated in **Table 3.14-11**, impact or vibratory pile driving occurring closer than 200 feet could result in noise levels exceeding

2 FTA (2018).

the daytime construction noise impact criteria of 90 dBA. Therefore, Mitigation Measure NOI-1 is identified to address noise from the operation of impact or vibratory pile drivers.

TABLE 3.14-11
ESTIMATED CONSTRUCTION NOISE LEVELS FROM SPECIFIED ACTIVITIES

Loudest Two Noise Sources	Reference Noise Level (dBA)[a]	Distance to Receptor (feet)[b]	Usage Factor	Adjusted L_{eq} Level (dBA)[c]	Exceed 90 dBA FTA Daytime Standard?
Noise levels from pile driving					
Pile driver/Crane	101/81	50	20/16 %	94	**Yes**
Pile driver/Crane	101/81	200	20/16 %	82	No
Pile driver/Crane	81/82	500	50/25%	74	No
Pile driver/Crane	81/82	1,200	50/25%	67	No
Noise levels from dredging					
Dredge/Tug	81/82	50	50/25%	80	No
Dredge/Tug	81/82	200	50/25%	68	No
Dredge/Tug	81/82	500	50/25%	60	No
Dredge/Tug	81/82	1,200	50/25%	52	No
Noise levels from well drilling					
Auger drill/Backhoe	81/82	50	50/25%	79	No
Auger drill/Backhoe	81/82	200	50/25%	67	No
Auger drill/Backhoe	81/82	500	50/25%	59	No
Auger drill/Backhoe	81/82	1,200	50/25%	51	No
Noise levels from standard construction					
Scraper/Grader	80/81	50	40/40%	83	No
Scraper/Grader	80/81	200	40/40%	71	No
Scraper/Grader	80/81	500	40/40%	63	No
Scraper/Grader	80/81	1,200	40/40%	56	No

The construction noise value presented in Table 3.14-11 also show that noise from dredging, well drilling, and standard construction activities have the potential to exceed the construction noise standard of 75 dBA applicable within the City of Turlock if conducted within 50 feet of a noise-sensitive receptor. Therefore, Mitigation Measure NOI-2 is identified to address construction noise for any PMAs conducted within the City of Turlock by implementation of best management practices (BMPs) for construction noise.

Mitigation Measure NOI-1: Noise Control for pile Installation Activities.

When pile driving would occur within 100 feet of a noise-sensitive receptor, implement "quiet" pile-driving technology (such as pre-drilling of piles, sonic pile drivers, auger cast-in-place, or drilled-displacement), where feasible, in consideration of geotechnical and structural requirements and conditions.

- Where the use of driven impact piles cannot be avoided, properly fit impact pile driving equipment with an intake and exhaust muffler and a sound-attenuating shroud, as specified by the manufacturer.
- Limit pile driving activities to weekdays from 9:00 a.m. to 4:00 p.m. if occurring within 500 feet of a noise-sensitive receptor.
- Notify neighboring noise-sensitive receptors within 500 feet of a PMA construction area at least 30 days in advance of high-intensity noise-generating activities (e.g., well drilling, pile driving, and other activities that may generate noise levels greater than 90 dBA at noise sensitive receptors) about the estimated duration of the activity.

Mitigation Measure NOI-2: Best Management Practices for Construction Noise Control within the City of Turlock.

***Noise Control and Monitoring Plan*.** Requires that the contractor submit a plan detailing the means and methods for controlling and monitoring noise generated by construction activities, including demolition, alteration, repair, or remodeling of or to existing structures and construction of new structures, as well as by items of machinery, equipment, or devices used during construction activities on the site for the engineer's acceptance prior to any work at the jobsite. The plan shall detail the equipment and methods used to monitor compliance with the plan.

***Noise Control*.** Require contractors to implement noise controls for on-site activities and describe measures that shall be implemented to reduce the potential for noise disturbance at adjacent or nearby residences. Noise control measures required by the specification include:

- Contractor is responsible for taking appropriate measures, including muffling of equipment, selecting quieter equipment, erecting noise barriers, modifying work operations, and other measures to bring construction noise into compliance.
- Each internal combustion engine used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler.
- Best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) shall be used for all equipment and trucks.
- Stationary noise sources (e.g., chippers, grinders, compressors) shall be located as far from sensitive receptors as possible. If they must be located near receptors, adequate muffling (with enclosures) shall be used. Enclosure opening or venting shall face away from sensitive receptors. Enclosures shall be designed by a registered engineer regularly involved in noise control analysis and design.
- Material stockpiles as well as maintenance/equipment staging and parking areas (all on site) shall be located as far as practicable from residential receptors.

- If impact equipment (e.g., jack hammers, pavement breakers, and rock drills) is used, the contractor is responsible for taking appropriate measures, including but not limited to the following:
  - Hydraulically or electric-powered equipment shall be used wherever feasible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where the use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust shall be used (a muffler can lower noise levels from the exhaust by up to about 10 dB). External jackets on the tools themselves shall be used, where feasible, which could achieve a reduction of 5 dB. Quieter procedures, such as drilling rather than impact equipment, will be used whenever feasible. It is the contractor's responsibility to implement any mitigations necessary to meet applicable noise requirements.
  - Impact construction including jackhammers, hydraulic backhoe, concrete crushing/recycling activities, and vibratory pile drivers will be limited to between 8:00 a.m. and 4:00 p.m., Monday through Friday, within residential communities, and will be limited in duration to the maximum extent feasible.
  - Limit the noisiest phases of construction to 10 workdays at a time, where feasible.
  - Notify neighbors/occupants within 300 feet of project construction at least 30 days in advance of extreme noise-generating activities about the estimated duration of the activity.

Nighttime Construction

Well drilling activities could require continuous drilling for 24 hours per day for up to several days per well. While the Merced County Code exempts construction activities from its sound level limits, during nighttime hours the limits of Section 10.60.030(A) would apply if drilling were to occur in or adjacent to urban areas. Specifically, a maximum noise level of 75 dBA would be applicable as wells as a 5 dBA increase over exiting ambient noise level.

Noise from well drilling activities could exceed the 75 dBA, L_{max} nighttime standard if it were to occur within 80 feet of a residential property line in an urbanized area of Merced County. Additionally, the potential for exceeding the 5 dBA increase over ambient levels could likely occur, depending on the existing nighttime noise level at the receptor location. Implementation of **Mitigation Measure NOI-3**, which requires the installation of engineered sound walls, would reduce the nighttime noise level by approximately 5 dBA. Additionally, Mitigation Measure NOI-3 includes an additional requirement to offer off-site lodging accommodations for all residences within 80 feet of any proposed 24-hour drilling activities. This would reduce the nighttime noise nuisance-related impact on adjacent residences to a less-than-significant level.

Mitigation Measure NOI-3: Nighttime Well Construction.

If nighttime (10:00 p.m. to 7:00 a.m.) well construction within 80 feet of a residence or other noise-sensitive location is required for a given PMA, the following measures shall be implemented to reduce potential noise impacts:

- The PMA proponent shall install 20-foot tall, engineered noise walls along the northern, eastern, and southern perimeter of the drill site. The walls shall consist of 20-foot by 4-foot and 20-foot by 8-foot sound panels, installed with sound curtains on the noise source side of the wall (batt insulation sewn between vinyl laminates with a weight of 1 pound per square feet).

- At least 30 days prior to drilling activities drill site, the PMA applicant shall offer off-site lodging accommodations for all residences within 80 feet of the drill site.

With implementation of Mitigation Measures NOI-1, NOI-2, and NOI-3, impacts related to increases in ambient noise levels from construction of direct and in-lieu recharge projects would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

Once constructed, direct and in-lieu recharge projects would require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips. As a practical matter, these vehicle trips would not result in increased roadside noise levels. Generally, roadway traffic volumes must double to result in a significant (3 dBA) increase in roadside noise levels, which would not occur from occasional O&M activities.

Additionally, direct recharge projects may require the routine maintenance and testing of emergency backup generators. Such generators, if necessary, would require a permit from the San Joaquin Valley Air Pollution Control District (SJVAPCD), which would limit their operation to 52 hours per year. These occasional engine operations would not be substantial and would be exempt from County of Merced noise standards per Policy HS-7.13. Therefore, this operational impact would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Water conservation management actions could generate construction noise. For example, expanding the groundwater monitoring network may include the installation of new wells that could involve pile driving (either impact or vibratory), well drilling, or dredging. **Mitigation Measure NOI-1**, identified above for noise, would address the potential for potential vibration impacts from well drilling, and should well drilling occur at night, **Mitigation Measure NOI-3**, would reduce the nighttime noise level. Therefore, with mitigation, the construction-related noise impacts associated with water management and conservation actions would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

While conservation management actions could require O&M activities to inspect project features and/or evaluate program effectiveness, these activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips (likely even fewer than recharge projects). Additionally, some of these O&M activities could be considered agricultural activities (on farm recharge basins or diversion infrastructure construction) and would therefore be exempt from operational noise restrictions of both the Merced County and Stanislaus County Codes. Therefore, O&M vehicle trips would not result in a noticeable increase in roadside noise levels and would have a **less than significant** noise impact.

Impact NOI-2: Implementing PMAs under the Turlock Subbasin GSP could generate excessive groundborne vibration or groundborne noise levels.

Direct and In-Lieu Recharge Projects

Effects of Construction Activities

Many of the PMAs implemented under the Turlock Subbasin GSP could include direct and in-lieu recharge projects which require construction activities that could include off-road equipment known to generate vibration. Specifically, operation of pile drivers, compactors, auger drills, and bulldozers are associated with groundborne vibration.

The specific locations of pile driving activities, among other construction activities, are not yet known with certainty; therefore, the analysis was conducted using a matrix of vibration from construction activities with distances to receptors. This matrix, presented in **Table 3.14-12**, uses dark-shaded areas to indicate the distances at which vibration levels would exceed the criterion for damage to conventional structures. The lighter shaded areas indicate the distances at which the criterion for historic structures or buildings that are documented to be structurally weakened would be exceeded. As shown in Table 3.14-12, cosmetic damage could result from pile driving closer to a conventionally constructed building than 75 feet or closer to a historic building than 170 feet.

TABLE 3.14-12
VIBRATION LEVELS FOR CONSTRUCTION ACTIVITY

	Estimated Peak Particle Velocity (inches per second)				
Equipment	**At 25 Feet (reference)**	**At 50 Feet**	**At 75 Feet**	**At 100 Feet**	**At 170 Feet**
Jackhammer	0.035	0.016	0.010	0.008	0.004
Loaded Trucks	0.076	0.035	0.023	0.017	0.009
Caisson Drilling	0.089	0.041	0.027	0.019	0.011
Large Bulldozer	0.089	0.041	0.027	0.019	0.011
Vibratory Roller	0.20	0.100	0.063	0.046	0.025
Impact Pile Driver	0.65	0.303	0.194	0.141	0.079
Vibratory Pile Driver	0.65	0.303	0.194	0.141	0.079

NOTE:
Dark-shaded areas indicate distances where vibration levels would exceed the damage criterion for conventional structures.
Lighter shaded areas indicate the distances at which the criterion for historic structure or buildings that are documented to be structurally weakened would be exceeded.

SOURCES: Caltrans (2020), FTA (2018).

As shown in Table 3.14-12, proposed construction equipment could result in damage to nearby historic and non-historic structures if the activities occur within the distances specified. This would be a **potentially significant** impact warranting mitigation measures. **Mitigation Measure NOI-1**, identified above for noise, would address the potential for vibration impacts from pile driving by implementing other methods of pile installation. **Mitigation Measure NOI-4, Vibration Avoidance from Compaction**, is necessary to address this impact.

Mitigation Measure NOI-4: Vibration Avoidance from Compaction.

All PMA applicants for projects requiring compaction shall implement the following vibration avoidance and reduction measures:

- Contractors shall use non-vibratory, excavator-mounted compaction wheels and small, smooth drum rollers for final compaction of asphalt base and asphalt concrete, if within 50 feet of a historic structure or 25 feet of a conventionally constructed structure. If needed to meet compaction requirements, smaller vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet vibration standards.
- Avoid using vibratory rollers and clam shovel drops near sensitive areas.
- Construction methods shall be modified, or alternative construction methods shall be identified, and designed to reduce vibration levels below the limits.

With implementation of these mitigation measures, impacts related to groundborne vibration or noise from construction of direct and in-lieu recharge projects would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

Once constructed, direct and in-lieu recharge projects would require O&M activities to inspect project features and/or evaluate program effectiveness. These activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips and would not involve vibration-generating activities.

Direct recharge projects may also require the routine maintenance and testing of emergency backup generators, which are not a known source of vibration outside of their foundation slab. Therefore, this operational impact with respect to vibration would be **less than significant**.

Conservation Management Actions

Effects of Construction Activities

Water conservation management actions could generate construction vibration. For example, expanding the groundwater monitoring network may include the installation of new wells that could involve pile driving (either impact or vibratory), well drilling, or dredging. **Mitigation Measure NOI-1**, identified above for noise, would address the potential for potential vibration impacts from well drilling, and should well drilling occur at night, **Mitigation Measure NOI-3**, would reduce the nighttime noise level. Therefore, with mitigation, the construction-related vibration impacts associated with water management and conservation actions would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

While conservation management actions could require O&M activities to inspect project features and/or evaluate program effectiveness, these activities would only be required on an intermittent basis and would result in a minor increase in motor vehicle trips (likely even fewer than recharge projects). Therefore, O&M vehicle trips would not result in a new source of vibration and would have a **less than significant** impact.

3.15 Population and Housing

3.15.1 Introduction

This section describes population and housing in the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect population and housing. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2.) As discussed below, potential impacts related to population and housing include substantial population growth or an increase in demand for housing, or the necessity for construction of replacement housing because of displacement of people or houses.

No comments specifically addressing population and housing were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.15.2 Environmental Setting

This section describes population and housing that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The population and housing statistics for the Turlock Subbasin are largely discussed here at the county level (e.g., Stanislaus and Merced counties) because of the broad nature of the PMAs that would be implemented in the Turlock Subbasin under the GSP, as well as the lack of certainty about the locations of specific projects in the subbasin.

Population and Population Growth

Stanislaus County

According to the California Department of Finance, between January 1, 2011, and January 1, 2021, Stanislaus County's population increased by 518,035 to a total of 555,968 people (DOF 2021a). This population increase represents a growth rate of 7.32 percent between 2011 and 2021. Stanislaus County's total population is anticipated to grow by 49,000 (87 percent) between 2020 and 2030, reaching 688,585 by 2050 (StanCOG 2021). **Table 3.15-1** shows the estimated populations for Stanislaus County and the primary cities located within the Turlock Subbasin's boundaries, with annual percent change between January 1, 2020, and January 1, 2021.

Merced County

According to the California Department of Finance, between January 1, 2011, and January 1, 2021, Merced County's population increased by 259,419 to a total of 284,836 people (DOF 2021a). This population increase represents a growth rate of 9.80 percent between 2011 and 2021. Merced County's total population is anticipated to grow to 417,200 by 2030 (City of Merced 2010). Table 3.15-1 shows the estimated populations for Merced County and the primary cities located within the Turlock Subbasin's boundaries, with annual percent change between January 1, 2020, and January 1, 2021.

TABLE 3.15-1
POPULATION: CITY/COUNTY POPULATION ESTIMATES WITH ANNUAL PERCENT CHANGE WITHIN THE TURLOCK SUBBASIN

County or City	Total Population (January 1, 2020)	Total Population (January 1, 2021)	Percent Change
Stanislaus County	554,931	555,968	0.2
Ceres	48,886	48,901	0.0
Hughson	7,260	7,303	0.6
Turlock	75,030	74,820	-0.3
Merced County	283,352	284,836	0.5

SOURCE: DOF 2021b

Housing

Stanislaus County

As of 2019, Stanislaus County had approximately 182,978 housing units (U.S. Census Bureau 2021a). The county's housing units are projected to increase to a total of 220,377 units by 2030, which includes housing in both the unincorporated areas (40,567 units) and the incorporated cities (179,810 units) (Stanislaus County 2016). According to the Stanislaus County *2015–2023 Housing Element Update*, household growth between 2000 and 2040 increased at a greater rate throughout the county as a whole than it did in the unincorporated areas. Historically, the growth rate has been greater in the county's incorporated cities.

Merced County

As of 2019, Merced County had approximately 86,388 housing units (U.S. Census Bureau 2021b). The county's housing units are projected to increase to a total of 137,200 units by 2030, which includes housing in both the unincorporated areas (41,600 units) and the incorporated cities (95,600 units) (Merced County 2016). According to the Merced County *Housing Element Update*, household growth increased at a greater rate in cities (12,788 units total), and cities in the county are anticipated to have a greater rate of growth than the unincorporated county.

3.15.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to population and housing. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

The Fair Housing Act (United States Code Title 42, Section 3601 et seq.) affects municipal land use throughout California. The Fair Housing Act prohibits discrimination by direct providers of housing (e.g., landlords, real estate companies) and other entities (e.g., municipalities, banks, other lending institutions, homeowners' insurance companies) whose discriminatory practices make housing unavailable to persons because of race or color, religion, sex, national origin, familial status, or disability.

State

The State Tenement House Act of 1909 was California's first housing regulation. The law applied only to apartment houses and hotels in cities. Later laws such as the State Dwelling Act and the State Housing Law (formerly known as the State Housing Act) were applied to a wider range of housing types and eventually led to the formation of the California Department of Housing and Community Development in 1965.

The California Department of Housing and Community Development develops and enforces statewide minimum construction regulations for all types of housing. The department is responsible for promoting and maintaining adequate housing and decent living environments for all of California's citizens.

Regional and Local

Stanislaus County General Plan

The Stanislaus County General Plan (2015) contains population and housing goals and policies that supplement or complement present endeavors to meet housing needs. The following goals and policies in the Stanislaus County General Plan are relevant to implementation of the PMAs.

> **Goal One:** Provide for diverse land use needs by designating patterns which are responsive to the physical characteristics of the land as well as to environmental, economic and social concerns of the residents of Stanislaus County.
>
> - ***Policy Five*:** Residential densities as defined in the General Plan shall be the maximum based upon environmental constraints, the availability of public services, and acceptable service levels. The densities reflected may not always be achievable and shall not be approved unless there is proper site planning and provision of suitable open space and recreational areas consistent with the supportive goals and policies of the General Plan.
>
> **Goal Four:** Ensure that an effective level of public service is provided in unincorporated areas.
>
> - ***Policy Twenty-One*:** At least three net acres of developed neighborhood parks, or the maximum number of acres allowed by law, should be provided for every 1,000 residents, through land dedication and development, payment of in-lieu-of fees, or other methods acceptable to the Parks Department.
> - ***Policy Twenty-Two*:** Future growth shall not exceed the capabilities/capacity of the provider of services such as sewer, water, public safety, solid waste management, road systems, schools, health care facilities, etc.

Merced County General Plan

The Merced County General Plan (2012) contains population and housing goals and policies that supplement or complement present endeavors to meet housing needs. The following goals and policies in the Merced County General Plan are relevant to implementation of the PMAs.

Goal LU-5F: Provide for the establishment of new Urban Communities in order to accommodate future growth in the unincorporated parts of Merced County that are located off productive agricultural land or the valley floor.

Goal ED-1: Support and promote growth and diversification of the County's economy.

- ***Policy ED-1.5:*** **Infrastructure Investment (MPSP/FB).** Direct infrastructure investments to infill areas and other areas with the greatest potential for economic growth in an effort to obtain the greatest pay-off in terms of economic development. This will include taking advantage of existing infrastructure such as Interstate 5, State Route 99, UC Merced, Castle Commerce Center and Airport, as well as planned infrastructure such as the California High-Speed Rail. Encourage the grouping of related and complementary activities and discourage isolated facilities, except when necessary based upon their locational or operational characteristics, in order to minimize vehicle miles traveled (VMT), especially for diesel trucks.
- ***Policy ED-1.8: Jobs/Housing Balance (RDR).*** Encourage all communities, and require new or expanded Community Plans, to include sufficient employment-based land uses to maintain a 1:1 jobs/housing balance.
- ***Policy ED-1.9: Facilities and Service Adequacy (SO/JP).*** Encourage new industries to locate within communities that have or can provide adequate infrastructure capacity to meet the needs of new development.

Goal LU-1: Create a countywide land use pattern that enhances the integrity of both urban and rural areas by focusing urban growth towards existing or suitably located new communities.

- ***Policy LU-1.10: Orderly Community Growth (RDR)*****.** Require the orderly, well planned, and balanced growth of the unincorporated communities consistent with the limits imposed by local infrastructure, services, public facilities, and their ability to assimilate growth.

Goal LU-5.A.6: Ensure that development in county/city fringe areas is well planned and adequately serviced by necessary public facilities and infrastructure.

- ***Policy LU-7.1: Infill Development Focus (RDR).*** Encourage infill development to occur in cities in order to maximize the use of land within existing urbanized areas, minimize the conversion of productive agricultural land, and minimize environmental impacts associated with new development.

Goal LU-8: Recognize pre-existing isolated areas designated for urban land uses as limited exceptions to the "Urban Centered Concept" of the General Plan.

- ***Policy LU-8.2: Land Use Controls (RDR).*** Prohibit the expansion or redesignation to a more intensive use of an existing urban land use located outside of an Urban Area Boundary. Require the Board of Supervisors, during the review of a General Plan

Amendment and Zone Change application, to make a determination that the land use intensity will not increase as a result of a redesignation.

Goal HE-1: To provide for a broad range of housing types and densities to meet the needs of all residents of the unincorporated area.

- ***Policy 1.5*:** The County shall support infill residential development and other mid- to large-sized residential projects in unincorporated urban communities that have the infrastructure necessary to support such development.

City General Plans

Table 3.15-2 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.15-2
CITY GENERAL PLAN POLICIES GOVERNING POPULATION AND HOUSING WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Population and Housing
City of Turlock	Chapter 2, Land Use and Economic Development: Policy 2.10-a; Chapter 3, New Growth Areas and Infrastructure: Policies 3.1-a through 3.1-h; see also City of Turlock 2015–2023 Housing Element
City of Modesto	Chapter 2, Community Growth Strategy, B. Growth Policies, Goal II.A and Goal II.B; Chapter 4, Housing Element
City of Ceres	See City of Ceres 2014–2023 Housing Element.
City of Hughson	See City of Hughson 2015–2023 Housing Element.

SOURCE: Data compiled by Environmental Science Associates in 2022

3.15.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts related to population and housing focuses on how typical construction and operation of PMAs implemented under the Turlock Subbasin GSP could affect growth and housing displacement. Trends for construction workforces and housing are discussed. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes caused by the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The assessment of population and housing impacts used a qualitative and conservative approach, assuming that all PMAs would be implemented. The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop surveys, open-access databases, maps, and models. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2, *Project Description*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact related to population and housing if it would:

- Induce substantial unplanned population growth in the area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure); or
- Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.

Impacts and Mitigation Measures

Table 3.15-3 summarizes the impact conclusions presented in this section for easy reference. No mitigation is required.

TABLE 3.15-3
SUMMARY OF IMPACT CONCLUSIONS—POPULATION AND HOUSING

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
POP-1: Implementing PMAs under the Turlock Subbasin GSP could induce substantial unplanned population growth in the area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).	LTS	LTS
POP-2: Implementing PMAs under the Turlock Subbasin GSP could result in the displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.	LTS	LTS

NOTES: LTS = less than significant

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact POP-1: Implementing PMAs under the Turlock Subbasin GSP could induce substantial unplanned population growth in the area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

Effects of Construction Activities

PMAs implemented under the Turlock Subbasin GSP (e.g., recharge basins or ponds, water storage tanks, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins) could include the construction activities identified in Table 2-4 in Chapter 2, *Project Description*. During construction, non-locals may move to a project area to support these activities; however, construction employees are generally pulled from the region's existing labor pool and typically do not need to relocate when assigned to a new construction site. Those who are hired from outside of the existing labor pool generally tend to commute to jobsites, as projects can change several times a year and offer no permanent place of business.

Some more specialized construction workers may be needed and could relocate to the construction area; however, relocation by specialized workers is usually temporary, limited to the duration needed to complete a particular construction phase that requires their skills. Once that phase is completed, specialized workers typically move onto the next jobsite that requires their skills.

Construction of the PMAs may be as short as a few days or may extend for as long as several years, depending on the specific project being constructed. Worker relocation could vary depending on the size, type, and length of construction activities. Therefore, PMAs would not be expected to result in substantial population or demand for housing.

Some PMAs identified in the Turlock Subbasin GSP could indirectly remove an obstacle to growth (e.g., lack of adequate water supplies) and could be considered growth inducing. (For more information on growth-inducing impacts, see Chapter 5, *Other CEQA Considerations*.)

The locations, scale, and staffing needs of individual PMAs that could be implemented under the Turlock Subbasin GSP are not known at this time. Factors necessary to identify potential impacts include the number of construction workers employed, the duration of project construction, and the location of PMAs relative to populated areas. However, none of the PMAs identified in the GSP would include the construction of any housing or businesses that would provide new long-term employment opportunities or result in population growth and demand for housing. Furthermore, although temporary or longer-term population increases could occur, the potential presence of existing vacant units in and around the Turlock Subbasin area would help absorb the population increases, which would be negligible and temporary. Therefore, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

Operations and maintenance (O&M) activities to support constructed infrastructure or PMAs implemented under the Turlock Subbasin GSP may include any of the following:

- Regularly scheduled inspections and evaluations of feature performance.

- Installation of fencing and/or signage around newly constructed features.
- Removal of accumulated sediment around intakes.
- Removal of accumulated silt and vegetation from recharge basins.
- Water quality testing for groundwater wells.
- Water quality testing for water storage tanks.
- Clearing of debris from surface water conveyance features.
- Establishment of programs.
- Management of pumping data.
- Ongoing monitoring of the pumping reduction strategy.
- Identification of staff and protocols for field inspections.
- Ongoing maintenance of the approved fallowed agricultural fields.
- Efforts to ensure consistency with state law and related conservation and/or fallowing programs.

These O&M activities could require additional staff. However, these activities would most likely be similar to those elsewhere in the Turlock Subbasin. Furthermore, the potential presence of existing vacant units in and around the subbasin area are expected to be sufficient to accommodate any workers who temporarily relocate to the area.

Routine O&M activities for PMAs implemented under the Turlock Subbasin GSP could result in the relocation of an operations crew. However, potential vacant units in the area would provide sufficient housing for the small number of operations workers who may relocate to the study area. Therefore, this impact would be **less than significant**.

Impact POP-2: Implementing PMAs under the Turlock Subbasin GSP could result in the displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.

Effects of Construction Activities, Effects of Constructed Features, and Operation and Maintenance of those Features

Construction of PMAs, constructed facilities, and O&M of those facilities implemented under the Turlock Subbasin GSP would not result in the displacement of existing housing. Some construction activities could involve the removal or relocation of recreational structures.

Many of the PMAs constructed and operated under the Turlock Subbasin GSP would be located in or near waterways or rural lands. PMAs would not be expected to displace substantial numbers of housing or people; any displacements that could occur would not be likely to result in the need to construct new housing, and displaced individuals could be accommodated within existing available housing stock. In addition, individual PMAs would need to be consistent with the Stanislaus and Merced County general plans and would not result in the displacement of substantial numbers of people or housing that would necessitate the construction of housing elsewhere.

Because the precise locations and detailed characteristics of potential future PMAs are yet to be determined, the potential exists for such projects to result in the displacement of some housing or people. Factors necessary to identify specific impacts include the range of construction workers; the origins of trips by construction worker vehicles; the number of existing and new O&M staff at the site of each project or management action implemented under the Turlock Subbasin GSP; the type of project; and the location of construction.

Even though these factors are not known, construction and O&M activities for PMAs implemented under the Turlock Subbasin GSP are not anticipated to include the removal or relocation of housing that would result in the displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere. Therefore, this impact would be **less than significant**.

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3.16 Recreation

3.16.1 Introduction

This section describes recreation activities and resources in the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to increase the use of existing parks, require construction of new recreational facilities, or otherwise physically affect facilities discussed in this section (see Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2). This section evaluates the potential for significant impacts involving recreational facilities and activities and identifies mitigation measures that could be considered for the PMAs implemented under the Turlock Subbasin GSP.

No comments specifically addressing recreation were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.16.2 Environmental Setting

This section describes recreational activities and resources that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and includes many types of recreational opportunities.

Aquatic Features

Rivers and Streams

Waterways in the Turlock Subbasin offer a variety of recreation experiences, from major rivers and open water to ephemeral streams. The waterways allow for water-based activities such as fishing, sailing, waterskiing, and boating; using personal watercraft; canoeing, kayaking, and windsurfing; and other water-based activities. National, state, and local parks have been developed at many riverside and stream locations and generally provide improved parking, picnicking, boat launching, sanitation, and drinking water facilities, and sometimes camping and developed trails. Some of the parks adjacent to the Tuolumne River, Merced River, and San Joaquin River within the Turlock Subbasin include, but are not limited to, Lakewood Cemetery Park, Fox Grove Park, Turlock Lake State Recreation Area (SRA) (temporarily closed), Tuolumne River Campgrounds (temporarily closed), Joe Domecq Wilderness Area, La Grange Regional Park, Lake McSwain Recreational Area, Henderson Park, McConnell SRA, George J. Hatfield SRA, Levie Farms, Adamsville State Historic Landmark, and Liard Regional Park. Boat launch ramps and campgrounds can also be found along rivers throughout the Turlock Subbasin.

In addition, the corridors of Tuolumne River, Merced River, and San Joaquin River and adjacent land areas have been designated as open space parkways, often expanding the value of river corridors for recreation by expanding public access.

Lakes and Ponds

The Turlock Subbasin contains scattered lakes and ponds within its boundaries. Recreational activities vary by location, property ownership, and ease of access. Lakes are typically surrounded by recreational facilities such as campgrounds, parking, picnicking, sanitation, drinking water facilities, and developed trails.

The most notable lake within the Turlock Subbasin is Turlock Lake. The area around Turlock Lake includes the Turlock Lake SRA. Facilities and activities within the area include overnight camping, river access, swimming, fishing, hunting, boating, canoeing, kayaking, paddleboarding, windsurfing, and vehicle/boat parking. A portion of the recreation area is restricted to duck hunters from approximately September 25 through February 15 each year. On May 13, 2021, California State Parks (CSP) announced the temporary full closure of Turlock Lake SRA, which took effect on May 14, 2021 (California Parks and Recreation 2021).

Ponds in the Turlock Subbasin are often used as local swimming holes and offer aesthetic views containing a variety of wildlife and aquatic species.

Wetlands

California has approximately 454,000 acres of nonagricultural wetlands, with over 90 percent of its historical wetlands being drained, primarily due to agricultural purposes (USGS 1996). The Turlock Subbasin contains scattered wetlands within its boundaries. Wetlands provide countless recreational activities such as hiking, boating, hunting, fishing, trapping, birdwatching, and wildlife photography. Wetlands often co-occur with, and are integral to the health and recreational value of, rivers, streams, lakes, and ponds.

Refer to Section 3.11, *Hydrology and Water Quality,* for additional discussion of surface water features in the Turlock Subbasin.

Wildlife-Oriented Recreation

Hunting, wildlife viewing, birdwatching, and viewing of natural scenery (along interpretive, walking, and driving trails) are wildlife-oriented recreation opportunities available throughout the Turlock Subbasin. Many wildlife areas and nature observation areas are operated in partnership with other state or local agencies. Types of wildlife areas and hunting facilities include national wildlife refuges, state wildlife areas, private hunting clubs, and private nonprofit wildlife preserves. Popular seasonal recreational activities include waterfowl and pheasant hunting, wildlife viewing, birdwatching, and fishing. Within the Turlock Subbasin, areas along river floodplains have been established as wildlife refuges, such as San Joaquin River National Wildlife Refuge. These areas provide opportunities for wildlife viewing, fishing, and hunting. Seasonal hunting on private lands requires permission from the landowner, whereas hunting and duck clubs are open to members and their guests only.

Fishing

The aquatic and riparian habitats within the Turlock Subbasin are home to a variety of fish species desirable for recreational fishing. Examples of non-commercial fishing activities include bait fishing, bait casting/spin fishing, and fly fishing, which can occur from the shore/bank, wading, or watercraft. Shore/bank and wading fishing can include fishing from piers, levees, and waterway banks. Watercraft fishing can occur from either motorized or nonmotorized watercraft. Fly fishing can be done from both land or watercraft, or anglers can stand in the waterways. Fishing opportunities exist throughout the Turlock Subbasin.

Roadways

The California Department of Transportation (Caltrans) manages the State Scenic Highway Program, provides guidance, and assists local government agencies, community organizations, and citizens with the process of officially designating scenic highways. In some cases, scenic highways may be located adjacent to aquatic and riparian habitats where restoration projects could occur. Visitors may drive along these scenic roadways to enjoy the aesthetic attributes, such as scenic vistas of waterways and farmland dotted with historic sites. For example, segments of State Route (SR) 59, SR 99, SR 140, SR 152, and SR 165 have known vista points that allow motorists to view scenery.

Parks

Parks provide outdoor areas for gathering and recreation and are generally developed and maintained by state or local governments. They include local, small parks and larger parks such as state recreation areas. Stanislaus County maintains five regional parks, 12 neighborhood parks, ten community parks, two off-highway vehicle parks, La Grange Historical areas, five fishing access points along rivers and lakes, and numerous acres of open space (Stanislaus County Parks & Recreation 2020). Merced County maintains three regional parks, ten community parks, five other area parks, and other recreation activities for the community (Merced County 2020). Park amenities include restrooms, picnic tables, and fishing access. Additional amenities include playgrounds, trails, and historic site interpretation.

Hiking, Biking, and Trail Use

Trails and paths are often located in areas along the edge of waterways and can be found in parks or wildlife areas, or along shorelines in urban areas.

Camping

A few tent camping and recreational vehicle (RV) sites are located within the Turlock Subbasin. For example, Stanislaus County Fair RV and Tuolumne River Campgrounds (temporarily closed) are located within the Turlock Subbasin. Campsites offer recreational amenities and provide a variety of activities during vacations or visits. Examples of this type of multi-use facility include RV and/or tent camping sites, picnic and barbecue facilities, cafés, and fishing and water access.

Historic Sites

The National Register of Historic Places is the official list of the nation's historic places, structures, objects, sites, and districts that have been deemed worthy of preservation because of their significance in American history, architecture, archaeology, engineering, and culture. Designated California historical landmarks are sites, buildings, features, or events that are of statewide significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value.

Some historic places or California historical landmarks within the Turlock Subbasin include, but are not limited to, John W. Laird Monument, Adamsville Landmark, Twenty Hill Hollow, and Tuolumne Gold Dredge Monument.

3.16.3 Regulatory Setting

This section discusses the federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to recreation. Implementation of any project or management action may be subject to the laws and regulations listed below, as well as other local plans, policies, and ordinances depending on the project location.

Federal

Clean Water Act

The Federal Water Pollution Control Act Amendments of 1972, better known as the Clean Water Act, established the institutional structure for the U.S. Environmental Protection Agency to regulate discharges of pollutants into waters of the United States, establish water quality standards, conduct planning studies, and fund grant projects. Congress has amended the Clean Water Act several times since 1972.

The U.S. Environmental Protection Agency has provided most states with the authority to administer many of the provisions of the Clean Water Act. In California, the State Water Resources Control Board (State Water Board) has been designated to develop and enforce water quality objectives and implementation plans. The State Water Board has delegated specific responsibilities for development and enforcement actions to the individual regional water quality control boards.

Section 303(d) of the Clean Water Act requires states, territories, and authorized tribes to develop a list of water quality-impaired segments of waterways and other water bodies under their jurisdiction. The law requires the jurisdictions to establish priority rankings for the waters they list and to develop action plans, known as total maximum daily loads, to improve water quality.

For descriptions of other parts of the Clean Water Act, see Section 3.5, *Biological Resources*, and Section 3.11, *Hydrology and Water Quality*.

Federal Water Project Recreation Act

Under the Federal Water Project Recreation Act [U.S. Code Title 16, Sections 460(L)(12) through 460(L)(21)], recreation and fish and wildlife enhancement are to be given full consideration as purposes of federal water development projects if non-federal public bodies agree to do all of the following:

- Bear no less than half the separable costs allocated for recreational purposes or 25 percent of the cost for fish and wildlife enhancement.
- Administer project land and water areas devoted to these purposes.
- Bear all costs of operation, maintenance, and replacement.

Where federal lands or authorized federal programs for fish and wildlife conservation are involved, cost-sharing is not required.

The Federal Water Project Recreation Act also authorizes using federal water project funds for land acquisition to establish refuges for migratory waterfowl when recommended by the Secretary of the Interior. The law further authorizes the Secretary to provide facilities for outdoor recreation and fish and wildlife at all reservoirs under their control, except within national wildlife refuges.

Federal Land and Water Conservation Fund Act

The Land and Water Conservation Fund, created by Congress in 1964, provides money to federal, state, and local governments to purchase land, water, and wetlands for the benefit of all Americans. Lands and waters purchased through the Land and Water Conservation Fund do all of the following:

- Provide recreational opportunities
- Provide clean water
- Preserve wildlife habitat
- Enhance scenic vistas
- Protect archaeological and historical sites
- Maintain the pristine nature of wilderness areas

State

California State Parks

The mission of CSP is to provide for the health, inspiration, and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation. In addition to lands directly owned by CSP, it also has certain jurisdiction over granted or ungranted tidelands or submerged lands abutting CSP System lands (Public Resources Code Section 5003.5). Within the Turlock Subbasin, CSP properties include McConnell SRA, George J Hatfield SRA, and Turlock Lake SRA. TID is owned by TID but under an agreement with the State of California the recreation facilities are run by the CSP system.

California Division of Boating and Waterways

The Division of Boating and Waterways (DBW), which is part of CSP, has a mission to provide safe and convenient public access to California's waterways and leadership in promoting the public's right to safe, enjoyable, and environmentally sound recreational boating. To that end, DBW has several authorities with regard to activities in the Sacramento–San Joaquin Delta. DBW endorses boating safety and education, assists local boating law enforcement agencies, ensures uniformity in boating regulations, and licenses boat operators and brokers. DBW is also responsible for reviewing, updating, and adopting state boating regulations to reflect changes in federal and state boating laws, and planning and designing state boating facilities. DBW has been the lead agency for controlling water hyacinth (since 1982) and *Egeria densa* (since 1997) (State Parks 2018).

Regional and Local

Stanislaus County General Plan

The Stanislaus County General Plan (2015) contains recreational goals and policies that preserve and guide the development of recreation and recreational resources within the county. Below is a summary of key policies identified in the Stanislaus County General Plan relevant to implementation of the PMAs.

Goal One: Provide for diverse land use needs by designating patterns which are responsive to the physical characteristics of the land as well as to environmental, economic and social concerns of the residents of Stanislaus County.

- **Policy Two**: Land designated Agriculture shall be restricted to uses that are compatible with agricultural practices, including natural resources management, open space, outdoor recreation and enjoyment of scenic beauty.

Goal Four: Ensure that an effective level of public service is provided in unincorporated areas.

- ***Policy Twenty-One*:** At least three net acres of developed neighborhood parks, or the maximum number of acres allowed by law, should be provided for every 1,000 residents, through land dedication and development, payment of in-lieu-of fees, or other methods acceptable to the Parks Department.

Goal Four: Provide for the open-space recreational needs of the residents of the County.

- ***Policy Twelve*:** Provide a system of local and regional parks which will serve the residents of the County.
- ***Policy Thirteen*:** Promote the use of water reservoirs for multiple recreational purposes, where appropriate.
- ***Policy Fourteen*:** Provide for diverse recreational opportunities such as horseback riding trails, hiking trails, and bikeways.

Merced County General Plan

The Merced County General Plan (2012) contains aesthetics goals and policies that preserve and guide development of recreation and recreational resources within the county. Below is a summary of key policies identified in the Merced County General Plan relevant to implementation of the PMAs.

Goal LU-1: Create a countywide land use pattern that enhances the integrity of both urban and rural areas by focusing urban growth towards existing or suitably located new communities.

- ***Policy LU-1.10*:** Orderly Community Growth: Require the orderly, well-planned, and balanced growth of the unincorporated communities consistent with the limits imposed by local infrastructure, services, public facilities, and their ability to assimilate growth.

Goal LU-7: Ensure that development in county/city fringe areas is well planned and adequately serviced by necessary public facilities and infrastructure.

Goal NR-4: Protect scenic resources and vistas.

- ***Policy NR-4.1*:** Scenic Resources Preservation: Promote the preservation of agricultural land, ranch land, and other open space areas as a means of protecting the County's scenic resources.

Goal CIR-1: Maintain an efficient roadway system for the movement of people and goods that enhances the physical, economic, and social environment while being safe, efficient, and cost-effective.

- ***Policy CIR-1.7*:** Alternative Transportation Modes: Require development projects that have the potential to reduce existing level of service to plan for and accommodate alternatives modes of transportation (i.e., bicycle, pedestrian, transit).

Goal CIR-4: Maintain and expand a safe, continuous, and easily accessible bicycle and pedestrian circulation system.

- ***Policy CIR-4.1*:** Bicycle and Pedestrian System: Encourage a complete, safe, and interconnected bicycle and pedestrian circulation system that serves both commuter and recreational travel, and provides access to major destinations within and between Urban Communities and cities. Prioritize Class I bicycle paths and separate trails between communities as part of the MCAG [Merced County Association of Governments] Regional Bikeway Plan. To the extent possible, use railroad and canal as right-of-way instead of streets to promote safety.
- ***Policy CIR-4.3*:** City and County Coordination: Coordinate on the location and construction of new bikeways with cities and adjacent counties.
- ***Policy CIR-4.4*:** Bicycle Lane Standards: Ensure that the design and construction of bicycle lanes is consistent with Caltrans criteria and standards.
- ***Policy CIR-4.6*:** Multi-Use Trails: Encourage the development of multi-use corridors (such as hiking, equestrian, and mountain biking) in open space areas, along power line transmission corridors, utility easements, rivers, creeks, abandoned railways, and irrigation canals.

- ***Policy CIR-4.8*****:** Bicycle and Pedestrian Amenities: Encourage the installation of amenities that serve bicyclists and pedestrians, such as secure and convenient bicycle parking, water fountains, and shaded seating areas at public facilities.
- ***Policy CIR-4.10*****:** Bicyclist Amenities: Require non-residential developments to provide amenities for bicyclists, including bicycle racks, showers, and changing facilities.

Goal RCR-1: Preserve, enhance, expand, and manage Merced County's diverse system of regional parks, trails, recreation areas, and natural resources for the enjoyment of present and future residents and park visitors.

- ***Policy RCR-1.1*****:** Public Recreation Land Use: Encourage the continuation and expansion of existing public recreation land uses, including, but not limited to, public beaches, parks, recreation areas, wild areas, and trails.
- ***Policy RCR-1.2*****:** County Park Financing: Require new County park locations and improvements to existing parks to be financed through the implementation of the Local Recreational Park Land Space and Fee Obligation Ordinance.
- ***Policy RCR-1.3*****:** Neighborhood, Community, and Regional Parkland Standards: Encourage a minimum of three acres of either neighborhood, community, or regional parkland per each 1,000 persons in the County by:
  a) Working with other agencies and private interests to provide for adequate neighborhood, community, and regional parkland and facilities;
  b) Actively participating in the planning of projects that have regional recreation benefits;
  c) Encouraging and supporting local agency efforts to achieve their objectives for providing local parkland. All local providers should seek to provide at least three acres of parkland for each 1,000 persons;
  d) Actively seeking available regional, State, and Federal grant funds for acquiring, developing, and maintaining regional parks; and
  e) Encouraging and supporting other public agencies and private groups in the development of recreation facilities that are consistent with the 2030 Merced County General Plan.
- ***Policy RCR-1.6*****:** Non-Recreational Land Use Buffers: Require buffering between non-recreational land uses and sensitive public recreation lands through site design and other techniques when the non-recreational land use may significantly impact recreational lands.
- ***Policy RCR-1.7*****:** Agricultural Land Use Compatibility: Consider agriculture as a compatible land use and appropriate buffer for public and private recreation areas.
- ***Policy RCR-1.8*****:** Trails within Transmission Lines: Encourage the use of equestrian, bicycle, and pedestrian/hiking trails within existing energy, communication, transmission, and distribution easements.
- ***Policy RCR-1.9*****:** California Recreational Trail System Integration: Require that areas proposed for the California Recreational Trails System be reviewed during project proposals for consideration of easements and integration into County recreation facilities.

- ***Policy RCR-1.10*****:** Trail Development: Develop pedestrian, bike, and/or equestrian trails along the Merced River.
- ***Policy RCR-1.11*****:** Scenic Resource and Public Land Protection: Encourage the use of regional parks and open space areas as a mechanism to preserve the County's natural scenic beauty and protect land for public purposes.
- ***Policy RCR-1.12*****:** Recreation Services: Support recreation services to promote the full use of recreation facilities within their design capacity, and improve connections and access to a wide range of recreation opportunities in order to improve the quality of life for residents and visitors.
- ***Policy RCR-1.13*****:** Joint Use Facilities in Parks: Require, where feasible, parks to be developed as joint use facilities (e.g., stormwater facilities with ball fields) in order to provide more cost-efficient active parks.
- ***Policy RCR-1.14*****:** Community Oriented Neighborhood Parks: During the preparation of Community Plans and during the review of subdivision applications review process, ensure neighborhood parks are sited near activity centers such as schools, libraries, and community centers.

City General Plans

Table 3.2-1 summarizes the key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.16-1
CITY GENERAL PLAN POLICIES GOVERNING RECREATION WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Recreation
City of Turlock	Chapter 2, Land Use and Economic Development, Policy 2-10-a, Policy 2.11-m; Chapter 3, New Growth Areas and Infrastructure, Policy 3.3-z, 3.3-ab; Chapter 4, Parks, Schools and Community Facilities, Policy 4.1-a through 4.1-d, Policy 4.1-n through 4.1-p, Policy 4.1-z, Policy 4.1-aa; Chapter 5, Circulation, Policy 5.3-a and 5.3-b; Chapter 6, City Design, Policy 6.1-K; Chapter 7, Conservation, Policy 7.1-a, Policy 7.1-c, Policy 7.1-d.
City of Modesto	Chapter 3, Community Development Policies, Goal 3.B; Chapter 6, Community Facilities and Services, D. Open Space and Parks, Policy VI.H.10; Chapter 7 Environmental Resources, Open Space and Conservation, B. Open Space Plan, Policies 7a through 7w
City of Ceres	Chapter 2, Land Use & Community Design, Policy 2.L.15, Chapter 3, Transportation & Circulation, Policy 3.F.1; Chapter 4, Agriculture and Natural Resources, Goal 4.B, Policy 4.B.1 through 4.B.7, Policy 4.F.11, Goal 5.B, Policy 5.B.3, Policy 5.B.4; Chapter 6, Public Facilities and Services, Goal 6.C, Policy 6.C.1, Policy 6.C.4, Policy 6.C.9, Policy 6.C.11, Policy 6.C.12, Policy 6.C.13, Policy 6.C.16, Policy 6.C.18, Policy 6.C.23; Chapter 6, Public Facilities and Services, Policy 6.F.12.
City of Hughson	Chapter 4, Conservation and Open Space Element, Goal COS-2, Policy COS-2.1 through COS-2.6; Chapter 8, Public Services and Facilities Element, Action PSF-8.2.

3.16.4 Impacts and Mitigation Measures

Analysis Methodology

Recreational impacts from the PMAs implemented under the Turlock Subbasin are evaluated in terms of how typical construction and operation could affect existing recreational opportunities and facilities. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on foreseeable changes from implementation of the types of PMAs that might be taken in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational-related activities). Temporary impacts are those that would be temporary in nature (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The approach to assessing recreational impacts was qualitative and conservative, assuming that all PMAs are implemented. The impact analysis relies on the use of existing quantitative and qualitative data including but not limited to existing reports, desktop (versus field) surveys, open access databases, maps, and models. Information regarding example projects similar to the types of PMAs identified in Section 2.2 were also reviewed.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A PMA implemented under the Turlock Subbasin GSP would result in a significant impact on recreation if it would:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated; or
- Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment.

3.16.5 Impacts and Mitigation Measures

Table 3.16-2 summarizes the impact conclusions presented in this section for easy reference.

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

TABLE 3.16-2
SUMMARY OF IMPACT CONCLUSIONS—RECREATION

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
REC-1: Implementing PMAs under the Turlock Subbasin GSP could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	LTS	LTSM
REC-2: Implementing PMAs under the Turlock Subbasin GSP could include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment.	LTS	LTSM

NOTES: LTS = less than significant; LTSM = less than significant with mitigation

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact REC-1: Implementing PMAs under the Turlock Subbasin GSP could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

Effects of Project Construction Activities

PMAs implemented under the Turlock Subbasin GSP could include construction activities presented in Table 2-4.

Construction of PMAs implemented under the Turlock Subbasin GSP could result in the removal or replacement of recreational structures. These activities could result in an increase of use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. For example, the construction of water distribution and conveyance infrastructure could result in a decrease in surface water, which could affect recreational water opportunities within the area. As another example, the construction of irrigation basins to enable surface water deliveries to drip/micro systems could require permanently relocating or decommission existing recreational opportunities such as existing trails or roads. Recreationists who use the trails and/or roads would need to use other facilities while the trails/and or roads are closed. This displacement may increase the use of other existing recreational resources or facilities, potentially leading to substantial physical deterioration. However, given the short-term nature of construction activities and the wide range of other recreational opportunities within the Turlock Subbasin that recreationists could choose from, impacts on other existing recreational resources or facilities would not result in substantial physical deterioration of any one facility.

Additionally, PMAs located in or near recreational areas could affect the use of public recreational facilities. For example, construction of irrigation basins could inundate a trail and/or existing recreational facilities and prompt their long-term and permanent closure. PMAs located in or near recreational areas could also generate noise that would impair the use of a nearby park or facility. The increase of noise from construction activities would be temporary and would not likely prompt construction of a new recreational facility to replace the loss of the existing facility.

Some PMAs implemented under the Turlock Subbasin GSP could result in the construction of new or expanded recharge basins or ponds. These activities would likely be located in agricultural fields, and impacts on recreational facilities would not occur. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, the locations and characteristics of new or modified recharge basins and ponds in the Turlock Subbasin and impacts on existing recreational facilities cannot be determined at this time.

In summary, construction activities for PMAs implemented under the Turlock Subbasin GSP could result in the construction and modification of recreation facilities and associated impacts. However, given the short-term nature of construction activities and the wide range of existing recreational opportunities available within the Turlock Subbasin, impacts on existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated would be **less than significant**.

Constructed Features and Operations and Maintenance of those Features

Operation and maintenance of PMAs could include routine inspections and the evaluation of feature performance; removal of vegetation, sediment, and debris from infrastructures; and ongoing monitoring of the pumping station. These activities would be temporary in nature and would not likely prompt the construction of new recreation facilities to replace the loss of use of the existing facility.

In summary, construction and operation of features for the PMAs implemented under the Turlock Subbasin GSP could result in the construction and modification of recreational facilities and associated environmental impacts. However, the precise locations and detailed characteristics of possible future PMAs are not currently known. Therefore, the locations and characteristics of new or modified recreational facilities in the Turlock Subbasin cannot be determined at this time. Factors necessary to identify individual PMAs impacts include the project’s size and characteristics, the duration of construction, and the types and precise locations of construction activities and the facility or resource itself. Because PMAs implemented under the Turlock Subbasin GSP could result in changes in recreational resources that could result in impacts on the environment, this impact would be **potentially significant**.

Compliance with the following mitigation measure would be required when applicable to a given project or management action.

> **Mitigation Measure REC-1: Minimize Impairment, Degradation, or Elimination of Recreational Resources.**
>
> If PMAs implemented under the Turlock Subbasin GSP result in the substantial impairment, degradation, or elimination of recreational facilities, replacement facilities of equal capacity and quality shall be developed and installed.

Implementing Mitigation Measure REC-1 would reduce this impact to a **less-than-significant** level.

Impact REC-2: Implementing PMAs under the Turlock Subbasin GSP could include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment.

Effects of Project Construction Activities

PMAs implemented under the Turlock Subbasin GSP could result in the construction, alteration, or expansion of recreational facilities, as discussed for Impact REC-1. Some PMAs may result in a short-term or permanent closure or alteration of a recreational use. For example, some PMAs that would relocate utilities for pipeline placement could result in the temporary closure of recreational facilities during construction. As another example, the construction or expansion of regulating reservoirs, water storage tanks, and irrigation basins could require the temporary or permanent closure of recreational facilities within the area.

Additionally, similar to discussion under Impact REC-1, some PMAs implemented under the Turlock Subbasin GSP could result in the construction of new or expanded recharge basins or ponds. These activities would likely be located in agricultural fields and impacts to recreational facilities would not occur. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, the locations and characteristics of new or modified recharge basins and ponds in the Turlock Subbasin and their impact on recreational resources cannot be determined at this time.

In summary, construction activities for PMAs implemented under the Turlock Subbasin GSP could result in the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment. However, given the short-term nature of construction activities and the wide range of existing recreational opportunities available within the Turlock Subbasin, impacts resulting from PMAs implemented under the Turlock Subbasin GSP that could include recreational facilities or require the construction or expansion of recreational facilities would be **less than significant**.

Constructed Features and Operations and Maintenance of those Features

PMAs implemented under the Turlock Subbasin GSP could include operations and maintenance activities presented in Table 2-4. These activities would be temporary in nature and would not likely prompt the construction of a new recreational facility to replace the loss of use of the existing facility.

Additionally, similar to discussion under Impact REC-1, some PMAs implemented under the Turlock Subbasin GSP could result in the construction of new or expanded recharge basins or ponds. These activities would likely be located in agricultural fields, and impacts on recreational facilities would not occur. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, the locations and characteristics of new or modified recharge basins and ponds in the Turlock Subbasin and their impact on recreational resources cannot be determined at this time.

As described in Section 3.15, *Population and Housing*, none of the PMAs implemented under the Turlock Subbasin GSP would involve constructing new homes, businesses, or other infrastructure that would provide new long-term employment opportunities or result in population growth and demand for housing. Therefore, construction or expansion of recreational facilities (due to an increase in population) would not occur.

Many construction-related impacts may be temporary; however, it is reasonable to expect that some impacts may be long-term and permanent. Furthermore, the precise location and detailed characteristics of PMAs implemented under the Turlock Subbasin GSP are not currently known. Therefore, the potential for displacement would accelerate physical deterioration at existing recreational facilities in the Turlock Subbasin GSP cannot be determined at this time. The factors necessary to identify PMA impacts include the size and characteristics of the project; the duration of construction; and the types and precise locations of construction activities, the facility or resource itself, and alternative recreational opportunities. Because adverse changes in recreational resources could result from the construction and operation of PMAs implemented under the Turlock Subbasin GSP, this impact would be **potentially significant**.

Implementing Mitigation Measure REC-1 discussed under Impact REC-1 would reduce this impact to a **less-than-significant** level.

3.17 Transportation

3.17.1 Introduction

This section describes and evaluates potential impacts related to transportation that could result from implementation of projects and management actions (PMAs) under the Turlock Subbasin Groundwater Sustainability Plan (GSP). (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan,* in Chapter 2.)

The section includes relevant adjusted baseline information, including a description of the anticipated project travel characteristics and relevant federal, state, regional, and local regulations. The impacts of PMAs on the roadway, bicycle, pedestrian, and transit systems in the Turlock Subbasin have been analyzed and potentially feasible mitigation measures (where applicable) have been identified to avoid or lessen the impacts.

No comments specifically addressing transportation were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.17.2 Environmental Setting

This section describes the transportation facilities and characteristics that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and includes many types of transportation facilities.

Roadways

Generally bounded by the San Joaquin River on the west, the Tuolumne River on the north, and the Merced River on the south, and including an eastern boundary located near the Mariposa County line, the Turlock Subbasin is situated in the southern portion of Modesto, Turlock, and several smaller communities. Those areas include roadways of various capacities and designations and are interconnected by systems of rural principal arterial, minor arterial, collector, and rural local roadways. Chapter 2, Circulation Element, of the Stanislaus County General Plan provides roadway classifications, identifying key roadways throughout the portion of Stanislaus County that are within and adjacent to the Turlock Subbasin (Stanislaus County 2016). Similarly, the Transportation and Circulation Element of the Merced County General Plan provides roadway classifications for the section of the Turlock Subbasin within Merced County. The roadways described below are the prominent roadways in the Turlock Subbasin (Merced County 2013).

State Route 99

State Route (SR) 99 is a six-lane freeway facility in Stanislaus and Merced counties that connects the largest urban areas in and around the Turlock Subbasin to other metropolitan areas in the San Joaquin Valley.

State Route 132/Yosemite Boulevard

State Route 132 (SR 132)/Yosemite Boulevard runs generally east-west from Interstate 580 along the west side of the San Joaquin Valley, adjacent to the Turlock Subbasin along the north side of the Tuolumne River, and east to its terminus at an interchange with SR 49 in Coulterville. SR 132 provides regional access to the Turlock Subbasin from areas to the north and east.

State Route 165

SR 165 runs north-south, extending south from SR 99 in Turlock in the Turlock Subbasin through Hilmar, across the Merced River, and farther south to Interstate 5.

State Route 59

SR 59 runs generally north-south between Merced and Snelling, in the southern portion of the Turlock Subbasin, and intersects SR 99 and Santa Fe Drive.

Santa Fe Drive

Santa Fe Drive is designated as a Principal Arterial in the Stanislaus County General Plan and as a Minor Arterial by Merced County, extending southeast from Modesto to SR 59 in Merced.

La Grange Road

La Grange Road is designated as a Major Collector by Stanislaus County and as a Minor Arterial by Merced County. The roadway extends from Snelling north to SR 120 in Keystone.

Lake Road

Lake Road is designated as a Major Collector in the Stanislaus County General Plan. It extends generally east-west and runs along the north side of Turlock Lake, from Hickman, 8 miles west of the western boundary of the Turlock Subbasin, to its terminus with SR 132/Yosemite Boulevard, approximately 3.6 miles to the northeast of the subbasin's eastern boundary (Stanislaus County 2016).

Los Cerritos Road

Los Cerritos Road is designated as a Minor Collector roadway in the Stanislaus County General Plan. It extends south from Lake Road to east of the Turlock Subbasin, providing access from areas to the south, including neighboring Merced County.

Bicycle and Pedestrian Transportation

Bicycle and pedestrian facilities within the Turlock Subbasin are limited to urbanized areas in Turlock, Ceres, and other smaller cities and towns. The majority of the subbasin's area contains rural agricultural roadways that generally have unpaved roadway shoulders and no designated bicycle or pedestrian facilities. However, a number of bicycle lanes are proposed along rural arterial roadways in northern Merced County.

Transit

Transit service and facilities within the Turlock Subbasin are limited to urbanized areas; limited or no services and facilities are available in the rural agricultural areas that constitute the majority of the subbasin's land area. Currently, four local transit operators provide local, regional, and inter-county transit services in Stanislaus County:

- The County of Stanislaus (Stanislaus County Regional Transit [StaRT and StaRT Dial a Ride])
- The City of Modesto (Modesto Area Express and Modesto Area Dial-a-Ride)
- The City of Turlock (Turlock Transit and Turlock Transit Dial-a-Ride)
- The City of Ceres (Ceres Area Transit and Ceres Dial-a-Ride)

Within Merced County, the Transit Joint Powers Authority for Merced County operates urban and rural bus transit services, known as "The Bus." The Bus operates on 16 fixed-route lines and provides paratransit service throughout the county.

Railroads

Rail facilities within the Turlock Subbasin include two primary rail lines, which run northwest and southeast generally adjacent to SR 99 and Santa Fe Drive. A network of rail spurs is located in the industrial section of Modesto, north of the Tuolumne River, south of Yosemite Boulevard, and west of Santa Fe Road.

Airports

Two airports operate within or near the Turlock Subbasin: Turlock Municipal Airport, located at 13604 Newport Road in Ballico, and Modesto City-County Airport, 617 Airport Way in Modesto.

3.17.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to transportation. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

Rivers and Harbors Act of 1899

The Rivers and Harbors Act prohibits the construction of any bridge, dam, dike, or causeway over or in navigable waterways of the United States without congressional approval. The U.S. Coast Guard manages oversight of these structures and protects people, maritime commerce, and the environment against hazards in navigable waters of the United States.

U.S. Department of Transportation

The U.S. Department of Transportation administers numerous laws and regulations that regulate California roads and interstate commerce. The department is responsible for planning and coordinating federal restoration projects while setting safety regulations for all major modes of transportation.

Federal Railroad Administration

The Federal Railroad Administration regulates interstate railroads and is responsible for providing for safe, reliable, and efficient movement of people and goods throughout the United States.

Federal Aviation Administration

The Federal Aviation Administration regulates civil aviation that promotes safety. The agency develops and operates a system of air traffic control and navigation for both civil and military aircraft.

State

The California Department of Transportation (Caltrans) is responsible for planning, designing, constructing, operating, and maintaining all state-owned roadways, and for implementing federal highway standards for interstate highways. SR 99 is under the jurisdiction of Caltrans. Caltrans has mandated that impacts on freeway facilities would occur if off-ramp queuing were to spill back into the mainline or metered on-ramp queuing were to spill back into a roadway.

Senate Bill 743, enacted in fall 2013, led to a change in the way that transportation impacts are measured under CEQA. As of July 1, 2020, automobile delay and level of service (LOS) may no longer be used as the performance measure to determine the transportation impacts of land development projects under CEQA. Instead, an alternative metric that supports the goals of Senate Bill 743 is required. Although there is no requirement to use any particular metric, the Governor's Office of Planning and Research has recommended the use of vehicle miles traveled (VMT). This requirement does not modify lead agencies' discretion to develop their own methodologies or guidelines, or to analyze impacts on other components of the transportation system, such as walking, bicycling, transit, and safety.

Regional and Local

Stanislaus County General Plan

The Circulation Element of the Stanislaus County General Plan (2015) identifies goals, policies, and implementation measures that ensure compatibility between land use, infrastructure, and transportation modes within Stanislaus County. The following goal and policy are relevant to implementation of the PMAs.

> **Goal One:** Provide and maintain a transportation system throughout the County for the movement of people and goods that also meets land use and safety needs for all modes of transportation.

- ***Policy One*:** Development will be permitted only when facilities for circulation exist, or will exist as part of the development, to adequately handle increase traffic and safety needs for all modes of transportation.

2030 Merced County General Plan

The Transportation and Circulation Element of the 2030 Merced County General Plan (2013) includes policies to ensure that adequate access is provided and maintained for all county land uses. The following goal and policy are relevant to implementation of the PMAs.

Goal CIR-1: Maintain an efficient roadway system for the movement of people and goods that enhances the physical, economic, and social environment while being safe, efficient, and cost-effective.

- ***Policy CIR-1.5*:** County Level of Service Standards. Implement a Countywide roadway system that achieves the following level-of-service (LOS) standards during peak traffic periods:

  a) For roadways located within rural areas: LOS ″C″ or better.

  b) For roadways located outside Urban Communities that serve as connectors between Urban Communities: LOS of "D" or better.

  c) For roadways located within Urban Communities: LOS of ″D″ or better.

City General Plans

Table 3.17-1 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.17-1
CITY GENERAL PLAN POLICIES GOVERNING TRANSPORTATION WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Transportation
City of Turlock	Circulation Element: Guiding Policies 5.2-h and 5.2i
City of Modesto	Chapter 5, Transportation, Goals V.A and V.H
City of Ceres	Transportation and Circulation: Goal 2.A, Policies 2.A.2, 2.A.4, and 2.A.6; and Goal 2.B, Policy 2.B.1
City of Hughson	Circulation Element: Goal C-1, Policies C-1.2 and C-1.12; Goal C-2, Policies C-2.2, C-2.3, and C-2.5; and Goal V.H, Policy V.H.2

SOURCE: Data compiled by Environmental Science Associates in 2022.

3.17.4 Impacts and Mitigation Measures

Analysis Methodology

The analysis of environmental impacts related to transportation focuses on the potential for the PMAs to result in temporary construction traffic or future operations and maintenance (O&M) traffic that could have a significant effect on existing or future transportation conditions. The analysis also evaluates the PMAs to identify anticipated direct effects on existing transportation infrastructure.

Transportation impacts from the types of PMAs implemented under the Turlock Subbasin GSP have been evaluated in terms of how typical construction and operation could affect existing transportation. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

The following factors were considered when determining the extent and implications of transportation impacts:

- Potential temporary construction-related transportation impacts caused by the movement of construction personnel, equipment, and materials to and from the PMA sites.
- Potential O&M transportation impacts from the operation of projects and maintenance actions completed pursuant to the PMAs.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The assessment of transportation impacts used a qualitative and conservative approach, assuming that all PMAs would be implemented.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact related to transportation if it would:

- Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities;
- Conflict or be inconsistent with State CEQA Guidelines Section 15064.3(b);
- Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or
- Result in inadequate emergency access.

Impacts and Mitigation Measures

Table 3.17-2 summarizes the impact conclusions presented in this section for easy reference.

TABLE 3.17-2
SUMMARY OF IMPACT CONCLUSIONS—TRANSPORTATION

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
TRANS-1: Implementing PMAs under the Turlock Subbasin GSP could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.	LTSM	NI
TRANS-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or be inconsistent with State CEQA Guidelines Section 15064.3(b).	LTSM	LTS
TRANS-3: Implementing PMAs under the Turlock Subbasin GSP could substantially increase hazards due to a geometric design feature or incompatible uses.	LTSM	LTSM
TRANS-4: Implementing PMAs under the Turlock Subbasin GSP could result in inadequate emergency access.	LTSM	LTS

NOTES: LTS = less than significant; LTSM = less than significant with mitigation incorporated; NI = no impact

SOURCE: Data compiled by Environmental Science Associates in 2022

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the activities, location, and potentially significant impacts of the individual project or management action. Implementation of the mitigation measures would be the responsibility of the project's or management action's proponent(s).

Impact TRANS-1: Implementing PMAs under the Turlock Subbasin GSP could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

Effects of Construction Activities

Many of the PMAs that would be implemented under the Turlock Subbasin GSP (e.g., Projects 3, 4, 11, 15, 18, 20, and 23) include projects requiring construction activities that could include mobilization of substantial off-road equipment and materials, removal of substantial soil quantities from borrow sites or off-site locations, and transportation of construction personnel. These PMAs would add construction vehicle traffic to roadways in and around the Turlock Subbasin, which would add to existing levels of roadway congestion in urban areas. The majority of the PMAs would generate temporary construction traffic on primarily rural roadways, which would not likely create substantial congestion, cause intersection delays, or degrade conditions for bicycle, pedestrian, and transit circulation, such that they would conflict with applicable programs, plans, ordinances, or policies addressing the circulation system for those areas. The exceptions would be PMAs that would be located in urban areas or would include the construction of transmission lines.

For example, Projects 3 and 4, the Dianne Storm Basin and Stanislaus State Stormwater Recharge projects, would likely add temporary construction traffic to roads in the city of Turlock—specifically, Geer Road, Monte Vista Avenue, and Fulkerth Road, the nearest roadways to both project sites. (This traffic from Projects 3 and 4 would include construction worker trips during peak-hour traffic.) These roads could be primary travel routes for construction traffic from one or both project sites, as they provide connectivity to SR 99. The Turlock General Plan (2012) identified intersections along Monte Vista Avenue and Fulkerth Road, along the anticipated travel routes for Project 3 and Project 4 construction traffic, as operating near capacity under conditions at the time of the general plan's adoption. However, as described in the Turlock General Plan (page 5-13), the operational capacity of those and other City of Turlock roadways would improve with implementation of the general plan. Thus, such conditions have most likely improved in the years since adoption of the Turlock General Plan and implementation of its policies.

It is assumed that construction-related trips for hauling excavated materials off-site during implementation of PMAs under the Turlock Subbasin GSP would be dispersed throughout the construction workday. As a result, these construction-related trips would not be anticipated to have a substantial effect on peak-period traffic or to conflict with relevant City of Turlock policies related to LOS.

As it relates to other modes of transportation, however, temporary construction traffic (e.g., from Project 4 around California State University, Stanislaus) could include a substantial number of haul trips, which could temporarily degrade conditions for multimodal travel near the entry points for project construction sites. Because the volume of construction vehicle trips is not known, implementation of the PMAs would have the potential to conflict with programs, plans, ordinances, or policies addressing multimodal access. This impact would be **potentially significant**.

Compliance with Mitigation Measure TRANS-1 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project's or management action's proponent(s).

Mitigation Measure TRANS-1: Prepare and Implement a Construction Traffic Management Plan.

The proponent(s) of a project or management action shall require that the contractor(s) prepare and implement a construction traffic management plan to manage traffic flow during construction, reduce potential interference with local emergency response plans, reduce potential traffic safety hazards, and ensure adequate access for emergency responders. Development and implementation of this plan shall be coordinated with local agencies with jurisdiction over affected roadways, and/or the construction contractor(s) shall ensure that the plan is implemented during construction. The plan may include but not be limited to the following measures:

- Identify construction truck haul routes and timing to limit conflicts between truck and automobile traffic on nearby roads. The identified routes will be designed to minimize impacts on vehicular, bicycle, and pedestrian traffic, circulation, and safety.
- Implement comprehensive traffic control measures, including scheduling of major truck trips and deliveries to avoid peak traffic hours, warning and detour signs (if required), lane closure procedures (if required), and traffic cones for drivers indicating potential road hazards or detours (if required).

- Coordinate construction activities to ensure that one lane of traffic in each direction remains open at all times, unless flaggers or temporary traffic controls are in place, to provide emergency access.
- Evaluate the need to provide flaggers or temporary traffic control at project driveways and entries to staging areas.
- Notify affected adjacent property owners and public safety personnel regarding the timing of major deliveries, detours, and lane closures.
- Develop a process for responding to and tracking issues pertaining to construction activity impacts on traffic, including identification of an on-site traffic manager. Post 24-hour contact information for the traffic manager on all construction sites.
- Document road pavement conditions for all routes that would be used by construction vehicles before and after project construction. Make provisions to monitor the condition of roads used for haul routes so that any damage or debris attributable to haul trucks can be identified and corrected. Roads damaged by construction vehicles shall be repaired to their preconstruction condition.

Mitigation Measure TRANS-1 requires the preparation and implementation of a construction traffic management plan, such that implementation of the PMAs would not conflict with regulations related to pedestrian or bicycle access. Implementing this mitigation measure would reduce the potentially significant temporary construction impact related to a conflict with a program, plan, ordinance, or policy addressing the circulation system to a **less-than-significant** level.

Effects of Constructed Features and Operations and Maintenance of Those Features

Once constructed, the PMAs would require that proponents inspect project features and/or evaluate program effectiveness during O&M activities. These inspections and evaluations would be required on only an intermittent basis and would result in a minor increase in motor vehicle trips. For this reason, the impact of constructed features and O&M of those features related to a conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities, would be **less than significant**.

Impact TRANS-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or be inconsistent with State CEQA Guidelines Section 15064.3(b).

Effects of Construction Activities

Section 15064.3(a) of the State CEQA Guidelines calls for evaluation of a project’s transportation impacts in terms of VMT, which refers to the amount and distance of automobile travel attributable to a project. Section 15064.3(a) also includes the following provisions:

- Except as provided in Section 15064.3(b), Criteria for Analyzing Transportation Impacts (e.g., land use and transportation projects), a project’s effects on automobile delay shall not constitute a significant environmental impact.

- CEQA lead agencies are allowed to tailor their criteria for determining the significance of transportation impacts, including using VMT.
- Not all transportation projects will induce vehicle travel; therefore, not all transportation projects would result in a significant transportation impact.

Construction activities for PMAs implemented under the Turlock Subbasin GSP could exceed the threshold of significance and conflict with State CEQA Guidelines Section 15064.3(b). Equipment, materials, and workers would have to be transported to project construction sites. However, the level of significance of impacts for automobile travel would depend on the locations and types of PMAs implemented under the Turlock Subbasin GSP.

Each project would require its own VMT analysis and would be required to adhere to State CEQA Guidelines Section 15064.3(b). However, the specific PMAs that would be carried out under the Turlock Subbasin GSP are yet to be determined. Therefore, the potential exists for a project or management action to exceed the threshold of significance set for transportation impacts by the CEQA lead agency, or to conflict or be inconsistent with State CEQA Guidelines Section 15064.3(b). This impact would be **potentially significant.**

Mitigation Measure TRANS-2 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project's or management action's proponent(s).

Mitigation Measure TRANS-2: Reduce Emissions.

To achieve compliance with State CEQA Guidelines Section 15064.3(b), the following measures shall be taken to reduce effects associated with increased VMT:

- Limit idling time for commercial vehicles, including delivery and construction activities.
- Use low- or zero-emissions vehicles, including construction vehicles.
- Institute a heavy-duty off-road vehicle plan and a construction vehicle inventory tracking system for construction projects.
- Promote ridesharing.
- Provide the necessary facilities and infrastructure to encourage the use of low- or zero-carbon emissions vehicles (e.g., electric vehicle charging facilities and conveniently located alternative fueling stations).
- Increase the cost of driving and parking private vehicles, such as by imposing tolls and parking fees.
- Provide information on all locally feasible options for individuals and businesses to reduce transportation-related emissions.

Implementing Mitigation Measure TRANS-2 would reduce this significant impact of PMAs implemented under the Turlock Subbasin GSP to a **less-than-significant** level.

Effects of Constructed Features and Operations and Maintenance of Those Features

Implementation of PMAs would result in a minor increase in VMT associated with O&M activities necessary to support the functionality of constructed features. O&M activities would primarily involve conducting regularly scheduled inspections and evaluating feature performance; these activities would be incorporated into existing groundwater management operations within the Turlock Subbasin. However, operation of the PMAs would not add VMT to the PMAs' sites to a substantial enough degree that operational VMT would exceed VMT thresholds. The PMAs would cause limited disruptions to traffic along roadways in the vicinity of the Turlock Subbasin, which would not be anticipated to affect transit or nonmotorized travel. For these reasons, operational impacts from the PMAs would be **less than significant**.

Impact TRANS-3: Implementing PMAs under the Turlock Subbasin GSP could substantially increase hazards due to a geometric design feature or incompatible uses.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of Those Features

Construction of PMAs, constructed features (natural or artificial infrastructure), and O&M of those features implemented under the Turlock Subbasin GSP could affect transportation infrastructure such as roads, bridges, railroads, and navigable waterways. PMAs have the potential to affect infrastructure elements such as campgrounds and campsites, day-use sites, roads and trails, and off-highway/off-road vehicle routes. Such work may require temporary alterations to the horizontal and vertical alignments of these facilities.

In addition, employees could commute along designated access routes. These routes would generally be preexisting public roads near construction sites; however, new off-road haul routes may be constructed between borrow sites, staging areas, and construction sites. These constructed access roads would be temporary, and would be restored to pre-project conditions upon completion of construction.

For example, for construction of a regulating reservoir, slow-moving trucks that deliver materials and remove materials and debris could enter and exit public streets, which could create hazards to vehicles, pedestrians, and bicyclists, thus resulting in potentially significant impacts.

Project operations could affect navigation in waterways and shallow-water channels, resulting in the potential for an increased navigation hazard if debris such as tree snags and other types of floating or submerged debris were to accumulate (e.g., on fish screens). This debris could pose a navigational hazard or damage vessels navigating the channel.

Therefore, impacts related to geometric design or incompatible use hazards would be **potentially significant**.

Mitigation Measures TRANS-3 and TRANS-4 would be required when applicable to a given project. Implementation of this mitigation measure would be the responsibility of the project's or management action's proponent(s).

Mitigation Measure TRANS-3: Conduct Routine Inspections.

An inspection and operation plan shall be developed and implemented, where applicable. The plan shall include procedures for routine inspections and operation of infrastructure facilities to allow safe navigation should a facility become damaged or malfunction. This plan shall include the following specific components:

- Routine inspections and correction procedures to ensure that the facility's safety features are in good working order.
- Routine inspections and correction procedures for navigational hazards around facilities, including floating or submerged debris.

Mitigation Measure TRANS-4: Repair Damaged Roadways and Trails Following Construction.

If damage to any roads, sidewalks, trails, and/or medians occurs, the construction contractor shall coordinate with the proponent(s) of the project or management action to ensure that the damage is adequately repaired in accordance with applicable agency standards. Roads and/or driveways disturbed by construction activities or construction vehicles shall be properly restored to ensure long-term protection of road surfaces. Roadside drainage structures and road drainage features (e.g., rolling dips) shall be protected by regrading and reconstructing roads to drain properly. The construction contractor shall work with the applicable agencies to document the preconstruction conditions of road features before construction begins.

PMAs would be required to adhere to statewide, regional, and local policies, regulations, and ordinances governing traffic and circulation systems. Implementing Mitigation Measures TRANS-3 and TRANS-4 would reduce the impact related to a substantial increase in hazards due to a geometric design feature or incompatible use to a **less-than-significant** level.

Impact TRANS-4: Implementing PMAs under the Turlock Subbasin GSP could result in inadequate emergency access.

Effects of Construction Activities

Implementing PMAs under the Turlock Subbasin GSP could include the construction activities identified in Table 2-4 in Chapter 2, *Project Description*. Traffic could be delayed and lanes temporarily closed when construction material or vehicles are being moved on and off the sites of the proposed PMAs, especially at high-volume intersections. This could interfere with emergency access, creating a **potentially significant** impact.

Mitigation: Implement Mitigation Measure TRANS-1.

Implementing Mitigation Measure TRANS-1, identified above, would provide traffic control at the access road for the project or management action that could allow emergency vehicles access to the site. Therefore, implementing this mitigation measure would reduce this impact to a **less-than-significant** level.

Effects of Constructed Features and Operations and Maintenance of those Features

Once constructed, the PMAs would require that proponents inspect project features and/or evaluate program effectiveness during O&M activities. These inspections and evaluations would be required on only an intermittent basis and would result in a minor increase in motor vehicle trips, which would not be substantial enough to result in congestion that could interfere with emergency access. Therefore, this impact would be **less than significant**.

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3.18 Tribal Cultural Resources

3.18.1 Introduction

This section identifies and evaluates tribal cultural resources in the context of the Turlock Subbasin Groundwater Sustainability Plan (GSP) and includes the physical and regulatory setting, the criteria used to evaluate the significance of potential impacts, the methods used in evaluating impacts, and the results of the impact assessment. Tribal cultural resources are sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are listed, or determined to be eligible for listing, in the national, state, or local register of historical resources.

No comments specifically addressing tribal cultural resources were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.18.2 Environmental Setting

Pre-contact and ethnographic settings, and indigenous resource types, are described in Section 3.6, *Cultural Resources*. This context, in conjunction with the tribal consultation described below, is to allow analysis at a program level of detail. This description does not preclude the need for or replace any project-level environmental review.

Tribal Consultation Effort

On January 19, 2022, the Turlock Subbasin Groundwater Sustainability Agencies (GSAs) sent notification letters via certified mail to 12 Native American tribal representatives per the requirements of California Public Resources Code (PRC) Section 21080.3, as well as 14 additional tribal representatives listed in the Native American Heritage Commission list for the GSP area. In response to the notification letter, the Turlock Subbasin GSAs consulted with the one tribe (Wilton Rancheria) who responded to the notification letter.

3.18.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to tribal cultural resources. Implementation of any PMA may be subject to the laws and regulations listed below, as well as other local plans, policies, and ordinances, depending on the project location.

Federal

There are no federal laws or regulations relevant to the Turlock Subbasin GSP specifically related to tribal cultural resources. Section 106 of the National Historic Preservation Act considers historic properties, which also include traditional cultural properties.[1] Sub-section 3.6.3, *Regulatory Setting*, within Section 3.6, *Cultural Resources*, provides a summary of Section 106 of the National Historic Preservation Act.

State

Public Resources Code Sections 21074, 21080, and 21083 (Assembly Bill 52)

In September 2014, the California Legislature enacted Assembly Bill (AB) 52, which added provisions to the Public Resources Code regarding the evaluation of impacts on tribal cultural resources under CEQA, and consultation requirements with California Native American tribes. In particular, AB 52 requires lead agencies to analyze project impacts on tribal cultural resources (PRC Sections 21074 and 21083.09). The law defines tribal cultural resources in a new section, PRC Section 21074. AB 52 also requires lead agencies to engage in additional consultation procedures with respect to California Native American tribes (PRC Sections 21080.3.1, 21080.3.2, and 21082.3).

PRC Section 21084.3 addresses mitigation for tribal cultural resources impacts as follows:

a) Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource.

b) If the lead agency determines that a project may cause a substantial adverse change to a tribal cultural resource, and measures are not otherwise identified in the consultation process provided in Section 21080.3.2, the following are examples of mitigation measures that, if feasible, may be considered to avoid or minimize the significant adverse impacts:

   1) Avoidance and preservation of the resources in place, including, but not limited to, planning and construction to avoid the resources and protect the cultural and natural context, or planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

   2) Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

      A. Protecting the cultural character and integrity of the resource.

      B. Protecting the traditional use of the resource.

      C. Protecting the confidentiality of the resource.

   3) Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

   4) Protecting the resource

Regional and Local

There are no regional or local regulations specifically related to tribal cultural resources.

[1] A Traditional Cultural Property is a property that is eligible for inclusion in the National Register of Historic Places based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community.

3.18.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on tribal cultural resources focuses on the potential for substantial adverse effects to a tribal cultural resources. Impacts on tribal cultural resources from the types of PMAs implemented under the Turlock Subbasin GSP are evaluated in terms of how typical construction and operation could affect the resources. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might be taken in the future, consistent with the level of detail appropriate for a program-level analysis.

The approach to assessing tribal cultural resources impacts was qualitative and conservative, assuming that all PMAs are implemented. The impact analysis relies on the use of existing quantitative and qualitative data including, but not limited to, existing reports, open access databases, maps, and models. Information on example projects similar to the types of PMAs identified in Section 2.2 was also reviewed. Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

Tribal Cultural Resources

For projects for which an NOP or a notice of negative declaration/mitigated negative declaration was filed on or after July 1, 2015, CEQA requires that a project's impacts on tribal cultural resources be considered as part of the overall analysis of project impacts (PRC Sections 21080.3.1, 21084.2, and 21084.3). The significance of a tribal cultural resource is assessed by evaluating the following factors as they apply to the resource:

(1) Eligibility for listing in the California Register.

(2) Eligibility as a unique archaeological resource pursuant to PRC Section 21083.2 (g).

(3) Listing status in the California Native American Heritage Commission's Sacred Lands File.

In addition, a lead agency can independently determine a resource to be a tribal cultural resource.

California Native American tribes traditionally and culturally affiliated with a geographic area may have expertise concerning their tribal cultural resources. Therefore, the analysis of whether project impacts may result in a substantial adverse change in the significance of a tribal cultural resource depends heavily on the results of consultation between the lead agency and culturally affiliated California Native American Tribes during the CEQA process.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A PMA implemented under the Turlock Subbasin GSP would result in a significant impact on tribal cultural resources if it would:

- Cause a substantial adverse change in the significance of a tribal cultural resource, defined in PRC Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American Tribe, and that is:
  - Listed or eligible for listing in the California Register, or in a local register of historical resources as defined in PRC Section 5020.1(k); or
  - A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC Section 5024.1. In applying the criteria set forth in subdivision (c) of PRC Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American Tribe.

Impacts and Mitigation Measures

Table 3.18-1 summarizes the impact conclusions presented in this section for easy reference.

TABLE 3.18-1
SUMMARY OF IMPACT CONCLUSIONS—TRIBAL CULTURAL RESOURCES

Impact Statement	Construction Activities	Constructed Features and Operations and Maintenance
TCR-1: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a tribal cultural resource, as defined in PRC Section 21074.	SU	SU

NOTES: SU = Significant and Unavoidable

SOURCE: Data compiled by Environmental Science Associates in 2022

Compliance with the mitigation measures listed below would be required when applicable to a given project or management action. Not all mitigation measures would apply to all PMAs. The applicability of the mitigation measures would depend on the individual PMA activities, location, and the potentially significant impacts of the individual PMA. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s).

Impact TCR-1: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a tribal cultural resource, as defined in PRC Section 21074.

Effects of Project Construction Activities

Construction for projects implemented under the GSP could involve ground disturbance, vibration, and the removal of archaeological resources and/or architectural resources. Constructing these projects may also affect the biological resources community (e.g., trees, vegetation, fish, riparian vegetation), visual setting, noise levels, and air quality, among other resources. However, the exact details, including locations, of any such construction activities have yet to be determined. Therefore, it is not known whether future projects implemented under the GSP would affect any tribal cultural resources.

Construction of new infrastructure or modifications to existing infrastructure (e.g., wells, water conveyance features, tanks, basins, pump stations) could result in significant impacts on tribal cultural resources by introducing new visual elements to landscapes associated with or comprising tribal cultural resources. Ground-disturbing activities could result in significant impacts on tribal cultural resources through their partial or complete destruction. In addition, construction activities could alter the makeup of biological communities (e.g., fish, riparian vegetation) that comprise tribal cultural resources (e.g., traditional hunting/fishing/gathering areas). Any impacts of these construction activities on such tribal cultural resources could be significant.

If construction activities for any of the projects implemented under the GSP resulted in either a direct impact (e.g., physical modification, damage, or destruction) or an indirect impact (e.g., alteration to setting, biological community, or visual setting) on any tribal cultural resources as defined in PRC Section 21074, the impact would be **potentially significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

Constructed features and operations and maintenance for projects implemented under the GSP could involve ground disturbance, vibration, and modifications to archaeological resources and/or architectural resources. These projects may also affect the biological resources community (e.g., trees, vegetation, fishes, riparian vegetation), visual setting, noise levels, and air quality, among other resources. However, the exact details, including locations, of any such features and operational activities have yet to be determined. Therefore, it is not known whether implementing future projects implemented under the GSP would affect any tribal cultural resources.

If constructed features and operations for any of the projects implemented under the GSP resulted in either a direct impact (e.g., physical modifications, damage, or destruction) or an indirect impact (e.g., alterations to setting, biological community, visual setting) on any tribal cultural resources as defined in PRC Section 21074, the impact would be **potentially significant**.

Impact Conclusion

Construction activities and constructed features and operations and maintenance for projects implemented under the GSP are the types of activities with the potential to affect tribal cultural resources. Because the exact details, including locations, of any such activities have yet to be determined, it is not known whether projects implemented under the GSP would affect any tribal cultural resources. Factors necessary to identify specific impacts on tribal cultural resources include the design and footprint of a project, type, and precise location and timing (i.e., seasonal access for cultural ceremonies or resources) of construction activities and features, and the type and location of operations activities. If any of the future projects implemented under the GSP were to affect tribal cultural resources as defined in PRC Section 21074, the impact would be **potentially significant**. The GSP does not include any general protection measures applicable to this impact.

Compliance with Mitigation Measures CUL-2, CUL-3, and CUL-4 would be required when applicable to a given project. Implementation of these mitigation measures would be the responsibility of the PMA proponent(s).

Mitigation Measure: Implement Mitigation Measure CUL-2.

For the text of this mitigation measure, see the discussion of Impact CUL-2 in Section 3.6, *Cultural Resources*.

Mitigation Measure: Implement Mitigation Measure CUL-3.

For the text of this mitigation measure, see the discussion of Impact CUL-2 in Section 3.6, *Cultural Resources*.

Mitigation Measure: Implement Mitigation Measure CUL-4.

For the text of this mitigation measure, see the discussion of Impact CUL-3 in Section 3.6, *Cultural Resources*.

Mitigation Measures CUL-2, CUL-3, and CUL-4 would be implemented to reduce the impacts of projects under the GSP. However, in some instances it may not be feasible to avoid a tribal cultural resource, and the resource may need to be altered or destroyed. Also, because the extent and location of such actions are not known at this time, it is not possible to conclude that the mitigation measures, or equally effective mitigation measures, would reduce significant impacts to a less-than-significant level in all cases. Therefore, this impact would be **significant and unavoidable**.

3.19 Utilities and Service Systems and Public Services

3.19.1 Introduction

This section describes existing utilities and service systems and existing public services within the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to affect these systems and services. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan*, in Chapter 2.)

No comments specifically addressing utilities and services systems or public services were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.19.2 Environmental Setting

This section describes the public services, utilities, and service systems that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin and includes many types of public services, utilities, and service systems.

Utilities and Service Systems

Water

Stanislaus Regional Water Authority is a joint powers authority that includes the Cities of Turlock and Ceres. These cities rely solely on groundwater to serve municipal and industrial water demands within their service areas.

The City of Ceres provides water to approximately 47,000 residents through a system of active wells and approximately 154 miles of water lines. In 2010, Ceres delivered a total of 7,041 acre-feet (approximately 2,294 million gallons) of water to its customers (City of Ceres 2021). The City of Turlock provides water supply to a population of about 71,000 through a system of 17 active wells and 250 miles of distribution pipe. In 2010, Turlock delivered approximately 7,094 million gallons of water to its customers (City of Turlock 2021).

Smaller water districts serving municipal and industrial water demand include the Delhi County Water District, Hilmar County Water District, and Keyes Community Services District.

Turlock Irrigation District (TID) provides irrigation water to agricultural lands in Stanislaus and Merced Counties and presently covers a service area of 197,261 gross acres, with approximately 157,800 acres that could be served by active TID irrigation service connections. TID operates the New Don Pedro Reservoir and Dam that impounds the Tuolumne River approximately one mile upstream of the Turlock Subbasin study area, providing 2.03 million acre-feet of storage. TID uses water stored in Don Pedro Reservoir to irrigate approximately 5,800 farms within its 308-square-mile irrigation service area (TID 2021).

Merced Irrigation District (MID) provides irrigation water to eastern Merced County's agricultural community. More than 140,000 acres of farmland are located within MID's boundaries, of which approximately 70 percent are irrigated with MID water. MID growers produce more than 25 different crops each year, including almonds, corn, alfalfa, and cotton. The water is stored behind New Exchequer and McSwain dams. More than 725 miles of canals, as well as sections of several creeks and sloughs, bring the water to MID's customers (MID 2021).

Eastside Water District serves more than 61,000 acres of irrigated agricultural land in Stanislaus and Merced counties using groundwater. The only other source of supply is a very limited amount of surface water provided by purchases made in wet years from the TID and MID canals lying adjacent to Eastside Water District, and from riparian water rights along the Tuolumne and Merced rivers (Eastside Water District 2022).

Other water districts meeting demands for agricultural irrigation water include Ballico-Cortez Water District and Modesto Irrigation District. Modesto Irrigation District also provides drinking water.

Wastewater

Several wastewater treatment plants operate within the Turlock Subbasin: the Turlock Regional Water Quality Control Facility, the Ceres Wastewater Treatment Plant, the Hughson Wastewater Treatment Facility, and the Delhi County Water District Wastewater Treatment Facility.

Solid Waste

During construction, solid waste could be generated by the PMAs implemented under the Turlock Subbasin GSP, in the form of domestic waste, cleared vegetation, excavation spoils, and sedimentation sludge from dewatering of wet well excavations. Domestic waste, cleared vegetation, and any spoils/sludge that could not be reused on-site could be hauled to the Fink Road Landfill, the only active solid waste landfill in Stanislaus County. The landfill has a remaining capacity of approximately 7.2 million cubic yards out of a total maximum permitted capacity of 14.6 million cubic yards. The landfill is projected to reach capacity and close in December 2023 (CalRecycle 2022). Depending on the PMA location, the Highway 59 Disposal Site Landfill in Merced County may also be used as a disposal site.

In lieu of using the landfill, contractors could dispose of solid waste to one of several large-volume transfer/processing facilities in Stanislaus County, including Turlock Transfer; Covanta Stanislaus, Inc.; Gilton Resource Recovery/Transfer Facility; and Bertolotti Transfer and Recycling Center.

Energy

Several of the water providers, including TID and MID, also provide electrical service. TID provides electricity to the city of Turlock. Power for construction activities would most likely be provided by TID or Pacific Gas and Electric Company, or by portable generators or generators that are integral to the equipment (e.g., pumps, air compressors), where necessary.

Public Services

Fire Protection

Several fire departments within the Turlock Subbasin coordinate to provide structural and wildland firefighting as well as hazardous materials mitigation, emergency medical services, and technical rescue services. These include the Stanislaus Consolidated Fire Protection District, City of Ceres Fire Department, City of Turlock Fire Department, and Denair Fire Department. Stations located throughout the Turlock Subbasin would provide service, depending on the location of the project or management action within their jurisdiction.

Police Protection

Several law enforcement agencies serve urban and rural communities across the Turlock Subbasin. These include the Stanislaus and Merced County sheriff's departments and the City of Turlock Police Department.

Schools

School districts within the Turlock Subbasin include the Turlock Unified, Hughson Unified, Waterford Unified, and Ceres Unified school districts.

Parks

The Turlock Subbasin study area has several regional, neighborhood, community, and off-highway vehicle parks. Fox Grove Regional Park and Ceres River Bluff Regional Park along the Tuolumne River and Henderson Park along the Merced River provide a variety of recreation amenities including sports fields, playgrounds, picnic areas, and parking.

Other Public Facilities

The nearest hospitals to the Turlock Subbasin study area located in Modesto and Turlock. Libraries in the subbasin area are the Empire, Hughson, Ceres, Keyes, Denair, and Turlock public libraries.

3.19.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to utilities and service systems, and to public services. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

Clean Water Act

The Federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act (CWA), established the institutional structure for the U.S. Environmental Protection Agency (USEPA) to regulate discharges of pollutants into waters of the United States, establish water quality standards, conduct planning studies, and provide funding for specific grant projects. Congress has amended the CWA several times since 1972.

USEPA has provided most states with the authority to administer many of the provisions of the CWA. In California, the State Water Resources Control Board (State Water Board) has been designated by USEPA to develop and enforce water quality objectives and implementation plans. The State Water Board has delegated the specific responsibilities for the development and enforcement actions to the regional water quality control boards (regional water boards).

Water quality criteria are designed to protect beneficial uses. Ambient surface water quality may be judged against national and state water quality criteria and specific numeric and narrative objectives of the water quality control plan (basin plan). Each regional water board has established its own basin plan, which contains regulations meant to control the discharge of waste and other controllable factors that affect the quality of waters of the state within each region’s boundaries.

CWA Section 303(d) requires states, territories, and authorized tribes to develop a list of water quality–impaired segments of waterways and other water bodies under their jurisdiction. The law requires that the jurisdictions establish priority rankings of waters on the list and develop action plans, or *total maximum daily loads*, to improve water quality.

CWA Section 402 established the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point-source discharges of pollutants into waters of the United States. (USEPA defines a *point source* as “any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or factory smokestack.”) An NPDES permit sets specific discharge limits for point sources that discharge pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. Typically, regional water boards issue NPDES permits for periods of 5 years.

Safe Drinking Water Act

The Safe Drinking Water Act, which was enacted to protect the quality of drinking water in the United States, authorizes USEPA to do all of the following:

- Establish minimum standards to protect tap water.
- Require all owners and operators of public water systems to comply with health-related standards.
- Establish minimum standards for state programs to protect underground sources of drinking water.

Under the Safe Drinking Water Act, state governments can be authorized to implement rules established by USEPA.

Resource Conservation and Recovery Act

Subtitle D of the Resource Conservation and Recovery Act (United States Code Title 42, Section 6901 et seq.) contains regulations for municipal solid waste landfills and requires states to implement their own permitting programs incorporating the federal landfill criteria. The federal regulations address the location, operation, design, groundwater monitoring, and closure of landfills. USEPA's waste management regulations are listed in Volume 40, Parts 239–282 of the Code of Federal Regulations. Resource Conservation and Recovery Act Subtitle D is implemented by Title 27 of the Public Resources Code, approved by USEPA.

State

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) established the State Water Board and divided the state into nine regions, each overseen by a regional water board. The State Water Board holds authority over statewide water resources allocation and water quality protection. The State Water Board allocates water rights, adjudicates water right disputes, develops statewide water protection plans, establishes water quality standards, and guides the nine regional water boards. The regional water boards have primary responsibility for coordinating and controlling water quality within their respective jurisdictional boundaries. Under the Porter-Cologne Act, *water quality objectives* are limits or levels of water quality constituents or characteristics established for the protection of beneficial uses.

The Porter-Cologne Act requires the regional water boards to establish water quality objectives, while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Designated beneficial uses, together with the corresponding water quality objectives, and an antidegradation policy also constitute water quality standards under the federal CWA. The water quality objectives provide requirements for water quality control. The Turlock Subbasin is located within the jurisdiction of the Central Valley Regional Water Board.

For purposes of the PMAs implemented under the Turlock Subbasin GSP, should USACE determine that only nonfederal waters are present in the area of a project or management action, no federal CWA permit would be required. However, regardless of federal jurisdiction, a permit, or waste discharge requirements (WDRs), would be required for impacts on any waters of the state. The WDRs would be issued by the Central Valley Regional Water Board. Under the Porter-Cologne Act, discharges to all waters of the state, including all wetlands and other waters of the state (including but not limited to isolated wetlands), are subject to state regulation.

A discharger whose project would disturb 1 or more acres of soil, or would disturb less than 1 acre but would be part of a larger common plan of development that in total would disturb 1 or more acres, must obtain coverage under the Construction General Permit (Order No. 2009-009-DWQ). Construction activity subject to this permit includes clearing, grading, grubbing, and disturbances to the ground such as stockpiling or excavation; however, it does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a storm water pollution prevention plan.

Limited Threat General Order No. R5-2022-0006 applies to discharges of limited-threat wastewater to waters of the United States for clean or relatively pollutant-free wastewaters that pose little or no threat to water quality, such as well development water, construction dewatering, pipeline/well testing, and water supply systems.

California Public Utilities Commission

The California Public Utilities Commission regulates privately owned water, energy, and telecommunications utilities. The commission is also responsible for safety enforcement, which includes investigating accidents occurring on the property of any public utility. The California Public Utilities Commission's Division of Ratepayer Advocates has a statutory mandate to obtain the lowest possible utility rates for service consistent with safe and reliable service levels.

State Water Resources Control Board, Division of Drinking Water

The State Water Board's Division of Drinking Water (DDW) regulates public water systems, oversees water recycling projects, permits water treatment devices, supports and promotes water system security, and performs a number of other functions. The DDW consists of three branches: The Northern California Field Operations Branch, the Southern California Field Operations Branch, and the Program Management Branch. The Northern California and Southern California field operations branches are responsible for enforcing the federal and California Safe Drinking Water Acts and conducting regulatory oversight of public water systems in California. In this undertaking, staff members perform field inspections, issue operating permits, review plans and specifications for new facilities, take enforcement actions for noncompliance with laws and regulations, review water quality monitoring results, and support and promote water system security. The Field Operations Branches also participate in funding infrastructure improvements, conducting source water assessments, overseeing water recycling projects, and promoting public water systems in drought preparation and water conservation.

Integrated Waste Management Act (Assembly Bill 939)

The regulations affecting solid waste disposal in California can be found in Title 14 of the California Public Resources Code, the Integrated Waste Management Act. Originally enacted in 1989 through Assembly Bill (AB) 939, the law is designed to increase the life of landfills by requiring diversion of solid waste from landfills in the state and conservation of other resources through increased recycling programs and incentives.

AB 939 requires counties to prepare integrated waste management plans to implement landfill diversion goals, and requires cities and counties to prepare and adopt source reduction and recycling elements. These elements must establish a program for managing solid waste generated within the city's or county's jurisdiction. Each source reduction and recycling element must include, but is not limited to, all of the following components for solid waste generated within the plan's jurisdictional area:

- Waste characterization
- Source reduction
- Recycling
- Composting
- Solid waste facility capacity
- Education and public information
- Funding
- Special waste

Source reduction and recycling element programs are designed to achieve landfill diversion goals by encouraging recycling in the manufacture, purchase, and use of recycled products. AB 939 also requires California cities to implement plans designed to divert the total solid waste generated within each jurisdiction by 50 percent, based on a base year of 2000. The diversion rate is adjusted annually for population and economic growth when calculating the percentage achieved in a particular jurisdiction.

Public Resources Code Section 41780

The California Legislature set a policy goal that not less than 75 percent of solid waste generated in the state would be source reduced, recycled, or composted beginning by January 1, 2020. A 50 percent diversion rate is enforced for local jurisdictions.

Assembly Bill 1220

The California Department of Resources Recycling and Recovery (CalRecycle) and the State Water Board completed parallel rulemaking as a result of AB 1220 (Chapter 656, Statutes of 1993). AB 1220 required clarification of the roles and responsibilities of CalRecycle and the State Water Board, the regional water boards, and CalRecycle's local enforcement agencies in regulating solid waste disposal sites. The approved regulations in California Code of Regulations (CCR) Title 27 combine the prior disposal site/landfill regulations of CalRecycle and the State Water Board, which were maintained in CCR Title 14 and CCR Title 23, Chapter 15 (which contains requirements for disposal of hazardous waste).

The purpose of CalRecycle's regulatory standards is to protect public health and safety and the environment. The regulations apply to active and inactive disposal sites, including facilities or equipment used there. These standards clarify that the local enforcement agency has primary responsibility for enforcing the state's minimum standards, working in cooperation with the regional water board or other oversight agencies.

The CCR Title 27 regulations also include the following operating criteria and requirements for landfills and disposal sites:

- Sufficient materials to cover waste to prevent a threat to human health and the environment.
- Proper handling of waste and the equipment needs of solid waste facilities.
- Control of activities on-site.
- Control of landfill gas that is made from the decomposition of wastes on-site.
- Proper operation of the site to protect the site from fire threats.

Assembly Bill 341

To reduce greenhouse gas emissions from disposal of recyclables in landfills, AB 341 requires local jurisdictions to implement commercial solid waste recycling programs. Businesses that generate 4 cubic yards or more of solid waste per week or multifamily dwellings of five units or more must arrange for recycling services. To comply with AB 341, jurisdictions' commercial recycling programs must include education, outreach, and monitoring of commercial waste generators and must report on the process to CalRecycle. Jurisdictions may enact commercial recycling ordinances to outline how the goals of AB 341 will be reached.

To comply with AB 341, businesses must arrange for collection of recyclables by self-hauling, subscribing to a franchised hauler for collection, or subscribing to a recycling service that may include mixed waste processing that yields diversion results comparable to source separation (CalRecycle 2022).

Assembly Bill 1826

To further reduce greenhouse gas emissions from disposal of organic materials in landfills, AB 1826 required certain businesses to recycle their organic waste beginning on April 1, 2016, with required recycling services dependent on the amount of solid waste generated per week. Similar to AB 341, jurisdictions must implement an organic waste recycling program that includes the education, outreach, and monitoring of businesses that must comply. *Organic waste* refers to food waste, green waste, landscaping and pruning waste, nonhazardous wood waste, and food-soiled paper that is mixed with food waste.

California Occupational Safety and Health Administration

In accordance with 8 CCR Section 1270, *Fire Prevention*, and 8 CCR Section 6773, *Fire Protection and Fire Equipment*, the California Occupational Safety and Health Administration has established minimum standards for fire suppression and emergency medical services. Among the standards are guidelines on the handling of highly combustible materials; requirements for the sizing of fire hoses; restrictions on the use of compressed air; access roads; and testing, maintenance, and use of all firefighting and emergency medical equipment.

Uniform Fire Code

The Uniform Fire Code provides regulations governing the construction, maintenance, and use of buildings. The code addresses fire department access, fire hydrants, automatic sprinkler systems, fire alarm systems, fire and explosion hazards safety, storage and use of hazardous materials, provisions for protecting and assisting fire responders, industrial processes, and many other general and specialized fire-safety requirements for new and existing buildings and the surrounding premises. The Uniform Fire Code contains specialized technical regulations related to fire and life safety. The code provides sprinkler system standards and requirements for different types of buildings, including hospitals.

Essential Services Building Seismic Safety Act

The Essential Services Building Seismic Safety Act of 1986 (California Health and Safety Code, Sections 16000–16022) applies to fire stations, police stations, and other public facilities that respond to emergencies. This law is intended to ensure that essential-services buildings can continue to serve the public after a disaster, and are designed and constructed to minimize fire hazards. In addition, these buildings and the nonstructural components vital to their operation must be able to resist, insofar as practical, the forces created by earthquakes, gravity, fire, and wind.

California Health and Safety Code

State fire regulations are set forth in Section 13000 et seq. of the California Health and Safety Code. The code includes regulations for building standards (as established in the California Building Code), fire protection and notification systems, fire protection devices such as extinguishers, smoke alarms, and fire suppression training.

Regional and Local

Stanislaus County General Plan

The Stanislaus County General Plan (2015) guides land use and development in the unincorporated portions of Stanislaus County. The following goals and policies in the Stanislaus County General Plan related to utilities and service systems and public services are relevant to implementation of the PMAs.

Conservation/Open Space Element

Goal Two: Conserve water resources and protect water quality in the County.

- ***Policy Eight*:** The County shall support efforts to develop and implement water management strategies.
- ***Policy Nine*:** The County will investigate additional sources of water for domestic use.

Goal Seven: Support efforts to minimize the disposal of solid waste through source reduction, reuse, recycle, composting, and transformation activities.

- ***Policy Twenty-Two*:** The County will support the solid waste management hierarchy established by the California Public Resources Code, Section 40051, and actively promote the goals and objectives specified in the Countywide Integrated Waste Management Plan.

Safety Element

Goal Two: Minimize the effects of hazardous conditions that might cause loss of life and property.

- ***Policy Seven*:** Adequate fire and sheriff protection shall be provided.

Merced County General Plan

The Public Services and Facilities Element of the 2030 Merced County General Plan (2013) guides land use and development in the unincorporated portions of Merced County. The following goals and policies in the Merced County General Plan related to utilities and service systems and public services are relevant to implementation of the PMAs.

Goal W-2: Ensure the adequate wastewater collection, treatment, and disposal within the County.

- ***Policy PFS-2.1: Water and Sewer Expansion (MPSP/SO).*** Encourage public sewer system operators to maintain and expand their systems to meet the development needs of the County.

- ***Policy PFS-2.2: Wastewater Treatment and Disposal Capacity (RDR/MPSP).*** Require applicants for discretionary projects located within special district boundaries to provide a "Can and Will Serve" letter or other documentation from the appropriate sewer and/or water district demonstrating the commitment of capacity prior to acceptance of the discretionary application as complete.

Goal PFS-4: Ensure the safe and efficient disposal and recycling of solid and hazardous waste generated in the County.

- ***Policy PFS-4.6: Solid Waste Reduction (SO).*** Support and promote feasible waste reduction, recycling, and composting efforts.

Goal PFS-5: Ensure the provision of adequate utilities to the residents of Merced County.

- ***Policy PFS-5.1: Adequate Utility Facilities and Services (SO).*** Encourage the provision of adequate gas and electric, communications, and telecommunications service and facilities to serve the needs of existing and future residents and businesses.
- ***Policy PFS-5.2: Utility Easements (RDR).*** Require utility easements to be obtained on individual parcels at the subdivision map approval stage to provide adequate area for installation of improvements, including sewer, water, cable-television, and telephone lines.
- ***Policy PFS-5.7: Utility System Expansion (RDR/JP).*** Coordinate with local gas and electric utility companies in the design and location, and appropriate expansion of gas and electric systems, while minimizing impacts to agriculture and minimizing noise, electromagnetic, visual, and other impacts on residents.

Goal PFS-6: Ensure the provision of timely and adequate law enforcement through proper management and staffing of the Sheriff Department in Merced County.

- ***Policy PFS-6.2: Sheriff Department Response Time Standards (SO).*** Strive to achieve and maintain appropriate Sheriff Department response times for all call priority levels to provide adequate law enforcement services for all County residents.

Goal PFS-7: Provide adequate fire and emergency medical facilities and services to protect County residents from injury and loss of life, and to protect property from fire.

- ***Policy PFS-7.1: Fire Staffing and Response Time Standards (SO).*** Strive to maintain fire department staffing levels and response times consistent with National Fire Protection Association standards.
- ***Policy PFS-7.6: Emergency Medical Service Staffing and Response Time Standards (SO).*** Strive to achieve and maintain optimum staffing levels and appropriate response times to provide adequate emergency medical services for all County residents.

City General Plans

Table 3.19-1 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

TABLE 3.19-1
CITY GENERAL PLAN POLICIES GOVERNING UTILITIES AND SERVICE SYSTEMS AND PUBLIC SERVICES WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Utilities and Service Systems and Public Services
City of Turlock	New Growth Areas and Infrastructure: Guiding Policies 3.3-a, 3.3-b, 3.3-c, 3.3-d, and 3.3-h; Safety: Guiding Policy 10.4-b; Parks, Schools and Community Facilities: Guiding Policies 4.1-a, 4.2-a, and 4.3-a
City of Modesto	Chapter 6, Community Facilities and Services, applicable goals and policies related to B. Wastewater, C. Storm Drainage, E. Public Schools, F. Police, G, Fire Protection, H. Solid Waste; Chapter 7, Environmental Resources, Open Space and Conservation, J. Public Safety
City of Ceres	Public Facilities and Services Element: Goal 4.C (Policies 4.C.1 and 4.C.6), Goal 4.D (Policy 4.D.4), Goal 4.G (Policy 4.G.1), Goal 4.H (Policy 4.H.2), Goal 4.I, Goal 4.J, and Goal 4.K
City of Hughson	Public Facilities and Services Element: Goals PSF-1 through PSF-4, Goal PSF-6 (Policies PSF 6.1 and 6.5), Goal PSF-7, Goal PSF-8 (Policy PSF-8.2), Goal PSF-9 (Policy PSF 9.2), and Goal PSF-10

SOURCE: Data compiled by Environmental Science Associates in 2022

3.19.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts on utilities and public services focuses on the potential for substantial adverse effects on existing utilities and services systems, and public services. Impacts have been evaluated in terms of how construction activities, constructed features, and operations and maintenance of those features resulting from PMAs could affect existing utilities and public services. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The assessment of utilities and public services impacts used a qualitative and conservative approach, assuming that all PMAs would be implemented. The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop (versus field) surveys, open-access databases, maps, and models. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2, *Project Description*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on utilities and service systems, and public services if it would result in:

- Construction or relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects;
- Insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years;
- A determination by the wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- A landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs and failure to comply with federal, state, and local statutes and regulations related to solid waste; or
- Substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, and other public facilities.

Issues Not Evaluated Further

As described in Section 2.1.1 in Chapter 2, *Project Description*, the objectives of the Turlock Subbasin GSP are to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. These objectives would be met by implementing the PMAs, purposefully selected to help the Turlock Subbasin achieve the sustainability goal by 2042 and avoid undesirable results over the remainder of the 50-year planning horizon. Implementation of the PMAs assumes a reliable water supply.

Recognizing that water supply availability could be affected by climate change or regulatory requirements, the PMAs would be implemented using adaptive management (see Appendix A, *Turlock Subbasin GSP*, Chapter 8). Therefore, implementing the PMAs could not result in insufficient water supplies available to serve the projects during normal, dry, and multiple dry years, as the PMAs would not be implemented if a reliable water source were not available. In addition, as described in Section 3.15, *Population and Housing*, the PMAs would not include the development of housing or commercial structures and/or induce substantial population growth that would increase demand for water supply during normal, dry, and multiple dry years. Therefore, no adverse impact would occur, and issues related to insufficient water supplies available during normal, dry and multiple dry years are not discussed further.

Construction of new wastewater systems (e.g., collection, treatment, and discharge facilities) or expansion of existing systems is prompted by increased customer demand. Such increased demand typically results from new land development—such as development that causes land use to transition from rural to more urban—or population growth. PMAs implemented under the

Turlock Subbasin GSP would not develop occupied structures that would cause an increase in demand for wastewater treatment. Although most direct and in-lieu recharge projects use surface water or stormwater to recharge the groundwater system, some projects may use recycled water that would be diverted from urban areas for recharge in rural areas. As described above, implementation of PMAs assumes a reliable water source. Therefore, if adequate capacity to serve the project's demand did not exist, the project would not be implemented (or subject to adaptive management).

Construction crews are generally available in existing population centers and would not be likely to relocate when assigned to a new construction site (as discussed further in Section 3.15, *Population and Housing*). Therefore, construction activities would not add substantial new customer demands to existing wastewater systems. For PMAs occurring in urban/municipal settings, the relatively small amount of wastewater temporarily generated by construction activities would not exceed any requirements or require the construction of new or expansion of existing wastewater treatment facilities. Therefore, no adverse impact would occur, and issues related to new or expanded wastewater treatment facilities are not discussed further.

Impacts and Mitigation Measures

Table 3.19-2 summarizes the impact conclusions presented in this section for easy reference.

TABLE 3.19-2
SUMMARY OF IMPACT CONCLUSIONS—UTILITIES AND SERVICE SYSTEMS AND PUBLIC SERVICES

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
UTIL-1: Implementing PMAs under the Turlock Subbasin GSP could result in the construction or relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.	PSU	LTS
UTIL-2: Implementing PMAs under the Turlock Subbasin GSP could result in a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs and fail to comply with federal, state, and local statutes and regulations related to solid waste.	LTS	LTS
UTIL-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, and other public facilities.	LTS	LTS

NOTES: LTS = less than significant; PSU = potentially significant and unavoidable

SOURCE: Data compiled by Environmental Science Associates in 2022.

Impact UTIL-1: Implementing PMAs under the Turlock Subbasin GSP could result in the construction or relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.

Effects of Construction Activities, Effects of Constructed Features, and Operations and Maintenance of Those Features

The objective of the PMAs to be implemented under the Turlock Subbasin GSP is to enhance regional groundwater sustainability. Construction activities for PMAs may require constructing new water or expanded water facilities, stormwater drainage, and/or electric power facilities; construction of natural gas and/or telecommunication facilities is not anticipated. Relocation of these facilities may occur to accommodate construction. However, the extent of construction or relocation of stormwater drainage, utilities, or water conveyance facilities would depend on the size, location, and nature of the PMAs. Stormwater drainage features, utilities, or water conveyance facilities would be constructed or relocated for several types of PMAs:

- Direct recharge projects that expand existing or create new recharge infrastructure (e.g., recharge basins, storm drain basins, French drains).
- In-lieu recharge projects that connect groundwater-reliant communities to surface water sources via pipelines.
- Conservation management actions that replace existing meters with advanced metering systems.

Should any stormwater drainage features, utilities, or water conveyance facilities be located near or in the footprint of a project or management action, relocating these facilities could cause significant environmental effects. Similarly, if the footprint of the project or management action were located in or near a sensitive area, facility construction could cause significant environmental effects. The other resource sections in Chapter 3 of this Draft PEIR analyze the types and range of potential construction-related environmental effects on other resource areas (e.g., effects on cultural or tribal cultural resources, special-status species and habitat, erosion, water quality, air quality). Once the specific characteristics and locations of PMAs are known, proponents would evaluate the PMAs’ footprints against existing stormwater drainage features, utilities, or water conveyance facilities to determine the extent to which implementation would result in relocation and/or construction. This would determine whether the CEQA significance determination of significant and unavoidable applies, and would have the potential to reduce the impact to less than significant.

However, because significant and unavoidable impacts would occur for some of these resource areas, this impact would be **potentially significant and unavoidable**.

Impact UTIL-2: Implementing PMAs under the Turlock Subbasin GSP could result in a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs and fail to comply with federal, state, and local statutes and regulations related to solid waste.

Effects of Construction Activities

Construction activities for PMAs implemented under the Turlock Subbasin GSP could temporarily increase the amount of solid waste hauled to local landfills. The magnitude of the increase in solid waste generation would depend on the size, number, location, and nature of the projects, and their ability to recycle, reuse, or dispose of materials on-site.

Several types of PMAs implemented under the Turlock Subbasin GSP would involve earthmoving activities that could generate large amounts of construction waste (e.g., organic materials from borrow areas and construction sites, excavated materials, and soil/debris not suitable for stockpiling). Examples of such PMAs include construction of water conveyance and delivery infrastructure, installation of aquifer storage and recovery and/or injection wells, and expansion of existing or creation of new recharge infrastructure.

The materials generated would be hauled off-site to landfills, recycled, or sold for commercial use (see Section 2.3.4 in Chapter 2, *Project Description*). Thus, construction waste generation is unlikely to cause local landfills to exceed their permitted capacity, or to fail to comply with federal, state, and local regulations related to solid waste. Once the specific characteristics and locations of PMAs are known, proponents would quantify the anticipated volume of solid waste to confirm that sufficient permitted capacity exists and the volume of solid waste generated complies with relevant regulations. Impacts related to solid waste disposal needs and compliance would be **less than significant**.

Effects of Construction Features and Operations and Maintenance of those Features

Depending on the nature of the PMAs implemented under the Turlock Subbasin GSP, operations of PMAs may involve maintenance activities that produce solid waste. For example, as part of routine maintenance, accumulated sediment may be removed from around intakes and/or accumulated silt and vegetation may be removed from recharge basins. As mentioned above, debris generated during operations and maintenance would be disposed of via methods that would vary by the type of material. Furthermore, the magnitude of increased generation of solid waste would depend on the size, number, location, and nature of PMAs.

The amount of solid waste likely to be generated by these uses is anticipated to small relative to landfill capacity. Once the specific characteristics and locations of PMAs are known, proponents would quantify the anticipated volume of solid waste to confirm that sufficient permitted capacity exists and that solid waste generation complies with relevant regulations. Impacts related to solid waste disposal needs and compliance would be **less than significant**.

Impact UTIL-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, and other public facilities.

The need for new or altered police and fire protection services, emergency medical facilities, and school and library facilities is prompted by increased demand, typically a result of new land development or population growth. Construction activities for PMAs implemented under the Turlock Subbasin GSP would not include new land development or occupied structures that would increase population and add new demands for public services. However, potential impacts on public services during construction, operations, and maintenance activities for the types of PMAs implemented under the Turlock Subbasin GSP are discussed below.

Effects of Construction Activities

Construction activities for implementation of PMAs under the Turlock Subbasin GSP would not include the construction of new or modified fire or police protection facilities, schools, or other public facilities and would not increase population or add new demands for public services. Construction activities could result in a temporary increase in the need for construction crews. However, any increase in the regional population resulting from construction of PMAs would be negligible because the number of workers needed for any given project would be a tiny fraction of the overall population of urban and suburban areas, and thus a less than measurable increase in demand for housing. In rural areas, the increase in the number of residents may create local demand for housing; however, such areas typically do not have the housing shortages associated with urban areas, and the demand would typically be temporary. Any increases in demand for law enforcement, fire protection, and medical services related to this small change in population in any one county are expected to be negligible.

Construction activities for implementation of PMAs under the Turlock Subbasin GSP could temporarily increase response times for fire protection, law enforcement, and emergency medical services because the transportation and relocation of construction materials could increase traffic levels. However, the extent of construction associated with the project or management action (i.e., the type of feature, location, and other specifics) that would be implemented—which would factor into the potential for increased response times—is not known at this time. Increases in demand for public services (e.g., from jobsite accidents and jobsite security during construction) related to future PMAs would be temporary or short term, and the PMAs likely would not create a need for new or altered public service facilities. Thus, this impact would be **less than significant**.

Effects of Constructed Features and Operations and Maintenance of those Features

Maintenance and monitoring activities would be required to support the operations of PMAs implemented under the Turlock Subbasin GSP. However, routine maintenance activities would not result in substantially adverse physical traffic impacts that would lead to increased response times for fire protection, police protection, schools, and other public facilities. Therefore, operations and maintenance activities would not result in substantial adverse physical impacts associated with construction of new or modified fire or police protection facilities, schools, or other public facilities. This impact would be **less than significant**.

3.20 Wildfire

3.20.1 Introduction

This section describes wildfire potential in and the characteristics of the study area and evaluates the potential for the types of projects and management actions (PMAs) to be implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) to exacerbate the potential for wildfire. (See Section 2.2, *Projects and Management Actions to Be Implemented under the Turlock Subbasin Groundwater Sustainability Plan,* in Chapter 2.) As discussed below, potential impacts include substantial impairment of an adopted emergency response plan or emergency evacuation plan; exacerbation of wildfire risks, with resulting exposure of project occupants to wildfire-related pollutant concentrations; the need to install or maintain infrastructure potentially exacerbating fire risk; and exposure of people or structures to significant risks from runoff, post-fire slope instability, or drainage changes.

No comments specifically addressing wildfire were received in response to the notice of preparation (NOP). See Appendix B for NOP comment letters.

3.20.2 Environmental Setting

This section describes the existing wildfire potential that could be affected by the types of PMAs that would be implemented under the Turlock Subbasin GSP. The area of analysis covers the Turlock Subbasin, which encompasses portions of Stanislaus and Merced counties.

Fire Protection Services

Within the Turlock Subbasin, several fire departments coordinate to provide structural and wildland firefighting, hazardous-materials mitigation, emergency medical services, and technical rescue services. These departments include the Stanislaus Consolidated Fire Protection District, City of Ceres Fire Department, City of Turlock Fire Department, and Denair Fire Department. Stations are located throughout the Turlock Subbasin and would provide service depending on the location of the project or management action within their jurisdiction.

Wildfire Hazard Zones Designated by the California Department of Forestry and Fire Protection

The Fire and Resource Assessment Program (FRAP) of the California Department of Forestry and Fire Protection (CAL FIRE) has published draft Fire Hazard Severity Zone (FHSZ) maps for both Local Responsibility Areas and State Responsibility Areas. The maps classify lands into FHSZs based on a hazard scoring system that accounts for localized factors such as fuel loading, slope, fire weather, and other relevant considerations, including areas where winds have been identified as a major cause of wildfire spread.

State Responsibility Areas are the official boundaries where the State of California (through CAL FIRE) has the primary legal and financial responsibility for the prevention and suppression of wildland fires. CAL FIRE provides a basic level of wildland fire prevention and protection services for these designated areas (CAL FIRE 2022). *Local Responsibility Areas* include incorporated cities and densely populated areas. Fire protection in these areas is typically provided by city fire departments, fire protection districts, and counties, and by CAL FIRE under contract to local governments (CAL FIRE 2022).

The Fire Hazard Severity Zone maps assign rating classifications of either “moderate,” “high,” or “very high” to fire hazards. In 2008, through a local review process, CAL FIRE determined that Stanislaus and Merced counties have no Very High Fire Hazard Severity Zones (VHFHSZs); thus, areas within the boundaries of the Turlock Subbasin are not within a VHFHSZ (CAL FIRE 2008). Although there are no VHFHSZs in Stanislaus and Merced counties, areas of moderate FHSZs exist throughout both counties (CAL FIRE 2007a, 2007b).

Emergency Response

In Stanislaus County, the Stanislaus County Emergency Operations Plan (EOP) (Stanislaus County 2021) and Local Hazard Mitigation Plan (Stanislaus County 2017) are the documents used to establish emergency procedures. In Merced County, the guiding documents for emergency procedures are the Merced County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) (Merced County 2021) and the Merced County EOP (Merced County 2017).

Neither county’s documents delineate specific roads or highways that are to be used during an emergency evacuation. However, the Stanislaus County EOP and Merced County MJHMP mention that the counties’ major roads and highways are likely to be used as evacuation routes in the event of an emergency evacuation. The major highways that run through both counties are State Routes 33, 59, 99, 108, 120, 132, 140, 165, and 219 and Interstate 5 (Stanislaus County 2021; Merced County 2021).

3.20.3 Regulatory Setting

This section discusses federal, state, and regional and local plans, policies, regulations, laws, and ordinances pertaining to wildfire. Implementation of any project or management action may be subject to the laws and regulations listed below, and to other local plans, policies, and ordinances, depending on the project location.

Federal

No federal laws, regulations, or policies related to wildfire apply to the PMAs that would be implemented under the Turlock Basin GSP.

State

2018 Strategic Fire Plan for California

Developed by the Board of Forestry and Fire Protection, the Strategic Fire Plan outlines goals and objectives to implement CAL FIRE’s overall policy direction and vision. The 2018 plan demonstrates CAL FIRE's two areas of focus: (1) fire prevention and suppression activities to protect lives, property, and ecosystem services; and (2) natural resource management to maintain the state's forests as a resilient carbon sink to meet California's climate change goals and serve as important habitat for adaptation and mitigation. Unit plans are developed and updated to implement the programs and goals of the 2018 Strategic Fire Plan. Through the Strategic Fire Plan, CAL FIRE implements and enforces the policies and regulations set forth by the Board of Forestry and Fire Protection and carries forth the mandates of California's Governor and Legislature.

California Emergency Response Plan

Under the Emergency Services Act (Government Code Section 8550 et seq.), California has developed a plan for coordinating emergency services provided by federal, state, and local governmental agencies and private persons. Response to hazardous materials incidents is one part of the California Emergency Response Plan. The Governor's Office of Emergency Services administers the plan, coordinating the responses of other agencies, including the U.S. Environmental Protection Agency, California Highway Patrol, California Department of Fish and Wildlife, Regional Water Quality Control Boards, local air districts, and local agencies. The California Emergency Response Plan defines the policies, concepts, and general protocols for implementing the California Standardized Emergency Management System, an emergency management protocol that agencies in California must follow during multiagency response efforts whenever state agencies are involved.

Fire Protection in California Fire Code and Public Resources Code

Created by the California Buildings Standards Commission and based on the International Fire Code, the California Fire Code (California Code of Regulations [CCR] Title 24, Chapter 9) regulates use, handling, and storage requirements for hazardous materials at fixed facilities. Similar to the International Fire Code, the California Fire Code and the California Building Code use a hazards classification system to determine the appropriate measures to incorporate to protect life and property.

The California Public Resources Code includes fire safety provisions that apply to State Responsibility Areas during the time of year that is designated as having hazardous fire conditions. During the fire hazard season, these regulations restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors on equipment that has an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire-suppression equipment that must be provided on-site for various types of work in fire-prone areas. Additional codes require that any person who owns, controls, operates, or maintains any electrical transmission or distribution line must maintain a firebreak clearing around and adjacent to any pole, tower, and conductors that carry electric current as specified in Public Resources Code Sections 4292 and 4293. Section 4292 requires maintaining a 10-foot clearance around the base of poles, which must be cleared of all flammable vegetation. The State's Fire Prevention Standards for Electric Utilities (14 CCR Sections 1250–1258) provide specific exemptions from clearance standards for electric poles and tower firebreaks and electric conductors and specifies when and where standards apply.

California Occupational Safety and Health Administration

In accordance with 8 CCR Section 1270, Fire Prevention, and 8 CCR Section 6773, Fire Protection and Fire Equipment, the California Occupational Safety and Health Administration has established minimum standards for fire suppression and emergency medical services. Among the standards are guidelines for the handling of highly combustible materials; requirements for the sizing of fire hoses; restrictions on the use of compressed air; access roads; and testing, maintenance, and use of all firefighting and emergency medical equipment.

California Health and Safety Code

State fire regulations are set forth in Section 13000 et seq. of the California Health and Safety Code. The code includes regulations for building standards (as established in the California Building Code), fire protection and notification systems, fire protection devices such as extinguishers, smoke alarms, and fire suppression training.

Uniform Fire Code

The Uniform Fire Code provides regulations governing the construction, maintenance, and use of buildings. The code addresses fire department access, fire hydrants, automatic sprinkler systems, fire alarm systems, fire and explosion hazards safety, storage and use of hazardous materials, provisions for protecting and assisting fire responders, industrial processes, and many other general and specialized fire-safety requirements for new and existing buildings and the surrounding premises. The Uniform Fire Code contains specialized technical regulations related to fire and life safety. The code provides sprinkler system standards and requirements for different types of buildings, including hospitals.

Regional and Local

Stanislaus County General Plan

The Stanislaus County General Plan includes the following goals and policies related to wildfire that are relevant to implementation of the PMAs:

> **Goal 2:** Minimize the effects of hazardous conditions that might cause loss of life and property.

- ***Policy 6*:** All new development shall be designed to reduce safety and health hazards.
- ***Policy 7*:** Adequate fire and sheriff protection shall be provided.
- ***Policy 8*:** Roads shall be maintained for the safety of travelers.
- ***Policy 14*:** The County will continue to enforce state-mandated structural Health and Safety Codes, including but not limited to the California Building Code, the International Property Maintenance Code, the California Fire Code, the California Plumbing Code, California Electric Code, and Title 24, Parts 1–9.

2030 Merced County General Plan

The 2030 Merced County General Plan includes the following goals and policies related to wildfire that are relevant to implementation of the PMAs:

> **Goal PFS-7:** Provide adequate fire and emergency medical facilities and services to protect County residents from injury and loss of life, and to protect property from fire.
>
> - ***Policy PFS-7.1: Fire Staffing and Response Time Standards (SO):*** Strive to maintain fire department staffing levels and response times consistent with National Fire Protection Association standards.
> - ***Policy PFS-7.6: Emergency Medical Service Staffing and Response Time Standards (SO):*** Strive to achieve and maintain optimum staffing levels and appropriate response times to provide adequate emergency medical services for all County residents.
> - ***Policy PFS-7.9: Fire Safety Standard Compliance (RDR):*** Ensure that all proposed developments are reviewed for compliance with fire safety standards by responsible local fire agencies per the Uniform Fire Code and other State and local ordinances.
>
> **Goal HS-1:** Minimize the exposure of County residents and public and private property to the effects of urban and wildland fires.
>
> - ***Policy HS-3.5: Vegetation Clear Zones (RDR):*** Encourage and maintain vegetation "clear zones" around new and existing residential structures in areas designated as having a high or extreme fire hazard severity and assist property owners in identifying how the clear zones should be maintained.
> - ***Policy HS-3.9: Building Permit Review:*** Require all buildings and structures to be constructed to fire safety standards prescribed in the Building Code and County Fire Prevention Ordinance. Where minimum fire flow water pressure is not available to satisfy Fire Department standards, alternate fire protection measures shall be identified and incorporated into the development.
> - ***Policy HS-3.13: Uniform Fire Code (RDR):*** Require the Uniform Fire Code to be used as a guide for project-level fire prevention and suppression activities, including site access, water supply, fire protection systems, and the use of fire-resistant building materials.

City General Plans

Table 3.20-1 summarizes key policies identified in the city general plans within the Turlock Subbasin relevant to implementation of the PMAs.

Turlock Irrigation District Wildfire Mitigation Plan

Per Senate Bill 901, the TID prepared a Wildfire Mitigation Plan that describes how electrical lines and equipment are constructed, maintained, and operated in a manner that minimizes the risk of wildfire. The Wildfire Mitigation Plan builds upon TID's standard requirements for design, construction, and maintenance in the Fire Zones to reduce wildfire risk (TID 2022).

TABLE 3.20-1
CITY GENERAL PLAN POLICIES GOVERNING WILDFIRE WITHIN THE TURLOCK SUBBASIN

General Plan	Policies Governing Wildfire
City of Turlock	Chapter 10, Safety: Policies 10.4-a, 10.4-g, and 10.4-n
City of Modesto	Chapter 7, Environmental Resources, Open Space and Conservation, M. Fire Hazards, Policies a through c
City of Ceres	Chapter 5, Health and Safety: Policies 5.K.1 through 5.K.3
City of Hughson	Chapter 6, Safety Element: Policies PSF-2.1 through PSF-2.5

SOURCE: Data compiled by Environmental Science Associates in 2022

3.20.4 Environmental Impact Analysis

Analysis Methodology

The analysis of environmental impacts related to wildfire focuses on the potential for a PMA to substantially impair an emergency response or evacuation plan, to expose people to pollutant concentrations from a wildfire, or to install infrastructure that may exacerbate fire risk.

Wildfire impacts from the types of PMAs implemented under the Turlock Subbasin GSP have been evaluated in terms of how typical construction and operation could affect the risk of wildfire. However, the precise locations and detailed characteristics of potential future PMAs are yet to be determined. Therefore, this analysis focuses on reasonably foreseeable changes caused by the types of PMAs that might occur in the future, consistent with the level of detail appropriate for a program-level analysis.

The following factors were considered when determining the extent and implications of potential wildfire risk:

- CAL FIRE Fire and Resource Assessment Program maps that depict areas of VHFHSZs to determine their presence (if any) within the Turlock Subbasin's boundaries.
- The locations of any established emergency evacuation routes.
- Various existing laws, regulations, and policies for fire prevention.

Permanent impacts are those that would continue through the life of a project as a result of the environmental conditions caused by PMAs implemented under the Turlock Subbasin GSP (e.g., operational activities). Temporary impacts are those that would be inherently temporary (e.g., construction-related activities). Impacts are not presented separately for direct and in-lieu recharge projects and water conservation management actions because the impacts did not vary based on the type of PMA.

The impact analysis relies on the use of existing quantitative and qualitative data, including existing reports, desktop surveys, open-access databases, maps, and models. The assessment also involved reviewing information regarding example projects similar to the types of PMAs identified in Section 2.2 of Chapter 2, *Project Description*.

Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines. A project or management action implemented under the Turlock Subbasin GSP would result in a significant impact on wildfire if it would, if located in or near State Responsibility Areas or lands classified as VHFHSZs:

- Substantially impair an adopted emergency response plan or emergency evacuation plan;
- Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;
- Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment; or
- Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

Impacts and Mitigation Measures

Table 3.20-2 summarizes the impact conclusions presented in this section for easy reference. No mitigation is required.

TABLE 3.20-2
SUMMARY OF IMPACT CONCLUSIONS—WILDFIRE

Impact Statement	Construction Activities	Constructed Facilities and Operations and Maintenance
WILD-1: Implementing PMAs under the Turlock Subbasin GSP could substantially impair an adopted emergency response plan or emergency evacuation plan.	LTS	LTS
WILD-2: Implementing PMAs under the Turlock Subbasin GSP could, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.	LTS	LTS
WILD-3: Implementing PMAs under the Turlock Subbasin GSP could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.	LTS	LTS
WILD-4: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	LTS	LTS

NOTE: LTS = less than significant

SOURCE: Data compiled by Environmental Science Associates in 2022

Impact WILD-1: Implementing PMAs under the Turlock Subbasin GSP could substantially impair an adopted emergency response plan or emergency evacuation plan.

Effects of Construction Activities, Constructed Features and Operations, and Maintenance of Those Features

As discussed in Section 3.10, *Hazards and Hazardous Materials*, the Stanislaus County EOP and the Merced County MJHMP state that the major arterial highways that run through both counties would likely be used as evacuation routes in the event of an emergency.

As discussed previously, the PMAs implemented under the Turlock Subbasin GSP would involve the construction of various types of structures and buildings. PMAs implemented under the Turlock Subbasin GSP may require one or more road closures to divert traffic away from an active construction site or to enable the completion of in-road construction activities. If future projects were to require the closure of main roads and/or major arterial highways (which would likely be used during an emergency evacuation), traffic congestion could occur, which could otherwise impair or interfere with an emergency response/evacuation plan. This impact would be **potentially significant**.

Although road closures or road work during construction would be temporary, they could still affect the implementation of an emergency response/evacuation plan. To reduce impacts related to future traffic obstructions to a less-than-significant level, implementation of Mitigation Measure TRANS-1, Prepare and Implement a Construction Traffic Management Plan, would be required. Mitigation Measure TRANS-1 would require the proponent(s) of a project or management action (or their contractors) to prepare and implement a construction traffic management plan, which would reduce potential interference with local emergency response plans, reduce potential traffic safety hazards, and ensure adequate access for emergency responders.

> **Mitigation Measure TRANS-1: Prepare and Implement a Construction Traffic Management Plan.** (See Section 3.17, *Transportation*, for a full description of this mitigation measure.)

Implementing Mitigation Measure TRANS-1 would reduce this potentially significant temporary construction impact related to conflict with an emergency response or evacuation plan to a **less-than-significant** level.

Impact WILD-2: Implementing PMAs under the Turlock Subbasin GSP could, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of Those Features

As discussed in Section 3.20.2, *Environmental Setting*, in 2008 CAL FIRE determined through a review process that Stanislaus and Merced counties do not have any lands that are classified as VHFHSZs. Mapping does indicate the presence of scattered areas of moderate fire hazard potential. As also discussed in Section 3.20.2, when determining VHFHSZs, CAL FIRE considers localized factors such as fuel loading, slope, fire weather, and other relevant considerations, including areas where winds have been identified as a major cause of wildfire spread.

Because CAL FIRE has accounted for slope, prevailing winds, and other factors that exacerbate wildfire risks when developing the FHSZ maps and has determined that Stanislaus and Merced counties do not have VHFHSZs, it can be concluded that these conditions are not an issue. These conditions are not prevalent within the Turlock Subbasin's boundaries; therefore, implementing PMAs under the Turlock Subbasin GSP would not expose people to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.

Further, all new developments proposed under the Turlock Subbasin GSP would be subject to the laws and regulations discussed in Section 3.20.3, *Regulatory Setting*. With compliance with existing laws and regulations established to prevent and control the spread of wildfire, and the goals and policies in the Stanislaus and Merced counties general plans, this impact would be **less than significant**.

Impact WILD-3: Implementing PMAs under the Turlock Subbasin GSP could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or may result in temporary or ongoing impacts to the environment.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of Those Features

PMAs implemented under the Turlock Subbasin GSP could include features such as injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, water storage tanks, and irrigation basins to enable deliveries of surface water to drip/micro systems.

Although PMAs would include the installation of new infrastructure within the Turlock Subbasin's boundaries, none of this new infrastructure would be expected to exacerbate fire risk, as the PMAs would be implemented to address groundwater sustainability. Further, the Turlock

Subbasin is not in an area that has been mapped by CAL FIRE as a VHFHSZ. Because the area is not within a VHFHSZ and the new infrastructure would not exacerbate the fire risk, this impact would be **less than significant**.

Impact WILD-4: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

Effects of Construction Activities, Constructed Features, and Operations and Maintenance of Those Features

As discussed in Section 3.8, *Geology, Soils, and Paleontological Resources*, areas within the Turlock Subbasin that are urbanized and have existing developments have very low landslide potential, as there are no steep slopes or hillsides. Additionally, based on geologic mapping, no previous or historical landslides are mapped within the Turlock Subbasin, although this does not necessarily mean that landslides cannot happen in the area. Although the area has not been mapped for landslide potential by the California Geological Survey, areas within the Turlock Subbasin where steep slopes occur could be susceptible to landslides.

As discussed in Section 3.11, *Hydrology and Water Quality*, implementation of PMAs under the Turlock Subbasin GSP could require construction activities that would temporarily change drainage patterns; however, these changes would not be expected to change surface runoff in a manner that could result in substantial erosion on- or off-site, create or increase on- or off-site flooding, exceed existing or planned stormwater drainage systems, and/or impede or redirect flood flows.

In addition, because CAL FIRE has determined that there are no VHFHSZs within the Turlock Subbasin's boundaries, the fire risk is already low. This also suggests that there are no (or few) areas of post-fire slope instability.

As described above, all future PMAs would be required to comply with the Stanislaus and Merced county fire codes, the California Building Code, and general plan policies, which would reduce the extent to which future projects could increase fire risk. Additionally, future PMAs would be subject to project-level review during which site-specific fire risks would be evaluated, and mitigation, if necessary, would be implemented to address significant impacts. Given compliance with existing laws, regulations, and general plan goals and policies, this impact would be **less than significant**.

CHAPTER 4
Cumulative Impacts

4.1 Introduction

This section describes the CEQA requirements for the analysis of cumulative impacts; the geographic scope of and timeframe for potential cumulative impacts; the projects considered and methodology used in the assessment of cumulative impacts; and the potential cumulative impacts of projects and management actions (PMAs) implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) developed from the analysis provided in the technical sections of Chapter 3, *Environmental Setting, Impacts, and Mitigation Measures*.

4.2 CEQA Requirements

The State CEQA Guidelines require that an EIR assess the cumulative impacts of a project when its incremental effect is "cumulatively considerable" (State CEQA Guidelines Section 15130). CEQA requires that an EIR analyze the cumulative impacts of a project, either by discussing the significant cumulative impacts with respect to past, current, and probable future projects within the context of the cumulative setting, or by providing a summary of projects contained in an adopted local, regional, or statewide plan or related planning document that describes or evaluates conditions contributing to the cumulative effect.

The State CEQA Guidelines Section 15355 defines "cumulative effects" as "*two or more individual effects that, when considered together, are considerable or which compound or increase other environmental impacts.*" A cumulative impact occurs from "*the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time*" (State CEQA Guidelines Section 15355[b]).

The State CEQA Guidelines identify two basic methods for establishing the cumulative environment in which the project is to be considered: the use of a list of past, present, and probable future projects (the "list approach") or the use of adopted projections from a general plan, other regional planning document, or certified EIR for such a planning document (the "plan approach"). Depending on the approach taken, the discussion of cumulative impacts should include:

- Either: (1) a list of past, present, and probable future projects producing related cumulative impacts; or (2) a summary of projects contained in an adopted general plan or similar document, or in an adopted or certified environmental document, that describes or evaluates conditions contributing to a cumulative impact.

- A discussion of the geographic scope of the area affected.
- A summary of expected environmental effects to be produced by these projects.
- Reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

This cumulative impact discussion considers projects and programs implemented under existing conditions (which includes the current effects of past projects) and reasonably foreseeable and probable future projects. Therefore, this PEIR uses the list of projects approach authorized by State CEQA Guidelines Section 15130(b)(1)(A). In this PEIR, the criterion for considering whether a project is reasonably foreseeable and probable is whether the project has been defined in adequate detail to estimate potential impacts, through the completion of either publicly available preliminary evaluations, feasibility studies, or draft environmental and engineering documents. Projects that were only in the development phase at the time this cumulative impact assessment was written, without detailed descriptions, operations criteria, or general locations, are not considered further.

As stated in Chapter 1, *Introduction*, the adoption of the Turlock Subbasin GSP does not involve construction or operation of features or other physical actions, nor does it describe specific construction methods, timing, or operational requirements by the Turlock Subbasin groundwater sustainability agencies (GSAs). However, this PEIR will allow the Turlock Subbasin GSAs to consider program-level impacts and mitigation measures and address program-wide issues and cumulative impacts. In addition, potential future proponents, the West Turlock Subbasin (WTS) GSA and East Turlock Subbasin (ETS) GSA and their members, as well as other proponents of and partners for PMAs listed in Section 1.3, will be able to rely on this PEIR for CEQA compliance pertinent to the types of PMAs to be implemented under the Turlock Subbasin GSP.

Additional PMA proponents and partners not listed in Section 1.3 may choose to implement PMAs in conformance with the GSP with the approval of the Turlock Subbasin GSAs. Implementation of PMAs would need to comply with the CEQA process and requirements outlined in Section 1.3.1, *Purpose and Use of the Program Environmental Impact Report*, and Section 1.3.2, *Determining Next Steps under CEQA*.

4.3 Geographic Scope of the Effects of the PMAs

Impacts of the implementation of PMAs under the Turlock Subbasin GSP would occur within the Turlock Subbasin, referred to as the study area. The Turlock Subbasin is a 544-square-mile (348,160-acre) area in the northern San Joaquin Valley in Stanislaus and Merced counties. The Turlock Subbasin is bounded on north by the Tuolumne River, the south by the Merced River, and the west by the San Joaquin River, all of which are included in the geographic scope. The eastern subbasin boundary is defined by crystalline basement rocks of the Sierra Nevada foothills (DWR 2006). **Table 4-1** defines the geographic scope of the effects of the types of PMAs implemented under the Turlock Subbasin for each of the resource topics addressed in this PEIR.

TABLE 4-1
GEOGRAPHIC SCOPE FOR CUMULATIVE ANALYSIS

Resource Topic	Geographic Area
Aesthetics and Visual Resources	Study area
Agriculture and Forestry Resources	Study area
Air Quality	Study area and surrounding airshed
Biological Resources	Study area
Cultural Resources	Study area
Energy	Study area
Geology, Soils, and Paleontological Resources	Study area
Greenhouse Gas Emissions	Study area
Hazards and Hazardous Materials	Study area
Hydrology and Water Quality	Study area and adjacent groundwater basins
Land Use and Planning	Study area
Mineral Resources	Study area
Noise	Study area
Population and Housing	Study area
Recreation	Study area
Transportation	Study area
Tribal Cultural Resources	Study area
Utilities and Service Systems and Public Services	Study area
Wildfire	Study area

SOURCE: Data compiled by Environmental Science Associates in 2022.

4.4 Cumulative Projects

The timeframe of past, present, and probable future projects was determined as follows:

- **Past Projects.** Past projects include those occurring prior to January 7, 2022 (the time that the PEIR's notice of preparation [NOP] was published). The influence of past activities is reflected in the baseline, which, pursuant to CEQA, reflects "existing conditions" at the time of the NOP [State CEQA Guidelines Section 15125[a]]).
- **Present Projects**. Projects are that are either under construction, have been approved for construction and operation, or are ongoing as of January 7, 2022 through the time of the PEIR process (i.e., the Group 1 project presented in Table 2-2).
- **Reasonably Foreseeable, Probable Future Projects.** Reasonably foreseeable future projects include a summary of reasonably foreseeable projects from planning documents within the subbasin (i.e., all Group 2 and 3 projects presented in Table 2-2 and management actions presented in Table 2-3).

As stated above, in this PEIR, the criterion for considering whether a project is reasonably foreseeable and probable is whether the project has been defined in adequate detail to estimate potential impacts, through the completion of either publicly available preliminary evaluations, feasibility studies, or draft environmental or engineering documents. Therefore, **Table 4-2** includes a representative sample (not an exhaustive list, but a range) of the reasonably foreseeable and probable programs and projects located within the Turlock Subbasin that could have impacts that cumulate with the impacts of the PMAs, and other programs, projects, and policies included in the cumulative impact assessment.

TABLE 4-2
SAMPLE OF PROGRAMS AND PROJECTS INCLUDED IN THE CUMULATIVE IMPACT ASSESSMENT FOR THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Program or Project Name	Proponent	Program or Project Type
Stanco Family Farms	Stanislaus County	Agriculture
The Fruit Yard Amphitheater	Stanislaus County	Development
A&R Mortuary Services	Stanislaus County	Development
Merced Biogas Pipeline Expansion Project	Merced County	Energy
Bradbury Master Plan Project	Merced County	Development
August Meadows Event Venue Project	Merced County	Development
Hillcrest Dairy Expansion Project	Merced County	Agriculture
Hilmar Biogas Cluster Project	Merced County	Energy
Martins View Jersey Dairy Expansion Project	Merced County	Agriculture
Toste Dairy Expansion Project	Merced County	Agriculture
Nunes Dairy Expansion Project	Merced County	Agriculture
Godinho Heifer Ranch Expansion Project	Merced County	Agriculture
Climate Action Plan	Merced County	Sustainability
Franklin-Beachwood Community Plan Update	Merced County	Development (Long-Range Planning)
Winton Community Plan Update	Merced County	Development (Long-Range Planning)
Jagjit Deol Truck Yard	City of Turlock	Development
Trax Food Park	City of Turlock	Development
Carson Hybrid Energy Storage	City of Turlock	Energy
Perez Industrial Park	City of Turlock	Development
Tegner Townhouses	City of Turlock	Development
Regional Surface Water Supply Project[a]	Stanislaus Regional Water Authority	Water Resources
Ceres Main Regulating Reservoir[a]	Turlock Irrigation District	Water Resources
Upland Pipeline Project[a]	Eastside Water District	Water Resources
Parkwood Subdivision Project	City of Hughson	Development
City of Hughson Farmland Preservation Program	City of Hughson	Agriculture
City of Hughson Non-Motorized Transportation Plan	City of Hughson	Transportation
Merced River Agricultural Diversion Improvement Project	Merced Irrigation District	Agriculture and Restoration
Merced River Salmonid Habitat Restoration Project – Above Henderson Park	Merced Irrigation District	Restoration

TABLE 4-2 (CONTINUED)
SAMPLE OF PROGRAMS AND PROJECTS INCLUDED IN THE CUMULATIVE IMPACT ASSESSMENT FOR THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Program or Project Name	Proponent	Program or Project Type
SMART Meters[a]	Turlock Irrigation District	Water Resources
Lateral 8 Total Channel Control Project	Turlock Irrigation District	Water Resources
Lateral 8 Regulating Reservoir[a]	Turlock Irrigation District	Water Resources
Don Pedro Relicensing	Turlock Irrigation District	Water Resources
Don Pedro Life Extension and Upgrade Project	Turlock Irrigation District	Water Resources
La Grange Licensing	Turlock Irrigation District	Water Resources
Bay Delta Water Quality Control Plan Amendment	State Water Board	Restoration

NOTES:
[a] Turlock Subbasin GSP Project

SOURCE: Data compiled by Environmental Science Associates, 2022.

4.5 Methodology and Assumptions for the Cumulative Impacts Analysis

A three-step process is followed to determine the significance of the PMA's cumulative impacts.

First, the extent of the cumulative impacts without implementation of PMAs under the Turlock Subbasin GSP is evaluated to determine whether a significant cumulative impact on a resource would exist in the future. To do so, the combined effects of past, present, and probable future projects are evaluated to determine whether there is a significant cumulative impact.

Second, a determination is made regarding whether the incremental contribution of the PMAs to any significant cumulative impact is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (PRC Section 21083).

Third, a determination is made as to whether mitigation measures identified in this draft PEIR would reduce the contribution of the PMAs to the cumulative impact to a less-than-considerable level, thus resulting in a less-than-significant cumulative impact. If not, then the cumulative impact would remain significant and unavoidable.

In many cases, applicable mitigation measures would reduce impacts in this draft PEIR to a less-than-significant level. However, the precise locations and detailed characteristics of PMAs are yet to be determined, and the specific resources present within a project footprint (e.g., construction footprint, infrastructure) cannot be determined. Factors necessary to identify specific impacts include individual restoration activities and the project's location. Therefore, in some cases, significant impacts would remain significant and unavoidable.

4.6 Cumulative Impact Analysis

The cumulative impact analysis is presented by resource section and in the same order as in Chapter 3, *Environmental Setting, Impacts, and Mitigation Measures.* The study area is the entire Turlock Subbasin and surrounding areas for certain resource areas (e.g., air quality, hydrology, and water quality). For each resource section, the cumulative impact analysis provides a general discussion of the environmental setting; individual projects or management actions that would be implemented under the Turlock Subbasin GSP are not discussed separately. All impacts of the PMAs discussed in this chapter are described in Sections 3.2 through 3.20.

For each issue area addressed in this draft PEIR, the criteria applied to evaluate the significance of the overall cumulative effect are the same as the criteria used to evaluate direct and indirect impacts for that issue area.

4.6.1 Aesthetics and Visual Resources

Construction, constructed features, and operations and maintenance (O&M) of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features into the existing landscape such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could result in significant adverse effects on visual quality, affect scenic vistas and scenic resources, and introduce new sources of light and glare. Both temporary (construction-related) effects and long-term or permanent effects (new features) could occur.

For example, project construction could include temporary activities such as excavation, grading, and staging of construction equipment that could alter the existing landscape of agriculture and natural open space areas. Unless these areas are replanted or recontoured to preconstruction conditions to the extent feasible, such activities could result in significant changes in the existing visual character and quality in the vicinity of the construction site. In addition, visually prominent features (such as injection wells, recharge basins, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, and irrigation basins to enable deliveries of surface water to drip/microsystems) may not be of the same visual character as surrounding landscapes. For example, a new water storage tank in a recreational area might add more contrast to the area and detract from the natural setting. Adding a project feature that prominently contrasts with the existing visual quality and character of the surrounding landscape could cause a substantial change in visual quality, scenic vistas, and scenic resources.

Nighttime lighting could be needed if construction activities extend into the nighttime hours. This temporary floodlighting could be visible to nearby residents and would be particularly noticeable in rural areas that have lower levels of light pollution from existing sources such as street lights.

Furthermore, construction and operation of PMAs identified in the Turlock Subbasin GSP could require substantial lighting (e.g., temporary floodlighting during nighttime construction) that could result in significant temporary adverse effects. In addition, glare could occur if reflective construction were positioned in highly visible locations where sunlight could be reflected during construction activities. These changes are associated with past, present, and planned future projects and could result in a cumulatively significant impact on aesthetic and scenic resources.

Implementation of PMAs under the Turlock Subbasin GSP would introduce new physical features into the existing landscape. These changes could result in significant temporary or permanent adverse effects on visual quality in the Turlock Subbasin. For example, construction-related temporary activities such as excavation, grading, and construction equipment staging could alter the existing landscape of agriculture and natural open space areas, and permanent features may not be of the same visual character as surrounding landscapes. (These potential adverse effects are addressed in Impacts AES-1, AES-2, and AES-3.) The implementation of PMAs under the Turlock Subbasin GSP could result in a cumulatively considerable, incremental contribution to a significant cumulative impact related to the substantial degradation of scenic vistas, scenic resources, and existing visual character.

Upon PMA approval, compliance with Mitigation Measures AES-1 and AES-2 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measures AES-1 and AES-2 is recommended to reduce potentially significant impacts from proposed lighting features. If necessary, impacts of individual projects or management actions would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures AES-1 and AES-2 would continue to be implemented as part of PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*. In most cases with implementation of Mitigation Measures AES-1 and AES-2, the potential aesthetic and visual impacts of PMAs implemented under the Turlock Subbasin GSP would be reduced to less than cumulatively considerable.

Furthermore, PMAs implemented under the Turlock Subbasin GSP may also result in the construction and operation of projects that could result in a beneficial change in the visual qualities of the subbasin. For example, PMAs for new or expanded water storage (e.g., recharge basins, canal interties, regulating reservoirs) could increase aquatic areas, which would be considered a beneficial change in existing visual quality. Therefore, cumulative impacts would be **less than significant**.

4.6.2 Agriculture and Forestry Resources

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

No land within the Turlock Subbasin is zoned for forestland, timberland, or timber production; therefore, PMAs implemented under the Turlock Subbasin GSP would not result in cumulative significant impacts in conflict with existing zoning for, or cause for rezoning of, forestland, timberland, or timber production.

These features and actions could convert Farmland (Prime Farmland, Farmland of Statewide Importance, and Unique Farmland, collectively called "Special Designation Farmland") to nonagricultural use, or convert forestland to nonforest use; conflict with a Williamson Act contract; or create a conflict with zoning for agricultural. As a result, cumulatively significant temporary, long-term, or permanent adverse effects on agriculture and forestry resources could occur.

For example, PMAs could be located in Farmland, areas with agricultural zoning, or Williamson Act lands and could result in adverse effects on agriculture and forestry resources. Construction activities could include developing temporary features such as designated access and haul routes, borrow sites, staging areas, equipment storage, and temporary work sites. Such activities could convert Farmland to nonagricultural use, conflict with a Williamson Act contract, or create a conflict with zoning for agricultural use if the PMA is not a permitted use in the area or under the contracts.

Fallowing of agricultural lands could promote land repurposing to nonagricultural uses, such as open space, solar, restoration, commercial development, etc. It could also include pumping reductions through fallowing to decrease overall groundwater demand. Construction and operation impacts from land repurposing (e.g., construction of solar or commercial developments) resulting from fallowing of agricultural lands is speculative at this time, beyond the scope of this Draft PEIR, and not evaluated further. Direct and indirect impacts of fallowing of land (e.g., air quality impacts from dust due to no irrigation, pumping reductions, etc.) are discussed in the respective sections of this Draft PEIR.

In addition, unless topsoil is replaced to preconstruction conditions and the affected area is replanted, these construction activities could result in a substantial long-term or permanent conversion of Farmland or conflicts with agricultural zoning or Williamson Act requirements. These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on agriculture and forestry resources.

PMAs implemented under the Turlock Subbasin GSP could result in significant temporary impacts (construction of staging areas or access and haul routes) or permanent impacts (from the features' footprint) related to conversion of Farmland; conflicts with Williamson Act contracts and agricultural zoning; or conversion of Farmland to nonagricultural uses. (These potential adverse effects are addressed in Impacts AG-1 and AG-2.) Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact on agriculture and forestry resources.

Upon PMA approval, compliance with Mitigation Measures AG-1 and AG-2 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measures AG-1 and AG-2 would minimize impacts on agriculture and forestry resources. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures AG-1 and AG-2 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*. In most cases, Mitigation Measures AG-1 and AG-2 would reduce the contribution of PMAs to less than cumulatively considerable.

However, because the extent and location of such actions are not yet to be determined, it is not possible to conclude that the mitigation measures, or equally effective mitigation measures, would reduce significant impacts to a less-than-significant level in all cases. Therefore, cumulative impacts on agricultural resources could remain **significant and unavoidable**.

4.6.3 Air Quality

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

Construction activities would likely require the use of diesel-powered equipment and vehicles; therefore, PMAs could conflict with an applicable air quality plan and result in a short- or long-term cumulatively considerable net increase in pollutants for which the region is nonattainment. PMAs also could create objectionable odors affecting a substantial number of people and expose sensitive receptors to substantial pollutant concentrations. For example, recharge projects with large amounts of excavation and soil transport have the potential to result in criteria pollutant emissions that exceed one or more of the San Joaquin Valley Air Pollution Control District's (SJVAPCD's) threshold significance.

For example, during project construction, the combustion of fuels by construction equipment and material transport trucks and during earthmoving activities would emit criteria air pollutants. Emissions-generating activities during O&M activities would be similar to those described above, and listed in Table 2.4, and would require periodic maintenance and repairs that could require the use of heavy construction equipment. However, O&M activities would result in lower emissions and occur less frequently than those during construction.

In addition, some O&M activities could generate stationary-source emissions. For example, pump stations associated with water distribution and conveyance infrastructure could generate pollutant emissions (e.g., from electrical generators). Although emissions would frequently be minimal, some air district thresholds are measured against daily emissions; some O&M activities could involve substantial use of heavy equipment or other emissions-intensive activities. For example, removal of accumulated silt and vegetation from recharge basins could require heavy equipment that generate emissions.

PMAs implemented under the Turlock Subbasin GSP could result in temporary or long-term emissions of air pollutants, substantially contribute to pollutant concentrations that exceed the National Ambient Air Quality Standards and California Ambient Air Quality Standards, and conflict with a local air quality management plan, thereby resulting in conflicts with applicable air quality plans. For example, the construction of PMAs implemented under the Turlock Subbasin GSP could include the use of mobile diesel-powered construction equipment listed in Section 2.3.3, *Equipment Types,* which would emit criteria air pollutants.

Construction of PMAs implemented under the Turlock Subbasin GSP could temporarily emit emissions (such as those leading to odors). Construction and O&M activities could also result in the anaerobic decay of organic material, which can generate gases (specifically hydrogen sulfide, commonly described as having a foul or "rotten-egg" smell).

Therefore, PMAs implemented under the Turlock Subbasin GSP could result in temporary or long-term emissions of air pollutants. (These potential adverse effects are addressed in Impacts AIR-1, AIR-2, AIR-3, and AIR-4.) Significant cumulative adverse effects on air quality in the Turlock Subbasin could occur.

Sources of construction-related emissions (such as those leading to odors) would not remain in one location for long periods of time, and the emissions would depend on the specific construction activities occurring at certain times and are not likely to be noticeable for extended periods of time beyond the boundaries of the project site (as described in Impact AIR-4). Because any odors would be intermittent and dissipate from the source rapidly over a short distance, construction and O&M activities would not result in odorous emissions that would affect a substantial number of people or result in a cumulatively considerable incremental contribution to a significant cumulative impact.

Construction of PMAs implemented under the Turlock Subbasin GSP could emit air pollutants such as diesel particulate matter (DPM), a toxic air contaminant that could present health risks to sensitive receptors (as described in Impact AIR-3) and could result in significant temporary adverse effects on air quality in the Turlock Subbasin. However, without specific information about the year of construction or the phasing sequence of PMAs, a quantitative analysis of construction-phase human health is not feasible. Because the extent and location of PMAs are not known at this time, project construction could present health risks to sensitive receptors and result in significant temporary adverse effects on air quality in the Turlock Subbasin. Routine O&M activities would only be required on an intermittent basis and would not be of sufficient intensity or duration to rise to the level of chronic exposure necessary to cause health impacts, and would not result in cumulatively significant impacts. Additionally, PMAs could require the routine maintenance and testing of diesel-powered backup engines. Such generators would require a permit from SJVAPCD, who would require a health risk assessment and would not issue such a permit if the increased cancer risk would exceed 10 in one million at the maximally impacted sensitive receptor. Because of SJVAPCD permit requirements, these occasional engine operations would not result in a substantial health risk concern.

Upon PMA approval, compliance with Mitigation Measures AIR-1 and AIR-2 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measures AIR-1 and AIR-2 would minimize impacts of the emissions of criteria air pollutants. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures AIR-1 and AIR-2 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*. In some cases, Mitigation Measures AIR-1 and AIR-2 would reduce the contribution of PMAs to less than cumulatively considerable. However, because the size and duration of future PMAs are speculative, it is not possible to conclude that the mitigation measures would reduce the contribution of PMAs to less than cumulatively considerable in all cases. Therefore, cumulative impacts on air quality could remain **significant and unavoidable**.

4.6.4 Biological Resources

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could result in substantial effects, either directly or through habitat modification for any species identified as a candidate, sensitive, or special-status species;

sensitive natural communities; and federally protected wetlands as defined by Section 404 of the Clean Water Act (CWA). For example, construction activities could result in temporary habitat disturbance and permanent habitat loss from clearing of vegetation in equipment staging areas; construction of new access and haul routes; and temporary dewatering, excavation, and fill of new materials when implementing the PMAs.

Additionally, construction activities including earthmoving, vegetation removal, equipment staging, and site preparation could indirectly affect special-status species in multiple ways, such as disturbance of prey species, mobilization of sediment, disturbance of riparian habitat, or chemical contamination. In addition, construction activities (e.g., noise and vibration) could temporarily disturb special-status species in the vicinity, causing them to avoid using adjacent habitat.

Habitat could also be affected during construction by being disturbed by vehicle access and equipment staging. In addition, construction equipment increases the potential for accidental spills of contaminants (e.g., fuels or lubricants), which could degrade habitat. Wetlands could be indirectly or directly affected as a result of accidental spills, disturbance from vehicle access and equipment staging, or if PMAs are placed in existing wetlands. For example, if a regulating reservoir or irrigation basin is placed in existing wetlands, wetland habitat could be converted to other aquatic features.

Construction activities could also lead to the introduction or spread of invasive species or noxious weeds in sensitive communities, which could degrade the habitat quality. For example, equipment used for site preparation could unintentionally introduce seeds or plant parts of weeds from other areas, and many invasive weeds colonize soils that have been disturbed by grading or other mechanical disturbance.

Construction activities could harm or kill special-status terrestrial wildlife that inhabit areas near or adjacent to PMA construction sites. For example, noise and nighttime lighting for construction equipment could disturb special-status birds and mammals. Special-status amphibians, reptiles, and small mammals could be killed by construction and earthmoving equipment. Terrestrial wildlife could also be harmed by becoming entrapped in open trenches or other project features. Aquatic special-status species could be injured or killed during in-water construction and O&M activities. In-water and nearshore construction activities could also cause adverse effects on special-status species through water quality degradation from increased turbidity, inadvertent spills of hazardous materials, and disruption of contaminated sediments.

Furthermore, construction and O&M activities could require the temporary dewatering or lowering of water levels in areas for PMAs to be constructed or to conduct maintenance activities. During dewatering, special-status fish may be stranded, injured, or killed. Water pumping as a result of constructed PMAs or to dewater construction sites could result in the entrainment or impingement of fish at the pumps. Operation of newly constructed or expanded features (e.g., water conveyance and delivery infrastructure, storage of surface water in storage tanks/reservoirs for later use, installation of regulating reservoirs) could result in direct impacts on special-status fish species, depending on the extent to which the operation influences the flows in connecting rivers or streams. Changes in water operations could result in the impingement or entrainment of special-status fish species.

Construction and O&M activities of PMAs listed in Table 2-4 in Chapter 2, *Description of the Types of PMAs to be Implemented Under the Turlock Subbasin Groundwater Sustainability Plan* could also interfere with the movement of native resident or migratory wildlife. For example, construction of water distribution and conveyance infrastructure has the potential to disrupt the dispersal of terrestrial wildlife. Another example is the construction of regulating reservoirs, which could restrict movement of wildlife. Movement could be substantially affected or even cut off completely if the entire width of the corridor were disturbed. This could affect the ability of wildlife to move between areas that are important for different life history functions (e.g., reproduction and feeding behaviors).

In addition, construction activities may include high-intensity lighting to facilitate night work. Such lighting can pose a risk to flying birds, including waterfowl and raptors, that occur in the vicinity of construction sites for PMAs. Most impacts of construction on the movement of wildlife would be temporary. However, there could be a longer-term impact on local and migratory movement of wildlife if existing vegetation within a wildlife migratory corridor is permanently removed.

Construction and O&M activities of PMAs listed in Table 2-4 have the potential to conflict with local policies or ordinances protecting biological resources or the provisions of an adopted Habitat Conservation Plan (HCP), natural community conservation plan, or other approved local, regional, or state HCP. These cumulatively significant effects could be both temporary during construction and operation and permanent during operation. These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on biological resources.

PMAs implemented under the Turlock Subbasin GSP could include the constructed features listed in Table 2-4. Such PMAs could result in significant temporary or permanent adverse effects on sensitive communities and special status-species and their habitat in the Turlock Subbasin. (These potential adverse effects are addressed in Impacts BIO-1, BIO-2, BIO-3, BIO-4, BIO-5, and BIO-6.)

Specifically, construction activities could result in temporary habitat disturbance and permanent habitat loss from site preparation; establishment of new haul and access routes; temporary dewatering activities; borrow sites; and dewatering, excavation, and fill activities associated with the construction and O&M of PMAs. (These potential adverse effects are addressed in Impacts BIO-1, BIO-2, and BIO-3.)

In addition, PMAs implemented under the Turlock Subbasin GSP could result in significant or permanent adverse effects on federally protected wetlands through direct removal, filling, hydrological interruption, or other means. (These potential adverse effects are addressed in Impact BIO-3.)

Similarly, construction adjacent to wetlands or other waters of the United States could indirectly or directly affect these resources through increased erosion, sedimentation from soil disturbance, or spills of hazardous materials. Such construction could also temporarily affect wildlife movement and migration conditions and alter the foraging patterns of resident wildlife species in the study area. For example, ground disturbance could temporarily disrupt the movement of amphibians and reptiles. Construction activities, including the use of equipment and personal vehicles and vegetation removal, could interfere with the movement of other wildlife species (e.g., such as large mammals, birds, or fishes). (These potential adverse effects are addressed in Impact BIO-4.)

PMAs also have the potential to conflict with local policies and ordinances protecting biological resources, such as a tree preservation policy or ordinance in the Turlock Subbasin. (These potential adverse effects are addressed in Impact BIO-5.)

Construction and O&M activities of PMAs implemented under the Turlock Subbasin GSP would not conflict with implementation of the Pacific Gas and Electric (PG&E) San Joaquin Valley O&M HCP because only a portion of the study area lies within the boundaries of the PG&E O&M HCP; however, GSP activities are not covered activities under the PG&E O&M HCP, which is applicable only to PH&G facilities. Therefore, PMAs would not conflict with implementation of this HCP. (These potential adverse effects are addressed in Impact BIO-6.)

Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to substantial adverse effects on biological resources.

Upon PMA approval, compliance with Mitigation Measures BIO-1, BIO-2, and BIO-3 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measures BIO-1, BIO-2, and BIO-3 would minimize impacts on biological resources. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures BIO-1, BIO-2, and BIO-3 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report.* In some cases, Mitigation Measures BIO-1, BIO-2, and BIO-3 would reduce the contribution of PMAs to less than cumulatively considerable. However, because the size and duration of future PMAs are not known at this time, it is not possible to conclude that the mitigation measures would reduce the contribution of PMAs to less than cumulatively considerable in all cases. Therefore, cumulative impacts on biological resources could remain **significant and unavoidable**.

4.6.5 Cultural Resources

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could disturb or destroy prehistoric and historic-era archaeological resources, or buried human remains, which could result in significant permanent adverse effects on cultural and archaeological resources. For example, PMAs could result in significant adverse changes in significant built properties by altering an existing historic resource or introducing new visual elements to the historic setting of a significant resource.

Impacts on historic resources could occur as a result of construction activities through the introduction of new elements to a historic setting or the alteration of a significant built resource. The installation of water conveyance and delivery infrastructure could involve the construction of intakes and water management features with the potential to damage historic structures and features, such as historic canals themselves or associated historic-period ancillary features (e.g., bridges, weirs).

In addition, construction could require the use of heavy equipment, such as those identified in Section 2.3.3, *Equipment Types*. Earthmoving activities during project construction could disturb surficial and subsurface archaeological resources. Construction and operation of constructed features could cause vibration that physically damages or alters nearby architectural resource. For example, new infrastructure or modification of existing infrastructure such as agricultural outbuildings and irrigation features could cause vibration that physically damages or alters nearby architectural resources. Project-related ground-disturbing activities could uncover prehistoric archaeological resources and human remains not documented in archival sources or identified during field surveys. These changes associated with past, present, and planned future projects would result in a cumulatively significant impact on cultural resources.

PMAs implemented under the Turlock Subbasin GSP could include new or modified tanks, basins, ancillary buildings, and structures (e.g., agricultural outbuildings, irrigation features, power poles, utility poles, utility lines, piping). These PMAs could result in significant permanent impacts on historic built resources, archaeological resources, and human remains in the Turlock Subbasin through their damage or destruction. (These potential adverse effects are addressed in Impacts CUL-1, CUL-2, and CUL-3.)

Specifically, construction of PMAs implemented under the Turlock Subbasin GSP could involve ground disturbance, vibration, and the removal of archaeological and historical resources. For example, construction of agricultural outbuildings could result in ground-disturbing construction activities that alter existing landscapes. (This potential adverse effect is addressed in Impact CUL-1.) Constructed features and O&M of new infrastructure or modification to existing infrastructure, such as agricultural outbuildings, irrigation features, power poles, utility lines, and piping, could physically damage or alter nearby architectural resources. In addition, construction-related ground disturbance could disturb surficial and subsurface archaeological resources and uncover prehistoric archaeological resources and human remains not documented in archival sources or identified during field surveys. (These potential adverse effects are addressed in Impacts CUL-2 and CUL-3.)

Therefore, PMAs permitted under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact relating to the substantial degradation or destruction of cultural resources.

Upon PMA approval, compliance with Mitigation Measures CUL-1, CUL-2, CUL-3, and CUL-4 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measures CUL-1, CUL-2, CUL-3, and CUL-4 would minimize impacts on cultural resources. If necessary, impacts of individual PMAs would be addressed in future environmental analyses conducted by the appropriate PMA proponent. Mitigation Measures CUL-1, CUL-2, CUL-3, and CUL-4 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report.* In addition, Mitigation Measures CUL-1, CUL-2, CUL-3, and CUL-4 would reduce the contribution of PMAs to less than cumulatively considerable in most cases. However, because the extent and location of such actions are yet to be determined, it is not possible to conclude that the mitigation measures would reduce significant impacts to less than cumulatively considerable in all cases. Therefore, cumulative impacts on cultural resources could remain **significant and unavoidable**.

4.6.6 Energy

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could result in changes in energy resources, including the substantial wasteful, inefficient, or unnecessary long-term consumption of energy. In addition, implementation of PMAs under the Turlock Subbasin GSP could conflict with or obstruct a state or local plan for renewable energy or energy efficiency. These significant effects could be either temporary (e.g., from construction activities) or permanent (e.g., from O&M activities).

California uses a substantial amount of energy annually, primarily because of the state's size, and not because of its efficient or inefficient use of energy. Multiple laws, regulations, and programs in the state require or promote the efficient use of energy. Section 3.4, *Air Quality*, includes a summary of state lows and executive orders that address emissions, many of which promote or require the efficient use of energy in the state and the expansion of renewable-energy generation and use. California's building codes (California Code of Regulations, Title 24) also contain stringent energy efficiency standards, and the state has adopted a specific California Green Building Standards Code that both includes energy efficiency requirements and addresses renewable energy generation.

PMAs implemented under the Turlock Subbasin GSP could result in wasteful, inefficient, or unnecessary long-term consumption of energy. (This potential adverse effect is addressed in Impact EN-1.) In addition, PMAs implemented under the Turlock Subbasin GSP could conflict with applicable plans, policies, or regulations in local, county, and/or state energy standards that have been adopted for renewable energy or energy efficiency. (These potential adverse effects are addressed in Impact EN-2.) Given these conditions, a cumulative adverse effect would not occur within the Turlock Subbasin related to the substantially wasteful, inefficient, or unnecessary long-term consumption of energy, or a substantial reduction in the generation of renewable energy.

Upon PMA approval, compliance with any mitigation measures would be required when applicable to a given project, as required by Section 15092 of the State CEQA Guidelines.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*. Because the extent and location of PMAs are yet to be determined, PMAs implemented under the Turlock Subbasin GSP could result in cumulative impacts on energy resources. However, as stated above, in California multiple laws, regulations, and programs require or promote the efficient use of energy. PMAs implemented under the Turlock Subbasin GSP must comply with California's building codes. Therefore, PMAs implemented under the Turlock Subbasin GSP would not result in a cumulatively considerable incremental contribution to energy, and cumulative impacts would be **less than significant**.

4.6.7 Geology, Soils, and Paleontological Resources

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could result in significant adverse effects associated with strong seismic ground shaking, rupture of known earthquake faults, and substantial soil erosion or loss of topsoil, and they could expose people or structures to hazards associated with unstable soil conditions. PMAs could also result in the direct or indirect loss of a unique paleontological resource or unique geologic feature. Construction of projects on or adjacent to a known fault could expose such features to risks associated with fault rupture or seismic ground shaking.

For example, reservoirs and storage tanks placed in areas subject to fault rupture or seismic ground shaking could be damaged during an earthquake, which could lead to flooding of the surrounding areas, potentially exposing people and structures to flood hazards. Linear improvements such as pipelines and canals are particularly susceptible to impacts of unstable soils because they must meet stringent tolerances for line and grade. If not accounted for in project design, expansive soils could lead to the degradation or even structural failure of constructed features.

In addition, construction activities could disturb large volumes of soil through excavating, earthmoving, grading, filling, and stockpiling of material. These disturbed soils could be more susceptible to wind and water erosion, and a loss of topsoil could occur.

Construction activities could also result in the loss of unique paleontological or geologic resources. For example, construction activities could disrupt or destroy fossil remains or sites during excavation and site preparation. Impacts could include a permanent loss of information and potential destruction of nonrenewable paleontological resources.

In general, impacts associated with soil disturbance (loss of topsoil) would occur primarily as a result of construction activities and would not increase in severity following the completion of construction. These significant effects could be temporary during construction and permanent from placement of new features These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on geology and soils.

PMAs implemented under the Turlock Subbasin GSP could expose people or structures to the risk of loss, injury, or death due to rupture of known earthquake faults, and could result in significant adverse effects associated with strong seismic ground shaking. (These potential adverse effects are addressed in Impacts GEO-1, GEO-2, GEO-3, and GEO-5.) For example, due to the proximity to the Holocene-active Ortigalita and Greenville fault zones, and the pre-Holocene San Joaquin fault, structures associated with the PMAs implemented under the Turlock Subbasin GSP could be subject to the effects of strong seismic ground shaking.

PMAs could also result in significant adverse effects on people or structures from unstable soil conditions, or could result in unstable soil conditions such as landslides, expansive soils, subsidence, high organic matter soils, and nuisance water, and could result in significant adverse effects associated with soil erosion and a loss of topsoil. (These potential adverse effects are addressed in Impacts GEO-4 and GEO-6). For example, construction activities could include ground-disturbing activities such as the mobilization of equipment and materials; preparation of staging areas; staging and storage of equipment and materials; preparation of project sites; preparation/use of borrow sites; well drilling; site restoration and/or site demobilization; disposal of excess materials; dewatering, excavation, fill, and placement of materials in water; and drainage modifications. These types of ground-disturbing activities could contribute to substantial soil erosion or the loss of topsoil.

Construction and O&M activities for PMAs implemented under the Turlock Subbasin GSP could result in the loss of a unique paleontological or geological resource. (This potential adverse effect is addressed in Impact GEO-7.) For example, construction activities could include grading, excavation, and drilling, which could result in the permanent loss of paleontological resources if construction activities were to disrupt or destroy fossil remains or sites, or to create a loss of information and potential destruction of nonrenewable paleontological resources. Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to geology and soils.

Upon PMA approval, compliance with Mitigation Measures GEO-1, GEO-2, GEO-3, and GEO-4 would be required when applicable to a given PMA, as required by Section 1509 of the State CEQA Guidelines. The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report.*

Implementation of Mitigation Measures GEO-1, GEO-2, GEO-3, and GEO-4 would minimize impacts on geology, soils, and paleontological resources. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures GEO-1, GEO-2, GEO-3, and GEO-4 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP. PMAs implemented under the Turlock Subbasin GSP could result in geology, soils, and paleontological impacts.

Therefore, with implementation Mitigation Measures GEO-1, GEO-2, GEO-3, and GEO-4, the effects of the PMA’s contribution to geology, soils, and paleontological resources would be reduced to less than cumulatively considerable, and cumulative impacts would be **less than significant**.

4.6.8 Greenhouse Gas Emissions

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site’s recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

Construction and operation of PMAs listed in Table 2-4 could result in an increase in greenhouse gas (GHG) emissions that may have a significant impact on the environment and could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. For example, construction activities such as ground disturbance from grading, excavation, etc.; worker vehicle trips; trips associated with the delivery of construction supplies, and hauling debris from, the construction areas; and fuel combustion by on-site construction equipment may generate GHG emissions. These significant effects could be either temporary (construction-related) or permanent (occurring during O&M of PMAs).

PMAs implemented under the Turlock Subbasin GSP could result in temporary and long-term GHG emissions. Such projects could conflict with GHG reduction policies, plans, and regulations as a result of GHG emissions during construction and O&M activities and emissions from stationary sources (e.g., motors for pump operation). GHG emissions during project maintenance would be similar to those during construction; however, the level of activity, and thus the emissions level, would be much lower during the operational phase than during construction because activity would not be as intense during operations. Construction- and O&M-related emissions and stationary-source emissions could result in significant adverse effects related to the production of GHG emissions in the study area. (These potential adverse effects are addressed in Impact GHG-1 and GHG-2.)

Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation of air quality and the generation of GHG emissions.

Upon PMA approval, compliance with Mitigation Measure GHG-1 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measure GHG-1 would minimize impacts from GHG emissions to the extent feasible. Additionally, PMAs implemented under the Turlock Subbasin GSP would be consistent with guidance prepared by SJVAPCD (SJVAPCD 2009) and with the California Air Resources Board (CARB) 2017 Scoping Plan Update (CARB 2017). If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measure GHG-1 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report.* In addition, Mitigation Measure GHG-1 would reduce the contribution of PMAs to less than cumulatively considerable in most cases. PMAs would also adhere to guidance prepared by SJVAPCD and comply with CARB's 2017 Scoping Plan update which would reduce GHG emissions to the extent feasible. However, because the extent and location of such actions are yet to be determined, it is not possible to conclude that PMAs implemented under the Turlock Subbasin GSP would not be located near or adjacent to present activities under construction, which when considered together, could result in a cumulatively considerable incremental contribution to a cumulative impact related to GHG emissions. Therefore, cumulative impacts could **remain significant and unavoidable**.

4.6.9 Hazards and Hazardous Materials

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could create a significant hazard to the public or the environment through the routine transport, use, disposal, or accidental release of hazardous materials. If this were to occur within 0.25 mile of an existing or proposed school, it could result in significant adverse effects involving the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination. Additionally, implementation of PMAs under the Turlock Subbasin GSP could be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, which could result in a significant hazard to the public or the environment. (These potential adverse effects are addressed in Impacts HAZ-1, HAZ-2, and HAZ-3.)

For example, depending on the types of project or management action, construction equipment and materials could include fuels, oils and lubricants, solvents and cleaners, adhesives, paints and thinners, degreasers, cement and concrete, and asphalt mixtures. The routine use or an accidental spill of hazardous materials could result in inadvertent releases, which could adversely affect construction workers, the public, and the environment. In addition, a school may be present within 0.25 mile of the construction of a PMA, and project construction activities could result in the accidental release of hazardous materials.

Construction activities could also include ground-disturbing activities such as excavation that could result in the release of previously unidentified contaminated soil and/or groundwater that could expose construction workers, the public, and the environment to risks associated with hazardous materials. The types and quantities of hazardous materials would vary at each construction site, depending on the location and the facility or infrastructure being constructed.

Implementation of PMAs also could result in airport safety hazards by placing projects within 2 miles of an airport, resulting in a safety hazard. (This potential adverse effect is addressed in Impact HAZ-4.) For example, PMAs could be located in areas that could have the potential to create a safety hazard for people by placing them at construction sites or operational features near airports. The construction and operation of projects near airports also could produce light, glare, or other distractions from lighting and/or reflection off of detained water that interfere with airport operations. Projects constructed in these areas would be subject to the consistency requirements of the Stanislaus County Airport Land Use Compatibility Plan (ALUCP) and the Merced County ALUCP.

In addition, the operation of PMAs implemented under the Turlock Subbasin could adversely affect airport safety by increasing the potential for collisions between aircraft and wildlife. For example, routine O&M activities for PMAs implemented under the Turlock Subbasin could occur within 2 miles of an airport. Such activities (e.g., the use of lights for nighttime construction) could produce light, glare, or other distractions; however, the light and glare would most likely be minimal and would conform to the requirements of the Stanislaus County ALUCP and the Merced County ALUCP.

Project construction and heavy equipment use could temporarily interfere with emergency response access by interfering with an adopted emergency response or evacuation plan. (This potential adverse effect is addressed in Impact HAZ-5.) For example, street closures or lane blockages could reduce the number of travel lanes and require rerouting of traffic. Traffic levels could increase during transportation and relocation of construction materials. As a result, construction activities for PMAs implemented under the Turlock Subbasin GSP could temporarily increase emergency response times or interfere with adopted emergency response or evacuation plans, depending on project locations. The effect of future individual PMAs on emergency response times could be a cumulatively significant impact.

PMAs implemented under the Turlock Subbasin GSP could expose people or structures to a significant loss, injury, or death due to wildland fires. (This potential adverse effect is addressed in Impact HAZ-6.) The California Department of Forestry and Fire Protection (CAL FIRE) has determined through an internal review process that there are no Very High Fire Hazard Severity Zones (VHFHSZs) within Stanislaus and Merced counties. However, the available Forest Resource Assessment Program maps for both counties indicates that there are scattered areas of moderate fire hazard (CAL FIRE 2007a, 2007b). For example, construction equipment and vehicles used for construction of PMAs could come into contact with vegetated areas, potentially igniting dry vegetation by accidental discharge of sparks. However, contractors would be required to comply with hazardous materials storage and fire protection regulations, which would minimize the potential for fire creation. Because there are no mapped VHFHSZs within the Turlock Subbasin boundary and because compliance with fire hazard safety protocol during construction would be required, significant impacts related to wildland fire are not expected.

Upon PMA approval, compliance with Mitigation Measures HAZ-1, HAZ-2, HAZ-3, and TRANS-1 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measures HAZ-1, HAZ-2, HAZ-3, and TRANS-1 would minimize impacts from hazards and hazardous materials. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures HAZ-1, HAZ-2, HAZ-3, and TRANS-1 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report.* Implementation of Mitigation Measures HAZ-1, HAZ-2, HAZ-3, and TRANS-1 and adherence to applicable guidelines and regulations (e.g., ALUCP guidelines, Federal Aviation Administration regulations, hazardous materials storage, and fire protection regulations) would reduce the contribution of PMAs to less than cumulatively considerable. Therefore, cumulative impacts from hazards and hazardous materials would be **less than significant**.

4.6.10 Hydrology and Water Quality

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could result in changes in hydrology and water quality, including changes in surface water, drainage patterns and impervious surface cover, flooding and inundation, conflict with existing water rights (beneficial use and/or point of diversion), and alteration of groundwater-surface water interactions.

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin could result in a release of pollutants into surface water or groundwater that could violate water quality standards or waste discharge requirements (e.g., National Pollutant Discharge Elimination System), substantially degrade water quality, or obstruct the implementation of the applicable water quality control plan (e.g., the Basin Plan for the Central Valley Region) (Central Valley Regional Water Board 2018). PMAs could also be located in a flood zone and the potential for pollutants to be released as a result of project inundation. For example, dredging, excavation, scraping, or scarification to modify existing detention basins or create new recharge basins could expose and release contaminated sediments, resulting in water quality impacts on receiving waters. As another example, construction within existing waterways or basins (e.g., canal interties or detention basins) could temporarily alter water quality by disturbing sediments and/or could resuspend sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides) associated with legacy or contemporary activities such as farming or watershed urbanization.

In addition, groundwater quality could be locally degraded by temporary, short-term construction activities such as creating new recharge infrastructure (e.g., recharge basins, storm drain basins, French drains), or from O&M activities such as vegetation control.

However, the effects of constructed features and O&M of constructed PMA features would be minimal because the overall objective of these projects is to deliver water to existing beneficial users. For example, the construction of wells as part of the pumping reduction program would involve water quality testing of groundwater.

Construction work could also introduce pollutants into affected waterways through equipment (e.g., oils, lubricants, hydraulic fluids) and materials (e.g., soil and cover materials, concrete). In addition, inundation could release pollutants in flood hazard zones. For example, dredging, excavation, scraping, or scarification to modify existing detention basins or create new recharge basins could expose and release contaminated sediments, resulting in water quality impacts on receiving waters.

PMAs could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces. This change would result in relatively localized decreases in infiltration rates and associated increases in the amount of land and rate of surface water runoff on-site and immediately downstream (or downslope) of the site, which could persist at any of the features that have permanent changes in land cover. These changes in the rate of surface water runoff could exceed the capacity of existing or planned stormwater drainage systems and/or cause localized flooding.

As described above, these significant effects could be either temporary (e.g., construction dewatering activities) or permanent (e.g., new or expanded conveyance and storage infrastructure). These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on water resources.

PMAs implemented under the Turlock Subbasin could result in the release of pollutants into surface water and/or groundwater. Such a release could substantially degrade water quality as a result of project construction (e.g., the localized degradation of surface water and groundwater quality from the discharge of hazardous materials during construction) and project operations (e.g., localized degradation of surface water and groundwater quality from a release of pollutants during operation). (These potential adverse effects are addressed in Impact HYD-1.)

PMAs implemented under the Turlock Subbasin GSP could require construction activities that would temporarily alter drainage patterns, which could increase the rate and amount of surface water runoff in a manner that would exceed the capacity of existing or planned stormwater drainage systems, result in flooding, or impede or redirect flood flows. For example, installing regulating reservoirs to capture and store operational fluctuations in canal deliveries would permanently alter drainage patterns in that area. (These potential adverse effects are addressed in Impact HYD-2.)

In addition, PMAs implemented under the Turlock Subbasin GSP could alter the groundwater–surface water interactions relied upon in the Turlock Subbasin GSP's analysis of interconnected surface water (GSP Chapter 4) and the water budgets (GSP Chapter 5) (Todd Groundwater 2022). The intent of the PMAs is to bring the Turlock Subbasin into sustainable conditions and avoid undesirable results, including the loss of hydraulic connectivity between the Tuolumne or Merced river and the groundwater system. Therefore, it is reasonable to assume that the construction and operation of PMAs geographically located in areas of interconnected surface water have the potential to alter groundwater–surface water interactions. (These potential adverse effects are addressed in Impact HYD-3.)

O&M of features constructed for direct and in-lieu recharge projects under the Turlock Subbasin GSP may result in conflicts with existing water rights. As described in the GSP, some types of PMAs would divert surface water through existing water rights. Other types of PMAs are proposed to improve or construct conveyance and delivery infrastructure to deliver excess flows, particularly during flood flow events, and otherwise within the purview of existing water rights. (These potential adverse effects are addressed in Impact HYD-4.)

Construction and O&M activities associated with constructed PMAs could alter groundwater conditions in adjacent subbasins. Particularly if these features were constructed along the northern, western, and southern boundaries of the Turlock Subbasin, the long-term operational effects of the constructed features could be observed in the neighboring subbasins along the shared boundaries. (These potential adverse effects are addressed in Impact HYD-5.) Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively incremental contribution to a significant cumulative impact related to hydrology and water quality.

Upon PMA approval, compliance with Mitigation Measures HYD-1, HYD-2, and HYD-3 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report.*

Implementation of Mitigation Measures HYD-1, HYD-2, and HYD-3 would minimize impacts on hydrology and water quality. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures HYD-1, HYD-2, and HYD-3 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP. PMAs implemented under the Turlock Subbasin GSP could result in significant hydrology and water quality impacts.

However, construction-related impacts would be minimal and temporary. Furthermore, many of the long-term effects on hydrology and water quality of PMAs implemented under the Turlock Subbasin GSP would be beneficial or, in some cases, neutral (i.e., direct and in-lieu recharge projects), because the specific purpose of these projects would be to recharge the groundwater system for groundwater sustainability. For example, PMAs such as conservation management actions would promote the fallowing of lands during dry hydrologic years to reduce demands for surface water and groundwater, and the implementation of conservation management action would be subject to California Water Rights. PMAs may provide for containment of reservoir releases in preparation for large storm events, which would also be beneficial. Although PMAs could alter current conditions, such projects would have relatively localized effects on-site and immediately downstream (or downslope) of the individual PMA project site.

In addition, Mitigation Measures HYD-1, HYD-2, and HYD-3 discussed above would reduce the contribution of PMAs to less than cumulatively considerable. Therefore, cumulative impacts would be **less than significant**.

4.6.11 Land Use and Planning

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site’s recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could conflict with land use plans, policies, or regulations or physically divide an established community, which could result in significant temporary or permanent adverse effects related to land use. For example, impacts from constructed features have the potential to conflict with land use policies, such as those related to conversion of agricultural land. As another example, locating a regulating reservoir outside of a community may require road closures to facilitate construction, which could temporarily physically divide the community. These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on land use and planning.

PMAs implemented under the Turlock Subbasin GSP could result in conflicts with land use plans, policies, and regulations adopted to avoid or mitigate an environmental effect or result in the division of an established community. (These potential adverse effects are addressed in Impacts LU-1 and LU-2.) This could result in significant temporary or permanent adverse effects on land use in the Turlock Subbasin. Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to land use and planning.

Upon PMA approval, compliance with the applicable city and county general plans and other local policies and ordinances would be required. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponents. Construction activities for PMAs could temporarily physically divide a community; however, these activities would take place on the periphery of a community, rather than through the community, and would be temporary.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the*

Program Environmental Impact Report. In most cases, implementation of the city and county general plans and other local policies and ordinances would reduce the contribution of PMAs to less than cumulatively considerable. However, because the extent and location of PMAs implemented under the Turlock Subbasin are yet to be determined, it is not possible to conclude that PMAs would not physically divide an established community. Therefore, cumulative impacts on land use and planning could remain **significant and unavoidable**.

4.6.12 Mineral Resources

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could affect the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or locally importation mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan. These significant impacts could be either temporary during construction or permanent from the placement of new or expanded features. The effect on mineral resources that would result from these changes could be a cumulatively significant impact.

PMAs implemented under the Turlock Subbasin GSP could result in the loss of availability of a known mineral resource or the loss of a locally important recovery site. (This potential adverse effect is addressed in Impact MIN-1.) For example, if a project or management action were proposed in an area with mineral resources, implementation activities could result in the loss of availability of a known mineral resource. Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to mineral resources.

However, the Stanislaus and Merced County general plans include goals and policies designed to protect significant mineral resources, and to ensure that mineral resources are not lost or destroyed as a result of PMAs proposed in designated mineral resource zones (MRZs). Additionally, the Surface Mining and Reclamation Act (SMARA) regulates surface mining operations to minimize adverse environmental impacts and ensure that mined lands are reclaimed to a usable condition. SMARA also encourages the production, conservation, and protection of the state's mineral resources.

Compliance with SMARA and with the goals and policies of the Stanislaus and Merced County general plans that protect mineral resources would be required before the construction of PMAs in MRZs. All features associated with PMAs under the Turlock Subbasin GSP would be subject to these state and local requirements. With compliance with these state and local requirements, implementation of the PMAs under the Turlock Subbasin GSP would not result in the loss of availability of known mineral resources.

Additionally, if necessary, impacts of PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponents. Therefore, cumulative impacts on mineral resources would be **less than significant**.

4.6.13 Noise

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could cause a substantial increase in ambient noise levels, and expose people to noise levels of excess of standards established in applicable plans and ordinances, or expose sensitive receptors to excessive groundborne vibration. These significant effects could be both temporary or long-term during construction and O&M activities.

For example, PMA construction activities could include the mobilization of substantial off-road equipment and materials, removal of substantial soil quantities from borrow sites or off-site locations, and well drilling that would generate temporary construction noise that could impact noise-sensitive land uses if they are located near the construction area. Additionally, impact- or vibratory-pile driving may be required for some phases of construction, such as for the installation of sheet piles, which can generate relatively high levels of noise. Activities also could occur at night and close to receptors in populated areas. Actual exposure levels would depend on the intensity of the construction activity, the distance of sensitive receptors to the noise or vibration source, and any intervening structures or topography that might affect noise or vibration attenuation. These changes associated with past, present, and planned future projects could result in a cumulatively significant noise impact.

PMAs implemented under the Turlock Subbasin GSP could expose people to elevated noise levels and result in substantial temporary or permanent increases in ambient noise levels and/or excessive groundborne noise levels, or could expose sensitive receptors to excessive groundborne vibrations. (This potential adverse effect is addressed in Impacts NOI-1 and NOI-2.)

Upon PMA approval, compliance with Mitigation Measures NOI-1, NOI-2, NOI-3, and NOI-4 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*.

Implementation of Mitigation Measures NOI-1, NOI-2, NOI-3, and NOI-4 would minimize impacts from noise levels. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures NOI-1, NOI-2, NOI-3, and NOI-4 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP. Because the extent and the location of such actions are not yet known, PMAs implemented under the Turlock Subbasin GSP could result in significant cumulative noise impacts.

However, implementation of the Mitigation Measures NOI-1, NOI-2, NOI-3, and NOI-4 discussed above would reduce the contribution of PMAs to less than cumulatively considerable in all cases. Therefore, cumulative impacts would be **less than significant**.

4.6.14 Population and Housing

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could induce substantial unplanned population growth in the area or result in the displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.

For example, water distribution and conveyance infrastructure, water storage tanks, pipelines, and regulating reservoirs could include excavation and grading activities that eliminate housing. These effects could be either temporary during construction or long-term and permanent during O&M activities. These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on population and housing.

PMAs implemented under the Turlock Subbasin GSP could require relocation by construction and O&M crew members, resulting in population growth and increased demand for housing. (This potential adverse effect is addressed in Impact POP-1.) For example, some PMAs implemented under the Turlock Subbasin GSP could include construction activities such as the expansion of existing or creation of new recharge infrastructure (e.g., recharge basins, storm drain basins, French drains). These PMAs might require more specialized construction workers who could potentially relocate to the area. However, impacts would less than significant because relocation by specialized workers is usually temporary and limited to the duration needed to complete a particular phase of construction that requires their skills. Furthermore, none of the PMAs implemented under the Turlock Subbasin GSP would involve the construction of new homes, businesses, or other infrastructure that would provide new long-term employment opportunities or result in population growth and demand for housing.

Routine O&M activities of PMAs implemented under the Turlock Subbasin GSP could include establishment of programs, including markets and platforms for trade, exchange, or sale of pumping allocations and credits. These O&M activities could require additional staff. However, these activities would be similar to those in the study area located near a waterway or agricultural lands. Furthermore, although temporary or longer-term population could occur, the potential presence of existing vacant units in and around the study area would help absorb any temporary population increases.

None of the PMAs implemented under the Turlock Subbasin GSP would eliminate housing. (This potential adverse effect is addressed in Impact POP-2.) Some construction activities could involve the removal or relocation of recreational structures. However, as mentioned above, none of the PMAs would eliminate housing or displace substantial numbers of people, necessitating the construction of replacement housing elsewhere. Additionally, most, if not all, PMAs that would be implemented and operated under the Turlock Subbasin GSP would be located in or near waterways or agricultural fields. Water conservation projects could involve the construction of new water conveyance infrastructure; however, these projects would most likely be in a less urbanized or rural environments in areas with minimal housing.

If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Applicable mitigation measures would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP. PMAs could result in some population and housing effects; given that the location and extent of individual PMAs are not yet determined, however, these impacts would be negligible because projects would typically occur in low-density population areas near waterways, or agricultural lands, limiting the potential for the displacement of people or housing. Furthermore, none of the PMAs implemented under the Turlock Subbasin GSP would remove or relocate housing. Therefore, PMAs implemented under the Turlock Subbasin GSP would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to population, employment, and housing, and this cumulative impact would be **less than significant**.

4.6.15 Recreation

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site’s recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could increase the use of existing neighborhood and regional parks or other recreational resources such that substantial physical deterioration of the facility would occur or be accelerated, and may include the construction or expansion of recreational facilities that could result in significant environmental impacts.

For example, the construction of water distribution and conveyance infrastructure could result in the temporary (constructed-related) or permanent (O&M of constructed features) closure of existing recreational facilities and opportunities in and within the project area. These activities may displace recreational users to other resources or facilities temporarily, over the long term, or permanently. Such displacement may increase the use of other existing recreational resources or facilities, potentially causing their physical condition to substantially deteriorate. Noise from construction activities also may directly detract from nearby recreational experiences. These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on recreational resources.

PMAs implemented under the Turlock Subbasin GSP could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated in the Turlock Subbasin because of the presence of work sites and other construction and O&M activities. (This potential adverse effect is addressed in Impact REC-1.) For example, the construction of irrigation basins to enable surface water deliveries to drip/micro systems could require permanently relocating or decommission existing recreational opportunities or facilities. Recreational facilities could be removed or replaced. These activities could require permanently relocating or decommissioning existing trails or roads, which could increase the use of other recreational facilities. PMAs implemented under the Turlock Subbasin GSP could result in the construction of new or expanded recharge basins or ponds, which may also preclude the use of recreational facilities that could be periodically inundated. This displacement may increase the use of other existing recreational resources or facilities, potentially leading to their substantial physical deterioration.

Construction activities and constructed features for PMAs implemented under the Turlock Subbasin GSP could include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment. (This potential adverse effect is addressed in Impact REC-2.) For example, PMAs that would relocate utilities for pipeline placement could result in the temporary closure of recreational facilities during construction. Therefore, PMAs implemented under the Turlock Subbasin GSP could result in cumulative impacts on recreational resources.

Upon PMA approval, compliance with Mitigation Measure REC-1 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of Mitigation Measure REC-1 would minimize impacts on recreational resources. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measure REC-1 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*. In addition, Mitigation Measure REC-1 would reduce impacts on recreation to less than cumulatively significant levels. Therefore, cumulative impacts on recreation would be **less than significant**.

4.6.16 Transportation

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could conflict with an applicable program, plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system; conflict with or be inconsistent with State CEQA Guidelines Section 15064.3(b); substantially increase hazards due to geometric design feature or incompatible uses; or result in inadequate emergency access. These significant effects could be temporary or long-term during construction or O&M activities, and could be permanent during operation.

For example, PMAs could include projects requiring construction activities that include the mobilization of substantial off-road equipment and materials, removal of substantial soil quantities from borrow sites or off-site locations, and transportation of construction personnel. These activities could result in the presence of new and/or rerouted traffic at intersections or road sections that are not designed to accommodate the additional traffic. Operations and construction activities such as the import and export of materials could increase the number of trucks at intersections and on road segments, which could lead to a substantial increase in traffic congestion in those locations. These activities also may reduce emergency access and increase emergency response times. Large vehicles entering roadways from construction and operation activities could pose a hazard to oncoming vehicles, bicyclists, and pedestrians. These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on transportation.

PMAs implemented under the Turlock Subbasin GSP could result in significant temporary, long-term, or permanent adverse effects on transportation by conflicting with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system including transit, roadways, bicycle, and pedestrian facilities. Such effects could include road closures or relocation, potentially by increasing traffic congestion from an increase in the numbers of trucks at intersections and on road segments. (These potential adverse effects are addressed in Impact TRANS-1.)

In addition, PMAs could conflict with or be inconsistent with State CEQA Guidelines Section 15064.3(b) and result in a significant amount and distance of automobile travel attributed to a PMA. (This potential adverse effect is addressed in Impact TRANS-2.) Construction and operation activities associated PMAs implemented under the Turlock Subbasin GSP could substantially increase hazards due to a geometric design feature or incompatible uses, or result inadequate emergency access. (This potential adverse effect is addressed in Impacts TRANS-3 and TRANS-4.)

Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to transportation.

Upon PMA approval, compliance with Mitigation Measures TRANS-1, TRANS-2, TRANS-3, and TRANS-4 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report*.

Implementation of Mitigation Measures TRANS-1, TRANS-2, TRANS-3, and TRANS-4 would minimize impacts on transportation resources. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent. Mitigation Measures TRANS-1, TRANS-2, TRANS-3, and TRANS-4 would continue to be implemented as part of the PMAs implemented under the Turlock Subbasin GSP.

Additionally, PMAs would be required to adhere to statewide, regional, and local policies, regulations, and ordinances governing traffic and circulation systems. Implementing Mitigation Measures TRANS-1, TRANS-2, TRANS-3, and TRANS-4 would reduce impacts on transportation to less than cumulatively significant levels. Therefore, cumulative impacts would be **less than significant**.

4.6.17 Tribal Cultural Resources

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site’s recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could require the use of heavy equipment and ground disturbance, such as the preparation and use of borrow sites. Construction and O&M activities could result in the disturbance or destruction of surficial and subsurface tribal cultural resources, which would result in significant permanent adverse effects on these resources. In addition, construction activities could alter the makeup of biological communities (e.g., fish, riparian vegetation) that comprise tribal cultural resources (e.g., traditional hunting/fishing/gathering areas). Any impacts of these construction activities on such tribal cultural resources would be significant. These changes associated with past, present, and planned future projects would result in a cumulatively significant impact on tribal cultural resources.

PMAs implemented under the Turlock Subbasin GSP could result in significant permanent adverse effects on tribal cultural resources, by direct impacts (e.g., physical modification, damage, or destruction) or an indirect impact (e.g., alteration to setting, biological community, or visual setting) on any tribal cultural resources through the use of heavy equipment. Thus, PMAs may disturb surficial and subsurface tribal cultural resource. (This potential adverse effect is addressed in Impact TCR-1.) Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact on tribal cultural resources.

Upon PMA approval, compliance with Mitigation Measures CUL-2, CUL-3, and CUL-4 would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of these mitigation measures would minimize impacts on tribal cultural resources. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies*, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact Report.* In addition, Mitigation Measures CUL-2, CUL-3, and CUL-4 would reduce the contribution of PMAs to less than cumulatively considerable in most cases. However, because the extent and location of such actions are yet to be determined, it is not possible to conclude that the mitigation measures would reduce significant impacts to less than cumulatively considerable in most cases. Therefore, cumulative impacts could **remain significant and unavoidable**.

4.6.18 Utilities and Service Systems and Public Services

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site's recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

Construction activities for PMAs may require constructing new water or expanded water, stormwater drainage, and/or electric power facilities; construction of natural gas and/or telecommunications facilities is not anticipated. Relocation of these facilities may occur to accommodate construction. (This potential adverse effect is addressed in Impact UTIL-1.). As described in Section 3.15, *Population and Housing*, PMAs implemented under the Turlock Subbasin GSP would not include new land development or induce substantial population growth that would add new water customer demands or increase long-term water demand from water systems.

Constructed features, including the expansion or creation of recharge basins or storage of surface water in storage tanks/reservoirs, could have effects on water supply availability if water levels are reduced near diversion intakes. However, anticipated changes in water levels resulting from constructed features would need to comply with relevant federal, state, and local regulations and ordinances and would not impede the operations of existing diversion features or substantially change water supply availability to water users.

Implementation of the PMAs listed in Table 2-4 could generate solid waste from construction and O&M activities, but the PMAs could be served by a landfill that has insufficient permitted capacity for the demand. Construction and O&M activities could result in adverse physical impacts by requiring the construction of new or modified fire protection and police protection facilities, schools, and other public facilities if such activities cause the population to increase. Adverse impacts would also occur if additional public facilities would be required to maintain acceptable service ratios, response times, or other performance objectives for the public services in response to the projects. These significant effects could be temporary or long-term during construction and permanent during operations. These changes associated with past, present, and planned future projects could result in a cumulatively significant impact on utilities and public service systems.

Several types of PMAs implemented under the Turlock Subbasin GSP would involve earthmoving activities that could generate large amounts of construction waste (e.g., organic materials from borrow areas and construction sites, excavated materials, and soil/debris not suitable for stockpiling) that would require disposal at a landfill. (This potential adverse effect is addressed in Impact UTIL-2.) Examples of such PMAs include the construction of water conveyance and delivery infrastructure, installation of aquifer storage and recovery and/or injection wells, and expansion of existing or creation of new recharge infrastructure. Constructed features and O&M could also produce solid waste; however, the magnitude of waste created would be less than that produced during construction activities and would most likely be very small relative to landfill capacity.

PMAs implemented under the Turlock Subbasin GSP could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, and other public facilities. (This potential adverse effect is addressed in Impact UTIL-3.) However, construction activities for PMAs implemented under the Turlock Subbasin GSP would not include new land development or occupied structures that would increase population and add new public service demands. Increases in demand for public services (e.g., from jobsite accidents and jobsite security during construction) related to future PMAs would be temporary or short term, and the PMAs likely would not create a need for new or altered public service facilities. Furthermore, any increases in demand for law enforcement, fire protection, and medical services related to this small change in population in any one county are expected to be negligible.

Therefore, PMAs implemented under the Turlock Subbasin GSP could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation or destruction of utilities and public services.

Upon PMA approval, compliance with any mitigation measures would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, *Turlock Subbasin Groundwater Sustainability Agencies,* as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, *Overview of the Program Environmental Impact* Report. Implementation of applicable mitigation measures would minimize impacts on public services and utilities. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent.

The extent and location of PMAs implemented under the Turlock Subbasin GSP are not known at this time; however, for the reasons discussed above, projects could result in significant and unavoidable impacts resulting from the relocation of stormwater outfalls or utilities (e.g., electric power, natural gas, or telecommunications facilities). Therefore, cumulative impacts could remain **significant and unavoidable**.

The extent and location of PMAs implemented under the Turlock Subbasin GSP are not known at this time; however, for the reasons discussed above, projects would not result in insufficient permitted capacity of the local landfill to accommodate the project’s solid wastes or result in the construction of new or modified fire protection, police protection, schools, and other public facilities. Therefore, cumulative impacts on these public services would be **less than significant**.

4.6.19 Wildfire

Construction, constructed features, and O&M of PMAs implemented under the Turlock Subbasin GSP would introduce new physical features such as injection wells, recharge basins or ponds, pump stations, pipelines, water storage tanks, French drains or other mechanisms to increase a site’s recharge potential, dry wells, water distribution and conveyance infrastructure, canal interties, regulating reservoirs, irrigation basins to enable the delivery of surface water to drip/microsystems, smart meters, and irrigation system modifications.

These features and actions could substantially impair an adopted emergency response plan or emergency evacuation plan; result in the temporary, long-term, or permanent increases in risk for fire exacerbation or result in downslope or downstream risks due to runoff, post-fire slope instability, or drainage changes; and/or require the installation or maintenance of associated infrastructure that may exacerbate fire risks or that may result in temporary or ongoing impacts on the environment. These significant effects could be temporary or long-term during construction and permanent during O&M. These changes associated with past, present, and planned future projects could result in a cumulatively significant wildfire impact.

PMAs implemented under the Turlock Subbasin GSP could substantially impair an adopted emergency response plan or emergency evacuation plan. (This potential adverse effect is addressed in Impacts WILD-1 and TRANS-4.) For example, Implementing PMAs under the Turlock Subbasin GSP could include the construction activities identified in Table 2-4. Traffic could be delayed and lanes temporarily closed when construction material or vehicles are being moved on and off the sites of the proposed PMAs, especially at high-volume intersections.

PMAs implemented under the Turlock Subbasin GSP could exacerbate fire risk if located in a High or Very High Fire Hazard Severity area. (This potential adverse effect is addressed in Impacts WILD-2 and WILD-3). For example, heavy construction equipment and passenger vehicles could drive on vegetated areas before clearing and grading, which could increase the fire danger. Construction equipment or heated mufflers could throw sparks, or oils, lubricants, and other combustible materials could accidentally ignite, resulting in a fire. Construction activities such as steel cutting and welding, while typically used only for unanticipated equipment maintenance during most PMA types, are also potential sources of ignition.

In addition, increased surface water runoff and erosion are possible in a post-fire environment where surface vegetation has been removed and steep slopes can increase the velocity of runoff flows. (This potential adverse effect is addressed in Impact WILD-4.) For example, restoration projects involving the removal of vegetation and revegetation with native plants could lead to unstable soil conditions or increased runoff. Therefore, PMAs implemented under the Turlock Subbasin could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to wildfire.

Upon PMA approval, compliance with any mitigation measures would be required when applicable to a given PMA, as required by Section 15092 of the State CEQA Guidelines. Implementation of applicable mitigation measures would minimize impacts on wildfire. If necessary, impacts of individual PMAs would be addressed in future environmental analyses that would be conducted by the appropriate PMA proponent.

The applicability of the mitigation measures would depend on the individual project and/or management action, and the potentially significant impacts of the project and/or management action. Implementation of the mitigation measures would be the responsibility of the PMA proponent(s) under the WTS GSA and ETS GSA and their members, identified in Section 2.1.3, Turlock Subbasin Groundwater Sustainability Agencies, as well as other proponents of and partners for PMAs identified in the Turlock Subbasin GSP, listed in Section 1.3, Overview of the Program Environmental Impact Report. In addition, mitigation measures would reduce impacts on wildfire when applicable to less than cumulatively significant levels. Therefore, cumulative impacts would be **less than significant**.

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CHAPTER 5
Other CEQA Considerations

5.1 Growth-Inducing Impacts

The State CEQA Guidelines (Section 15126.2[e]) require that an EIR evaluate the growth-inducing impacts of a project. The EIR must:

> *Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristics of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.*

Projects and management actions (PMAs) implemented under the Turlock Subbasin Groundwater Sustainability Plan (GSP) have the potential for either direct or indirect growth inducement. *Direct growth inducement* would result if a project or management action implemented under the Turlock Subbasin GSP would involve construction of new housing or commercial development. *Indirect growth inducement* would result if a project or management action would result in any of the following scenarios, among others:

- Generation of substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises).
- Generation of substantial short-term employment opportunities (e.g., construction employment) that would indirectly create the need for additional housing and services to support the new temporary employment demand.
- Removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., increasing the capacity of utility or road infrastructure could allow either new or additional development to occur in the surrounding area).

The State CEQA Guidelines do not distinguish between planned and unplanned growth for purposes of considering whether a project would foster additional growth. Therefore, for purposes of this PEIR, to conclude that a project would be growth inducing as defined by CEQA, the PEIR must find that PMAs implemented under the Turlock Subbasin GSP would foster (i.e., promote or encourage) growth in economic activity, population, or housing, regardless of whether the growth is already approved by and consistent with local plans. Consistent with the State CEQA Guidelines (Section 15126.2[e]), the conclusion does not determine that induced growth is beneficial or detrimental.

Environmental effects resulting from induced growth fit the CEQA definition of *indirect effects* as identified in the State CEQA Guidelines (Section 15358[a][2]). These indirect or secondary effects of growth may result in significant environmental impacts. CEQA does not require that the EIR unduly speculate about the precise locations and site-specific characteristics of significant, indirect effects caused by induced growth, but a good-faith effort is required to disclose whatever is feasible to assess. Potential secondary effects of growth could include consequences that result from growth fostered by the project, such as conversion of open space to developed uses; increased demand on community and public services and infrastructure; increased traffic and noise; degradation of air and water quality; or degradation or loss of plant and wildlife habitat.

5.1.1 Growth Inducement Potential of Projects and Management Actions Implemented under the Turlock Subbasin Groundwater Sustainability Plan

The purpose of this section is to evaluate the potential growth-inducing effects of the types of PMAs that would be implemented under the Turlock Subbasin GSP. As stated in Chapter 1, *Introduction*, the implementation of the Turlock Subbasin GSP would not involve construction or operation of facilities or other physical actions, nor does the GSP describe specific construction methods or timing, or operational requirements of the Turlock Subbasin groundwater sustainability agencies (GSAs). However, this PEIR will allow the Turlock Subbasin GSAs to consider program-level impacts and mitigation measures and address program-wide issues and cumulative impacts.

Further analysis of the PMAs' potentially growth-inducing effects is provided in Section 3.15, *Population and Housing*, which summarizes existing information and trends regarding population, housing, and employment in the study area. Section 3.15 also evaluates PMAs implemented under the Turlock Subbasin GSP that could induce substantial population growth and increase demand for housing, or that could necessitate the construction of replacement housing as a result of displacement of people or houses.

Direct Growth Inducement

The types of PMAs implemented under the Turlock Subbasin GSP would not involve construction of new housing or commercial or industrial development that would provide new long-term employment opportunities or result in population growth and demand for housing. Therefore, the PMAs would not directly induce growth.

As described in Section 3.15, *Population and Housing*, PMAs implemented under the Turlock Subbasin GSP are anticipated to result negligible levels of permanent population growth. Construction employees are generally pulled from the region's existing labor pool and typically do not need to relocate when assigned a new construction site. Those who are hired from outside of the existing labor pool generally tend to commute to jobsites, as projects can change several times a year and offer no permanent place of business. The planning guidelines and policies of local jurisdictions would control the potential for direct economic growth to result from implementation of the PMAs. Therefore, implementing PMAs under the Turlock Subbasin GSP would not induce substantial direct growth, and growth-related impacts would be less than significant.

Indirect Growth Inducement

Implementing a project or management action under the Turlock Subbasin GSP that would generate substantial new permanent employment could indirectly generate growth by creating demand for homes and services and fostering economic and population growth. Similarly, population growth induced by a short- or long-term construction effort with substantial employment opportunities could indirectly stimulate the need for additional housing and services to support the new temporary employment demand.

As described in Section 3.15, *Population and Housing*, construction and operation of PMAs implemented under the Turlock Subbasin GSP would result in only negligible levels of temporary and permanent population growth.

The specific characteristics and locations of potential future PMAs that could be implemented and their staffing levels are yet to be determined. Factors necessary to identify potential impacts include the number of construction workers employed, the duration of construction, and the locations of the PMAs relative to populated areas.

Although many construction activities would be temporary, it is reasonable to expect that construction activities for PMAs may be as short as a few days or as long as several years, depending on the specific project being constructed. As such, worker relocation could vary depending on the size, type, and length of construction activities. However, as described in Section 3.15, *Population and Housing*, any long-term population increase in the region resulting from the construction of PMAs would be negligible, and existing vacant units could absorb any such population increase.

A variety of factors influence new development or population growth in the study area, such as the region’s economic conditions, adopted land use plans and growth management policies, and the availability of adequate infrastructure. Economic conditions are generally the primary factor. Although water service is just one of many factors affecting the growth potential of a community, it is one of the critically important public services needed to support urban development. Lack of a reliable water supply could constrain future development. Conversely, improving the reliability of water supplies serving an area could make that area more likely to develop in the future.

Implementation of PMAs under the Turlock Subbasin GSP could indirectly remove obstacles to growth (e.g., lack of adequate water supplies) and could be considered growth inducing. An objective of the Turlock Subbasin GSP is to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. Implementing the PMAs could accelerate the development of local and regional water supply projects, and such projects could remove a potential obstacle to growth if the capacity of constructed features were expanded by providing more reliable water supplies. Therefore, the PMAs may have an indirect growth-inducing effect. However, local jurisdictions have evaluated this growth potential in the EIRs for their respective general plans, area plans, and specific plans, and in their existing guidelines. These plans and policies are in place to guide growth according to the development goals of the local jurisdictions so that growth would occur in areas designated for growth.

5.2 Significant Irreversible Environmental Changes

The State CEQA Guidelines (Section 15126.2[d]) require an evaluation of the significant irreversible environmental changes that would be caused by a project if implemented, as described below:

> *Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts, and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified.*

The State CEQA Guidelines refer to the need to evaluate and justify the consumption of nonrenewable resources and the extent to which a project would commit future generations to similar uses of nonrenewable resources. In addition, CEQA requires the evaluation of irreversible damage that could result from an environmental accident associated with the project.

Implementing PMAs under the Turlock Subbasin GSP could indirectly result in the commitment of nonrenewable natural resources used in the construction process and during project operation, including gravel, petroleum products, steel, and other materials. Implementation of PMAs would also result in the commitment of slowly renewable resources, such as wood products. As discussed in Section 3.19, *Utilities and Service Systems and Public Services*, PMAs that would involve earthmoving activities would not generate large amounts of construction waste (e.g., organic materials from borrow areas and restoration construction sites, excavated material, and soil not suitable for earthen structures).

As also discussed in Section 3.19, depending on the nature of the type of project or management action, operations and maintenance could produce solid waste. The increased generation of solid waste associated with construction and operation would depend on the size, number, location, and nature of the PMAs and their ability to reuse and recycle materials. Fee schedules for disposal of construction debris could be established to promote recycling and minimize solid waste; reuse or recycling of construction debris could be required; and solid waste plans could be developed for individual projects to maximize practices that reduce and recycle solid waste and collect, recycle, or compost litter. (See also Impact UTIL-2 in Section 3.19, *Utilities and Service Systems and Public Services*.)

Implementing PMAs under the Turlock Subbasin GSP could also result in the commitment of energy resources such as fossil fuels. As discussed in Section 3.7, *Energy*, construction and operation of PMAs would require the direct and indirect use of energy resources. Direct energy use during project construction and operation would involve using petroleum products and electricity to operate equipment; indirect energy use would involve consuming energy to extract raw materials, manufacture items, and transport the goods and people necessary for construction and operation activities.

Construction-related energy consumption would be temporary, occurring only during the construction period. Nevertheless, construction-related and operational activities would cause irreversible and irretrievable commitments of finite nonrenewable energy resources, such as gasoline and diesel fuel (see also Impacts ENE-1 and ENE-2 in Section 3.7, *Energy*). However, PMAs implemented under the Turlock Subbasin GSP would include all feasible control measures to improve equipment efficiency and reduce energy use, as required by the applicable local air pollution control or management districts. These measures include implementing best management practices for on-site construction vehicle efficiency standards; exhaust control plans that would reduce unnecessary equipment idling; and other policies to help reduce energy use, consistent with state and local legislation and policies to conserve energy.

Compliance with all applicable state, county, and local plans, policies, and regulations pertaining to energy standards would help to ensure that natural resources are conserved to the maximum extent possible. Therefore, energy consumption during construction or operations of the PMAs would not result in the unnecessary, inefficient, or wasteful use of resources, and energy would be used in a manner consistent with applicable laws and regulations.

To the extent that PMAs would be constructed on agricultural land or in currently sensitive natural communities (as discussed in Section 3.3, *Agriculture and Forestry Resources*, and Section 3.5, *Biological Resources*), they may also result in an irreversible conversion of agricultural land or sensitive natural communities. These include PMAs that would incentivize land fallowing or land repurposing.

Finally, construction and operation of PMAs implemented under the Turlock Subbasin GSP have the potential to result in accidental release of hazardous materials (as discussed in Impact HAZ-2 in Section 3.10, *Hazards and Hazardous Materials*), which may lead to irreversible damage.

5.3 Significant Unavoidable Impacts

The following discussion is a summary of potentially significant and unavoidable impacts that are identified and discussed in the technical sections of this PEIR in Chapter 3 and summarized in the Executive Summary. State CEQA Guidelines Section 15126.2(c) states that an EIR must include a description of impacts identified as significant and unavoidable should the project be implemented. These impacts would be unavoidable because it has been determined that no feasible mitigation is available or the mitigation measures available would not be enough to reduce the impact to a less-than-significant level.

It is reasonably anticipated that implementation of the types of PMAs under the Turlock Subbasin GSP would result in less-than-significant impacts or impacts that could be reduced to less than significant with mitigation. However, in some cases (e.g., Air Quality, Greenhouse Gas Emissions, Utilities and Service Systems), impacts are described as significant and unavoidable, even though the potential exists for impacts to be less than significant, because of uncertainty regarding the specific characteristics and location of the project or management action. The final determination of impact significance and the feasibility of mitigation measures would be within the responsibility and jurisdiction of the appropriate project or management action proponent.

The impacts identified below have been found to be significant and unavoidable.

5.3.1 Agriculture and Forestry Resources

Impact AG-1: Implementing PMAs under the Turlock Subbasin GSP could convert Special Designated Farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural use.

5.3.2 Air Quality

Impact AIR-1: Implementing PMAs under the Turlock Subbasin GSP could result in conflict with or obstruct implementation of the applicable air quality plan.

Impact AIR-2: Implementing PMAs under the Turlock Subbasin GSP could result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard.

5.3.3 Biological Resources

Impact BIO-1: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife (CDFW) or U.S. Fish and Wildlife Service (USFWS).

Impact BIO-2: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS.

Impact BIO-4: Implementing PMAs under the Turlock Subbasin GSP could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

5.3.4 Cultural Resources

Impact CUL-1: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines Section 15064.5.

Impact CUL-2: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines Section 15064.5.

Impact CUL-3: Implementing PMAs under the Turlock Subbasin GSP could disturb any human remains, including those interred outside of formal cemeteries.

5.3.5 Land Use and Planning

Impact LU-1: Implementing PMAs under the Turlock Subbasin GSP could conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.

5.3.6 Tribal Cultural Resources

Impact TCR-1: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a tribal cultural resource, as defined in Public Resources Code (PRC) Section 21074.

5.3.7 Utilities and Service Systems and Public Services

Impact UTIL-1: Implementing PMAs under the Turlock Subbasin GSP could result in construction or relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.

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CHAPTER 6
Alternatives

6.1 CEQA Requirements for Alternatives

This chapter describes alternatives to the implementation of projects and management actions (PMAs) under the Turlock Subbasin Groundwater Sustainability Plan (GSP) and compares the environmental impacts of those alternatives. This chapter also describes alternatives that were considered for further consideration but eliminated from detailed consideration.

The principles used to guide selection of the alternatives analyzed in this PEIR are provided by Section 15126.6 of the State CEQA Guidelines, which specifies that an EIR must do all of the following:

- Describe a reasonable range of potentially feasible alternatives to the project that could feasibly attain most of the basic objectives of the project.
- Consider alternatives that could reduce or eliminate any significant environmental impacts of the proposed project, including alternatives that may be costlier or could otherwise impede the project's objectives.
- Evaluate the comparative merits of the alternatives.

The focus and definition of the alternatives evaluated in this draft PEIR are governed by the "rule of reason," in accordance with Section 15126.6(f) of the State CEQA Guidelines. That is, the range of alternatives presented in this draft PEIR must permit a reasoned choice by the CEQA lead agency. The State CEQA Guidelines (Section 15126.6) require that an EIR evaluate at least one "No-Project Alternative," evaluate a reasonable range of alternatives to the project, identify alternatives that were considered during the scoping process but eliminated from detailed consideration, and identify the "environmentally superior alternative."

Although the State CEQA Guidelines (Section 15126.6[d]) require that alternatives be evaluated, they permit the evaluation to be conducted in less detail than for the implementation of PMAs under the Turlock Subbasin GSP. Consistent with Section 15126.6(d) of the State CEQA Guidelines, the information provided in this draft PEIR about each alternative is sufficient to allow for a meaningful evaluation, analysis, and comparison of the alternatives with the implementation of all types of PMAs under the Turlock Subbasin GSP.

The alternatives considered but eliminated from detailed consideration are discussed in Section 6.3.3, *Alternatives Considered but Rejected*. The alternatives carried forward for analysis are discussed in Section 6.4, *Alternatives to the PMAs Implemented Under the Turlock Subbasin*

GSP. The State CEQA Guidelines also require that the EIR identify the environmentally superior alternative. Section 6.5, *Environmentally Superior Alternative,* identifies the environmentally superior alternative and summarizes the impacts of each alternative, and their ability to meet plan objectives, as compared to the implementation of PMAs under the Turlock Subbasin GSP.

6.2 Objectives

As presented in Section 2.1.1, *Plan Objectives*, the objectives of the Turlock Subbasin GSP are to achieve the sustainability goal for the Turlock Subbasin by 2042 and avoid undesirable results over the remainder of a 50-year planning horizon. The sustainability goal for the Turlock Subbasin is to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. Undesirable results are significant and unreasonable adverse conditions for any of the six sustainability indicators defined in the GSP regulations (see Section 1.2.3, *Sustainable Management Criteria*). For the Turlock Subbasin, the applicable undesirable results are one or more of the following effects:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon.
- Significant and unreasonable reduction of groundwater storage.
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

The objectives of the Turlock Subbasin GSP are met through the implementation of the PMAs described in more detail in Section 2.2, *Projects and Management Actions to be Implemented Under the Turlock Subbasin Groundwater Sustainability Plan.*

6.3 Alternatives Considered and Screening Criteria

This section describes the development of a reasonable range of alternatives to the implementation of PMAs under the Turlock Subbasin GSP, the method used to screen the alternatives, and the alternatives considered but eliminated from detailed consideration in this document.

6.3.1 Development of a Reasonable Range of Alternatives

CEQA requires that an EIR describe and evaluate a reasonable range of alternatives to a project or to the location of a project that would feasibly attain most of the subbasin plan objectives and avoid or substantially reduce significant project impacts. The alternatives to the PMAs considered in this draft PEIR were developed based on information gathered during development of the

Turlock Subbasin GSP and during the PEIR scoping process (see Section 1.4.1, *Notice of Preparation and Scoping Meeting*).

In developing the Turlock Subbasin GSP, a range of potential actions and other ways to meet the plan objectives were considered. Several draft versions of the Turlock Subbasin GSP were prepared based on comments received; all comments made to the groundwater sustainability agencies (GSAs) during GSP development are included in the Final GSP (refer to the Turlock Subbasin GSP, Appendix E-15, Public Comment Summary) (Stantec 2022). Comments on the Turlock Subbasin GSP addressed a variety of topics[1], including the following:

- Impacts of groundwater levels, quality, monitoring on domestic wells, and the protection of domestic wells in the subbasin.
- Interconnected surface water with respect to streamflow habitat and streamflow depletions and the mapping of that information.
- Groundwater dependent ecosystems (GDEs) analysis.
- Sustainable management criteria related to water levels, water quality, and interconnected surface water.
- Land use policies and future development in an overdrafted groundwater basin.
- Climate change analysis.
- Disadvantaged communities with respect to drinking water, human right to water, and other outreach materials.
- Funding considerations for projects and management actions.

6.3.2 Method Used to Screen Alternatives

Potential alternatives were screened based on their ability to feasibly attain most of the basic Turlock Subbasin GSP (plan) objectives, their feasibility within the limits of the Sustainable Groundwater Management Act (SGMA), and their ability to reduce or eliminate any significant environmental impacts of the implementation of PMAs under the Turlock Subbasin GSP.

- **Meeting plan objectives—**The plan objectives are listed in Section 2.1.1, *Plan Objectives*. The State CEQA Guidelines state that alternatives must feasibly attain most of the basic objectives of the project. Alternatives that did not meet the majority of the objectives for the Turlock Subbasin GSP were screened out and not carried forward for further evaluation in the PEIR.
- **Feasibility—**SGMA established a statewide goal for achieving long-term groundwater sustainability by 2042. Under SGMA, GSAs are tasked with developing and implementing GSPs for groundwater basins designated by the California Department of Water Resources (DWR) as "high" or "medium" priority. GSPs are planning documents that provide a roadmap for how groundwater basins will reach long-term sustainability. Alternatives that do

[1] Topics were presented during the Special Meeting of the Turlock Subbasin GSA Technical Advisory Committee, January 4, 2022. Refer to the Turlock Subbasin GSP, Appendix E-15 for the complete summary of public comments and responses.

not meet the requirements of SGMA, or of other applicable laws and regulations, were not carried forward for further evaluation in the PEIR.

- **Avoiding or lessening any potentially adverse environmental effect of the proposed project—**Consistent with the State CEQA Guidelines, alternatives should avoid or substantially lessen one or more of the significant environmental effects of the proposed project. Alternatives that would not lessen or avoid a potentially significant environmental impact may be eliminated from detailed evaluation in the PEIR.

6.3.3 Alternatives Considered but Rejected

The State CEQA Guidelines require an EIR to identify any alternatives that were considered by the lead agency but were rejected as infeasible, and to briefly explain the reasons underlying the lead agency's determination. Section 15126.6(c) of the State CEQA Guidelines states the following:

> *The EIR should identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process and briefly explain the reasons underlying the lead agency's determination…Among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are: (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts.*

The alternative that was considered but was rejected is "Interbasin transfer of groundwater from an adjacent groundwater subbasin."

Groundwater subbasins adjacent to the Turlock Subbasin include the Merced Subbasin south of the Merced River, the Delta-Mendota Subbasin west of the San Joaquin River, and the Modesto Subbasin north of the Tuolumne River. Like the Turlock Subbasin, the Modesto Subbasin is a high-priority basin, while the Delta-Mendota and Merced subbasins are high-priority, critically overdrafted basins.

As stated above, the GSAs are governed by SGMA. An alternative that seeks to achieve the sustainability goal and avoid undesirable results at the expense of another groundwater basin would likely impair that basin's ability to achieve its sustainability goal and avoid undesirable results. For example, importing groundwater from the Modesto Subbasin could result in additional chronic lowering of groundwater and/or a significant and unreasonable reduction of groundwater storage in that subbasin. As another example, importing groundwater from the Merced Subbasin could result in additional depletions of interconnected surface water along the Merced River, further impacting beneficial uses of the surface water. Therefore, this alternative is not feasible and was rejected from further consideration in this PEIR.

6.4 Alternatives to the PMAs Implemented Under the Turlock Subbasin GSP

Based on the alternatives development and screening process described above, four alternatives were identified for further evaluation in the PEIR: the No Project Alternative and three potentially feasible alternatives to the Implementation of PMAs under the Turlock Subbasin GSP.

- **No Project Alternative**.
- **Alternative 1** – Specify more narrowly the types of PMAs implemented under the Turlock Subbasin GSP (e.g., the PMAs must provide at least 100 acre-feet of recharge per year).
- **Alternative 2** – Eliminate certain aspects of PMAs (e.g., eliminate PMAs that propose the construction of new features).
- **Alternative 3 –** Exclude entire categories of PMAs (e.g., exclude all direct and in-lieu recharge projects and only implement management actions).

These alternatives are described below, along with a comparison of the impacts of the alternatives to the impacts of the implementation of PMAs under the Turlock Subbasin GSP. The alternatives were also evaluated for their ability to achieve the plan objectives, which are presented in Section 2.1.1, *Plan Objectives* and summarized in Section 6.2.

The analysis of impacts is based on an evaluation of the potential changes in environmental resources that would result from implementation of actions in response to the alternatives, compared to the implementation of PMAs under the Turlock Subbasin GSP. The Turlock Subbasin GSP does not describe specific construction methods, timing, or operational requirements by the Turlock Subbasin GSAs for PMAs; the level of detail provided for each PMA varies, including the precise locations of PMA features and detailed descriptions of feature designs and/or modifications. Therefore, this analysis focuses on reasonably foreseeable changes from implementation of the types of PMAs that might be taken in the future, consistent with the level of detail appropriate for a program-level analysis.

Similar to the implementation of PMAs under the Turlock Subbasin GSP, impacts of the alternatives were evaluated in terms of how typical construction and operations and maintenance (O&M) of PMAs and associated features might cause adverse environmental impacts.

Consistent with Section 15126.6(d) of the State CEQA Guidelines, the information provided in this draft PEIR about each alternative is sufficient to allow for a meaningful evaluation, analysis, and comparison of the alternatives with the Implementation of PMAs under the Turlock Subbasin GSP. If an alternative would cause one or more significant effects in addition to those identified, the effects are discussed, but in less detail (State CEQA Guidelines Section 15126.6[d]). In the following sections, impacts are described with respect to whether they are likely to be similar to, more severe than, or less severe than the corresponding impacts of implementation of PMAs under the Turlock Subbasin GSP.

6.4.1 No Project Alternative

Description of Alternative

State CEQA Guidelines Section 15126.6(e) requires consideration of a "no project" alternative. The purpose of this alternative is to allow the decision makers to compare the impacts of the implementing PMAs under the Turlock Subbasin GSP with the impacts of not implementing PMAs under the Turlock Subbasin GSP. The No Project Alternative consists of existing conditions at the time the notice of preparation (NOP) is published, and what would be reasonably expected to occur in the foreseeable future if the PMAs were not implemented, based on current plans and consistent with available infrastructure.

Under the No Project Alternative, proponents would take no action to implement any type of PMAs under the Turlock Subbasin GSP and thus would not be working toward achievement of the sustainability goal for the Turlock Subbasin by 2042.

While some groundwater-related projects would still be carried out that may benefit the Turlock Subbasin, it is not known how many of these types of projects would be implemented in the future without a guiding document such as the Turlock Subbasin GSP. Therefore, it is reasonable to assume that without collective implementation of the PMAs listed in the Turlock Subbasin GSP, the Turlock Subbasin would not avoid undesirable results over the remainder of the 50-year planning horizon. As a result, the groundwater supply would continue along the path of being unreliable and unsustainable to support population growth, sustain the agricultural economy, and provide for beneficial uses. During drought conditions, these conditions would be worsened.

Undesirable results that could occur under the No Project Alternative include:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon.
- Significant and unreasonable reduction of groundwater storage.
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Other Projects Included in the No Project Alternative

The No Project Alternative includes reasonably foreseeable projects that are funded and for which construction and operation permits had been issued at the time of the NOP. The following other projects are included in the No Project Alternative:

- Projects addressing water sustainability including surface and groundwater projects.

- Development projects.
- Energy projects.
- Restoration projects that originate from programs and/or initiatives that guide restoration throughout the state.
- Multiple-benefit projects, including those that address groundwater recharge, recreation, flood management, water quality improvement, and/or adaptation to climate change.

Refer to Table 4-2 (in Chapter 4, *Cumulative Impacts*) for a sample list of other projects included in the No Project Alternative.

Relationship to Turlock Subbasin GSP Objectives

The No Project Alternative would not achieve the objective to achieve the sustainability goal for the Turlock Subbasin by 2042 and avoid undesirable results over the remainder of the 50-year planning horizon. As stated above, proponents would take no action, and therefore a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses would be compromised. In summary, the No Project Alternative does not meet the objectives of the Turlock Subbasin GSP.

6.4.2 Alternative 1 – Specify More Narrowly the Types of PMAs Implemented under the Turlock Subbasin GSP

Description of Alternative

Alternative 1 would include the same types of PMAs as described in Chapter 2, *Description of the Types of PMAs to be Implemented Under the Turlock Subbasin Groundwater Sustainability Plan*; however, this alternative would specify more narrowly the types of PMAs implemented under the Turlock Subbasin GSP.

This alternative would allow for the implementation of larger PMAs, defined as recharge projects that result in 100 acre-feet (AF)[2] or greater recharge. For example, the Dianne Storm Basin Project proposed by the City of Turlock, estimated to provide 22.5 AF per year of recharge to the Turlock Subbasin, would not be considered (refer to Table 2-2, Project No. 3). However, the Mustang Creek Flood Control Recharge Project proposed by the Eastside Water District, estimated to provide 600 AF per year of recharge to the Turlock Subbasin, would be considered (refer to Table 2-2, Project No. 10).

Furthermore, this alternative would only consider PMAs that were included in modeling scenarios with an annual recharge potential estimated (i.e., Group 1 and 2 projects), thereby disqualifying the Group 3 projects. Management actions would be considered if an estimate of recharge potential was made available to determine that the benefits exceed the 100 AF per year threshold.

[2] This value was determined based on the range of estimated recharge potential of the modeled PMAs (Group 1 and 2 projects).

The same authorization process for PMAs would be implemented under Alternative 1 (refer to Figure 1-1 in Chapter 1). Construction and O&M activities would be similar to those listed in Table 2-4, and implementation would incorporate the same mitigation measures as with all types of PMAs.

Because of the annual recharge potential constraints placed on the types of PMAs, this alternative would reduce the types, and potentially the locations, of PMAs that would be implemented under the Turlock Subbasin GSP. PMAs implemented by project proponents that do not meet the annual recharge potential required by Alternative 1 would not be covered under this alternative. Implementation of these PMAs would be the same as under the No Project Alternative (as described above).

Relationship to Turlock Subbasin GSP Objectives

Alternative 1 would not achieve all of the Turlock Subbasin GSP objectives. This alternative includes the implementation of all types of PMAs as described in Chapter 2; however, certain PMAs would not be implemented because of their potential to result in comparatively less annual groundwater recharge than other PMAs.

Setting an annual recharge potential threshold would remove smaller scale PMAs from the types of PMAs to be implemented under the Turlock Subbasin GSP. Additionally, only considering PMAs that were included in modeling scenarios with an annual recharge potential estimated (i.e., Group 1 and 2 projects) would disqualify Group 3 projects, thereby reducing the range of types of PMAs.

As described in Chapter 2 (Section 2.2), the number of PMAs included in the Turlock Subbasin GSP exemplifies the spatial and temporal variation in current groundwater conditions across the Turlock Subbasin, and thus provides a range of options for avoiding undesirable results and achieving sustainability based on existing conditions. The range of PMAs presented is intended to enable both the West Turlock Subbasin (WTS) GSA and the East Turlock Subbasin (ETS) GSA to be flexible in their responses as groundwater conditions change and new and better information becomes available.

While Alternative 1 would contribute toward achievement of the sustainability goal, more narrowly specifying the types of PMAs to be implemented may not ensure a reliable and sustainable groundwater supply that supports the diverse water demands of the Turlock Subbasin. PMAs that result in lower annual recharge potential may still be contributing to more sustainable conditions in that region of the Turlock Subbasin (West or East Turlock Subbasin) and/or for that specific water use community (urban versus agricultural). Therefore, the range of high and low recharge potential PMAs is favorable to achieve the sustainability goal by 2042 and avoid undesirable results over the remainder of the 50-year planning horizon.

Depending on the specific circumstances, imposing such annual recharge threshold limits may not reduce temporary adverse impacts, even with appropriate mitigation measures in place. Additionally, estimates of annual recharge potential may vary, and thus model uncertainty may result in inaccurate elimination of PMAs. Additional resources could be spent coordinating modeling efforts to improve estimates with more resources spent on planning and permitting and less on actual PMA implementation.

Because Alternative 1 would limit the PMAs implemented under the Turlock Subbasin GSP to specific annual recharge estimates, this alternative would not fully achieve the groundwater sustainability goal of the Turlock Subbasin and may not result in avoidance of undesirable results.

In summary, Alternative 1 partially achieves the Turlock Subbasin GSP objectives, but many smaller scale PMAs could be left out, and this alternative would not achieve the same degree of recharge benefits as would implementing all types of PMAs under the Turlock Subbasin GSP.

6.4.3 Alternative 2 – Eliminate Certain Aspects of PMAs Implemented under the Turlock Subbasin GSP

Description of Alternative

Alternative 2 would include the same types of PMAs as described in Chapter 2, *Description of the Types of PMAs to be Implemented Under the Turlock Subbasin Groundwater Sustainability Plan*. However, certain aspects of PMAs implemented under the Turlock Subbasin GSP would be removed under this alternative.

This could include aspects of PMAs that propose the construction of new features for direct recharge (e.g., injection wells, recharge basins, pump stations, pipelines), in-lieu recharge (e.g., canal interties, regulating reservoirs, pipelines), or water conservation (e.g., recharge basins or ponds, wells or pipelines) (refer to Table 2-4 for complete list of example features resulting from construction).

For example, under the Stanislaus State Stormwater Recharge Project proposed by California State University, Stanislaus would construct French drains and other recharge basins/infrastructure to recharge stormwater runoff. This type of project would be removed under this alternative. As another example, the domestic well mitigation program may result in the deepening or modification of wells, or in the construction of new wells, or the program may require connecting users to other water supplies. The construction of new wells would not be covered under this alternative.

PMAs that propose the modification or use of existing features, however, would still be included under this alternative. For example, the Recycled Water from the City of Turlock Project proposed by Turlock Irrigation District would divert recycled water from the city of Turlock to the Turlock Irrigation District conveyance system to irrigate fields (see Table 2-2, Project No. 7). As another example, the San Joaquin River Flood Diversion Project proposed by the City of Modesto would divert floodwater from the San Joaquin River into underused storage ponds (approximately 7,830 AF) for use in the Turlock Subbasin (see Table 2-2, Project No. 12). Because these projects do not propose the construction of new features, these types of projects would not be removed under this alternative.

The same authorization process for PMAs would be implemented under Alternative 2 (refer to Figure 1-1, in Chapter 1). Given the reduced construction, construction activities resulting from the implementation of PMAs may be fewer than those listed in Table 2-4. Operations and maintenance activities would be similar to those listed in Table 2-4, and implementation would incorporate the same mitigation measures as with all types of PMAs.

Because of the construction constraints placed on the types of PMAs, this alternative would reduce the types, and potentially the locations, of PMAs that would be implemented under the Turlock Subbasin GSP. PMAs implemented by project proponents that require the construction of new features would not be covered under this alternative.

Relationship to Turlock Subbasin GSP Objectives

Alternative 2 would not achieve all of the Turlock Subbasin GSP objectives. This alternative includes the implementation of the same types of PMAs as described in Chapter 2; however, this alternative would remove the aspects of PMAs that propose the construction of new features. Removing PMAs that propose the construction of new features could reduce impact mechanisms due to reduced construction activities and/or comparatively fewer effects of constructed features and O&M activities.

As described in Chapter 2 (Section 2.2), the number of PMAs included in the Turlock Subbasin GSP exemplifies the spatial and temporal variation in current groundwater conditions across the Turlock Subbasin, and thus provides a range of options for avoiding undesirable results and achieving sustainability based on existing conditions. The range of PMAs presented would enable both the WTS GSA and the ETS GSA to be flexible in their responses as groundwater conditions change and new and better information becomes available.

While Alternative 2 would contribute toward achievement of the sustainability goal, removing PMAs that propose construction of new features could substantially reduce the effectiveness of the Turlock Subbasin GSP to ensure a reliable and sustainable groundwater supply that supports the diverse water demands of the Turlock Subbasin. PMAs that necessitate the construction of new features, such as regulating reservoirs and/or recharge basins, may represent the PMAs with the largest groundwater recharge potential.

Additionally, the construction of new features as part of in-lieu recharge projects may bring surface water supply to existing users, thereby reducing groundwater pumping. For example, the Waterford/Hickman Surface Water Pump Station and Storage Tank proposed by the Community of Hickman would connect the city of Waterford and community of Hickman to Modesto Irrigation District’s surface water supply through construction of a storage tank (see Table 2-2, Project No. 2). Without a diversified water portfolio, these communities could experience additional lowering of groundwater levels and reduced groundwater storage (i.e., two undesirable results). Therefore, the range of PMAs is favorable to achieve the sustainability goal by 2042 and avoid undesirable results over the remainder of the 50-year planning horizon.

Depending on the specific circumstances, imposing construction limits may not reduce temporary adverse impacts, especially if appropriate mitigation measures are in place. Because Alternative 2 would limit the PMAs implemented under the Turlock Subbasin GSP to only PMAs that do not require construction of new features, this alternative would not fully achieve the groundwater sustainability goal of the Turlock Subbasin and may not result in avoidance of undesirable results.

In summary, Alternative 2 partially achieves the Turlock Subbasin GSP objectives, but necessary, construction-intensive PMAs could be left out, and this alternative would not achieve the same degree of recharge benefits as would implementing all types of PMAs under the Turlock Subbasin GSP.

6.4.4 Alternative 3 – Exclude Entire Types of PMAs Implemented under the Turlock Subbasin GSP

Description of Alternative

Alternative 3 would not include all types of PMAs as described in Chapter 2, *Description of the Types of PMAs to be Implemented Under the Turlock Subbasin Groundwater Sustainability Plan*; it would exclude entire types of PMAs that would be implemented under the Turlock Subbasin GSP. For example, under this alternative, no direct or in-lieu recharge projects, regardless of annual recharge potential or construction of new features, would be implemented. Rather, only management actions, or non-structural programs and policies, would be implemented. These management actions include demand reduction strategies, a pumping management framework, and domestic well mitigation (see Table 2-3).

The same authorization process for PMAs would be implemented under Alternative 3 (refer to Figure 1-1, in Chapter 1). With the exclusion of all direct and in-lieu recharge project types, construction and O&M activities resulting from the implementation of PMAs would be fewer than those listed in Table 2-4 and only consist of activities required for construction associated with management actions. Operations and maintenance activities specific to the management actions would be similar to those listed in Table 2-4, and implementation would incorporate the same mitigation measures as with all types of PMAs, as applicable.

Because of the exclusion of all direct and in-lieu recharge project types, this alternative would reduce the types, and potentially the locations, of PMAs that would be implemented under the Turlock Subbasin GSP. PMAs implemented by project proponents that require the construction of new features would not be covered under this alternative.

Relationship to Turlock Subbasin GSP Objectives

Alternative 3 would not achieve all of the Turlock Subbasin GSP objectives. This alternative would exclude direct and in-lieu recharge projects from implementation. Removing projects entirely would reduce impact mechanisms due to reduced construction activities and/or comparatively fewer effects of constructed features and O&M activities.

As described in Chapter 2 (Section 2.2), the number of PMAs included in the Turlock Subbasin GSP exemplifies the spatial and temporal variation in current groundwater conditions across the Turlock Subbasin, and thus provides a range of options for avoiding undesirable results and achieving sustainability based on existing conditions. The range of PMAs presented would enable both the WTS GSA and the ETS GSA to be flexible in their responses as groundwater conditions change and new and better information becomes available. Additionally, PMAs would be implemented adaptively to achieve an optimal balance between recharge projects and demand reduction management actions.

Alternative 3 would only consider management actions, most of which rely on land fallowing, conservation, and pumping reductions (see Table 2-3). While Alternative 3 would contribute toward achievement of the sustainability goal, only implementing non-structural programs and policies could substantially reduce the effectiveness of the Turlock Subbasin GSP to ensure a reliable and sustainable groundwater supply that supports the diverse water demands of the Turlock Subbasin. Direct and in-lieu recharge projects are necessary in conjunction with management actions to avoid undesirable results.

Assuming that management actions require minimal construction activities, Alternative 3 would reduce temporary adverse impacts. Because Alternative 3 would limit the PMAs implemented under the Turlock Subbasin GSP to only management actions, this alternative would not fully achieve the groundwater sustainability goal of the Turlock Subbasin and may not result in avoidance of undesirable results.

In summary, Alternative 3 would not likely achieve the plan objectives as it would exclude the range of direct and in-lieu recharge projects implemented in conjunction with the demand reduction management actions. This alternative would not achieve the same degree of recharge benefits as would implementing all types of PMAs under the Turlock Subbasin GSP.

6.4.5 Comparative Impact Analysis

This section compares the environmental impacts of the four alternatives to the impacts of implementation of PMAs under the Turlock Subbasin GSP.

Comparative Impact Analysis for the No Project Alternative

This section compares the impacts of the No Project Alternative to the impacts of implementation of all types of PMAs under the Turlock Subbasin GSP.

Impacts Identified as Less Severe

No impacts of the No Project Alternative have been identified as being less severe than impacts of implementation of all types of PMAs under the Turlock Subbasin GSP.

Impacts Identified as the Same as or Similar

Construction and O&M impacts of the No Project Alternative in the study area would be similar to construction and O&M impacts of implementation of all types of PMAs under the Turlock Subbasin GSP because other projects would be occurring (see Table 4-2). As a result, there may be comparatively less or more construction activity in some locations in the study area than others with the No Project Alternative. Construction and operation of these types of projects could result in significant and unavoidable environmental impacts, similar to those described for the implementation of all types of PMAs under the Turlock Subbasin GSP.

- **Aesthetic and Visual Resources:** The visual character of the study area is the same for the No Project Alternative. The No Project Alternative would still involve construction work for other projects; O&M activities of these projects could change the character of the project vicinity relative to current conditions. The No Project Alternative would include the presence of construction equipment and materials, vehicles, and crews, along with the construction of new and/or modification of existing features. This could result in substantial degradation of visual qualities, substantial adverse effects on scenic vistas and scenic resources, and new sources of substantial light and glare (Impacts AES-1, AES-2, and AES-3). Mitigation Measures AES-1 and AES-2 would reduce impacts of the No Project Alternative on visual resources to less-than-significant levels. For these reasons, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, aesthetics impacts of the No Project Alternative would be **less than significant**.

- **Agriculture and Forestry Resources:** The No Project Alternative would involve implementation of other projects that could require the conversion of farmland or forestland to accommodate new project features, and could conflict with existing agricultural or forest zoning and Williamson Act contracts (Impacts AG-1 and AG-2). Mitigation Measures AG-1 and AG-2 would reduce some impacts on agriculture and forestry resources. Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative on agriculture and forestry resources could be **significant and unavoidable**.

- **Air Quality:** Other projects implemented under the No Project Alternative could conflict with adopted air quality plans, contribute to a cumulatively considerable net increase of criteria pollutants, expose sensitive receptors to substantial pollutant concentrations, and result in other emissions (e.g., those leading to odors) (Impacts AIR-1, AIR-2, AIR-3, and AIR-4). The No Project Alternative would include construction and O&M activities that require the use of equipment that would contribute to pollutants. Mitigation Measures AIR-1, AIR-2, and AIR-3 would reduce impacts on air quality. However, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative on air quality could be **significant and unavoidable**.

- **Biological Resources**: Construction and O&M activities for projects under the No Project Alternative could result in substantial adverse effects on species identified as a candidate, sensitive, or special-status species, riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife (CDFW) or U.S. Fish and Wildlife Service (USFWS) (Impacts BIO-1 and BIO-2); or federally protected wetlands (Impact BIO-3). The No Project Alternative could also interfere with native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors (Impact BIO-4); conflict with any local policies or ordinances protecting biological resources (Impact BIO-5); or conflict with the provisions of an adopted Habitat Conservation Plan (HCP), natural community conservation plan, or other approved local, regional, or state HCP (Impact BIO-6). Mitigation Measures BIO-1, BIO-2, and BIO-3 would reduce impacts on biological resources. Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative on biological resources could be **significant and unavoidable**.

- **Cultural Resources:** Projects implemented under the No Project Alternative could disturb or destroy prehistoric or historic archaeological resources; historic buildings, structures, and linear features; unrecorded human remains; and paleontological resources (Impacts CUL-1, CUL-2, and CUL-3). Construction also could result in the alteration or removal of character-defining features of a cultural landscape. Mitigation Measures CUL-1, CUL-2, CUL-3, and CUL-4 would reduce impacts on cultural resources. Therefore, similar to the impacts of the implementation of all types of PMAs, impacts of the No Project Alternative on cultural and tribal cultural resources could be **significant and unavoidable**.

- **Energy:** Construction and O&M activities for the No Project Alternative could result in substantial inefficient, wasteful, or unnecessary long-term consumption of energy resources or conflict with a state or local plan for renewable energy or energy efficiency (Impacts ENE-1 and ENE-2). However, the No Project Alternative would not result in the inefficient, wasteful, or unnecessary long-term consumption of energy or changes in hydropower generation because local air pollution control or management districts require that construction activities improve equipment efficiency and reduce energy use. Routine O&M activities would require energy use; however, they would be consistent with current uses in the study area. In addition, the No Project Alternative would not conflict with applicable plans, policies, or regulations of local, county, and/or state energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels. Therefore, similar to the impacts of the implementation of all types of PMAs, impacts of the No Project Alternative on energy resources would be **less than significant**.

- **Geology, Soils, and Paleontological Resources:** The No Project Alternative could include the construction of infrastructure that exposes people or structures to seismic hazards, including fault rupture and strong ground motion, or landslides (Impacts GEO-1, GEO-2, and GEO-3). Projects also may expose people or structures to unstable geological conditions; result in a loss of topsoil associated with ground disturbance, with resulting erosion and sedimentation impacts; and result in a loss of a unique paleontological or geological resource (Impacts GEO-4, GEO-5, and GEO-7). Finally, the No Project Alternative could result in construction in areas on expansive soils (Impact GEO-6). Mitigation Measures GEO-1, GEO-2, GEO-3, and GEO-4 would reduce the impacts of the No Project Alternative related to geology and soils. Therefore, similar to the impacts of the implementation of all types of PMAs, impacts of the No Project Alternative related to geology and soils would be **less than significant**.

- **Greenhouse Gas Emissions:** The No Project Alternative could increase greenhouse gas (GHG) emissions that significantly affect the environment (Impact GHG-1) and/or conflict with applicable plans, policies, and regulations adopted for the purpose of reducing GHG emissions from construction and O&M activities (Impact GHG-2). The No Project Alternative would include construction and O&M activities that require the use of equipment that would contribute to pollutants. Mitigation Measure GHG-1 would reduce impacts of GHG emissions. Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative on GHG emissions could be **significant and unavoidable**.

- **Hazards and Hazardous Materials:** The No Project Alternative could result in exposure of the environment and sensitive receptors to unidentified contaminated soil and/or groundwater, and some of the impacts could occur within 0.25 mile of a school or within 2 miles of an airport (Impacts HAZ-1, HAZ-2, HAZ-3, and HAZ-4). Projects could also interfere with emergency response access or adopted emergency response or evacuation plans (Impact HAZ-5). In addition, they could expose people or structures to wildland fires or vector habitats (Impact HAZ-6). Mitigation Measures HAZ-1, HAZ-2, and HAZ-3 would reduce the impacts of the No Project Alternative related to hazards and hazardous materials. Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative related to hazards and hazardous materials would be **less than significant**.

- **Hydrology and Water Quality:** The No Project Alternative could result in the release of pollutants into surface water and/or groundwater, including in a flood zone as a result of project inundation, that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan (Impact HYD-1). The No Project Alternative could also result in substantial alteration of an existing drainage plan in a manner that results in substantial erosion or siltation on- or off-site; result in flooding on- or off-site; create or contribute runoff water that exceeds the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or impede or redirect flood flows (Impact HYD-2).

  Additionally, the No Project Alternative could result in substantial alteration of groundwater-surface water interactions, result in conflicts with existing water rights, and/or result in substantial alteration of groundwater conditions in adjacent basins (Impacts HYD-3, HYD-4, and HYD-5). The No Project Alternative would have the same impacts from construction and O&M activities, and Mitigation Measures HYD-1, HYD-2, and HYD-3 would reduce impacts on hydrology and water quality. Therefore, similar to the impacts of implementation all types of PMAs, impacts of the No Project Alternative on hydrology and water quality would be l**ess than significant**.

- **Land Use and Planning:** The No Project Alternative could potentially conflict with existing land use plans, policies, and regulations and divide an established community (Impacts LU-1 and LU-2). Therefore, similar to the impacts of the implementation of all types of PMAs, impacts of the No Project Alternative related to land use and planning could be **significant and unavoidable**.

- **Mineral Resources:** The No Project Alternative could result in the loss of availability of a known mineral resource or locally important mineral resource recovery site (Impact MIN-1). The No Project Alternative would have the same construction and O&M activities. Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative on mineral resources would be **less than significant**.

- **Noise:** Under the No Project Alternative, sensitive receptors could be exposed to excessive noise and groundborne vibrations associated with construction-related and operational improvements (Impacts NOI-1 and NOI-2). Mitigation Measures NOI-1, NOI-2, NOI-3, and NOI-4 would reduce the noise impacts of the No Project Alternative. Therefore, similar to the impacts of implementation of all types of PMAs, noise impacts of the No Project Alternative would be **less than significant**.

- **Population and Housing:** Projects implemented under the No Project Alternative could displace housing and/or people (Impact POP-1); however, these impacts would be less than significant and there would be sufficient housing units to accommodate any displaced people (Impact POP-2). Therefore, similar to the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative related to population and housing would be **less than significant**.

- **Recreation:** With the No Project Alternative, recreational facilities and activities could be impaired, degraded, or eliminated (Impact REC-1). Projects implemented under this alternative could place additional demands on recreation facilities by attracting more users or displacing people from existing recreation facilities, requiring the construction of new facilities or the expansion of existing facilities (Impact REC-2). Mitigation Measure REC-1 would reduce the impacts of the No Project Alternative on recreational resources. Similar to implementation of all types of PMAs under the Turlock Subbasin GSP, recreation impacts of the No Project Alternative would be **less than significant**.

- **Transportation:** Projects implemented under the No Project Alternative could conflict with adopted plans and policies for roadway performance; bicycle and pedestrian paths and trails; and rail and transit performance (Impacts TRANS-1 and TRANS-2). They also could increase traffic hazards as a result of road relocation, increase navigation hazards related to design features, and result in inadequate emergency access by blocking access or otherwise interfering with established emergency service routes (Impacts TRANS-3 and TRANS-4). Mitigation Measures TRANS-1, TRANS-2, TRANS-3, and TRANS-4 would reduce impacts of the No Project Alternative on transportation. Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of the No Project Alternative related to transportation would be **less than significant**.

- **Tribal Cultural Resources:** Projects implemented under the No Project Alternative could disturb or destroy tribal cultural resources as defined in California Public Resources Code (PRC) Section 21074 (Impact TCR-1). Mitigation Measures CUL-2, CUL-3, and CUL-4 would reduce impacts on tribal cultural resources. Therefore, similar to the impacts of the implementation of all types of PMAs, impacts of the No Project Alternative on tribal cultural resources could be **significant and unavoidable**.

- **Utilities and Service Systems and Public Services:** The No Project Alternative could require the relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities that would cause significant environmental effects (Impact UTIL-1). These impacts would be significant and unavoidable. Projects under the No Project Alternative could also result in landfill with insufficient permitted capacity to accommodate a project’s solid waste needs (Impact UTIL-2). However, the No Project Alternative would not include the construction of new or modified fire or police protection facilities, schools, or other public facilities and would not increase population or add new public service demands (UTIL-3). Therefore, similar to the implementation of all types of PMAs, impacts of the No Project Alternative on utilities and service systems could be **significant and unavoidable** and impacts on public services would be **less than significant**.

- **Wildfire:** The No Project Alternative could impair an adopted emergency response or evacuation plan, exacerbate fire risk, or result in downslope or downstream risks as a result of runoff, post-fire slope instability, or drainage changes (Impacts WILD-1, WILD-2, WILD-3, and WILD-4). However, similar to the impacts of the implementation of all types of PMAs, wildfire impacts of the No Project Alternative would be **less than significant**.

Impacts Identified as More Severe

No impacts of the No Project Alternative have been identified as being more severe than impacts of implementation of all types of PMAs under the Turlock Subbasin GSP.

Comparative Impact Analysis for Alternative 1, 2, and 3

This section compares the impacts of Alternatives 1, 2, and 3 to the impacts of implementation of all types of PMAs under the Turlock Subbasin GSP

Impacts Identified as the Less Severe

No impacts of Alternative 1, 2, or 3 have been identified as being less severe than impacts of implementation of all types of PMAs under the Turlock Subbasin GSP.

Impacts Identified as the Same as or Similar to Impacts

Construction and O&M impacts of Alternatives 1, 2, and 3 in the study area would be similar to construction and O&M impacts of all types of PMAs under the Turlock Subbasin GSP because Alternatives 1, 2, and 3 include implementation of some types of PMAs. Under these alternatives, the impacts could be of lesser magnitude than the impacts of all types of PMAs implemented under the Turlock Subbasin GSP (e.g., projects with comparatively greater annual groundwater recharge, eliminate constructed features, or exclude direct and in-lieu recharge projects). However, the general types of construction and O&M activities would be similar to those for the implementation of all types of PMAs. For example, less overall construction may occur under Alternative 1, 2, or 3, but the construction impact conclusions related to noise, air quality, etc. would be the same or similar (as described below).

- **Aesthetic and Visual Resources:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP such as direct and in-lieu recharge projects.

  However, Alternatives 1, 2, and 3 would still involve construction work for PMAs, and O&M activities for these PMAs could change the character of the project vicinity relative to current conditions. Also similar, Alternatives 1, 2, and 3 would include the presence of construction equipment and materials, vehicles, and crews along with the construction of new and/or modification of existing features. This could result in substantial degradation of visual qualities, substantial adverse effects on scenic vistas and scenic resources, and new sources of substantial light and glare (Impacts AES-1, AES-2, and AES-3). Mitigation Measures AES-1 and AES-2 would reduce impacts of Alternatives 1, 2, and 3 on visual resources to less-than-significant levels.

  For these reasons, aesthetic impacts of Alternatives 1, 2, and 3 would be similar to those of the implementation of all types of PMAs under the Turlock Subbasin GSP, and impacts would be **less than significant**.

- **Agriculture and Forestry Resources:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 would involve implementation of PMAs that could require the conversion of farmland or forestland to accommodate new project features, and could conflict with existing agricultural or forest zoning and Williamson Act contracts (Impacts AG-1 and AG-2). Mitigation Measures AG-1 and AG-2 would reduce some impacts on agriculture and forestry resources.

Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of Alternatives 1, 2, and 3 on agriculture and forestry resources could be **significant and unavoidable**.

- **Air Quality:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could conflict with adopted air quality plans, contribute to a cumulatively considerable net increase of criteria pollutants, expose sensitive receptors to substantial pollutant concentrations, and result in other emissions (e.g., those leading to odors) (Impacts AIR-1, AIR-2, AIR-3, and AIR-4). Alternatives 1, 2, and 3 would include construction and O&M activities that would require the use of equipment that contribute to pollutants. However, there would be fewer short-term conflicts with applicable air quality plans during construction because there likely would be lower levels of construction emissions with less construction activity. Mitigation Measures AIR-1, AIR-2, and AIR-3 would reduce impacts on air quality.

  Therefore, impacts on air quality would be less severe under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; however, impacts could still be **significant and unavoidable**.

- **Biological Resources**: Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Construction and O&M activities for projects under Alternatives 2, 3, and 3 could result in substantial adverse effects on species identified as a candidate, sensitive, or special-status species, riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS (Impacts BIO-1 and BIO-2); or federally protected wetlands (Impact BIO-3). Alternatives 1, 2, and 3 could also interfere with native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors (Impact BIO-4); conflict with any local policies or ordinances protecting biological resources (Impact BIO-5); or conflict with the provisions of an adopted HCP, natural community conservation plan, or other approved local, regional, or state HCP (Impact BIO-6). However, with Alternative 1, 2, and 3, fewer construction activities would occur because of the alternatives' limitation on the types of PMAs, which would be expected to reduce the likelihood of adverse impacts on biological resources. Mitigation Measures BIO-1, BIO-2, and BIO-3 would reduce impacts on biological resources.

  Therefore, impacts on biological resources could be of lesser magnitude under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; however, impacts could be **significant and unavoidable**.

- **Cultural Resources:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could disturb or destroy prehistoric or historic archaeological resources; historic buildings, structures, and linear features; unrecorded human remains; and paleontological resources (Impacts CUL-1, CUL-2, and CUL-3). Construction also could result in the alteration or removal of character-defining features of a cultural landscape. However, with Alternative 1, 2, and 3, fewer construction activities would occur because of the alternatives' limitation on the types of PMAs, which would reduce the likelihood of adverse impacts on cultural resources. Mitigation Measures CUL-1, CUL-2, CUL-3, and CUL-4 would reduce impacts on cultural resources.

  Therefore, impacts on cultural resources could be of lesser magnitude under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; however, impacts could be **significant and unavoidable**.

- **Energy:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Construction and O&M activities for Alternatives 1, 2, and 3 could result in substantial inefficient, wasteful, or unnecessary long-term consumption of energy resources or conflict with a state or local plan for renewable energy or energy efficiency (Impacts ENE-1 and ENE-2). However, Alternatives 1, 2, and 3 would not result in the inefficient, wasteful, or unnecessary long-term consumption of energy or changes in hydropower generation because local air pollution control or management districts require that construction activities improve equipment efficiency and reduce energy use. Routine O&M activities would require energy use; however, they would be consistent with current uses in the study area. In addition, Alternatives 2, 3, and 3 would not conflict with applicable plans, policies, or regulations of local, county, and/or state energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels. Alternative 1, 2, or 3 could result in reduced impacts on energy resources because these alternatives would limit the types of PMAs, including eliminating projects that construct new features.

  Therefore, impacts on energy resources could occur at a lesser magnitude under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; impacts would be **less than significant**.

- **Geology, Soils, and Paleontological Resources:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternative 1, 2, and 3 could include the construction of infrastructure that could expose people or structures to seismic hazards, including fault rupture and strong ground motion, or landslides (Impacts GEO-1, GEO-2, and GEO-3). Projects also may expose people or structures to unstable geological conditions; result in a loss of topsoil associated with ground disturbance, with resulting erosion and sedimentation impacts; and result in a loss of a unique paleontological or geological resource (Impacts GEO-4, GEO-5, and GEO-7). Finally, Alternatives 1, 2, and 3 could result in construction in areas on expansive soils (Impact GEO-6). However, Alternative 1, 2, or 3 would involve less construction activity in the study area and would result in fewer short-term impacts on geology and soils because fewer ground disturbance activities would occur. In addition, Mitigation Measures GEO-1, GEO-2, GEO-3, and GEO-4 would reduce the impacts of Alternatives 1, 2, and 3 related to geology and soils.

Therefore, impacts on geology and soils could occur at a lesser magnitude under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; impacts would be **less than significant**.

- **Greenhouse Gas Emissions:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could increase GHG emissions that significantly affect the environment (Impact GHG-1) and/or conflict with applicable plans, policies, and regulations adopted for the purpose of reducing GHG emissions from construction and O&M activities (Impact GHG-2). Alternatives 1, 2, and 3 would include construction and O&M activities that require the use of equipment that would contribute to pollutants. Mitigation Measure GHG-1 would reduce impacts of GHG emissions. However, there would be fewer short-term conflicts with applicable air quality plans during construction because there would be lower levels of construction emissions with less construction activity.

  Therefore, impacts of GHG emissions would be less severe under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; however, impacts could still be **significant and unavoidable**.

- **Hazards and Hazardous Materials:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could expose the environment and sensitive receptors to unidentified contaminated soil and/or groundwater, and some of the impacts could occur within 0.25 mile of a school or within 2 miles of an airport (Impacts HAZ-1, HAZ-2, HAZ-3, and HAZ-4). Alternatives 1, 2, and 3 could also interfere with emergency response access or adopted emergency response or evacuation plans (Impact HAZ-5). In addition, they could expose people or structures to wildland fires or vector habitats (Impact HAZ-6). Construction and O&M activities for Alternative 1, 2, or 3 would be of a lesser magnitude than with implementation of all types of PMAs. Mitigation Measures HAZ-1, HAZ-2, and HAZ-3 would reduce the impacts of Alternatives 1, 2, and 3 related to hazards and hazardous materials.

  Therefore, impacts on hazards and hazardous materials would occur at a lesser magnitude under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; impacts would be **less than significant**.

- **Hydrology and Water Quality:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternative 1, 2, and 3 could result in the release of pollutants into surface water and/or groundwater, including in a flood zone as a result of project inundation, that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan (Impact HYD-1). They could also result in substantial alteration of an existing drainage plan in a manner that results in substantial erosion or siltation on- or off-site; result in flooding on- or off-site; create or contribute runoff water that exceeds the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or impede or redirect flood flows (Impact HYD-2). Additionally, Alternatives 1, 2, and 3 could result in substantial alteration of groundwater-surface water interactions, result in conflicts with existing water rights, and/or result in substantial alteration of groundwater conditions in adjacent basins (Impacts HYD-3, HYD-4, and HYD-5). Alternatives 1, 2, and 3 would have the same types of impacts from construction and O&M activities, and Mitigation Measures HYD-1, HYD-2, and HYD-3 would reduce impacts on hydrology and water quality.

  Therefore, similar to the impacts of implementation all types of PMAs, impacts of Alternatives 1, 2, and 3 on hydrology and water quality would be **less than significant**.

- **Land Use and Planning:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could potentially conflict with existing land use plans, policies, and regulations and divide an established community (Impacts LU-1 and LU-2). Therefore, similar to the impacts of the implementation of all types of PMAs, impacts of Alternatives 1, 2, and 3 related to land use and planning could be **significant and unavoidable**.

- **Mineral Resources:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could result in the loss of availability of a known mineral resource or locally important mineral resource recovery site (Impact MIN-1). Alternatives 1, 2, and 3 would have the same types of construction and O&M activities. Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of Alternatives 1, 2, and 3 on mineral resources would be **less than significant**.

- **Noise:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

Under Alternatives 1, 2, and 3, sensitive receptors could be exposed to excessive noise and groundborne vibrations associated with construction-related and operational improvements (Impacts NOI-1 and NOI-2). Mitigation Measures NOI-1, NOI-2, NOI-3, and NOI-4 would reduce the noise impacts of Alternatives 1, 2, and 3. Therefore, similar to the impacts of implementation of all types of PMAs, noise impacts of Alternatives 1, 2, and 3 would be **less than significant**.

- **Population and Housing:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could displace housing and/or people (Impact POP-1); however, these impacts would be less than significant and there would be sufficient housing units to accommodate any displaced people (Impact POP-2). Therefore, similar to the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of Alternatives 1, 2, and 3 related to population and housing would be **less than significant**.

- **Recreation:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  With Alternatives 1, 2, and 3, recreational facilities and activities could be impaired, degraded, or eliminated (Impact REC-1). Alternatives 1, 2, and 3 could place additional demands on recreation facilities by attracting more users or displacing people from existing recreation facilities, requiring the construction of new facilities or the expansion of existing facilities (Impact REC-2). Mitigation Measure REC-1 would reduce the impacts of Alternatives 1, 2, and 3 on recreational resources. Similar to implementation of all types of PMAs under the Turlock Subbasin GSP, recreation impacts of Alternatives 1, 2, and 3 would be **less than significant**.

- **Transportation:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could conflict with adopted plans and policies for roadway performance; bicycle and pedestrian paths and trails; and rail and transit performance (Impacts TRANS-1 and TRANS-2). They also could increase traffic hazards as a result of road relocation, increase navigation hazards related to design features, and result in inadequate emergency access by blocking access or otherwise interfering with established emergency service routes (Impacts TRANS-3 and TRANS-4). Mitigation Measures TRANS-1, TRANS-2, TRANS-3, and TRANS-4 would reduce impacts of Alternatives 1, 2, and 3 on transportation.

  Therefore, similar to the impacts of the implementation of all types of PMAs under the Turlock Subbasin GSP, impacts of Alternatives 1, 2, and 3 related to transportation would be **less than significant**.

- **Tribal Cultural Resources:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could disturb or destroy tribal cultural resources as defined in PRC Section 21074 (Impact TCR-1). However, with Alternative 1, 2, and 3, fewer construction activities would occur because of the alternatives' limitation on the types of PMAs, which would reduce the likelihood of adverse impacts on tribal cultural resources. Mitigation Measures CUL-2, CUL-3, and CUL-4 would reduce impacts on tribal cultural resources.

  Therefore, impacts on tribal cultural resources would be of lesser magnitude under Alternatives 1, 2, and 3 than with implementation of all types of PMAs; however, impacts could still be **significant and unavoidable**.

- **Utilities and Service Systems and Public Services:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could require the relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities that would cause significant environmental effects (Impact UTIL-1). These impacts would be significant and unavoidable. Alternatives 1, 2, and 3 could also result in landfill with insufficient permitted capacity to accommodate a project's solid waste needs (Impact UTIL-2). However, the Alternatives 1, 2, and 3 would not include the construction of new or modified fire or police protection facilities, schools, or other public facilities and would not increase population or add new public service demands (UTIL-3). Therefore, similar to the implementation of all types of PMAs, impacts of Alternatives 1, 2, and 3 on utilities and service systems could be s**ignificant and unavoidable**, and impacts on public services would be **less than significant**.

- **Wildfire:** Construction and O&M activities under Alternative 1, 2, and 3 would be of lesser magnitude because these alternatives would limit the type of PMA based on estimated annual recharge potential; eliminate certain aspects of PMAs, such as constructed features; and/or exclude entire categories of PMAs that would be implemented under the Turlock Subbasin GSP, such as direct and in-lieu recharge projects.

  Alternatives 1, 2, and 3 could impair an adopted emergency response or evacuation plan, exacerbate fire risk, or result in downslope or downstream risks as a result of runoff, post-fire slope instability, or drainage changes (Impacts WILD-1, WILD-2, WILD-3, and WILD-4). However, similar to the impacts of the implementation of all types of PMAs, wildfire impacts of Alternatives 1, 2, and 3 would be **less than significant**.

Impacts Identified as More Severe

No impacts of Alternative 1, 2, or 3 have been identified as being more severe than implementation of all types of PMAs under the Turlock Subbasin GSP.

6.5 Environmentally Superior Alternative

CEQA requires the identification of the environmentally superior alternative—that is, the alternative that has the least significant impacts on the environment. State CEQA Guidelines Section 15126.6(e)(2) states: *"If the environmentally superior alternative is the 'no project' alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives."*

Table 6-1 presents a comparison of impacts by resource issue area, after mitigation, for the No Project Alternative, and Alternatives 1, 2, and 3 as compared to the implementation of all types of PMAs under the Turlock Subbasin GSP. In Table 6-1, the most conservative environmental impact was used for the entire resource area section.

As shown in Table 6-1, and as discussed in the alternatives analysis above, Alternatives 1, 2, and 3 would result in similar impacts compared to implementation of all types of PMAs, but potentially at a lesser magnitude. Alternative 3 excludes entire types of PMAs (i.e., direct and in-lieu recharge projects), which would result in the least construction activity than under the other alternatives. Therefore, Alternative 3 would be the environmentally superior alternative.

However, as described above, Alternative 3 would not fully achieve most of the plan objectives. Implementation of all types of PMAs are essential to achieve the sustainability goal for the Turlock Subbasin by 2042 and avoid undesirable results over the remainder of the 50-year planning horizon. Implementation of appropriate mitigation measures would minimize the potential for significant impacts of Alternative 3. However, as with the implementation of all types of PMAs, the exact location and extent of PMAs that would be permitted under Alternative 3 are not known at this time. Therefore, construction-related impacts would still be considered significant and unavoidable.

TABLE 6-1
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Aesthetic and Visual Resources	**AES-1:** Implementing PMAs under the Turlock Subbasin GSP could result in substantial degradation of visual qualities.	LTSM	Similar	Similar *	Similar *	Similar *
	AES-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse effects on scenic vistas and scenic resources.	LTS	Similar	Similar *	Similar *	Similar *
	AES-3: Implementing PMAs under the Turlock Subbasin GSP could result in new sources of substantial light or glare.	LTSM	Similar	Similar *	Similar *	Similar *
Agriculture and Forestry Resources	**AG-1:** Implementing PMAs under the Turlock Subbasin GSP could convert Special Designated Farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural use.	SU	Similar	Similar *	Similar *	Similar *
	AG-2: Implementing PMAs under the Turlock Subbasin GSP could result in other changes in the existing environment that, because of their location or nature, indirectly result in the conversion of Special Designated Farmland to nonagricultural use or conversion of forestland to nonforest use.	LTS	Similar	Similar *	Similar *	Similar *
Air Quality	**AIR-1:** Implementing PMAs under the Turlock Subbasin GSP could result in conflict with or obstruct implementation of the applicable air quality plan.	SU	Similar	Similar *	Similar *	Similar *
	AIR-2: Implementing PMAs under the Turlock Subbasin GSP could result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard.	SU	Similar	Similar *	Similar *	Similar *
	AIR -3: Implementing PMAs under the Turlock Subbasin GSP could expose sensitive receptors to substantial pollutant concentrations.	LTSM	Similar	Similar *	Similar *	Similar *
	AIR -4: Implementing PMAs under the Turlock Subbasin GSP could result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.	LTS	Similar	Similar *	Similar *	Similar *
Biological Resources	**BIO-1:** Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.	SU	Similar	Similar *	Similar *	Similar *
	BIO-2: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS.	SU	Similar	Similar *	Similar *	Similar *
	BIO-3: Implementing PMAs under the Turlock Subbasin GSP could result in a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means.	LTSM	Similar	Similar *	Similar *	Similar *

TABLE 6-1 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Biological Resources (cont.)	**BIO-4:** Implementing PMAs under the Turlock Subbasin GSP could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	SU	Similar	Similar *	Similar *	Similar *
	BIO-5: Implementing PMAs under the Turlock Subbasin GSP could conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.	LTSM	Similar	Similar *	Similar *	Similar *
	BIO-6: Implementing PMAs under the Turlock Subbasin GSP could conflict with the provisions of an adopted HCP, natural community conservation plan, or other approved local, regional, or state HCP.	NI	Similar	Similar *	Similar *	Similar *
Cultural Resources	**CUL-1:** Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines Section 15064.5.	SU	Similar	Similar *	Similar *	Similar *
	CUL-2: Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines Section 15064.5.	SU	Similar	Similar *	Similar *	Similar *
	CUL-3: Implementing PMAs under the Turlock Subbasin GSP could disturb any human remains, including those interred outside of formal cemeteries.	SU	Similar	Similar *	Similar *	Similar *
Energy	**ENE-1:** Implementing PMAs under the Turlock Subbasin GSP could result in result in wasteful, inefficient, or unnecessary consumption of energy resources.	LTS	Similar	Similar *	Similar *	Similar *
	ENE-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	LTS	Similar	Similar *	Similar *	Similar *
Geology, Soils, and Paleontological Resources	**GEO-1:** Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-2: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-3: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-4: Implementing PMAs under the Turlock Subbasin GSP could result in substantial soil erosion or the loss of topsoil.	LTSM	Similar	Similar *	Similar *	Similar *

TABLE 6-1 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Geology, Soils, and Paleontological Resources (cont.)	**GEO-5:** Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potential result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.	LTS	Similar	Similar *	Similar *	Similar *
	GEO-6: Implementing PMAs under the Turlock Subbasin GSP could result in new projects that could be located on expansive soil creating substantial direct or indirect risks to life or property.	LTSM	Similar	Similar *	Similar *	Similar *
	GEO-7: Implementing PMAs under the Turlock Subbasin GSP could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	LTSM	Similar	Similar *	Similar *	Similar *
Greenhouse Gas Emissions	**GHG-1:** Implementing PMAs under the Turlock Subbasin GSP could generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.	LTSM	Similar	Similar *	Similar *	Similar *
	GHG-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.	LTS	Similar	Similar *	Similar *	Similar *
Hazards and Hazardous Materials	**HAZ-1**: Implementing PMAs under the Turlock Subbasin GSP could create a significant hazard to the public or the environment through the routine transport, use, disposal, or accidental release of hazardous materials.	LTS	Similar	Similar *	Similar *	Similar *
	HAZ-2: Implementing PMAs under the Turlock Subbasin GSP could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	LTS	Similar	Similar *	Similar *	Similar *
	HAZ-3: Implementing PMAs under the Turlock Subbasin GSP could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment.	LTSM	Similar	Similar *	Similar *	Similar *
	HAZ -4: Implementing PMAs under the Turlock Subbasin GSP could be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the area.	LTS	Similar	Similar *	Similar *	Similar *
	HAZ -5: Implementing PMAs under the Turlock Subbasin GSP could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	LTS	Similar	Similar *	Similar *	Similar *
	HAZ -6: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.	LTS	Similar	Similar *	Similar *	Similar *

TABLE 6-1 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Hydrology and Water Quality	**HYD-1:** Implementing PMAs under the Turlock Subbasin GSP could result in release of pollutants into surface and/or groundwater, including in a flood zone as a result of project inundation, that could violate water quality standards or waste discharge requirements, substantially degrade water quality, or conflict with or obstruct implementation of a water quality control plan.	LTSM	Similar	Similar *	Similar *	Similar *
	HYD-2: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: result in substantial erosion or siltation on- or off-site; result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or impede or redirect flood flows.	LTSM	Similar	Similar *	Similar *	Similar *
	HYD-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration of groundwater-surface water interactions.	LTS	Similar	Similar *	Similar *	Similar *
	HYD-4: Implementing PMAs under the Turlock Subbasin GSP could result in conflicts with existing water rights (beneficial use and/or point of diversion).	LTS	Similar	Similar *	Similar *	Similar *
	HYD-5: Implementing PMAs under the Turlock Subbasin GSP could result in substantial alteration to groundwater conditions in adjacent basins.	LTSM	Similar	Similar *	Similar *	Similar *
Land Use and Planning	**LU-1:** Implementing PMAs under the Turlock Subbasin GSP could conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.	SU	Similar	Similar *	Similar *	Similar *
	LU-2: Implementing PMAs under the Turlock Subbasin GSP could physically divide an established community	LTS	Similar	Similar *	Similar *	Similar *
Mineral Resources	**MIN-1:** Implementing PMAs under the Turlock Subbasin GSP would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.	LTS	Similar	Similar *	Similar *	Similar *
Noise	**NOI-1:** Implementing PMAs under the Turlock Subbasin GSP could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	LTSM	Similar	Similar *	Similar *	Similar *
	NOI-2: Implementing PMAs under the Turlock Subbasin GSP could generate excessive groundborne vibration or groundborne noise levels.	LTSM	Similar	Similar *	Similar *	Similar *

TABLE 6-1 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Population and Housing	**POP-1:** Implementing PMAs under the Turlock Subbasin GSP could induce substantial unplanned population growth in the area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).	LTS	Similar	Similar *	Similar *	Similar *
	POP-2: Implementing PMAs under the Turlock Subbasin GSP could result in the displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.	LTS	Similar	Similar *	Similar *	Similar *
Recreation	**REC-1:** Implementing PMAs under the Turlock Subbasin GSP could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	LTSM	Similar	Similar *	Similar *	Similar *
	REC-2: Implementing PMAs under the Turlock Subbasin GSP could include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.	LTSM	Similar	Similar *	Similar *	Similar *
Transportation	**TRANS-1:** Implementing PMAs under the Turlock Subbasin GSP could conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.	LTSM	Similar	Similar *	Similar *	Similar *
	TRANS-2: Implementing PMAs under the Turlock Subbasin GSP could conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).	LTS	Similar	Similar *	Similar *	Similar *
	TRANS-3: Implementing PMAs under the Turlock Subbasin GSP could substantially increase hazards due to a geometric design feature or incompatible uses.	LTSM	Similar	Similar *	Similar *	Similar *
	TRANS-4: Implementing PMAs under the Turlock Subbasin GSP could result in inadequate emergency access.	LTSM	Similar	Similar *	Similar *	Similar *
Tribal Cultural Resources	**TCR-1:** Implementing PMAs under the Turlock Subbasin GSP could cause a substantial adverse change in the significance of a tribal cultural resource, as defined in PRC Section 21074.	SU	Similar	Similar *	Similar *	Similar *
Utilities and Service Systems and Public Services	**UTIL-1:** Implementing PMAs under the Turlock Subbasin GSP could result in construction or relocation of new water or expanded water, stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.	PSU	Similar	Similar *	Similar *	Similar *
	UTIL-2: Implementing PMAs under the Turlock Subbasin GSP could result in landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs and fail to comply with federal, state, and local statutes and regulations related to solid waste.	LTS	Similar	Similar *	Similar *	Similar *
	UTIL-3: Implementing PMAs under the Turlock Subbasin GSP could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, and other public facilities.	LTS	Similar	Similar *	Similar *	Similar *

TABLE 6-1 (CONTINUED)
SUMMARY COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES TO THE IMPLEMENTATION OF PMAS UNDER THE TURLOCK SUBBASIN GSP

Resource Topic	Impact	Implementation of all Types of PMAs under the Turlock Subbasin GSP	No Project Alternative	Alternative 1—Specify More Narrowly Types of PMAs	Alternative 2—Eliminate Certain Aspects of PMAs	Alternative 3—Exclude Entire Categories of PMAs
Wildfire	**WILD-1:** Implementing PMAs under the Turlock Subbasin GSP could substantially impair an adopted emergency response plan or emergency evacuation plan.	LTS	Similar	Similar *	Similar *	Similar *
	WILD-2: Implementing PMAs under the Turlock Subbasin GSP could, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.	LTS	Similar	Similar *	Similar *	Similar *
	WILD-3: Implementing PMAs under the Turlock Subbasin GSP could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts on the environment.	LTS	Similar	Similar *	Similar *	Similar *
	WILD-4: Implementing PMAs under the Turlock Subbasin GSP could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	LTS	Similar	Similar *	Similar *	Similar *

NOTES:

LTS—Less than significant; LTSM—Less than significant after application of feasible mitigation measure(s); NI—No Impact; SU—Significant and Unavoidable.

* The impact related to the alternative could be at a lesser magnitude than the impacts from the PMAs implemented under the Turlock Subbasin GSP; however, it is assumed the final impact conclusion (e.g., LTSM, SU) is similar to the conclusion for the PMAs implemented under Turlock Subbasin GSP. For example, there may be less overall construction related to the alternative, but the construction impacts related to noise, air quality, etc., could result in the same final impact conclusion as for the PMAs implemented under the Turlock Subbasin GSP PEIR.

SOURCE: Data compiled by Environmental Science Associates in 2022.

CHAPTER 7
List of Preparers

The purpose of this chapter is to meet requirements described in Section 15129 of the CEQA Guidelines, Organizations and Persons Consulted, which states the following regarding EIRs prepared pursuant to CEQA:

> "*The EIR shall identify all federal, state, or local agencies, other organizations, and private individuals consulted in preparing the draft EIR, and the persons, firm, or agency preparing the draft EIR, by contract or other authorization (Authority Cited: Section 21083, Public Resources Code; Reference: Sections 21104 and 21153, Public Resources Code).*"

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CHAPTER 8
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Chapter 7, *List of Preparers*

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Appendix A

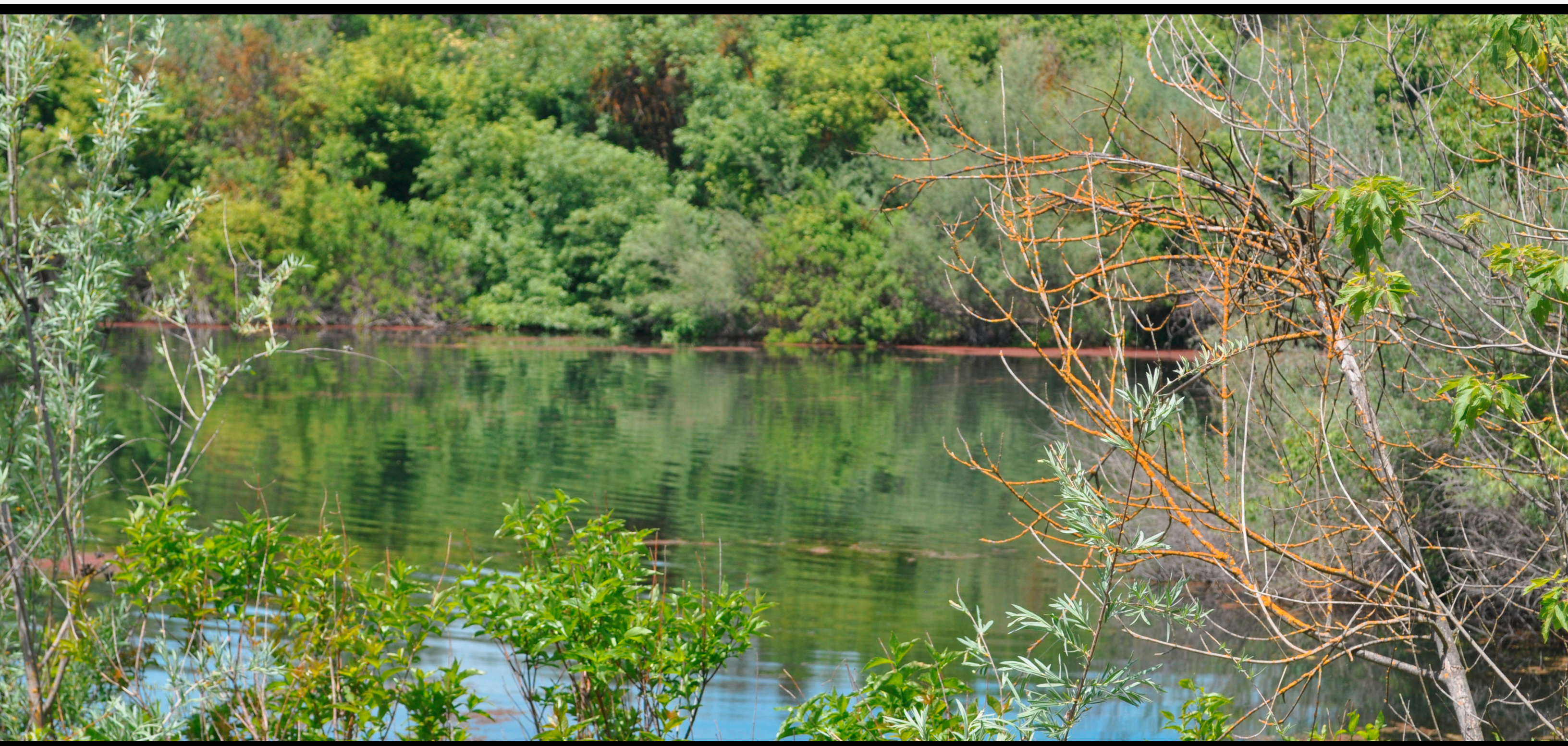
Approved Turlock Subbasin GSP, Select Chapters

January 2022

TURLOCK GROUNDWATER

Turlock Subbasin

Groundwater Sustainability Plan



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January 26, 2022

Department of Water Resources (DWR)
Attention: Mr. Paul Gosselin
Deputy Director, Statewide Groundwater Management
P.O. Box 942836
Sacramento, CA 94236-0001

RE: Submittal of the 2022 Turlock Subbasin Groundwater Sustainability Plan

Dear Mr. Gosselin and DWR staff:

On behalf of the West Turlock Subbasin Groundwater Sustainability Agency (WTSGSA) and the East Turlock Subbasin Groundwater Sustainability Agency (ETSGSA), I am pleased to submit the Turlock Subbasin Groundwater Sustainability Plan (GSP) to the Department of Water Resources. The GSP was adopted by the GSAs on January 6, 2022. In compliance with §353.4(b), this transmittal letter accompanies the GSP, which is being uploaded to the DWR SGMA portal.

We look forward to working with DWR on our plan as we move forward with GSP implementation. As you begin your review process, if there are any questions please do not hesitate to contact me at 209-883-8428 or via email at dcmontalbano@tid.org.

Sincerely,

DCMontalbano

Debra Montalbano, P.E.
Plan Manager

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TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY PLAN (GSP)

WEST TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY AGENCY

EAST TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY AGENCY

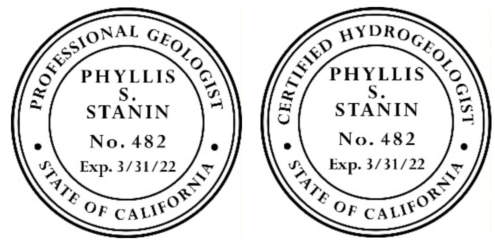
JANUARY 2022

Prepared by:
Todd Groundwater and
Woodard & Curran

In association with:
Davids Engineering
Wood Rodgers
California State University

SIGNATURE PAGE

Phyllis S. Stanin, PG, CHG, Vice President
Todd Groundwater, Alameda, CA



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APPENDIX C: GSP Preparation – Notices of Intent and Memorandum of Agreement

- Notice of Intent to Prepare a Groundwater Sustainability Plan; West Turlock Subbasin Groundwater Sustainability Agency
- Notice of Intent to Prepare a Groundwater Sustainability Plan; East Turlock Subbasin Groundwater Sustainability Agency
- Memorandum of Agreement (MOA) between the West Turlock Subbasin Groundwater Sustainability Agency and the East Turlock Subbasin Groundwater Sustainability Agency

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Acronyms

1,2,3-TCP	1,2,3-trichloropropane
AWMP	Agricultural Water Management Plan
bgs	below ground surface
BMP	Best Management Practices
BCWD	Ballico-Cortez Water District
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
C2VSim	California Central Valley Groundwater-Surface Water Simulation Model
C2VSimTM	C2VSim-Turlock/Modesto; revised regional C2VSim model for Turlock and Modesto subbasins
CalGEM	California Geologic Energy Management Division, formerly DOGGR, Department of Conservation
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CDEC	California Data Exchange Center
CGPS	Continuously Operating Global Positioning System
CIMIS	California Irrigation Management Information System
COC	Constituent of Concern
CPD	Community Planning Districts
CGPF	CalSim II Generated Perturbation Factors
CSD	Community Services District
CWD	County Water District
CVRWQCB	Regional Water Quality Control Board, Central Valley Region
DBCP	Dibromochloropropane
DDW	Division of Drinking Water
DMMs	Demand Management Measures
DMS	Data Management System
DOGGR	Geologic Energy Management Division (CalGEM), formerly the Division of Oil, Gas and Geothermal Resources, California Department of Conservation
DTSC	Department of Toxic Substances Control

DWR	Department of Water Resources, State of California
EC	Electrical conductivity/ specific conductance
EGRP®	Energy Passive Groundwater Recharge Product
ESJWQC	East San Joaquin Water Quality Coalition
ETSGSA	East Turlock Subbasin Groundwater Sustainability Agency
ET	Evapotranspiration
EWD	Eastside Water District
EWMP	Efficient Water Management Practices
FMMP	Farmland Mapping and Monitoring Program
GAMA	Groundwater Ambient Monitoring and Assessment
GDE	Groundwater dependent ecosystem
GPS	Global Positioning System
GRAT	Groundwater Recharge Assessment Tool
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWMP	Groundwater Management Plan
ID	Irrigation District
ILRP	Irrigated Lands Regulatory Program
IM	Interim Milestone
InSAR	Interferometric Synthetic Aperture Radar
IPL	Interested Parties List
IWFM	Integrated Water Flow Model
IWMP	Irrigation Water Master Plan
JPA	Joint Powers Agreement
LUST	Leaking Underground Storage
M&I	Municipal & Industrial
MAR	Managed Aquifer Recharge
MCL	Maximum Contaminant Level
MID	Merced Irrigation District
MOA	Memorandum of Agreement
MO	Measurable Objective

MOU	Memorandum of Understanding
MT	Minimum Threshold
Mya	Million years ago
NCCAG	Natural Communities Commonly Associated with Groundwater
NCP	Nitrate Control Program
NDVI	Normalized Derived Vegetation Index
NDMI	Normalized Derived Moisture Index
NMP	Nitrogen Management Plan
NOAA	National Oceanic and Atmospheric Administration
PCAs	Potentially Contaminating Activities
PCE	Tetrachloroethylene
PEIR	Programmatic Environmental Impact Report
PRISM	Parameter-elevation Relationships on Independent Slopes Model
RSWSP	Regional Surface Water Supply Project (City of Turlock)
RWQCB	Regional Water Quality Control Board
SCHM	Stanislaus County Hydrologic Model
SGMA	Sustainable Groundwater Management Act
SOI	Sphere of Influence
SOP	Standard Operating Procedure
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TCP	1,2,3-Trichloropropane
TDS	Total Dissolved Solids
TGBA	Turlock Groundwater Basin Association
TID	Turlock Irrigation District
TRRP	Tuolumne River Regional Park
TSS	DWR's Technical Support Services Program
USBR	United States Bureau of Reclamation
UWMP	Urban Water Management Plan
VIC	Variable Infiltration Capacity
WCR	Well Completion Reports (available from DWR)

WDL	DWR's Water Data Library
WDR	Waste Discharge Requirements
WTSGSA	West Turlock Subbasin Groundwater Sustainability Agency

6. SUSTAINABLE MANAGEMENT CRITERIA

GSP regulations provide a framework for locally-defined and quantitative *sustainable management criteria*, which allows the GSAs to quantitatively measure and track ongoing sustainable management. These criteria include the following terms, along with a brief summary[25] of how each is used in this GSP:

- Undesirable Result – significant and unreasonable adverse conditions for any of the six sustainability indicators defined in the GSP regulations.
- Minimum Threshold (MT[26]) – numeric value used to define undesirable results for each sustainability indicator at representative monitoring sites.
- Measurable Objective (MO[2]) – numeric goal to track the performance of sustainable management at representative monitoring sites.
- Interim Milestone (IM[2]) – target numeric value representing measurable groundwater conditions, in increments of five years, as set by the GSAs as part of the GSP.

Collectively, these terms provide the framework on which to:

- define sustainable management for the Turlock Subbasin
- provide guidelines for favorable groundwater conditions
- identify unfavorable groundwater conditions and associated warning signs
- select and evaluate appropriate management projects and actions
- monitor progress on achieving the sustainability goal.

6.1. SUSTAINABILITY GOAL

A sustainability goal provides a mission statement for what the GSAs wish to achieve through sustainable management. GSP regulations provide requirements for a GSP Sustainability Goal, as follows:

> Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the

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[25] Sustainable management criteria are more fully defined in SGMA (CWC 10721(a) – (ab) and GSP regulations (§351(a) – (an)).

[26] Because of the frequency of use, and to facilitate review of the text, the terms “minimum threshold,” “measurable objective,” and “interim milestone” are abbreviated as “MT”, “MO”, and “IM” respectively, throughout remaining sections of the GSP. However, the terms are spelled out in un-abbreviated form where helpful for context and clarity or when contained in a direct quotation.

> sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon. (§354.24).

DWR requires one succinct, common sustainability goal for the entire Subbasin (DWR, 2017). Based on DWR guidance and GSP requirements, the consultant team prepared technical memoranda to facilitate discussion and development of a Draft Sustainability Goal by members of the ETSGSA and WTSGSA Technical Advisory Committees (collectively referred to in this GSP as the Joint TACs). The technical memoranda summarized GSP requirements, provided examples of Sustainability Goals from other San Joaquin Valley subbasins, and prepared a draft initial Sustainability Goal for consideration and revision by the Joint TACs.

The Joint TACs reviewed requirements and discussed aspirations for an initial sustainability goal for the Turlock Subbasin GSP at two public meetings (February 26 and March 26, 2020). The initial Sustainability Goal was revised as the GSP progressed. The most recent draft sustainability goal as revised in August 2021 is provided below.

The Sustainability Goal for the Turlock Subbasin *is to ensure a reliable and sustainable groundwater supply that supports population growth, sustains the agricultural economy, and provides for beneficial uses, especially during drought. This goal is supported by and includes the following actions:*

- *Manage the Subbasin within its sustainable yield and arrest ongoing long-term water level declines.*
- *Support interconnected surface water to avoid adverse impacts to surface water uses.*
- *Manage groundwater extractions and water levels to avoid impacts from future potential land subsidence.*
- *Optimize conjunctive use of surface water, recycled water, and groundwater.*
- *Support efficient water use and water conservation.*
- *Coordinate with GSAs in neighboring subbasins to avoid undesirable results along shared Subbasin boundaries.*
- *Adaptively manage the Subbasin over time to improve operational flexibility and to ensure sustainability of the groundwater resources.*

The sustainability goal will be achieved through implementation of projects and management actions that may involve improved conjunctive use, increased supplies, conservation, and/or reductions in groundwater demand. Achievement of the sustainability goal will be demonstrated through the GSP monitoring network, which will monitor performance of both projects and groundwater conditions and will document the absence of undesirable results.

The sustainable management criteria and monitoring network will be based on the basin setting, including the hydrogeologic conceptual model, groundwater conditions and water budgets – which collectively provide the understanding necessary to define sustainable groundwater management.

6.2. Process for Selection of Sustainable Management Criteria

An interactive process was used by the GSAs to develop sustainable management criteria for the Turlock Subbasin. In brief, the Joint TACs led the process, with input from stakeholders, and recommended draft sustainable management criteria to be incorporated into the Draft GSP for consideration by the GSAs. Periodic updates were provided to both of the GSAs' Board of Directors. Steps taken during this process are generally summarized below:

1. Develop a Sustainability Goal (process described above, **Section 6.1**).
2. Analyze Sustainability Indicators.
3. Define Undesirable Results.
4. Assign Minimum Thresholds and Measurable Objectives.
5. Provide for ongoing evaluations of sustainable management criteria as projects and management actions are developed, and adjust criteria, as needed.
6. Develop the GSP monitoring network and finalize criteria based on representative monitoring sites.
7. Select interim milestones for achieving sustainability.

These steps were accomplished through a series of TAC committee meetings and input from members of the Joint TACs and stakeholders at numerous public meetings. More than 20 public meetings were held from February 2020 through September 2021 that focused on various aspects of sustainable management criteria conditions including a review of applicable GSP regulations, DWR Best Management Practices (BMPs) and guidance documents, and relevant groundwater conditions within the Turlock Subbasin and adjacent subbasins.

In February 2021, the Joint TACs formed a smaller working group referred to as the Ad Hoc Committee[27] to move through the technical issues more quickly and provide immediate input to the technical team. For these meetings, the technical team provided focused information and recommendations to the Ad Hoc Committee regarding the items listed above.

[27] The Ad Hoc Committee consists of a small subset of members of the Joint TACs to provide input and recommendations to both the technical team and the Joint TACs.

Once the Ad Hoc Committee agreed upon a recommended approach for specific sustainable management criteria, the recommended draft criteria, along with the technical basis and information for the recommendation, were brought before the Joint TACs in a public meeting for a recommendation to use in the Draft GSP. Each TAC provided periodic updates on this process to its GSA Board of Directors at regularly scheduled public Board meetings. **Chapter 3** provides a more complete summary of the overall outreach process.

6.2.1. Analyze Sustainability Indicators

SGMA defines six sustainability indicators as illustrated in the following diagram, each with its DWR-developed icon. The Joint TACs considered the applicability of each sustainability indicator to conditions in the Turlock Subbasin as described in the basin setting, with particular attention to future projected water budgets (**Sections 4** and **5**).

Chronic Lowering of Water Levels	Reduction of Groundwater in Storage	Degraded Water Quality	Seawater Intrusion	Inelastic Land Subsidence	Depletion of Inter-connected Surface Water

As discussed in the sections below, five of the six sustainability indicators were determined to be applicable to the Turlock Subbasin; seawater intrusion was not applicable to Subbasin groundwater conditions, as discussed further in **Section 6.5**.

As explained in more detail in previous chapters of this GSP, there are a variety of technical considerations for each of the applicable sustainability indicators in the Turlock Subbasin. Those considerations were used to develop the sustainable management criteria and are illustrated on **Figure 6-1**. As shown on the figure, sustainability indicator icons are placed in the general areas of the Subbasin where the indicators have the most potential for future adverse impacts.

Chronic lowering of groundwater levels and reduction of groundwater in storage (overdraft) are primarily concerns in the Eastern Principal Aquifer. Water level declines in the northwestern portion of the aquifer have contributed to domestic well failures during the 2014-2017 drought. The cone of depression in the central portion of the aquifer, as indicated by the Fall 2015 groundwater elevation contours, shows the areas of historical and ongoing extractions where groundwater has served as the primary source of water supply (**Figure 6-1**; see also **Figure 4-30a**). Water level declines and reductions of groundwater in storage are also observed east of this delineated cone of depression, as indicated by groundwater elevations and hydrographs from sparse well data available in that area (see **Figure 4-27**, hydrographs 17 and 18). Chronic lowering of water levels has also impacted drinking water supply wells in the urban communities, including in the cities of Ceres and Turlock and urban communities of Delhi and Hickman.

Concerns regarding degradation of water quality have been documented by public water suppliers – especially in the cities of Turlock and Ceres, as indicated by the degraded water quality icons in those two areas (**Figure 6-1**).

No impacts from land subsidence have been documented to date in the Turlock Subbasin. However, the presence of the Corcoran Clay and associated compressible clay layers suggests the potential for future land subsidence if water levels are allowed to decline and depressurize or dewater regional clays. The western principal aquifers are within the extent of the Corcoran Clay and, as such, are likely the most susceptible areas for potential land subsidence (**Figure 6-1,** see the land subsidence icon and the area highlighted by red stripes). Although the Eastern Principal Aquifer are less likely to experience significant future land subsidence (due to more consolidated aquifers outside of the Corcoran Clay extent), sustainable management criteria and a GSP monitoring network have also been established for the entire Subbasin as a protective measure.

Finally, all three river boundaries are interconnected surface water as defined by SGMA, and sustainable management criteria have been selected based on conditions along each river. The most protective criteria have been established along the Merced River to prevent future projected streamflow depletions and the potential for disconnection from the aquifer. Criteria are also established along the Tuolumne River and San Joaquin River to preserve net gaining conditions along each boundary (**Figure 6-1**).

6.2.2. Define Undesirable Results

For each of the five applicable sustainability indicators, the Joint TACs identified related potential adverse impacts that either had occurred or could occur in the Subbasin. These impacts were considered in the context of the technical analyses in the basin setting including the hydrogeologic conceptual model, groundwater conditions, and water budgets.

The Joint TAC members considered whether impacts were significant and unreasonable, and thereby undesirable results. The causes of existing or potential future undesirable results were identified, as well as locations and timing. Recognizing that management actions and groundwater conditions vary throughout the Subbasin, spatial and temporal characteristics were used to clarify conditions that could lead to undesirable results. Each sustainability indicator was discussed in multiple public TAC meetings and workshops; input from the public was considered throughout the process.

The GSP may, but is not required to, address undesirable results that occurred before, and have not been corrected by January 1, 2015 (§10727.2 (b)(4)). In the Turlock Subbasin, undesirable results for 2015 conditions were identified for chronic lowering of water levels and reduction of groundwater in storage (overdraft). Analysis of future projected conditions suggest that undesirable results for interconnected surface water would likely occur without managing groundwater levels. Finally, although less likely, undesirable results for land subsidence and degraded water quality could also occur under future projected conditions without additional GSA monitoring and management. Accordingly, sustainable management criteria were focused on either improving or, at a minimum, avoidance of worsening groundwater conditions that could lead to undesirable results.

6.2.3. Assign Preliminary Minimum Thresholds and Measurable Objectives

The definition of undesirable results guided the selection of quantitative metrics to serve as sustainable management criteria. Specifically, metrics were identified for minimum thresholds (MTs), exceedances of which may cause undesirable results. Measurable Objectives (MOs) were selected to provide a target metric for sustainable management. MTs and MOs were developed for each sustainability indicator applicable to the Turlock Subbasin. As agreed by the Joint TACs, the seawater intrusion sustainability indicator was found to not apply to the Subbasin; accordingly, no sustainable management criteria were developed for this indicator (see **Section 6.5**).

6.2.4. Adjust Sustainable Management Criteria

The sustainable management criteria were interactively adjusted during the GSP development. Specifically, sustainable management criteria were refined based on the final projected future water budgets (presented August 13, 2020), initial development of a sustainable yield (presented May 13, 2021), and the analysis of projects and management actions (through Fall 2021).

As summarized in **Section 6.10**, the Joint TACs acknowledge that the selected sustainable management criteria represent estimates based on the best available information at this time. Nonetheless, application of these criteria in the Subbasin will likely require future adjustment. Monitoring data and project performance will be evaluated over the first five years of the Plan and criteria will be reevaluated during the five-year GSP update in 2027.

6.2.5. Develop the GSP Monitoring Network

Based on the approach to the sustainable management criteria for each Principal Aquifer and each sustainability indicator, the types and locations of the GSP monitoring network were identified. **Chapter 7** describes the GSP monitoring network developed for the Turlock Subbasin.

6.2.6. Select Interim Milestones

In order to achieve the Subbasin Sustainability Goal of sustainably managing the Turlock Subbasin by 2042, the Joint TACs selected targeted water levels over the 20-year implementation horizon. These targets, or interim milestones, will provide a benchmark at the 5-year, 10-year, and 15-year intervals and considered the timing of projects and the ability to arrest ongoing groundwater level declines.

6.2.7. Organization and Presentation of Sustainable Management Criteria in the GSP

The process described above supports the sustainable management criteria selected for each of the six sustainability indicators, discussed separately in **Sections 6.3** through **6.8** below. Information within each of these sections is organized similarly and tracks the order of GSP requirements provided in *Subarticle 3. Sustainable Management Criteria*. Headings and subheadings are similar in each of the sections on the individual sustainability indicators to facilitate locating the required information. The material for each of the six sustainability indicators is organized as follows:

- Introduction including regulatory definitions
- Definition for <u>Undesirable Results</u> along with quantitative criteria that are used to define when and where undesirable results would occur.
    - Causes of Undesirable Results
    - Potential Effects on Beneficial Uses and Users of Groundwater
- Quantification of <u>Minimum Thresholds</u> (MTs). Quantified MTs are followed by the six topics below that are required to be addressed by the regulations.
    - Justification and Support for Minimum Thresholds
    - Relationship of MT with MTs of the other sustainability indicators and how GSAs determined that undesirable results would be avoided
    - Impacts of MTs on Adjacent Subbasins
    - Effects of MTs on Beneficial Uses and Users of Groundwater
    - Consideration of State, Federal, or Local Standards in MT Selection
    - Quantitative Measurement of Minimum Thresholds
- Quantification of <u>Measurable Objectives</u> (MOs)
- <u>Quantification of Interim Milestones (IMs)</u>

6.3. CHRONIC LOWERING OF GROUNDWATER LEVELS

SGMA defines an undesirable result for the chronic lowering of groundwater levels as a “significant and unreasonable depletion of supply if continued over the planning and implementation horizon” (§10721 (x)(1)). As described in **Section 4.3.1**, the amount of groundwater supply beneath the Turlock Subbasin is large (about 23 to 30 million acre feet, MAF); about 1.6 MAF of this supply has been depleted over the 25-year historical study period, representing a relatively small percentage of the total supply.

Nonetheless, the chronic lowering of groundwater levels in the Subbasin has created adverse impacts to the accessible supply from numerous water supply wells, a condition that can cause undesirable results. As such, the emphasis of this sustainability indicator is depletion of *accessible* supply and focuses on adverse impacts to Subbasin supply wells. This emphasis is also consistent with GSP regulations, which qualify that the depletion of supply is considered "*at a given location*," such as at a well (§354.28(c)(1)).

The SGMA definition of chronic lowering of groundwater levels also addresses water level declines within the context of overdraft and storage as shown below:

> Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods. (§10721 (x)(1)).

This definition allows for water level declines during droughts as long as such declines do not cause undesirable results and as long as water levels recover to acceptable levels over average hydrologic conditions. Accordingly, the analysis of the chronic lowering of groundwater levels focuses on long-term trends of water level declines that cause undesirable results for a significant number of water supply wells.

The undesirable results, including causes and impacts to beneficial uses, are described in **Section 6.3.1** below, with the definition of undesirable results provided at the end of the section along with criteria to quantify where and when undesirable results will occur. **Section 6.3.2** describes the quantification of minimum thresholds (MTs). **Section 6.3.3** provides the approach and selection of measurable objectives (MOs). Interim milestones that cover all of the sustainability indicators are described in **Section 6.9**.

6.3.1. Undesirable Results for Chronic Lowering of Groundwater Levels

The cause of the groundwater level declines in the Turlock Subbasin are the combined results of long-term overdraft and multi-year drought conditions. Increased agricultural production in areas that rely solely on groundwater has caused a historical Subbasin overdraft of about 63,900 AFY (**Section 5.1.4** and **Table 5-6**). This deficit has resulted in chronic declines in groundwater levels, primarily in the east-central portion of the Subbasin where a cone of depression is delineated by groundwater elevation contours around an area of over-pumping (see **Figure 6-1**, **Section 4.3**, and **Figure 4-30a**). This depression has altered natural groundwater flow directions and induced subsurface flows from WTSGSA to ETSGSA (. This reversal of flow has also contributed to the lowering of water levels in areas of the eastern WTSGSA that support numerous domestic wells, more than 150 of which failed during drought conditions in 2013-2016 (**Figure 2-13**).

Numerous factors during drought exacerbate the chronic declines in groundwater levels in the Turlock Subbasin. First, surface water supplies, which support the agricultural economy and other Subbasin beneficial uses, are less available due to decreased precipitation in the associated watersheds of the Sierra Nevada (which feed the Tuolumne and Merced rivers). In addition, requirements for maintenance of minimum flows in the rivers for biological purposes equate to less availability for other Subbasin beneficial uses. In addition, drought conditions are often accompanied by higher temperatures, resulting in a higher water demand for beneficial uses. Finally, lower precipitation in these years also result in less natural recharge on the valley floor. All of these factors result in increased groundwater pumping to meet demands.

In addition to impacts to wells as described below, the lowering of water levels may also lead to additional undesirable results such as reduction of groundwater in storage, land subsidence, depletions of interconnected surface water and adverse impacts to groundwater dependent ecosystems (GDEs). These impacts to the other sustainability indicators are summarized in **Section 6.3.2.2** and described more fully in remaining sections of **Chapter 6**.

6.3.1.1. Causes of Undesirable Results – Adverse Impacts to Wells

The imbalance between groundwater recharge and extraction described above has caused adverse impacts on water supply wells and associated beneficial uses. Lower water levels in a pumping well increase costs to lift the water to the surface. If water levels fall below the pump intake, costs are incurred for pump lowering and/or other well modifications. Further declines can result in water levels falling below the top of well screens, resulting in geochemical changes, air entrainment, and/or decreased capacity from the well. Water level declines can also damage wellbore equipment (including pumps or casing) from cavitation or other mechanisms. If water levels fall below the bottom of the well, the well is completely dewatered and would require replacement to access groundwater.

In general, older wells, shallow wells, and/or wells with casing integrity issues are at the highest risk of failure. SGMA does not require the protection of all groundwater wells nor the correction of historical undesirable results; for this GSP, the analysis of undesirable results considers groundwater conditions during the 2013-2016 drought (which resulted in the largest rate of water level declines) and the need to avoid similar undesirable results in the future.

6.3.1.2. Potential Effects on Beneficial Uses

Well impacts can increase costs, delay operations, damage crops or property, and even jeopardize the ability to secure a reliable drinking water supply for some. Impacts can affect any beneficial use of groundwater from wells including municipal, domestic, industrial, and agricultural water supply.

Although this sustainability indicator is focused on adverse impacts to wells, chronic lowering of groundwater levels can also adversely impact environmental uses of groundwater including GDEs (**Section 4.3.8**). Given that GDEs in the Turlock Subbasin are primarily located along the rivers, GDE impacts are also affected by the interconnected surface water sustainability indicator (**Section 6.8**).

6.3.1.3. Specific Impacts to Wells and Beneficial Uses in the Turlock Subbasin

Long-term water level declines in the Subbasin combined with the 2015 drought conditions resulted in many of the adverse impacts to water supply wells and beneficial uses described above in the Turlock Subbasin. Impacts to wells and beneficial uses were initially discussed in a public workshop of the Joint TACs on February 26, 2020, with numerous follow-up discussions in Ad Hoc Committee meetings and multiple public meetings of the Joint TACs in 2020 and 2021. Many TAC member agencies are also responsible for provision of drinking water supplies; those agencies documented numerous adverse impacts to drinking water supply wells resulting from declining water levels during drought conditions (WY 2014 through WY 2016) that occurred at the end of the historical Study Period.

During that time period, water levels reached then-historic low levels throughout much of the Subbasin, providing an opportunity to observe adverse impacts associated with water level declines. Most agencies observed a decrease in capacity and well efficiency. Some agencies experienced failed wells and other adverse impacts. Numerous domestic wells were also adversely impacted. Significant adverse impacts to Turlock Subbasin water supply wells are summarized in **Table 6-1** as follows.

Table 6-1: Adverse Impacts to Wells Associated with Declining Groundwater Levels

Adverse Impacts to Water Supply Wells from 2014 through 2016	Agencies Reporting Impacts
Dry[1] or failed domestic wells	Stanislaus and Merced counties, Delhi CWD
Dry shallow, older domestic wells (<100 feet deep and > 50 years old)	Stanislaus County
Collapsed casing/borehole in municipal wells	Hickman, Hilmar CWD
Loss of capacity in municipal wells (pump lowering required)	City of Waterford[2]
Dry landscape irrigation wells	City of Turlock
Loss of capacity in rented agricultural wells; curtailed agricultural pumping in some areas	Turlock Irrigation District
Aging wells at risk of failure if water levels decline further	Hilmar CWD, City of Waterford
Water quality issues (increasing arsenic, nitrate, and/or TDS)	Cities of Modesto, Ceres, and Waterford; Hilmar CWD

[1]For purposes of this table, a "dry" domestic well does not necessarily mean that water levels in the aquifer have declined below the bottom of the well; well failures are also associated with water levels falling below a shallow pump intake or below the top of well screens such that capacity is adversely affected.

[2] Although the City of Waterford is located primarily in the Modesto Subbasin, it oversees the urban water supply system for the community of Hickman in the Turlock Subbasin and is an Associate member of the WTSGSA.

With respect to the domestic wells listed as the first two items in **Table 6-1** above, Stanislaus and Merced County representatives documented about 165 impacted domestic wells during drought conditions from 2014-2016 (see **Section 2.3.2.4**). The counties aided well owners through various County and State assistance programs that involved trucked water, provision of storage tanks, assistance with new well installations, and other measures. The City of Turlock attempted to address as many emergency requests to tie into the City water system as feasible (as mentioned by former City employees in public GSP meetings).

Lower groundwater levels also created adverse impacts on agricultural operations in the WTSGSA. For example, TID could not pump groundwater in some areas to supplement surface water deliveries of agricultural supply as was typical in TID operations. Some wells had lost capacity and others were in areas that were adversely impacting nearby wells. Pumping from private agricultural wells also had to be curtailed to avoid local impacts to other wells.

Given the difficulty agencies expressed in managing water supply and the number of failed public and domestic wells, the conditions associated with the 2015 drought (with most of the adverse impacts occurring in 2016) were defined as undesirable results for water supply wells in the western Subbasin. Similar adverse impacts were not identified in the ETSGSA due, in part, to deeper wells, a smaller number of drinking water supply wells, and subsurface groundwater inflow from the west. However, water level declines in the ETSGSA affect areas with domestic wells, such as in the northwestern area of the Eastern Principal Aquifer.

Since that time, the member agencies and domestic well owners have responded to mitigate these adverse impacts associated with drought conditions. Since 2015, DWR well completion reports document about 386 new domestic wells that have been installed in the Subbasin. Most of these wells were constructed in areas of previously failed wells and to deeper depths. Even though water levels have only recovered up to about 20 feet in most areas of the new wells (see **Figures 4-25** and **4-26**), no additional well failures have been reported. This information suggests that long-term maintenance of water levels at or above 2015 levels should be protective of domestic wells, with some decline allowed during future droughts as long as water levels can recover. Additional information on Subbasin domestic wells and adverse impacts associated with declining water levels are provided in **Section 2.3.2.4** of this GSP.

The public water suppliers within the Subbasin (including GSA member agencies) have also responded to mitigate adverse impacts to public water supply wells associated with drought conditions. Various management and mitigation actions have included infrastructure improvements and operational efficiencies. Accordingly, adverse impacts from water levels at or above 2015 levels are thought to be able to be mitigated or managed into the future. However, future adverse impacts are expected to re-occur if ongoing declines in the Subbasin are not arrested.

6.3.1.4. Turlock Subbasin Definition of Undesirable Results

Based on the information summarized above and additional information presented in the basin setting (especially **Sections 2.3.2.4** and **4.3**), a definition has been developed for undesirable results relating to chronic lowering of groundwater levels in the Turlock Subbasin. This definition focuses on adverse impacts to drinking water wells including public water supply wells and domestic wells.

Regulations also require that the undesirable result definition include quantitative criteria used to define when and where groundwater conditions can cause an undesirable result (§354.26(b)(2)). These criteria address the number of monitoring sites and events of MT exceedances that would cause an undesirable result. This framework recognizes that a single MT exceedance at one monitoring site is not likely to cause an undesirable result. This framework also allows clear identification for when an undesirable result is triggered under the GSP.

Table 6-2: Undesirable Results for Chronic Lowering of Groundwater Levels

	Undesirable Results Definition	Principal Aquifer(s)
Chronic Lowering of Groundwater Levels	An undesirable result is defined as significant and unreasonable groundwater level declines such that water supply wells are adversely impacted during multi-year droughts in a manner that cannot be readily managed or mitigated. An undesirable result for each principal aquifer will occur when at least 33% of representative monitoring wells exceeds the MT for that Principal Aquifer in three (3) consecutive Fall semi-annual monitoring events.	All

As indicated in the definition above, flexibility is provided for future drought conditions whereby water levels are allowed to decline somewhat during drought as long as periods of decline are relatively short, and ongoing projects/management actions support subsequent water level recovery above the MTs.

The use of three consecutive Fall semi-annual monitoring events in the undesirable result definition recognizes the three-year critically dry period (WY 2013 – WY 2015, see **Figure 4-2**) which caused undesirable results previously; most of the impacts to wells and associated beneficial uses occurred at the end of this three-year period (i.e., Fall 2015) and extended throughout 2016. By comparing Fall events, long-term groundwater level declines are more readily tracked without re-stating the number of exceedances due to partial recovery occurring each Spring.

Between Fall 2015 and Fall 2021, there have been three below normal or dry years, yet no additional undesirable results have been identified. Even though well resiliency has improved with hundreds of new, deeper domestic wells and improvements by public water suppliers, only short-term declines in limited areas of each Principal Aquifer are allowed under this undesirable results definition.

It is also recognized that exceedance of an MT in one well generally is not sufficient to trigger undesirable results as defined above. The use of 33 percent of the representative monitoring wells in each Principal Aquifer represents a rough estimate of the number of wells that might indicate an overall water level decline in each Principal Aquifer. For example, the area represented by the failed domestic and public water supply wells covers more than one-half of the Subbasin with impacts occurring in all three Principal Aquifers. Given these conditions, the estimate of 33 percent in each Principal Aquifer seems sufficiently protective against undesirable results and reasonable given the size of the Subbasin and number and distribution of the GSP representative monitoring wells.

For example, the proposed GSP monitoring program for chronic lowering of groundwater levels includes the following number of wells in each principal aquifer and the number of wells in 33 percent of that program. As indicated from the list below, MT exceedances in only three to seven wells (depending on the Principal Aquifer) would indicate an undesirable result. Numbers of wells and additional details are provided in **Chapter 7**, which describes the GSP monitoring network (see **Section 7.1.1** and **Figures 7-1, 7-2** and **7-3**).

- Western Upper Principal Aquifer: 18 wells (33% - 6 wells)
- Western Lower Principal Aquifer: 8 wells (33% - 3 wells)
- Eastern Principal Aquifer: 21 wells (33% - 7 wells)

The extent of the Western Upper Principal Aquifer and the Eastern Principal Aquifer each cover generally about one half of the Subbasin – roughly 160,000 to 190,000 acres each. (The Western Lower Principal Aquifer lies directly below the Western Upper Principal Aquifer and covers the same area). Each of these areas also have similar numbers of wells in the GSP monitoring network for chronic lowering of water levels (18 wells for the Western Upper Principal Aquifer and 21 wells for the Eastern Principal Aquifer, see **Section 7.1.1**).

Wells are relatively well-distributed across the Subbasin, with a focus on areas of groundwater use (see **Figures 7-1** and **7-3** in **Chapter 7**). Areas of groundwater use can be approximated by the urban and agricultural areas shown on **Figures 2-4** and **2-5**). With water level declines transitional across the Subbasin, it appears that changes in more than 6 or 7 wells could impact adjacent areas in the Subbasin. While far from exact, these estimates provide a preliminary process for estimating areas that may exceed the MTs without triggering undesirable results.

6.3.2. Minimum Thresholds for Chronic Lowering of Groundwater Levels

The quantitative MT metric required by the regulations for this indicator is "the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results" (§354.28 (c)(1). In the Turlock Subbasin, MTs are quantified as the low groundwater elevations observed in Fall 2015 at representative monitoring sites for all three

Principal Aquifers. These MTs generally approximate the groundwater elevations presented in **Figures 4-30a** and **4-30b** of the basin setting. While water levels have continued to decline in many areas of the Subbasin, the Fall 2015 levels represented the historic low water level throughout most of the Subbasin.

These MTs allow GSAs to manage to an existing groundwater surface throughout the Subbasin, demonstrating that hydraulic gradients associated with the MTs can be supported by the Principal Aquifer systems. **Table 6-3** documents the selected approach for the MTs; the MT at each representative monitoring well is presented in **Chapter 7**, which describe the GSP monitoring network (see **Section 7.1.1**).

Table 6-3: Minimum Thresholds for Chronic Lowering of Groundwater Levels

	Minimum Thresholds	Principal Aquifer(s)
Chronic Lowering of Groundwater Levels	Minimum thresholds are established as the low groundwater elevation observed in Fall 2015 at each representative monitoring site in each Principal Aquifer.	All

Information from the basin setting used to support these MTs are summarized in the following section.

6.3.2.1. Justification and Support for Minimum Thresholds

GSP regulations require that MTs for this indicator be supported by:

- The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.
- Potential effects on other sustainability indicators. (§354.28 (c)(1)(A)(B)).

Historical declines in groundwater levels across the Subbasin are discussed throughout **Section 4.3** and specifically in **Section 4.3.2**; associated water year types in that section are based on the detailed information in **Section 4.2.2.1** (also see **Figure 4-2**). **Figures 4-23** through **4-27** present hydrographs showing rates of decline in selected wells with relatively long water level records across the Subbasin. **Figure 6-1** provides locations of failed domestic wells from 2014 to 2017, representing undesirable results caused by groundwater level declines. **Figure 2-15** shows the location of new and/or replacement domestic wells drilled since the 2015 drought. A comparison of **Figures 4-28a** and **4-30a** shows the long-term water level decline during the Historical Study Period (WY 1991 to Fall 2015). Rates of decline are summarized briefly by Principal Aquifer below.

- <u>Western Upper Principal Aquifer</u>: relatively shallow and stable water levels in the western Subbasin with minimal – but observable – declines during drought; rates of decline increase in the eastern portion of the aquifer. The water level declines in the eastern portion of the aquifer resulted in failed domestic wells during 2014-2017 drought conditions. The County reported that most of those failures occurred in shallow (less than 100 feet deep) and older (more than 50 years) wells. DWR well completion reports document about 386 new, and generally deeper, domestic wells that have been drilled since 2015 in the Subbasin. Since 2016, no domestic dry wells have been reported on the DWR website[28] for reporting household water supply shortages, even though water levels remain near historic lows.

- Western Lower Principal Aquifer: wells known to be screened in this aquifer only are sparse; nonetheless, water levels appear to be relatively shallow and stable with small rates of decline that increase during drought. Although variable, the rate of decline during drought is estimated at about 1.5 feet/year. Nonetheless, local declines in the southern/southeastern portion of this aquifer resulted in adverse impacts to water supply wells during the 2014-2017 drought (e.g., near Delhi).
- Eastern Principal Aquifer: Overall declines throughout the eastern Subbasin have been observed throughout the historical Study Period with long-term declining trends since the 1990s and increased rates of decline since about 2007. Declining trends and rates vary, with representative overall declines of about 3 feet/year to more than 4.5 feet/year. Although historical water level data are sparse in the easternmost portion of the aquifer, several wells indicate the largest rates of decline in the Subbasin. Water level declines in the northwestern portion of the aquifer caused adverse impacts to a concentrated area of domestic wells.

Replacement wells and other improvements to local water supply wells appear to have mitigated impacts from 2015 levels; even though the Subbasin is close to historic low levels now, water supply wells are being managed without identified undesirable results. The large number of deeper domestic wells drilled since 2015 can be reasonably assumed to accommodate 2015 water levels, with some tolerance for future droughts (**Figure 2-15**). Nonetheless, Subbasin public water suppliers caution that additional adverse impacts to water supply wells could occur if chronic water level declines – especially in the Eastern Principal Aquifer – are not arrested and note the long-term monetary costs of continuing to operate public water supply wells at increasing water level depths over time.

SGMA does not require the GSAs to correct the historical rates of decline that resulted in 2015 conditions. However, setting the MTs at the low water levels of 2015 will prevent significant future groundwater level declines that could lead to undesirable results.

6.3.2.2. Relationship between MTs of Each Sustainability Indicator

Regulations require a description of the relationship between the MTs for each sustainability indicator and how the GSAs have determined that basin conditions at each MT will avoid undesirable results (§354.28(b)(2)). To facilitate a comparison between MTs, a summary table of MTs for each sustainability indicator is provided below. Justification for

[28] https://mydrywatersupply.water.ca.gov/report/

the approach to each MT is described in subsequent sections of this chapter, as indicated in the summary table.

Table 6-4: Summary of Minimum Thresholds by Sustainability Indicator

Sustainability Indicator	Minimum Threshold (MT)	GSP Section
Chronic Lowering of Groundwater Levels	Fall 2015 Groundwater Elevation	**6.3.2.1, 6.3.2.2**
Reduction of Groundwater in Storage	Fall 2015 Groundwater Elevation	**6.4.2.1, 6.4.2.2**
Seawater Intrusion	Not applicable	**6.5**
Degraded Water Quality	MCL of Each Constituent of Concern	**6.6.2.1, 6.6.2.2**
Land Subsidence	Fall 2015 Groundwater Elevation, or top of the Corcoran Clay, whichever is shallower	**6.7.2.1, 6.7.2.2**
Interconnected Surface Water	Tuolumne River and San Joaquin River: Fall 2015 groundwater elevation Merced River: Spring 2014 groundwater elevation	**6.8.2.1, 6.8.2.2**

As indicated in the table above, the Fall 2015 groundwater elevations are used as the MTs for three of the six sustainability indicators and also for two of the three rivers associated with interconnected surface water. For land subsidence, the MT definition also prevents the MT from being set below the top of the Corcoran Clay (applicable to the Western Lower Principal Aquifer only, see **Section 6.7.2.2** for more information).

Only for the interconnected surface water sustainability indicator along the Merced River is the MT represented as a different water level (Spring 2014). Although these levels are higher, the difference is not sufficiently significant such that the lower MTs (Fall 2015 in inland wells) would prevent the higher MTs (Spring 2014 in near-river wells) from being achieved. The monitoring networks, along with the quantification of MTs at each representative monitoring well for these sustainability indicators are provided in **Sections 7.1.1** through **7.1.6**.

As indicated in **Table 6-4**, an MT has not been selected for the Seawater Intrusion indicator because it is not applicable to the inland Turlock Subbasin (see **Section 6.5**). The MT for degraded water quality is the MCL of the constituents of concern. This MT selection does not conflict with the other sustainability indicators, as described in more detail in the following discussions.

All of the MTs are supported by basin conditions. SGMA does not require the GSAs to correct undesirable results that occurred prior to January 1, 2015. By setting the MT at Fall 2015 groundwater elevations (or Spring 2014), the conditions associated with 2015 are not exacerbated by the MTs. The interrelatedness of MTs among the sustainability indicators are summarized below.

- MTs for chronic lowering of groundwater levels are used as a proxy for reduction of groundwater in storage for all three Principal Aquifers and therefore, will not present conflicts between these two indicators. As explained in **Section 6.4**, the use of groundwater elevations as a proxy is supported by the sustainable yield analysis, whereby the Fall 2015 water levels are correlated directly to a sustainable yield volume for the Subbasin, which avoids undesirable results and also meets the requirement to use a volume as the metric for the reduction of groundwater in storage indicator (see **Section 6.4**).
- MTs have not been selected for the Seawater Intrusion indicator because it is not applicable to the inland Turlock Subbasin (see **Section 6.5**).
- MTs for chronic lowering of groundwater levels are supportive of the MTs developed for degraded water quality. By arresting water level declines (as occurs with the proposed MTs for chronic lowering of groundwater levels), potential increases in constituents of concern associated with depth (such as TDS) can be avoided. By managing to a previous groundwater surface (Fall 2015), the MTs will not significantly alter historical hydraulic gradients and will not accelerate the rate of migration of any groundwater contaminants. MTs for chronic lowering of water levels also protect against water level declines in the Western Lower Principal Aquifer, which could potentially exacerbate the vertical migration of contaminants into that aquifer (**Section 6.6**).
- MTs for chronic lowering of groundwater levels are also used as a proxy for the potential for future land subsidence. Because the 2015 groundwater elevations are either close to or above the historic low levels across the Subbasin, these MTs are protective against future land subsidence and undesirable results. The MTs also contain an additional specific stipulation that groundwater elevations will remain above the Corcoran Clay in the Western Lower Principal Aquifer (**Section 6.7**). In this manner, the MTs for chronic lowering of groundwater levels are also protective against the potential for future land subsidence.
- MTs for chronic lowering of groundwater levels are also the same as those proposed for interconnected surface water along the Tuolumne and San Joaquin rivers. If water levels were allowed to continue to decline along these river boundaries, induced recharge and increased depletion of streamflow could occur and may lead to undesirable results for interconnected surface water (see **Section 6.8**).

- MTs for chronic lowering of water levels are similar to and do not interfere with interconnected surface water MTs established for the Merced River. As explained in **Section 6.8**, the MTs along the Merced River are set at slightly higher (Spring 2014) groundwater elevations to maintain interconnectedness along the river and reduce the potential for future streamflow depletion, as predicted by the water budget analysis. By arresting water level declines in the central portions of the Subbasin, the slightly higher MTs set for the Merced River are supported (**Section 6.8**).

These additional sustainability indicators are analyzed separately in subsequent subsections of **Chapter 6** as referenced in the information above.

MT development was based on the connection between adverse impacts to beneficial users of groundwater and groundwater conditions in the Subbasin. Members of the Joint TACs reviewed data and analyses presented by the technical team and provided feedback for MT selection during numerous public Joint TAC meetings and Ad Hoc Committee meetings. For the chronic lowering of groundwater levels, these discussions focused on impacts to beneficial uses and wells, as described in **Section 6.3.1.3** and summarized on **Table 6-1**.

Working with the Joint TACs, the technical team led numerous presentations, workshops, and discussions at public Joint TAC meetings on the chronic lowering of groundwater levels. The first such workshop was held on February 27, 2020; subsequent discussions occurred in meetings in March through June 2020. From July through September 2020, the technical team prepared a framework for the sustainable management criteria for the Joint TACs consideration. During that time, details were clarified regarding water level declines, domestic wells, and how best to define undesirable results for water supply wells.

TAC members provided feedback, agreed upon a list of beneficial users of groundwater, and documented the potential for declining water levels to adversely impact existing or proposed water supply wells and beneficial uses (April and May 2020). At numerous public meetings, the technical team presented details on groundwater conditions including trends and fluctuations of water levels and rates of water level declines, which supported the approach for setting MTs at the Fall 2015 water levels.

The Fall 2015 groundwater elevations would contain the expansion of groundwater level declines and support groundwater levels in areas of water supply wells, including areas where undesirable results had been observed. By managing water levels to a previously-observed groundwater level surface (i.e., 2015 conditions), it is less likely that MTs in one area of the Subbasin will interfere with achieving MTs in another area. Previous basin conditions have demonstrated empirically that the hydraulic gradients associated with these groundwater elevations can be maintained to allow overall compliance with the MTs.

The results of the projected future conditions water budget (presented to the Joint TACs and the public in October and December 2020), provide further support for setting the MTs at 2015 groundwater elevations. Those model results indicate that, unless arrested, the cone of depression would continue to expand to the north and south beneath the Tuolumne and Merced rivers. These declines were projected to increase streamflow depletion and potentially result in disconnection of the river and the groundwater system (see **Section 5.1.4.3**).

Collectively, these projected basin conditions supported the approach for setting the MT at 2015 groundwater elevations to arrest the declines in the central Subbasin and to maintain sustainable management criteria for interconnected surface water. Final criteria for chronic lowering of groundwater levels were reviewed and selected for GSA consideration first by the Ad Hoc Committee and then by the Joint TACs in several meetings in 2021. Stakeholders, including the Leadership Counsel for Justice and Accountability, expressed support for selection of the 2015 groundwater levels as the MTs.

As indicated above, the 2015 water levels are set to work together with the other sustainability indicators. For interconnected surface water, the MTs along the Merced River are slightly more restrictive than the 2015 groundwater levels; however as explained in **Section 6.8**, the MTs are not expected to conflict significantly with lower MTs for the chronic lowering of groundwater levels. Results of the sustainable yield modeling analysis indicated that MTs for chronic lowering of groundwater levels and interconnected surface water could be maintained together (see **Section 5.3**).

Notwithstanding all of the protective measures above, preventing all impacts to water supply wells may be difficult in areas where a large number of densely-spaced water supply wells are pumping at maximum capacities during drought conditions. Closely-spaced pumping wells can cause interference with other wells, even if water levels are managed at reasonable levels. Well interference between two closely-spaced wells is not included in the undesirable results definition. Rather, by setting MTs at the 2015 groundwater elevations across the Subbasin, regional long-term declines are arrested and significant and unreasonable adverse impacts to water supply wells can be avoided.

6.3.2.3. Impacts of MTs on Adjacent Subbasins

Regulations require consideration of how Turlock Subbasin MTs impact the ability of an adjacent subbasin to achieve its sustainability goal. Through a series of coordination meetings with adjacent subbasin representatives and review of draft and completed GSPs, the MTs selected for chronic lowering of water levels in the three adjacent subbasins were considered together, including the Merced Subbasin to the south, the Delta-Mendota Subbasin to the west, and the Modesto Subbasin to the north. In brief, the Turlock Subbasin MTs are not expected to either cause undesirable results or adversely impact GSP implementation in adjacent subbasins, as summarized below.

6.3.2.3.1. Merced Subbasin

As a critically overdrafted subbasin, the Merced Subbasin submitted sustainable management criteria in its Final GSP in 2020 (W&C, 2019). In that GSP, the Merced Subbasin set its MTs for the chronic lowering of water levels as the depth of the shallowest wells in a two-mile radius of each representative monitoring well or the minimum groundwater elevation prior to the January 1, 2015. An undesirable result would occur if more than 25 percent of those representative monitoring wells fall below the MT in two consecutive non-drought years (all water year types except dry or critically dry).

The Merced Subbasin GSP includes a table of MTs for wells, including monitoring wells, near the subbasin boundary (see Table 3-1 in the Merced Subbasin GSP (W&C, 2019)). Those MTs suggest that groundwater elevations would be allowed to decline to lower levels (e.g., deeper than 30 feet below sea level) than the 2015 levels (MTs) in the Turlock Subbasin. MTs in the Turlock Subbasin are all above sea level along the Merced River boundary (see **Table 7-1** and **Figures 7-2** and **7-3**). Based on these data, it appears that Turlock Subbasin MTs would not cause an undesirable result in the Merced Subbasin.

Recent water levels provided in the Merced Subbasin GSP are higher than allowed by the MTs along the Turlock Subbasin boundary and may not reach the low MTs in this area; water levels are generally higher at the boundary than adjacent groundwater elevations in the Turlock Subbasin. Water budgets for the historical, future projected, and sustainable yield scenarios all estimate a net subsurface inflow into the Turlock Subbasin from the Merced Subbasin on an average annual basis (see **Table 5-17**). However, the average annual subsurface flow under the sustainable yield scenario is only 27 percent of the average historical flows (compare net inflows and outflows for the Merced Subbasin on **Table 5-17**). This suggests that the two subbasins will be closer to being in balance under Turlock Subbasin sustainable yield conditions.

Further, Turlock Subbasin MTs along the Merced River are set at Spring 2014 groundwater elevations – higher than 2015 water levels – to be more protective of groundwater-surface water interaction along the Merced River (see **Section 6.8** below). Accordingly, MTs in the Turlock Subbasin are not anticipated to adversely impact implementation of the Merced Subbasin GSP.

Coordination with the Merced Subbasin will continue as both subbasins implement their respective GSPs. Several member agencies of the Turlock Subbasin GSAs are also member agencies of GSAs in the Merced Subbasin, which will facilitate future inter-basin coordination.

6.3.2.3.2. Delta-Mendota Subbasin

Sustainable management criteria in the adjacent Delta-Mendota Subbasin are provided in the Northern & Central Delta-Mendota Regions GSP (W&C and P&P, 2019). In that GSP, the MTs for water levels are defined as the hydrologic low groundwater level for the Upper Principal Aquifer and 95 percent of the hydrologic low groundwater level for the Lower Principal Aquifer. The 2015 groundwater elevations for both Principal Aquifers appear to be lower than the hydrologic low groundwater elevations for the Turlock Subbasin as indicated by the subsurface outflows estimated for both the historical and future projected water budgets, at 11,500 AFY and 12,800 AFY, respectively (**Table 5-17**). Although outflow is reduced to approximately 3,500 AFY in the sustainable yield scenario, the continuation of subsurface outflow from the Turlock Subbasin will not prevent successful GSP implementation in the Delta-Mendota Subbasin.

6.3.2.3.3. Modesto Subbasin

The Draft GSP chapter for sustainable management criteria has not yet been published by the Modesto Subbasin; however, draft MTs for chronic lowering of water levels have been proposed in multiple public meetings of the GSA Technical Advisory Committee (TAC). As described in those meetings, a draft MT of hydrologic low groundwater elevations is being considered for the Modesto Subbasin. Further, the Subbasin is planning to maintain MTs along the Tuolumne River (boundary with the Turlock Subbasin) at 2015 groundwater levels to coordinate with levels set in the Turlock Subbasin. Although historical and projected water budgets estimate a net subsurface inflow from the Modesto Subbasin into the Turlock Subbasin, the sustainable yield scenario estimates that net subsurface flows will be reversed with a net flow from the Turlock Subbasin into the Modesto Subbasin (see **Table 5-17**). Accordingly, MTs in the Turlock Subbasin are not anticipated to negatively affect GSP implementation in the Modesto Subbasin.

6.3.2.4. Effects of MTs on Beneficial Uses and Users of Groundwater

By arresting groundwater level declines in the Subbasin, long-term use of groundwater will become more sustainable and provide benefits to all beneficial uses of groundwater in the Subbasin. However, there are consequences to some current beneficial uses of groundwater.

In brief, the current level of groundwater use will not be able to be sustained without sufficient projects or management actions to replenish the Subbasin. This will require maintenance of water levels in deep wells that could otherwise accommodate additional declines. In the Turlock Subbasin, where growers are currently reliant on groundwater for agricultural beneficial uses, significant investment in projects and supplemental water will be required to continue to support the current level of agricultural production. If projects cannot meet the sustainable yield, demand reduction will need to be considered, which could negatively affect property interests in the Subbasin.

Conversely, the beneficial uses of public water suppliers and domestic well owners will be supported by the MTs. Although water levels will be allowed to decline somewhat during drought conditions, the Subbasin will not be subject to the continual historic lows that would occur with deeper MTs. With improved long-term maintenance of water levels, municipal water suppliers will not lose the use of expensive public supply wells as has occurred in the past (as documented in multiple public meetings by the Cities of Ceres, Turlock, and Modesto, as well as the urban communities including Delhi and Hickman; see **Table 6-1**)).

The prevention of further water level declines will also support the potential GDEs that have been identified in the Subbasin, most of which are located along the river boundaries (see **Section 4.3.8**). Even more protective MTs have been set along the Merced River as described in more detail in **Section 6.8.2**.

6.3.2.5. Consideration of State, Federal, or Local Standards in MT Selection

GSP regulations require that GSAs consider how the selection of MTs might differ from other regulatory standards. For the chronic lowering of groundwater levels, the MT consists of quantified water levels in each representative monitoring well. Accordingly, there are no conflicts with regard to other regulatory standards.

6.3.2.6. Quantitative Measurement of Minimum Thresholds

As stated above, the MTs for the chronic lowering of water levels will be monitored by quantitatively measuring water levels in representative monitoring well networks for each Principal Aquifer as described in **Chapter 7** (Monitoring Network) of this GSP. Monitoring will occur on a semi-annual basis, in Spring and Fall, to represent the seasonal high and low water level and to adhere to water level sampling protocols (**Chapter 7**).

6.3.3. Measurable Objectives for Chronic Lowering of Groundwater Levels

GSP regulations define measurable objectives (MOs) as "specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin" (§351(s)). The MO is used to identify goals for desired groundwater conditions; MOs provide a margin of operational flexibility above the MTs.

For chronic lowering of water levels, the MT represents a "floor" for maintenance of low water levels, with allowance for short-term exceedances by less than a third of representative monitoring wells during droughts. Accordingly, water levels will be managed generally between the MT and anticipated high water levels that occur during wet periods. This operational range can be represented by the midpoint between the MT and high water levels observed over average hydrologic conditions. Using the average hydrologic condition for the historical water budget study period of WY 1991 – WY 2015, the MO is defined as the midpoint between the selected MT and the high water level during that period (usually observed in 1998) for each representative monitoring location as summarized in the table below.

Table 6-5: Measurable Objectives for Chronic Lowering of Groundwater Levels

	Measurable Objectives	Principal Aquifer(s)
Chronic Lowering of Groundwater Levels	Measurable objectives are established as the midpoint between the MT and the high groundwater elevation observed over the historical Study Period WY 1991 – WY 2015 at each representative monitoring for each Principal Aquifer.	All

Each representative monitoring well is assigned a quantitative MT and MO; these data are provided in **Chapter 7** of this GSP (see **Table 7-1**).

Setting the MO at the midpoint between the MT and the high-water level results in a very small margin of operational flexibility for some western Subbasin wells screened in the Western Upper Principal Aquifer. In the far western areas of the Subbasin, water levels are shallow, and historical water levels have not fluctuated significantly. As a result, the MO is close to the MT; in some portions of the western Subbasin, there are only a few feet between the MO and the MT in representative monitoring wells. Setting the MO higher would not be consistent with the need to manage shallow groundwater such that existing agricultural land use can be preserved. Although the MO is maintained in this GSP for consistency, the GSAs will consider a management action to allow more flexible operation of shallow drainage wells to support local agricultural operations while maximizing beneficial uses of the shallow groundwater.

It is also recognized that this methodology may be setting MOs higher than could be easily attained if ongoing drought conditions persist. At the time of preparation of this GSP, most years since WY 2014 have been dry; these conditions may have reset the range of future expected high water levels in the Subbasin. Nonetheless, this approach to MO selection provides a reasonable method to quantify desired groundwater conditions using best available data. Sustainable management criteria will be reevaluated at the five-year assessment of the GSP and may require revision at that time.

6.4. REDUCTION OF GROUNDWATER IN STORAGE

SGMA defines an undesirable result for the groundwater in storage sustainability indicator as "significant and unreasonable reduction of groundwater storage." (§10721 (x)(2)). GSP regulations require that the MT for the reduction of groundwater in storage be set as "a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results" (§354.28(c)(2)). This requirement contains almost identical language as the SGMA definition of sustainable yield.[29] In addition, regulations require the MT to be supported specifically by the sustainable yield. The sustainable yield analysis for the Turlock Subbasin is presented in **Section 5.3** and discussed in the context of this indicator throughout the remaining subsections of **Section 6.4**, as well as throughout the remaining sections of **Chapter 6**.

Although the Turlock Subbasin is not at risk of depleting a large percentage of its total volume of groundwater supply, the ongoing depletion due to overdraft conditions requires mitigation to meet the Subbasin sustainability goal. The chronic lowering of groundwater

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[29] SGMA defines sustainable yield as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result." (§10721(w)).

levels caused by overdraft has resulted in adverse impacts to Subbasin water supply wells and may lead to future undesirable results.

The definition of undesirable results for reduction of groundwater in storage, including causes and impacts to beneficial uses, is described in **Section 6.4.1** below, along with additional criteria to quantify where and when undesirable results occur. **Section 6.4.2** describes the selection and quantification of minimum thresholds (MTs), along with the justification and rationale. **Section 6.4.3** provides the approach and selection of measurable objectives (MOs). Interim milestones that cover all of the sustainability indicators are described in **Section 6.9**.

6.4.1. Undesirable Results for Reduction of Groundwater in Storage

As described in **Chapter 5**, the historical reduction of groundwater in storage is estimated at about 63,900 AFY (see **Table 5-17**). That reduction could potentially improve to about 7,600 AFY for projected future conditions but would do so at the expense of significant streamflow depletion of the rivers along the Subbasin boundaries (see **Table 5-7**). That streamflow depletion is reduced under the sustainable yield conditions analysis (see **Table 5-17**). In that analysis, a sustainable yield is estimated at 310,700 AFY (see the total volume of groundwater production in **Table 5-17**). This amount is associated with a positive change in groundwater in storage to support slightly higher groundwater levels for interconnected surface water, primarily on the Merced River.

The sustainable yield modeling analysis incorporated the sustainable management criteria for chronic lowering of water levels and targeted a balanced subbasin over the 50-year implementation and planning horizon (**Section 5.3**). Accordingly, both the chronic lowering of water levels criteria and elimination of overdraft are correlated to the sustainable yield of 310,700 AFY. The volume of 310,700 AFY can be applied as a metric for reduction of groundwater in storage and linked directly to management criteria for the chronic lowering of groundwater levels indicator. Therefore, the chronic lowering of water levels criteria is applied as a proxy for the reduction of groundwater in storage sustainability indicator.

The causes of groundwater conditions that lead to reductions of groundwater in storage are described below. Impacts to beneficial uses are also discussed.

6.4.1.1. Cause of Undesirable Results

Conditions relating to the reduction of groundwater in storage are primarily caused by over-pumping in the central and eastern portions of the Subbasin. Lowering of water levels in this area has resulted in groundwater flow into an existing cone of depression, which has expanded to the south and is inducing additional recharge along the Merced River (see **Figure 6-1**). Although additional recharge from the river would improve the overall groundwater budget – and, in turn, the reduction of groundwater in storage, – these conditions have the potential to cause undesirable results for interconnected surface water.

Agricultural pumping represents the largest outflow component of the water budget (**Table 5-6**). Urban pumping has accounted for about 14 percent of the Subbasin pumping historically but is projected to increase in the future with population growth. Additional historical outflows from the Subbasin that also affect the reduction of groundwater in storage include a net subsurface outflow into the Delta-Mendota Subbasin on the west and discharges to baseflow in the Tuolumne and San Joaquin rivers.

6.4.1.2. Potential Effects on Beneficial Uses

The reduction of groundwater in storage causes lowering of water levels, which in turn, affects beneficial uses of groundwater and wells. The potential impacts to wells from reduction of groundwater in storage are the same as those from chronic lowering of water levels; those impacts are documented in **Sections 6.3.1.1** and **6.3.1.3** above. Impacts to beneficial uses are also the same as for chronic lowering of water levels as documented in **Sections 6.3.1.2** and **6.3.1.3**.

Recognizing that the volume of usable groundwater is relatively large, and the base of freshwater is deep, it is noted that a large groundwater supply would be accessible with sufficiently deep wells. However, the increased costs associated with installation and pumping lifts could ultimately place limits on beneficial uses of groundwater. With the large number of wells in the Subbasin, increased costs could be substantial and could also negatively impact land use and property interests. Operating the Subbasin at significantly deeper levels also has the potential to adversely impact groundwater quality. As noted in **Section 4.3.5.3.2**, high salinity groundwater has been detected in deep wells in several areas of the Subbasin.

6.4.1.3. Turlock Subbasin Definition of Undesirable Results

Based on the information summarized above and presented in the basin setting, a definition of undesirable results has been developed for *Reduction of Groundwater in Storage* in the Turlock Subbasin.

Regulations also require that the undesirable result definition include quantitative criteria used to define when and where groundwater conditions can cause an undesirable result (§354.26(b)(2)). These criteria address the number of monitoring sites and events that an MT can be exceeded before causing an undesirable result. This framework builds on the narrative definition and recognizes that a single MT exceedance at one monitoring site may not indicate an undesirable result. This framework also allows clear identification for when an undesirable result is triggered under the GSP.

As explained in the previous section, the sustainable yield modeling, described in **Section 5.3,** demonstrates that the chronic lowering of groundwater levels sustainable management criteria can be linked to the sustainable yield volume of 310,700 AFY. Accordingly, groundwater levels are used as a proxy for this sustainability indicator, which is incorporated into the definition of undesirable results and the quantitative combination of MT exceedances that cause undesirable results, as provided in the following table.

Table 6-6: Undesirable Results for Reduction of Groundwater in Storage

	Undesirable Results Definition	Principal Aquifer(s)
Reduction of Groundwater in Storage	Undesirable results are defined as a significant and unreasonable reduction of groundwater in storage that would occur if the volume of groundwater supply is at risk of depletion and/or may not be accessible for beneficial use. An undesirable result is also defined as long-term overdraft, based on projected water use and average hydrologic conditions. An undesirable result will occur for each principal aquifer when at least 33% of representative monitoring wells exceed the MT for that principal aquifer in three (3) consecutive Fall monitoring events.	All

The use of 33 percent of the representative monitoring wells is based on the chronic lowering of groundwater levels criteria as discussed in **Section 6.3.1.4**. The use of three Fall events for triggering undesirable results recognizes that short-term declines during drought are anticipated. SGMA allows for reduction of groundwater in storage during droughts if water levels recover during wet conditions (see introductory paragraphs in **Section 6.3** above; see also **Section 6.3.1.4**).

The change in groundwater in storage is a required element for the GSP annual reports and will be documented annually in those reports over time. Over average hydrologic conditions, this element can be used to substantiate the correlation of overdraft conditions to the combination of MT exceedances for each Principal Aquifer as provided in the definition above.

The MTs selected for this indicator are also the same as those for chronic lowering of water levels, as presented in the following section.

6.4.2. Minimum Thresholds for Reduction of Groundwater in Storage

The DWR Draft BMP on Sustainable Management Criteria emphasizes the need for a volume to be used as the metric for this indicator and states, "contrary to the general rule for setting MTs, the reduction of groundwater in storage MT is not set at individual monitoring sites. Rather the MT is set for a basin or management area."

As described in **Section 5.3** and summarized in **Table 5-17**, a C2VSimTM sustainable yield scenario has been developed to meet long-term criteria for multiple sustainability indicators to avoid undesirable results. Model results estimate a sustainable yield of about 310,700 AFY for the Turlock Subbasin. This estimate is based on a relatively simplistic analysis that relies on demand reduction only (**Section 5.3**). It is recognized that sustainable yield is not a fixed number and will vary over time with changes in land use, hydrologic conditions, and GSP implementation of projects and management actions. Nonetheless, this sustainable yield represents the current best available estimate to use as a required metric for the MT of this indicator.

Because the MTs selected for the chronic lowering of groundwater levels were incorporated into the sustainable yield modeling analysis, the sustainable yield of 310,700 AFY from model results can also be correlated to the MT for chronic lowering of groundwater levels. In addition, when long-term water level declines are arrested with sustainable management, the reduction of groundwater in storage/overdraft would also be mitigated over average hydrologic conditions. Therefore, using the chronic lowering of groundwater levels criteria as a proxy for the reduction of groundwater in storage MT would both correlate water levels directly to the sustainable yield volume and be protective against undesirable results. Accordingly, the MTs for chronic lowering of groundwater levels are selected as a proxy for the reduction of groundwater in storage indicator, as described below.

Table 6-7: Minimum Thresholds for Reduction of Groundwater in Storage

	Minimum Thresholds	Principal Aquifer(s)
Reduction of Groundwater in Storage	Minimum thresholds are established as the low groundwater elevation observed in Fall 2015 at each representative monitoring site for each principal aquifer.	All

6.4.2.1. Justification and Support for Minimum Thresholds

In the BMP on sustainable management criteria, DWR lists several technical topics to consider when selecting an MT for reduction of groundwater in storage. Those considerations, along with a summary of relevant information from the basin setting (and other related portions of the GSP), are provided below:

- <u>Historical trends, water year types, and projected water use</u>: The historical conditions of overdraft are based on the historical declining trend of groundwater in storage since at least 2001 as depicted by the historical water budgets described in **Section 5.1.4.1** and shown on **Figure 5-16**. Declining water levels and reduction of groundwater in storage in the Turlock Subbasin has been documented since the 1990s by DWR (2006). Average annual reductions of groundwater in storage are shown by water year types on **Table 5-10**, which documents reductions even in years of above normal precipitation. Projected water supply and demand are included in the Projected Conditions water budget on an average annual basis (**Table 5-6**).
- <u>Groundwater reserves needed to withstand future droughts:</u> Groundwater production during the recent critically dry water years of 2013 and 2014 averaged about 525,000

AFY in the Turlock Subbasin. For those years, the annual average reduction of groundwater in storage was estimated at 285,000 AFY. With more than 23 MAF of groundwater in storage, the total groundwater supply may be sufficient to meet future droughts; however, impacts on water levels, streamflow, or other sustainability indicators could lead to undesirable results. Potential negative impacts on water levels affecting beneficial uses of wells during drought are described in **Sections 6.3.1.1** through **6.3.1.4**. Information on other sustainability indicators is discussed in subsequent sections of **Chapter 6**.

- Whether production wells have ever gone dry: As described in **Section 2.3.2.4**, more than 150 domestic wells failed during the 2014 – 2016 drought of record. Additional adverse impacts to public supply wells related to water level declines were also documented (see **Section 6.3.1.4** and **Table 6-1** above).
- Effective storage of the basin: As mentioned previously, the Subbasin contains more than 20 MAF of fresh groundwater in storage and overall depletion of groundwater supply is unlikely (**Section 4.3.1.;** see also **Figure 4-21a**).
- Understanding of well construction and potential impacts to pumping costs: Depths of domestic wells are analyzed in **Section 2.3.2.4**. Well construction was considered in adverse impacts to public water supply wells summarized in **Section 6.3.1.3** above. Most of those wells were sufficiently deep for water supply during the 2015 drought; however, adverse impacts associated with declining water levels were documented (**Section 6.3.1.4** and **Table 6-1**).
- Adjacent Subbasin MTs: MTs for chronic lowering of groundwater levels in the two completed GSPs for the adjacent Merced and Delta-Mendota subbasins and the GSP in progress for the adjacent Modesto Subbasin were considered in the selection of Turlock Subbasin MTs as summarized in **Section 6.3.2.3** above. Because these MTs are used as a proxy for reduction of groundwater in storage MTs, these relationships are also applicable to the reduction of groundwater in storage indicator.

Much of the relevant material from the basin setting used to analyze and justify the MTs for this indicator is provided in **Section 4.3** on groundwater conditions and in **Chapter 5** on water budgets.

6.4.2.2. Relationship between MTs of Each Sustainability Indicator

Regulations require a description of the relationship between the MTs for each sustainability indicator and how the GSAs have determined that basin conditions for each MT will avoid undesirable results (§354.28(b)(2)). As previously discussed, the MTs for each sustainability indicator are summarized in **Table 6-4** and discussed in **Section 6.3.2.2**.

Section 6.3.2.2 also describes the relationship between the MT for chronic lowering of water levels and the MTs for each of the remaining sustainability indicators. Because the MTs for reduction of groundwater in storage are the same as the MTs for chronic lowering of water levels, that discussion would be identical for the reduction of groundwater in storage. As such, please refer to **Section 6.3.2.2** for this required component of the GSP.

These additional sustainability indicators are also analyzed separately in subsequent subsections of **Chapter 6** as referenced in **Table 6-4**. Additional information on how the MTs avoid undesirable results is provided below along with a summary of the process by which the MTs were selected.

Considerable time was spent reviewing technical information in public meetings of the Joint TACs regarding the chronic lowering of water levels as described throughout **Section 6.3**. In particular, the detailed public process described in **Section 6.3.2.2.** also applied to the reduction in groundwater in storage as the two indicators were typically addressed together by the technical team. By ensuring that MTs for chronic lowering of water levels would avoid undesirable results, and, by ensuring that those MTs would also result in an elimination of reduction of groundwater in storage (overdraft), the sustainable yield analysis shows that undesirable results for both sustainability indicators can be avoided with the same MTs.

6.4.2.3. Impacts of MTs on Adjacent Subbasins

Regulations require consideration of how Turlock Subbasin MTs impact the ability of an adjacent subbasin to achieve its sustainability goal. Through a series of coordination meetings with adjacent subbasin representatives and review of draft and completed GSPs, the Turlock TACs considered the MTs selected for reduction of groundwater in storage for the three adjacent subbasins including the Merced Subbasin to the south, the Delta-Mendota Subbasin to the west, and the Modesto Subbasin to the north. In brief, the Turlock Subbasin MTs are not expected to either cause undesirable results or affect implementation of adjacent subbasin GSPs as summarized below.

6.4.2.3.1. Merced Subbasin

The Merced Subbasin GSP did not set MTs for the reduction in groundwater in storage indicator because it was not judged applicable to subbasin conditions. As explained in **Section 6.3.2.3.1**, MTs for chronic lowering of water levels in the Turlock Subbasin do not adversely impact the Merced Subbasin GSAs' ability to implement their GSP. Because the MTs for chronic lowering of water levels are assigned as a proxy for the reduction of groundwater in storage indicator, it follows that there is no impact from this indicator on the Merced Subbasin. It is noted that member agencies of GSAs overlap both the Merced and Turlock subbasins and are committed to ongoing data sharing and coordination on GSP implementation.

6.4.2.3.2. Delta-Mendota Subbasin

Both the Delta-Mendota and Turlock subbasins are using MTs for chronic lowering of water levels as a proxy for the reduction of groundwater in storage. As explained in **Section 6.3.2.3.2**, the Turlock Subbasin contributes a net subsurface flow into the Delta-Mendota Subbasin under historical, projected future, and sustainable yield scenarios (see **Table 5-17**). As such, the MTs for reduction of groundwater in storage will not impact the implementation of the Delta-Mendota GSP.

6.4.2.3.3. Modesto Subbasin

Draft sustainable management criteria presented in various public meetings indicate that the Modesto Subbasin plans to use Fall 2015 groundwater levels as a proxy for the MT of the interconnected surface water sustainability indicator along the Tuolumne River – the boundary between the two subbasins. As mentioned in **Section 6.3.2.3.3**, this is the same approach being used for the Turlock Subbasin MTs along the Tuolumne River boundary. Under those conditions, the sustainable yield scenario for the Turlock Subbasin indicates a net subsurface outflow on an average annual basis from the Turlock Subbasin into the Modesto Subbasin. Collectively, these conditions indicate that the Turlock Subbasin would not affect GSP implementation in the Modesto Subbasin.

6.4.2.4. Effects of MTs on Beneficial Uses and Users of Groundwater

Benefits of these MTs on the beneficial uses and users of groundwater are similar to those stated for the chronic lowering of groundwater levels in **Section 6.3.2.4**. Long term benefits include a more sustainable groundwater supply for all beneficial uses.

Lift costs for pumping groundwater will be reduced for all well owners. In particular, public water suppliers and domestic well owners will benefit from the long term sustainable supply with relatively stable groundwater levels. In addition to well owners, environmental uses of groundwater, including any potential GDEs, will benefit from management of groundwater levels to the selected MTs. With these management criteria, the Subbasin will not be subject to the continual reduction of groundwater in storage that causes ongoing water level declines.

6.4.2.5. Consideration of State, Federal, or Local Standards in MT Selection

GSP regulations require that GSAs consider how the selection of MTs might differ from other regulatory standards. For the reduction of groundwater in storage indicator, the MT consists of quantified water levels in each representative monitoring well. Accordingly, there are no conflicts with regard to other regulatory standards.

6.4.2.6. Quantitative Measurement of Minimum Thresholds

As stated above, the MTs for the reduction of groundwater in storage will be monitored by quantitatively measuring water levels in representative monitoring well networks for each Principal Aquifer as described in **Chapter 7** (Monitoring Network) of this GSP. Monitoring will occur on a semi-annual basis, in Spring and Fall, to represent the seasonal high and low water level and adhere to water level sampling protocols (**Chapter 7**). **Table 7-1** provides the quantitative MTs for each representative monitoring well used to monitor both chronic lowering of groundwater levels and reduction of groundwater in storage. Representative monitoring wells in the GSP network for reduction in groundwater in storage are also the same wells used for chronic lowering of groundwater levels (**Figures 7-1** through **7-3**)

6.4.3. Measurable Objectives for Reduction of Groundwater in Storage

In the same manner that the MTs for chronic lowering of groundwater levels are used for the reduction in groundwater in storage, the same approach for setting MOs is also applied to this indicator as shown in the following table.

Table 6-8: Measurable Objectives for Reduction of Groundwater in Storage

	Measurable Objectives	Principal Aquifer(s)
Reduction of Groundwater in Storage	Measurable objectives are established at the midpoint between the MT and the high water level observed over the historical Study Period WY 1991 – WY 2015 at each representative monitoring site for each principal aquifer.	All

Even though GSP regulations note that reduction in groundwater in storage is controlled by a single value for the Subbasin, the management of that single value (310,700 AFY) is manifested by applying chronic lowering of water levels criteria as a proxy for reduction of groundwater in storage including both the MTs and MOs in the same representative monitoring wells. MOs are listed for representative monitoring wells on **Table 7-1** for chronic lowering of groundwater levels, which are used as a proxy for reduction of groundwater in storage.

6.5. SEAWATER INTRUSION

GSP regulations define *Seawater Intrusion* as “the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin and includes seawater from any source.” The minimum threshold for the indicator “sh*all be defined by a chloride concentration isocontour*…where seawater intrusion may lead to undesirable results.” Further, a description is also required regarding how the seawater intrusion minimum threshold considers the effects of “*current and projected sea levels*” (§354.28 (c)(3) *emphasis added*).

This information is consistent with a coastal groundwater basin where aquifers can be in direct communication with the open ocean, either directly or by interconnected waterways such as bays, deltas, or inlets. As an inland basin, the Turlock Subbasin is not directly or indirectly connected to the open ocean. The Subbasin aquifers are separated from the Pacific Ocean by the bedrock units of the Coast Ranges; further Subbasin aquifers are more than 20 miles upgradient from the edge of the from the Sacramento-San Joaquin Delta and not influenced by deltaic seawater intrusion.

The consulting team developed a technical memorandum on this indicator to frame the issues and facilitate discussions. The Joint TACs, with input from the public, reviewed the technical information, and discussed this indicator at its regularly scheduled public meetings held via webinar[30] in April, May, and June 2020.

A key issue was whether the reported higher-salinity groundwater in deep sedimentary units beneath the Turlock Subbasin would be applicable to this sustainability indicator. The groundwater beneath the base of fresh water could potentially impact Turlock Subbasin aquifers if localized pumping resulted in upwelling of poor-quality water. The total dissolved solids (TDS) content of this deeper groundwater is likely due to dissolution of sedimentary units (due to long groundwater residence times) and older connate water from marine sediments; these conditions are not related to a current connection to the open ocean. Importantly, the Joint TACs determined that any potential adverse impact from this deep groundwater could be readily addressed by a separate sustainability indicator, which addresses degraded water quality (see discussion of TDS as a constituent of concern in **Section 6.6.2.1.4**).

Accordingly, the consulting team was directed to revise the memorandum to memorialize the technical issues and allow the Joint TACs to make the following findings and recommendations to the GSAs:

- Seawater intrusion, as defined by GSP regulations, does not exist in the inland Turlock Subbasin and does not have the potential to occur in the future.
- Sustainable management criteria are not applicable and will not be defined for the seawater intrusion indicator in the Turlock Subbasin.
- Deeper high salinity groundwater in the Subbasin is not related to seawater intrusion but is recognized as a potential future impact to Subbasin groundwater quality; accordingly, this condition will be addressed by the degraded water quality sustainability indicator (as discussed in **Section 6.6.2.1.4**).

The WTSGSA and the ETSGSA approved the Joint TAC findings and recommendations at a Joint meeting of the GSA Boards on November 15, 2021 (Resolution 2021-06).

6.6. DEGRADATION OF WATER QUALITY

Similar to the other sustainability indicators, GSAs are not required to correct degraded water quality that occurred before January 1, 2015. However, GSAs want to avoid causing any future water quality degradation resulting from management of groundwater use or by GSA projects or management actions. Because GSAs have the legal authority to regulate pumping and groundwater levels, GSA management could potentially affect groundwater quality. In addition, GSA projects and management actions could introduce potential constituents of concern from other water sources into the Subbasin or cause migration of constituents through project implementation. GSP regulations specifically require the

[30] TAC meetings are public meetings and were held via webinar to comply with orders from the State Department of Public Health during the COVID-19 pandemic.

consideration of management actions that could inadvertently exacerbate the migration of contaminant plumes, which could impair water supplies. (§354.28(c)(4))

Nonetheless, the GSAs are not mandated to assume responsibility for water quality conditions that are under the purview of other primary water quality regulatory agencies. The SWRCB DDW, the associated RWQCB, the California DTSC, and local County environmental departments have primary responsibilities for groundwater quality, and the GSAs are not meant to duplicate those efforts. The Joint TACs have reviewed information from the technical team regarding the need to coordinate and confer with regulatory programs and agencies on water quality management (Moran and Belin, 2019). Because almost all of the public drinking water suppliers in the Turlock Subbasin are also member agencies of the GSAs, there is already close coordination between GSA members and water quality regulators.

The undesirable results associated with degraded water quality, including causes and impacts to beneficial uses, are described in **Section 6.6.1** below, with a definition of undesirable results at the end of the section. **Section 6.6.2** describes the quantification of minimum thresholds (MTS), along with justification on how MTs avoid undesirable results. **Section 6.6.3** provides the approach and selection of measurable objectives (MOs). Interim milestones are described in **Section 6.9** but are not set for this sustainability indicator.

6.6.1. Undesirable Results for Degraded Groundwater Quality

SGMA defines an undesirable result for the water quality sustainability indicator as "significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies." (§10721 (x)(4)). GSP guidance clarifies that GSAs are responsible for degraded water quality that is caused by management activities including regulation of pumping and water levels, along with projects and management actions conducted as part of GSP implementation (Moran and Belin, 2019). In addition, as with the other sustainability indicators, GSAs are not required to correct any undesirable results that have occurred prior to January 1, 2015. Recognizing that numerous constituents have already been detected in water supply wells above MCLs, the focus is not to exacerbate these conditions.

The GSAs are not responsible for enforcing drinking water requirements or for remediating groundwater quality problems caused by others (Moran and Belin, 2019). Further, the existing regulatory framework does not require the GSAs to take affirmative actions to manage the existing groundwater quality. Rather, GSAs are responsible for ensuring that their groundwater management activities do not cause or contribute to exceedances of drinking water standards. In the event that GSP projects and management actions might have impacted water quality standards, the GSAs will confer and coordinate with the appropriate regulatory agencies responsible for water quality.

6.6.1.1. Causes of Undesirable Results

As mentioned above, GSAs could cause degradation of water quality through management of water levels and pumping, which could increase concentrations of constituents that vary with depth or induce the vertical or horizontal migration of contaminants. In addition, GSA projects could introduce constituents of concern from other water sources through recharge projects.

Degraded water quality can impair groundwater supplies and impose restrictions and/or costs on drinking water supply wells. If constituents exceed drinking water standards, public water suppliers may need to abandon impacted wells, re-distribute wellfield pumping, blend contaminants with clean wells, drill additional wells, install wellhead or regional treatment facilities, and/or make other operational changes. Immediate notifications to customers may be required. If constituents of concern impact domestic wells, residents may lose their water supply; if water quality is not well known, impacts to public health and safety could occur.

Constituents of concern originate from a variety of sources including naturally-occurring constituents and human related (anthropogenic) sources. Public water suppliers have noted some deterioration in water quality during the 2015 drought conditions, especially for the naturally-occurring constituents of concern such as arsenic, uranium, and TDS; however, the depth-related impacts are complex.

High salinity water has been documented at depth in the Subbasin as mentioned in **Section 6.5** above. Pumping in deep wells could potentially produce groundwater elevated in TDS or lower vertical gradient such that elevated TDS groundwater could mix with lower TDS groundwater in other aquifers.

For the anthropogenic constituents of concern, including nitrate, 1,2,3-TCP and PCE (and some sources of TDS), the source of impacts to groundwater quality likely occurs at or near the ground surface (compared to naturally-occurring constituents, which can occur at depth). This suggests that shallow aquifers are often more impacted from these constituents. However, pumping can cause these contaminants to migrate to deeper aquifers either through more permeable portions of an aquitard or in conduits such as wells.

6.6.1.2. Potential Effects on Beneficial Uses

As summarized above, degraded water quality can cause considerable operational costs or constraints on public water suppliers. Certain constituents can harm crops, limit water supply for certain industrial processes, harm pipes, cause accelerated corrosion or clogging of fixtures, cause staining on bathtubs and sinks, produce bad taste or odor, and cause acute or chronic health effects.

For the Turlock Subbasin, five of the six constituents of concern have primary MCLs that are associated with health concerns such as toxicity (i.e., nitrate, uranium) or carcinogens (i.e., arsenic, 1,2,3-TCP, and PCE). Accordingly, elevated concentrations of these constituents in drinking water can cause deleterious health effects. These health-based limits affect operations and costs for public water suppliers to provide a safe drinking water supply.

The regulatory drinking water standard for TDS is not health based and is a secondary MCL, which is related to aesthetics of the water such as taste or odor. However, elevated TDS concentrations in groundwater can affect crop yields and impact agricultural beneficial uses of groundwater. TDS can also limit industrial beneficial uses for industrial processes requiring low salinity water. Finally, elevated TDS in wastewater can affect costs of recycled water.

As indicated above, most of the constituents of concern have been identified due to potential impacts to drinking water supplies. In particular, the cities of Turlock and Ceres have had to remove water supply wells from service to address local water quality issues (see water quality icon locations on **Figure 6-1**).

6.6.1.3. Turlock Subbasin Definition of Undesirable Results

Based on the information summarized above and presented in the basin setting, a definition for undesirable results has been developed for degraded water quality in the Turlock Subbasin.

Regulations also require that the undesirable result definition include quantitative criteria used to define when and where groundwater conditions can cause an undesirable result (§354.26(b)(2)). This framework allows clear identification for when an undesirable result is triggered under the GSP.

The definition of undesirable results for degraded water quality is provided in the following table.

Table 6-9: Undesirable Results for Degraded Water Quality

	Undesirable Results Definition	Principal Aquifer(s)
Degraded Water Quality	Undesirable results are defined as significant and unreasonable adverse impacts to groundwater quality caused by GSA projects, management actions, or management of water levels or extractions such that beneficial uses are affected and well owners experience an increase in operational costs. The undesirable result will occur if a new (first-time) exceedance of an MT is observed in a potable water supply well in the representative monitoring network that results in a well owners increase on operational costs and is caused by GSA management activities as listed above.	All

The undesirable result is conservative in that it requires analysis of every first-time exceedance of an MT for a constituent of concern in each potable supply well monitored for that constituent. Accordingly, historical data for each well must be reviewed on an annual basis to determine if the constituent has been exceeded in that well in the past. Each new (i.e., first-time) exceedance occurring after January 31, 2022, must be tracked and analyzed separately to determine if such an exceedance could have been caused by GSA regulated groundwater levels, extractions, or projects/management actions, and if additional operational costs are incurred by the well owner.

This analysis will consider the recent groundwater elevations and extractions near each impacted well. Data will be analyzed in the context of the historical record to establish correlations between groundwater levels, monitoring well locations and construction, and water quality analyses. Changes in water levels and water quality in nearby wells will be incorporated into the analysis. Each constituent of concern will be analyzed as to the likely source (geogenic or anthropogenic), historical records of nearby and regional wells, and occurrence/concentrations with respect to the principal aquifer and well screens.

Increases in concentration will also be tracked to comply with the measurable objective described in **Section 6.6.3** below. Hydrographs and chemographs will be used to support the analyses, as needed. Analyses will be coordinated with local public agencies providing drinking water supply including member agencies of the GSAs. Data and analyses will be reported in annual reports and coordinated with the regulatory agencies responsible for water quality. Any undesirable results will be identified, and GSAs will coordinate with regulatory agencies on options and mitigation measures for water quality impacts.

These analyses will fill, in part, a data gap that was identified by the water quality analysis in **Section 4.3.5** regarding changes in water quality with depth in the Subbasin (see data gaps list in **Section 4.4**).

The MTs are quantified in the following section. The MOs, quantified in subsequent **Section 6.6.3,** provide further support for analysis of degraded water quality by examining increasing concentrations for constituents of concern in addition to new exceedances.

6.6.2. Minimum Thresholds for Degraded Water Quality

GSP regulations require that the MT metric for degraded water quality be set at the water quality measurement that indicates degradation at the monitoring site (DWR, 2017). As provided in the basin setting (**Section 4.3.5**), historical data for numerous water quality constituents have been analyzed as potential constituents of concern. From this analysis, six constituents of concern were selected based on the exceedances of water quality standards, including MCLs (when designated), over a relatively widespread area of the Subbasin with an emphasis on areas where groundwater provides most of the Subbasin drinking water supply (Western Principal Aquifers and western portions of the Eastern Principal Aquifer). Although total dissolved solids (TDS) did not indicate widespread exceedances, TDS is a designated constituent of concern as an overall indicator of groundwater quality and as an indicator of potential increasing salinity with depth (see **Section 6.5** above).

As explained above, the GSAs do not wish to exacerbate existing water quality conditions in the Subbasin as a result of GSA actions. Accordingly, MTs are set as a new exceedance of a MCL for any of the constituents of concern at a potable water supply well to ensure that future water quality issues are identified even if the GSAs are not responsible for the adverse impacts. The MTs for this indicator are expressed as follows.

Table 6-10: Minimum Thresholds for Degraded Water Quality

	Minimum Thresholds	Principal Aquifer(s)
Degraded Water Quality	Minimum thresholds are set as a new (first-time) exceedance of a drinking water quality standard (primary or secondary MCL) in a potable supply well in the representative monitoring network for any of the Subbasin constituents of concern as listed below: • Nitrate (as N) – 10 mg/L • Arsenic – 10 µg/L • Uranium – 20 pCi/L • Total dissolved solids (TDS) – 500 mg/L • 1,2,3-Trichloropropane (1,2,3-TCP) – 0.005 µg/L • Tetrachloroethene (PCE) – 5 µg/L	All

6.6.2.1. Justification and Support for Minimum Thresholds

Analysis of existing groundwater quality conditions in the Turlock Subbasin was provided in **Section 4.3.5** as part of the basin setting Results of that study analyzed potential constituents of concern, six of which were determined to have elevated concentrations above water quality standards over a relatively widespread area of the Subbasin. Data are summarized by Principal Aquifer (where known) on **Figures 4-36** through **4-57**.

All three principal aquifers are used for groundwater supply, with most municipal and urban drinking water systems concentrated in the Western Upper Principal Aquifer and Western Lower Principal Aquifer including Turlock, Ceres, Hilmar, Delhi, and Keyes. Hughson, Hickman, parts of Denair, and other small water systems, rely on the Eastern Principal Aquifer for drinking water supply.

Potential constituents of concern were selected from database reviews and other local knowledge regarding ongoing water quality issues with water supply wells. Six of those potential constituents of concern were selected to be assigned an MT in this GSP based on the prevalence of detections above the MCL within the Subbasin and widespread distribution of recent elevated concentrations. Additional information on the water quality database is provided in **Section 4.3.5.1**. Summary information on the six constituents of concern assigned an MT in this GSP is provided below; more detailed information is provided in **Section 4.3.5** and on the water quality distribution maps (**Figures 4-37** through **4-57**).

6.6.2.1.1. Nitrate

Nitrate is the most widespread groundwater contaminant in the Turlock Subbasin. Because of its serious health effects, the MCL of 10 mg/L of nitrate as N is selected as the MT. Sources, recent concentrations, and occurrence of nitrate in Turlock Subbasin groundwater are described in **Section 4.3.5.3.1** and shown on **Figures 4-37** and **4-38**.

Elevated nitrate concentrations occur in all of the Principal Aquifers with most of the higher concentrations located in the western Subbasin. Highest concentrations are in the Western Upper Principal Aquifer generally west of Highway 99 and in Ceres. High nitrate concentrations also occur in the Eastern Principal Aquifer near Denair, Hughson, and the nearby Tuolumne River. Because nitrates are most often sourced from surface/shallow application of nitrogen, elevated concentrations would more likely occur in the Western Upper Principal Aquifer and shallow portions of the Eastern Principal Aquifer rather than the Western Lower Principal Aquifer. Nonetheless, high levels of nitrate have been observed in the Western Lower Principal Aquifer indicating downward vertical migration. Depending on the construction of each well, nitrate in shallow groundwater may be above wells screens during high water level conditions and pulled into lower well screens when water levels decline.

The widespread contamination of groundwater by nitrogen in California's Central Valley is being regulated by the Central Valley RWQCB under three broad programs (in addition to individual site regulatory orders); those three programs are the General Dairy Order (Dairy Order), the Irrigated Lands Regulatory Program (ILRP), and the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS). Nitrate concentrations in domestic wells are being mitigated through the Nitrate Control Program, which involves management areas where participants are mandated to provide safe drinking water to impacted well owners (**Section 2.4.4**).

6.6.2.1.2. Arsenic

Arsenic is a naturally-occurring trace element in the rocks, soils, and groundwater of the Turlock Subbasin. Given its toxicity, the MT has been set at the arsenic MCL of 10 micrograms per liter (µg/L). Although the arsenic MCL has been exceeded in wells within all three Principal Aquifers, elevated concentrations are more widespread and higher in western aquifers within the extent of the Corcoran Clay. Elevated arsenic concentrations can occur through dissolution of iron or manganese oxyhydroxides under reducing conditions, geochemical conditions that may be more prevalent below the Corcoran Clay. Drinking water wells in the Subbasin are monitored for arsenic, and several municipalities note that increasing arsenic concentrations have been correlated with declining groundwater levels.

However, an exploratory drilling program conducted in 2018 for the City of Turlock indicated highly variable levels of arsenic throughout the principal aquifers and depth-related concentrations are not straightforward (see **Section 4.3.5.3.3** and **Figures 4-41** and **4-42**).

6.6.2.1.3. Uranium

Uranium is another naturally-occurring trace element emitted from radioactive elements in the rocks, soils, and groundwater of the Turlock Subbasin. It is toxic and associated with health effects. Although less widespread than arsenic, increases in uranium concentrations have been correlated with declining groundwater levels in supply wells in Ceres and Turlock. Uranium has been detected close to or above its MCL of 20 pCi/L in all three principal aquifers, but concentrations have been higher in aquifers adjacent to the Corcoran Clay. Hydrogeologic investigations in the cities of Turlock and Ceres found the highest concentrations of uranium at the base of the Corcoran Clay (see **Section 4.3.5.3.5** and **Figures 4-45** and **4-46**). The City of Ceres operates a drinking water treatment plant for uranium removal.

6.6.2.1.4. Total Dissolved Solids

TDS is a sum of the dissolved substances in water and is used as a general indicator of salinity. TDS in groundwater occurs naturally from the dissolution of minerals in adjacent aquifer materials. Evaporative enrichment from irrigation of crops and application of synthetic fertilizers, manures, and wastewater treatment facilities can all contribute salts to groundwater.

The MT for TDS, is set at the regulatory-recommended secondary MCL of 500 mg/L. Several thresholds are used in California for drinking water supplies and consist of a Recommended MCL of 500 mg/L, an Upper Limit MCL of 1,000 mg/L, and a Short Term MCL of 1,500 mg/L. Using the Recommended MCL as the MT is based on current TDS data in the Subbasin, which indicates ambient concentrations at or below this secondary MCL throughout most of the Subbasin; locally elevated TDS values are indicated in shallow wells near the San Joaquin River and in wells near Ceres (**Figures 4-39** and **4-40**). In addition, this lower MCL is more protective of Subbasin crops. TDS concentrations at or below 640 mg/L is recommended for irrigation of almond orchards, a primary crop in the Subbasin (see notes on **Figure 4-39;** see **Figure 2-4** for Subbasin crops).

Elevated TDS has been documented in both shallow and deep wells in the Subbasin. Exceedances in shallow wells may be caused by salt loading at the surface while elevated TDS at depth may be the result of older marine sediments and/or other deep high-salinity groundwater zones. The City of Ceres encountered TDS at concentrations of 1,200 mg/L in a 460-foot well below the Corcoran Clay. The City controls operation of this well to avoid groundwater quality impacts to their distribution system. In the eastern Subbasin, a 1,680-foot well reportedly encountered brackish water; this deep well has been properly abandoned to prevent the upward migration of high-TDS groundwater.

As indicated on **Figure 4-40**, construction data is not available for many wells with exceedances of the secondary MCL in the western Subbasin. Additional information will be needed to determine which of the two western principal aquifers has higher concentrations. (For more information on TDS, see **Section 4.3.5.3.2** and **Figures 4-39** and **4-40**).

6.6.2.1.5. 1,2,3-Trichloropropane (1,2,3-TCP)

1,2,3-TCP is a manufactured chlorinated hydrocarbon that has been used for cleaning and degreasing and has also been associated with soil fumigants, which were widely used in agriculture through most of the 1980s. A MCL of 0.005 μg/L was only recently established (effective 2018), and historical data are sparse.

Detections above the MCL have been observed in all three Principal Aquifers. Elevated concentrations have been observed in Ceres and Turlock wells and in other areas of the WTSGSA. Ceres has recently installed wellhead treatment for TCP on multiple wells. Elevated concentrations in the Eastern Principal Aquifer have occurred near Denair, Hughson, Delhi, and southeast of Turlock Lake (See **Section 4.3.5.3.8** and **Figures 4-51** and **4-52**).

6.6.2.1.6. Tetrachloroethene (PCE)

PCE is a common industrial solvent that was used for decades in a variety of industrial applications including widespread use in dry cleaning. Discharges from a number of dry cleaners in the City of Turlock have resulted in local contaminant plumes of PCE. Elevated concentrations of PCE have occurred in all three principal aquifers but the highest concentrations are associated with several potential point sources within urban areas occurring along the Highway 99 corridor. PCE has migrated vertically into the Western Lower Principal Aquifer beneath the City of Turlock and has impacted three City wells. The City of Turlock has been working cooperatively with the Central Valley RWQCB and DTSC to install facilities to pump and treat the PCE for containment and management of the plume of contamination (See **Section 4.3.5.3.9** and **Figures 4-53** and **4-54**).

6.6.2.1.7. Potential GSA Management Impacts on Degraded Water Quality

The relationship between elevated concentrations and depth would be helpful in interpreting whether GSA activities could potentially affect groundwater quality and lead to undesirable results. If GSAs allowed water levels to decline such that constituents at depth produce elevated concentrations, then there would be an increased potential for undesirable results. In other parts of the Central Valley, naturally-occurring arsenic, uranium, and TDS have been correlated with depth and observed to increase in concentration when water levels decline.

However, the linkage between constituents of concern with depth is not straightforward and those naturally-occurring constituents do not consistently increase in deeper wells. Many wells are screened in both western principal aquifers that complicate the interpretations. Separate hydrogeologic investigations for wellfields in the cities of Turlock and Ceres suggest that discrete sand layers within the principal aquifers may cause elevated concentrations. The City of Modesto also reports that correlating increased concentrations of certain constituents of concern with depth are not straightforward, especially in water supply wells with multiple screens.

Anthropogenic constituents of concern such as nitrates, 1,2,3-TCP and PCE are typically released at the surface and are often associated with the shallow-most aquifers. However, if well screens are relatively deep, these constituents can increase with declining water levels, as shallow constituents are no longer above the top of the screen. Although those constituent concentrations are more likely to be higher in the Western Upper Principal Aquifer and shallow wells in the Eastern Principal Aquifer, occurrences do occur in the Western Lower Principal Aquifer, confirming vertical migration.

Through management of groundwater use, GSAs could also inadvertently allow pumping to spread contaminants throughout the aquifer. In addition to defined contaminant plumes, elevated concentrations of other constituents could be pulled horizontally or vertically allowing poor quality groundwater to spread within the aquifer system.

Finally, GSA projects could introduce constituents of concern to the aquifer, exacerbating salt loading or causing local exceedances of MTs. As projects are implemented, the potential impacts to water quality will be assessed, primarily through regulatory and CEQA compliance. New monitoring wells may be installed and added to the GSP water quality monitoring network to demonstrate both project performance and the avoidance of undesirable results for water quality.

The annual water quality analysis of the six constituents of concern will need to consider the local conditions within the aquifer, historical water levels and water quality data, well construction, and concentrations in other Principal Aquifers in nearby wells. These details will assist with the interpretations of whether GSA management activities are causing undesirable results.

6.6.2.2. Relationship between MTs of Each Sustainability Indicator

Regulations require a description of the relationship between the MTs for each sustainability indicator and how the GSAs have determined that basin conditions at each MT will avoid undesirable results (§354.28(b)(2)). To facilitate a comparison between MTs, a summary of MTs for each sustainability indicator was provided in **Table 6-4** and discussed previously in **Section 6.3.2.2**.

As provided in **Section 6.3.2.2**, the MCLs for each constituent of concern – selected as the MTs – would not interfere with the MTs for the other sustainability indicators. In addition, the MTs for the other indicators are generally supportive of the water quality indicator. As indicated in **Table 6-4**, the MTs for chronic lowering of water levels, reduction of groundwater in storage, land subsidence, and interconnected surface water are all based on previous water levels in the Subbasin (Spring 2014 or Fall 2015 conditions). By preventing future long-term lowering of groundwater levels, depth-related water quality impacts would not be expected to worsen.

In addition, the use of previously observed water levels associated with these snapshots in time across the Subbasin will generally preserve general groundwater flow directions and be protective again spreading any constituents of concern into unimpacted areas. If groundwater flow conditions are altered as a result of GSP projects, the analysis of projects would consider those conditions.

By setting the MT for water quality at the MCLs for the six primary constituents of concern in the Subbasin, any new increases in constituent concentrations above the MCL will be tracked and evaluated with respect to the GSP implementation and GSA management. In this manner, beneficial uses of groundwater for drinking water will be preserved. Data will be compiled and analyzed annually as part of the Annual Report and coordinated with member agencies responsible for provision of public drinking water supplies and with regulatory agencies primarily responsible for water quality protection.

These MTs are also developed to work in concert with the MOs for water quality (see **Section 6.6.3**). By setting the MOs at concentrations at or below the historical maximum at representative monitoring wells, increases in constituent concentrations in wells that have already exceeded MCLs will also be tracked and analyzed.

Throughout the process of establishing sustainable management criteria for the degraded water quality indicator, the Joint TACs coordinated with other regulatory programs in the Subbasin including the Nitrate Control Program, CV-Salts, and drinking water quality monitoring conducted by the municipal public water suppliers in the Subbasin, all of whom are member agencies in the GSAs. Representatives from the Valley Water Collaborative – a coalition responsible for implementing the Nitrate Control Program – provided a presentation at a public Joint TAC meeting in December 2020. Many Subbasin landowners are directly participating in the NCP, providing additional opportunities for coordination. DWR representatives for the Turlock Subbasin also attended public meetings in which the water quality indicator was discussed and provided comments both at meetings and in follow-up conversations with members of the Joint TACs.

6.6.2.3. Impacts of MTs on Adjacent Subbasins

Regulations require consideration of how Turlock Subbasin MTs impact the ability of an adjacent subbasin to achieve its sustainability goal. Through intra-basin coordination and a review of draft and completed GSPs, the Turlock TACs considered the MTs selected for degraded water quality in the three adjacent subbasins including the Merced Subbasin to the south, the Delta-Mendota Subbasin to the west, and the Modesto Subbasin to the north. In brief, the Turlock Subbasin MTs are not expected to either cause undesirable results or affect implementation of adjacent subbasin GSPs as summarized below.

6.6.2.3.1. Merced Subbasin

The Merced Subbasin GSP focused on those constituents where groundwater management activities have the potential to cause undesirable results and selected salinity as the only constituent of concern (W&C, 2019). The undesirable result would occur if at least 25 percent of the representative monitoring sites exceeded the MT for two consecutive years.

Undesirable results were related to deeper high salinity groundwater that has migrated upward in some areas of the Subbasin as a result of groundwater pumping. These areas are located along the San Joaquin River near Livingston and Atwater. No high salinity groundwater has been identified adjacent to the Turlock Subbasin. TDS was used as the overall indicator of salinity, and an MT of 1,000 mg/L was determined to be protective against undesirable results. The GSP incorporated the monitoring program conducted by ESJWQC, which includes two wells adjacent to the Merced River, both west of Highway 99, in the Western Upper and Western Lower principal aquifers.

Several monitoring wells from the GeoTracker portal occur in that same area in the Turlock Subbasin just north of the Merced River. Because these data are used as the Turlock Subbasin representative monitoring network, it should be straightforward to coordinate TDS concentrations with the Merced Subbasin. Because TDS is also a constituent of concern for the Turlock Subbasin – with similar depth-related concerns – there should be no conflicts between the MTs for degraded water quality selected in the two subbasins.

6.6.2.3.2. Delta-Mendota Subbasin

The Delta-Mendota Northern & Central GSP focused on constituents that are linked to groundwater elevations or other groundwater-related activities. Undesirable results are to be triggered if TDS, nitrate, or boron exceed the MCL or water quality objectives (WQOs) in three consecutive sampling events in non-drought years or additional degradation where current groundwater quality already exceeds the MCLs or WQOs. An undesirable result would also occur if a recharge project exceeded 20 percent of the aquifer's assimilative capacity without justification of a greater public benefit.

MTs were set at each monitoring site based on these criteria. Two water quality monitoring wells in the Upper Aquifer, 03-001 and 03-003, are located adjacent to the Turlock Subbasin. For the Lower Aquifer, only one Delta-Mendota water quality monitoring well (06-003) appears to be within three miles of the San Joaquin River, closest to the northwest edge of the Turlock Subbasin.

For the Upper Aquifer, the MTs selected for both wells close to Turlock Subbasin were higher than the MCLs for TDS (4,000 mg/L) or nitrate (80 mg/L) based on current groundwater quality. Although concentrations were lower in the Lower Aquifer – with MTs set for TDS at 2,000 mg/L and for nitrate at 50 mg/L – MTs still exceeded the MCLs. In the Turlock Subbasin, TDS concentrations are also elevated (>1,000 mg/L) in the Western Upper Aquifer in wells adjacent to the San Joaquin River, but nitrate concentrations are low in that area (see **Figures 4-37** and **4-39**).

The water budget analyses suggest that subsurface outflow occurs from the Turlock Subbasin into the Delta-Mendota Subbasin under historical (11,500 AFY) and future projected conditions (12,800 AFY). However, under the sustainable yield analysis, subsurface outflow is greatly reduced (about 3,500 AFY) (see **Tables 5-7** and **5-17**). In addition, except for TDS, no elevated concentrations of constituents of concern in the Turlock Subbasin were observed within about two miles of the San Joaquin River. As such, no water quality impacts are anticipated on the Delta-Mendota Subbasin from the Turlock Subbasin.

6.6.2.3.3. Modesto Subbasin

The Modesto Subbasin has defined undesirable results for degraded water quality in a similar manner to the Turlock Subbasin, using MCLs for seven constituents of concern as the MTs. The constituents of concern in the Modesto Subbasin include all of the constituents of concern in the Turlock Subbasin with the same MTs assigned to each. Both subbasins have similar water quality issues and will coordinate the tracking and analysis across the Tuolumne River boundary.

In addition to the coordination of sustainable management criteria, two member agencies of the Turlock Subbasin GSAs provide groundwater supply in both subbasins, allowing for close coordination of any water quality issues along the Tuolumne River boundary. Specifically, the City of Modesto operates drinking water wells and samples water quality in both the Turlock and Modesto subbasins. The City of Waterford in the Modesto Subbasin operates drinking water supply wells in the Turlock Subbasin for the community of Hickman. Water quality data for both subbasins will be analyzed annually using similar data sources and methods, which will allow for close coordination of any degraded water quality across the two subbasins.

6.6.2.4. Effects of MTs on Beneficial Uses and Users of Groundwater

The setting of MCLs as the MTs is protective with respect to the avoidance of undesirable results. By protecting drinking water quality, the long-term quality and quantity of useable groundwater for all beneficial uses will be preserved.

Anthropogenic contaminants such as PCE has degraded water quality in some portions of the Subbasin causing water supply wells to be removed from service (see **Section 4.3.5.3.9**). By tracking and analyzing impacts on a PCE plume from local groundwater extractions – as is being done by the City of Turlock – the cost and reliability of drinking water supplies can be better managed.

The commitment to analyze a large dataset of groundwater quality data across the Subbasin on an annual basis will improve GSA understanding of water quality in each Principal Aquifer and lead to better management practices. This fulfills two data gaps identified in the basin setting with respect to water quality, including the coordination with water quality agencies on both contaminant plumes and the need to characterize water quality with depth (see **Section 4.4**).

Expanded and ongoing data collection and analysis will also support ongoing regulatory monitoring, allowing others to evaluate their local water quality monitoring data in the context of Subbasin-wide water quality. For example, an improved understanding of water quality with depth allows future wells to be sited and designed such that water quality is optimized. Overall, these improvements will support all beneficial uses of groundwater in the Subbasin.

6.6.2.5. Consideration of State, Federal, or Local Standards in MT Selection

In setting MTs for degraded water quality, GSP regulations require that GSAs consider local, state, and federal water quality standards applicable to the Subbasin (354.28(c)(4)). As provided above, the degradation of water quality indicator relies on California MCLs for the MT; in this manner, the MT adheres to drinking water quality standards set by California, which are either as protective or more protective than federal standards. The MCLs are also consistent with the local standards and water quality objectives (WQO) in the Central Valley RWQCB Basin Plan for the San Joaquin River Basin (2018). Accordingly, there are no conflicts with regard to regulatory standards.

6.6.2.6. Quantitative Measurement of Minimum Thresholds

As stated above, the MTs for the degradation of water quality will be quantitatively monitored through existing monitoring programs conducted by public agencies, regulated coalitions, and private well owners in representative monitoring wells for each Principal Aquifer using regulatory-approved sampling protocols. All of these existing water quality monitoring programs have been approved by the SWRCB or other water quality regulatory agency. Data will be downloaded from the State GeoTracker water quality website and supplemented with data from the salt and nutrient regulatory programs in the Subbasin (see **Section 2.4.4**). Water quality data will be analyzed for constituents of concern in each Principal Aquifer as described in **Chapter 7** (Monitoring Network) of this GSP (see **Section 7.1.4**). Analyses will be included in the Subbasin GSP annual reports.

More than 300 wells with water quality data for Turlock Subbasin constituents of concern were available from GeoTracker from January 2020 to May 2021; these water quality monitoring sites are shown on **Figure 7-4** in **Chapter 7** and tabulated in **Appendix H**. Wells were distributed throughout the Subbasin but focused in areas of drinking water supply wells including in Disadvantaged Communities (DACs, SDACs, and EDAs – see **Figure 3-1**). Although monitored wells will change from year to year based on regulatory monitoring requirements, public water suppliers generally monitor and report water quality data for all active drinking water wells (see **Section 2.4.2** and **Table 2-2**). GeoTracker also includes water quality monitoring data from sites with contaminant plumes as a part of the RWQCB regulatory programs (see summary data on **Figure 4-57**).

Additional wells from supplemental regulatory programs are also either included on GeoTracker or available for public download to allow for a broad analysis of water quality on an annual basis. Monitoring programs for TDS and nitrate are conducted by ESJWQC in coordination with the CV-SALTS program and the Nitrate Control Program, which requires growers in management zones to ensure safe drinking water supplies for well owners impacted by nitrate concentrations (see **Section 2.4.4**). As a result of this large dataset, the GSAs are not planning to develop a separate GSP water quality monitoring network, and no water quality sampling will be conducted by the GSAs.

However, the GSAs may monitor water quality in existing wells or install new water quality monitoring wells in the future if required by GSP projects or management actions. GSAs will ensure that projects and management actions comply with regulatory water quality requirements and will consider appropriate constituents, MCLs, and water quality objectives (WQOs), as needed, to avoid undesirable results. Potential water quality considerations for currently proposed projects will be evaluated, in part, through the CEQA process, which is already underway on a programmatic basis.

MTs and MOs will be quantitatively analyzed through an evaluation of the water quality datasets. Results will be reported in annual reports. MTs will involve analysis for new exceedances of MCLs for each of the six constituents of concern. MOs will involve analysis for increases in concentrations for the six constituents of concern as described below.

6.6.3. Measurable Objectives for Degraded Water Quality

To avoid exacerbation of the nature and extent of current groundwater quality by management activities, the GSAs establish a target water quality condition whereby GSA management does not cause an increase in historical concentrations of constituents of concern (i.e., further degradation of water quality). This target is managed by the definition of measurable objectives for degraded water quality as follows.

Table 6-11: Measurable Objectives for Degraded Water Quality

	Measurable Objectives	Principal Aquifer(s)
Degraded Water Quality	Measurable objectives are defined as no increase above the maximum historical concentration for any constituent of concern in a potable water supply well in the GSP monitoring program caused by GSA management activities.	All

The same monitoring data summarized in **Section 6.6.2.6** above will be used to analyze MOs for the constituents of concern (see also **Figure 7-4**).

6.7. LAND SUBSIDENCE

SGMA defines an undesirable result for land subsidence as "significant and unreasonable land subsidence that substantially interferes with surface land uses" (§10721 (x)(5)). In general, land subsidence can interfere with land use by causing damage to either the natural land surface (e.g., surface fissures) or to structures on the land surface (e.g., roads or pipelines). Potential impacts from land subsidence are documented in **Section 4.3.6** and summarized in **Section 6.7.1.1** below.

As described in **Section 4.3.6**, there have been no known impacts from inelastic land subsidence in the Turlock Subbasin to date. Land subsidence associated with groundwater extraction has been documented across large segments of the San Joaquin Valley since the 1950s, but these areas are located significant distances to the south of the Turlock Subbasin.

Although local conditions vary, much of the documented subsidence to the south is associated with increases in groundwater pumping, which lowers pore pressure and can lead to the subsurface compaction of regional clay layers, such as those associated with the widespread Corcoran Clay. Subsurface compaction allows the land surface to subside. In the southern portion of the adjacent Merced Subbasin, land subsidence is thought to be related to groundwater extraction below the Corcoran Clay that depressurized clay layers in the deep confined aquifer system (W&C, 2019) (see also **Figure 4-59**).

As described in **Chapter 4** (see **Section 4.2.4**), the Corcoran Clay is the regional aquitard in the western Turlock Subbasin that separates the Western Upper Principal Aquifer (unconfined) from the Western Lower Principal Aquifer (confined). Clay layers are also present in the Eastern Principal Aquifer but regional compressible clay layers, such as the Corcoran Clay, have not been identified and are not likely present. Although impacts from land subsidence have not been documented anywhere within the Turlock Subbasin, the potential for future undesirable results associated with land subsidence cannot be dismissed. Because groundwater drains slowly from compacted clay layers, there is a time lag between the triggering mechanisms that cause land subsidence and the actual depression on the land surface. A slow and small rate of decline in the land surface can go unnoticed until disruption of infrastructure or other physical manifestation of the problem occurs.

Given these conditions, the Joint TACs have determined that the land subsidence sustainability indicator is applicable to the Turlock Subbasin. Sustainable management criteria have been selected for all principal aquifers, while recognizing the higher potential for impacts in the Western Upper Principal Aquifer and the Western Lower Principal Aquifer that are within the extent of the Corcoran Clay (see striped area on **Figure 6-1**).

A GSP monitoring network for land subsidence has been established for the entire Subbasin, and includes all three principal aquifers, based on Fall 2015 groundwater levels (see **Section 7.1.5**). In addition, Subbasin-wide remote sensing data will be incorporated into the GSP monitoring program to provide annual screening to supplement the groundwater elevation monitoring network (see **Section 7.1.5** and also **Section 6.7.2.6** below).

Potential undesirable results, including causes and impacts to beneficial uses, are described in **Section 6.7.1** below, with a definition of undesirable results provided at the end of the section. **Section 6.7.2** describes the quantification of minimum thresholds (MTs) and provides additional information on rationale and coordination of MTs in adjacent subbasins. **Section 6.7.3** provides the approach and selection of measurable objectives (MOs). Interim milestones that cover all of the sustainability indicators are described in **Section 6.9**.

6.7.1. Undesirable Results for Land Subsidence

Vertical displacement of the land surface can be caused by a variety of mechanisms, including extraction of oil and gas, the wetting of collapsible soils, piping of sediment from underground pipeline or tank leaks, collapse from underground mining facilities, tectonic activity along geological faults, and other conditions. This GSP focuses on land subsidence related to groundwater extraction only. The sections below summarize the physical processes that could cause potential future land subsidence in the Turlock Subbasin as well as the related causes and effects of potential undesirable results.

6.7.1.1. Causes of Undesirable Results for Land Subsidence

As mentioned above, no impacts from land subsidence have been documented in the Turlock Subbasin; accordingly, no undesirable results have been observed. However, hydrogeological conditions in the western Turlock Subbasin are similar to areas in the San Joaquin Valley where significant amounts of land subsidence have been recorded. Many of these areas have linked subsidence with groundwater pumping below the thick and compressible Corcoran Clay. As pumping removes groundwater from storage, the pore pressure and support of the aquifer framework are reduced, and sediments can be realigned and compacted at depth. This subsurface compaction reduces the volume of sediments, and the ground surface can subside. Although the actual processes and mechanisms that result in land subsidence are more complex than summarized herein, the concept of subsurface compaction is typically used to provide a general understanding of the physical causes of land subsidence. Additional information on the process of land subsidence is summarized in **Section 4.3.6** and illustrated on **Figure 4-58**.

Given the correlation of land subsidence to areas within the extent of the Corcoran Clay – both in the adjacent subbasin to the south and throughout much of the Central Valley – the western Turlock Subbasin is thought to be the area most susceptible to future land subsidence (see **Figure 6-1**). Groundwater production zones east of the extent of the Corcoran Clay in the Turlock Subbasin contain no known regional clay zones similar to the Corcoran Clay and are generally more consolidated; accordingly, the Eastern Principal Aquifer is judged to be less susceptible to subsurface compaction. However, pumping in this aquifer could impact water levels in adjacent western aquifers.

Further, recent InSAR data published by DWR indicates areas of vertical displacement in the Eastern Principal Aquifer (see **Section 4.3.6** and **Figure 4-61**). It isn't known if this vertical displacement is related to groundwater extraction or other mechanisms described in **Section 6.7.1** above. However, the highest rates of vertical displacement occur in areas of historical groundwater pumping. Accordingly, MTs are designated for all principal aquifers and a representative monitoring network is defined for land subsidence across the entire Subbasin. Groundwater extraction that could cause land subsidence in the Subbasin is described below.

Many of the cities and urban communities (e.g., Turlock, Ceres, Delhi, Hilmar, and Keyes) rely on groundwater wells in the Western Lower Principal Aquifer (i.e., the confined aquifer system below the Corcoran Clay that has been associated with land subsidence to the south). Private wells are also completed in that aquifer, but the number of active wells, locations, and pumping details are unknown. Although there have been no significant long-term groundwater level declines in the Western Upper Principal Aquifer, water levels from wells screened solely in the Western Lower Principal Aquifer are sparse; water levels in this aquifer have been identified as a data gap in the basin setting description in this GSP (see

Section 4.4). Additional pumping in the hydraulically-connected Eastern Principal Aquifer – outside of the Corcoran Clay extent – has resulted in a large volume of subsurface outflow from the western aquifers toward the east (see **Table 5-8**, subsurface outflow to ETSGSA). This subsurface flow could also contribute to depressurization of clay layers in the Western Lower Principal Aquifer.

Although the Eastern Principal Aquifer is outside the extent of the Corcoran Clay, it is possible that localized land subsidence could occur in this aquifer as well. Clay layers are observed on lithologic logs within the aquifer, although their compressibility and susceptibility to compaction is unknown. As a precautionary measure, sustainable management criteria are assigned to manage water levels at or near the historic low water levels to prevent extractions from triggering inelastic land subsidence in the future.

The western Subbasin is likely to be more susceptible to land use impacts that would cause undesirable results. There are larger urban areas with utilities and pipelines in the western Subbasin along with surface water canals and major transportation corridors including freeways and bridges. Cracks in foundations, canals, roads, or bridges, or damage to utilities or pipelines could cause an interruption to vital services; any of these examples could lead to undesirable results from land subsidence. In addition to cracks and breaks, land subsidence can affect gravity drainage in sewers, pipelines, and water conveyance canals and can also increase risk of flooding (LSCE, 2014; W&C, 2019; W&C and P&P, 2019).

The technical team provided numerous examples of land subsidence causes and impacts for TAC consideration, including documentation in GSPs completed in adjacent subbasins and other Central Valley subbasins. The Merced Subbasin defined an undesirable result from land subsidence as the interference with *the viability of the use of infrastructure* (W&C, 2019). In the Delta-Mendota GSP, undesirable results are described as significant property damage, adverse impacts to natural resources, or conditions that threaten public health or safety (W&C and P&P, 2019). Concepts from these undesirable definitions in adjacent subbasins were incorporated into the Turlock Subbasin definition of undesirable results as described in subsequent subsections of this GSP below.

6.7.1.2. Effects on Beneficial Uses of Groundwater

Adverse impacts of land subsidence on beneficial uses of groundwater have been well-documented throughout California (LSCE, 2014). Two commonly-cited effects in the Central Valley include damage to casings in water supply wells and interference with water canal capacity and conveyance.

Widespread collapse of well casings resulting from land subsidence have been documented in numerous areas of both the Sacramento and San Joaquin Valleys. Near El Nido, California, well casings have been observed protruding above the land surface, in some cases balancing the connected concrete well pad in the air (LSCE, 2014). Casing damage typically requires well replacement, resulting in significant costs to beneficial users of groundwater.

Given the close linkage between groundwater and surface water use in the Central Valley, land subsidence impacts on water conveyance facilities have also had a negative impact on the beneficial users of groundwater. Land subsidence has reduced freeboard and flow capacity in large water conveyance canals such as the Delta-Mendota Canal, the California Aqueduct, and the Friant-Kern Canal. Repairs to restore conveyance capacity along critical segments of the Friant-Kern Canal alone is estimated to cost as much as $200 million or more (FWA, 2018). In the GSP for the Merced Subbasin, undesirable results for land subsidence were related primarily to the viability of the Eastside Bypass canal, where subsidence has caused a reduction in freeboard and capacity over the last 50 years. Collectively, the impacts to these canals have resulted in an increase in groundwater pumping, often from groundwater basins already associated with overdraft conditions.

Subsurface compaction of clay layers is also associated with a permanent removal of some groundwater from storage. Although the usable storage capacity of an aquifer is not substantially impacted by the dewatering and compaction of clay layers, there is some amount of groundwater that is permanently lost. Pumping an identical amount of groundwater after this loss can result in a lower water level than before the clay layer was drained, resulting in higher pumping lift costs and other negative effects on beneficial uses of groundwater (LSCE, 2014).

Land subsidence could cause disruption for any activities on the physical land surface including agricultural production. Changes to the land, such as a surface depression, could affect how both surface water and groundwater is conveyed onto and within productive parcels and create inefficiencies in beneficial water use or interferences with agricultural land uses.

In the Turlock Subbasin, land subsidence could affect beneficial uses of groundwater in a variety of ways. Well owners would be affected by well failures from land subsidence. In the western Subbasin, groundwater elevations are shallow and can create wet surficial conditions that interfere with farming. Historically, shallow groundwater is controlled in these areas by pumping shallow wells (referred to as drainage wells) to allow ground conditions to support heavy equipment and machinery. Land subsidence in these areas could exacerbate these conditions and require more pumping to control soil moisture locally. In addition, elevation changes along the widespread network of surface canals could interfere with the efficient delivery of surface water and increase groundwater use. Increased groundwater use could lower water levels locally, potentially impacting environmental users of groundwater such as GDEs.

6.7.1.3. Turlock Subbasin Definition of Undesirable Results

In consideration of the land use and infrastructure impacts summarized above, undesirable results that could interfere with land uses are considered to be either physical surficial impacts that disrupt land use operations or potential damage to engineered structures such as roads, bridges, utilities, pipelines, canals, and/or well casings that are linked to land subsidence. An undesirable result would occur if groundwater extractions caused significant damage to the ground surface or to critical infrastructure and adversely impact its intended use.

Regulations also require that the undesirable result definition include quantitative criteria used to define when and where groundwater conditions can cause an undesirable result (§354.26(b)(2)). These criteria address the number of monitoring sites and events that an MT can be exceeded before causing an undesirable result. This framework builds on the narrative definition and recognizes that a single MT exceedance at one monitoring site may not indicate an undesirable result. This framework also allows clear identification for when an undesirable result is triggered under the GSP.

The narrative definition of undesirable results and the quantitative combination of MT exceedances that cause undesirable results are provided as follows.

Table 6-12: Undesirable Results for Land Subsidence

	Undesirable Results Definition	Principal Aquifer(s)
Land Subsidence	Undesirable results are defined as significant and unreasonable inelastic land subsidence, caused by groundwater extraction and associated water level declines, that adversely affects land use or reduces the viability of the use of critical infrastructure. An undesirable result will occur in the Western Upper Principal Aquifer when 33% of representative monitoring wells exceed the MT in three consecutive Spring monitoring events. An undesirable result will occur in the Western Lower Principal Aquifer when 33% of representative monitoring wells exceed the MT in two consecutive Spring monitoring events. An undesirable result will occur in the Eastern Principal Aquifer when 33% of representative monitoring wells exceed the MT in three consecutive Fall monitoring events.	As specified

The use of 33 percent of the representative wells was developed for the chronic lowering of water levels indicator as discussed in **Section 6.3.1.4** and is also appropriate for land subsidence because the monitoring networks for the two indicators are identical in numbers and locations of monitoring sites for each Principal Aquifer. The 33 percent value represents 6 of 18 in the Western Upper Principal Aquifer, 3 of 8 wells in the Western Lower Principal Aquifer, and 7 of 21 wells in the Eastern Principal Aquifer. By establishing a portion of the aquifer that would indicate undesirable results, the criteria recognizes that land subsidence is typically triggered by compressible clay layers that are relatively regional in extent and would not be expected to vary on a well by well basis.

Spring monitoring events are used for the more susceptible western aquifers because low water levels in Fall may result in higher rates of subsidence that will recover when water levels rise the following Spring (elastic land subsidence). The use of only two consecutive Spring exceedances for the Western Lower Principal Aquifer acknowledges the higher susceptibility for land subsidence in the Western Lower Principal Aquifer.

Because land subsidence is less likely to cause undesirable results in the Eastern Principal Aquifer – due to the more consolidated nature of the aquifer systems as well as a lower density of critical infrastructure – the undesirable result definition is modified for that principal aquifer to align with the MT exceedances allowed for both the chronic lowering of groundwater levels and the reduction of groundwater in storage indicators (i.e., Fall monitoring events).

Water level monitoring will be supplemented by annual screening of InSAR data. These data will be re-evaluated with the water level monitoring network in the five-year GSP evaluation. If InSAR data indicate increasing rates of subsidence, the monitoring network will be bolstered by additional monitoring, such as the installation of GPS stations, in targeted areas of the Subbasin.

6.7.2. Minimum Thresholds for Land Subsidence

As provided in the GSP regulations, the MT for land subsidence "shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results" (§354.28(c)(5)). The MTs are required to be supported by:

- Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence, including an explanation of how these uses and interests were determined.
- Rationale for establishing MTs in consideration of the above effects
- Maps and graphs showing the extent and a rate of land subsidence in the basin that defines the MT and MO.

Given the lack of undesirable results associated with land subsidence in the Turlock Subbasin, it is not possible to correlate a rate of subsidence to undesirable results. Current rates from incomplete data sets indicate low rates of vertical displacement across the Subbasin. Supporting technical information on land subsidence in the Turlock Subbasin is provided in **Section 4.3.6** and summarized below in **Section 6.7.2.1**.

Because the greatest risk for land subsidence in the Turlock Subbasin is thought to be the dewatering/depressurization of clays within and below the Corcoran Clay, maintaining groundwater levels at or above historic low levels and, at a minimum, above the top of the Corcoran Clay in both of the western principal aquifers was viewed as a reasonable strategy for minimizing any future subsidence. In this manner, groundwater levels would be protective against worsening conditions that could lead to future undesirable results for land subsidence and could serve as a proxy for direct subsidence monitoring.

Because data availability and hydrogeologic conditions provide different considerations for the Western Upper Principal Aquifer compared to the Western Lower Principal Aquifer, the approach for MTs is slightly different, as described below.

WESTERN UPPER PRINCIPAL AQUIFER

Most of the land subsidence documented in the San Joaquin Valley is related to groundwater extraction in the confined aquifer below the Corcoran Clay (Western Lower Principal Aquifer in the Turlock Subbasin) (LSCE, 2014). Nonetheless, relatively thick clay lenses occur in the Western Upper Principal Aquifer (for example, see **Figure 4-14**), which could potentially contribute to future land subsidence.

The MT for the chronic lowering of water levels sustainability indicator – set at the low water level in 2015 – is sufficiently protective to mitigate the future potential for inelastic land subsidence and avoid undesirable results. These water levels are at or above the historic low levels recorded for wells across the Western Upper Principal Aquifer and are also maintained above the Corcoran Clay. Based on these conditions, the MTs for the chronic lowering of water levels in the Western Upper Principal Aquifer are selected as a proxy for the land subsidence indicator.

WESTERN LOWER PRINCIPAL AQUIFER

The Western Lower Principal Aquifer is considered a higher risk for triggering land subsidence in the Turlock Subbasin compared to the other principal aquifers. In addition, there are data gaps for historical water levels in this aquifer (**Section 4.4**).

The MT for the chronic lowering of water levels sustainability indicator – set at the low water level in 2015 – would be sufficiently protective to avoid future potential undesirable results for land subsidence; where data are available, this level is at or above historic low water levels. However, some of the measured water levels appear to be close to the top of the Corcoran Clay. Given the data gaps, it is unclear if water levels are near the top of the clay in other portions of the lower aquifer. If water levels fall below the top of the clay layer, the potential for future land subsidence could increase. New monitoring wells are being installed in the Western Lower Principal Aquifer to address the current data gap, but it will not be possible to document accurate historical low water levels in new wells. However, the location of the Corcoran Clay in each new well will be readily available.

Based on these considerations, the MT for the Western Lower Principal Aquifer will be either the estimated Fall 2015 water level based on generalized water level contours or the top of the Corcoran Clay, whichever is shallower.

EASTERN PRINCIPAL AQUIFER

As discussed above, the Eastern Principal Aquifer is considered a lower risk for potential land subsidence compared to the Western principal aquifers. The sustainable management criteria established for both chronic lowering of water levels and reduction of groundwater in storage are protective against potential land subsidence in the Eastern Principal Aquifer because they manage groundwater levels at or above historic low levels in the area. Accordingly, the use of these criteria and water level MTs are used as a proxy for land subsidence potential in the Eastern Principal Aquifer.

The undesirable results definition for these other indicators guards against significant lowering of water levels and overdraft conditions, a definition which also guards against the potential for significant rates of future land subsidence. Similarly, MTs are above historic low water levels, so that any small rates of ongoing land subsidence will not be exacerbated.

Considerations provided above are used to quantify the MTs selected for each principal aquifer for land subsidence. Although MTs have been selected for each principal aquifer to meet slightly different considerations, the MTs can be summarized for all principal aquifers as provided in the following table.

Table 6-13: Minimum Thresholds for Land Subsidence

	Minimum Thresholds	Principal Aquifer(s)
Land Subsidence	Minimum thresholds are the low groundwater elevations observed in Fall 2015 or the top of the Corcoran Clay (where present), whichever is shallower, at each representative monitoring site for each principal aquifer.	All

Additional support and justifications for the MTs, along with the quantitative criteria for the combination of MT exceedances provided in the undesirable results definition, are discussed in the following section.

6.7.2.1. Justification and Support for Minimum Thresholds

As indicated above and discussed in **Section 4.3.6**, estimated rates of subsidence in the Turlock Subbasin are available at an existing global positioning system (GPS) station[31] south of the City of Turlock (**Figure 4-60**) and from InSAR data published by DWR (**Figure 4-61**). GPS data from July 2012 to July 2018 indicates a total amount of land subsidence of -0.22 feet (-2.64 inches), indicating a rate of about -0.037 feet per year (-0.44 inches per year) over that six-year period.

[31] Installed and operated by the U.S. Bureau of Reclamation in connection with the San Joaquin River Restoration Program.

InSAR data available from June 2015 to September 2019 (4.2 years) indicate no vertical displacement of the land surface over about one-half of the extent of the western principal aquifers. Remaining portions suggest negative displacement (land subsidence) from about -0.002 feet (-0.024 inches) to about -0.18 feet (-2.16 inches) over the 4.6-year period; these data suggest land subsidence rates between about -0.005 and -0.47 inches per year.[32] Data and maps were reviewed by the Joint TACs in several public meetings including a technical presentation on June 25, 2020.

Given the limited vertical displacement data and the lack of noticeable impacts, it is not possible to link specific rates of subsidence directly to undesirable results for the Turlock Subbasin. Most of the adverse impacts from land subsidence documented in the Central Valley have occurred in areas with several feet or more of subsidence (LSCE, 2014). With an overall rate of -0.44 inches per year (GPS station data), it would take about 27 years before land subsidence in the Turlock Subbasin would reach a magnitude of one foot.

Increased subsidence rates are often triggered during drought conditions (LSCE, 2014); the available recent land subsidence data in the Turlock Subbasin were collected during the long-term (and ongoing) drought conditions that produced historic low water levels throughout the Subbasin. These conditions were in place by January 2015; as previously mentioned, GSAs are not responsible for correction of undesirable results occurring before and/or currently as of January 2015. It is not possible to know whether the current rates will continue or if land subsidence triggered to date is capable of being arrested.

Nonetheless, the GSAs wish to prevent exacerbation of land subsidence in the Subbasin by managing water levels at or above the historical low levels. As an additional backstop, the GSAs will institute a monitoring program using annual InSAR data published by DWR for screening purposes in the Subbasin. This tracking will allow ongoing evaluation of the rate and extent of land subsidence and a re-evaluation of the data in the required five-year evaluation in 2027. if significant rates of subsidence are indicated at that time, additional monitoring, such as GPS stations will be installed, targeting the area of high rates.

In this manner, the GSAs will also ensure that the potential for impacts on land uses from land subsidence throughout the entire Subbasin is not missed. Screening data will be used to develop an on-ground monitoring network including use of existing GPS stations and/or installation of additional GPS stations, as needed. This approach is reasonable based on the best available data and associated uncertainty.

6.7.2.2. Relationship between MTs of Each Sustainability Indicator

Regulations require a description of the relationship between the MTs for each sustainability indicator and how the GSAs have determined that basin conditions at each MT

[32] InSAR data accuracy is estimated at about ±0.1 inches per year (Towill, 2021).

will avoid undesirable results (§354.28(b)(2)). To facilitate this comparison, MTs for each sustainability indicator was summarized in **Table 6-4** as discussed in **Section 6.3.2.2** above.

Section 6.3.2.2 also provides a discussion on the relationship between the MT for chronic lowering of water levels and the MTs for each of the remaining sustainability indicator. Because the MTs for land subsidence are the same as the MTs for chronic lowering of water levels (and also for the reduction in groundwater in storage), that discussion would also be applicable to the land subsidence sustainability indicator. As such, the discussion in **Section 6.3.2.2** fulfills most of this required component of the GSP.

One additional qualifier relating to the Corcoran Clay has been incorporated into the land subsidence MT. As shown in **Table 6-13** above (and also in **Table 6-4**), the MT is either the low groundwater elevation observed in Fall 2015 (for the Western Upper Principal Aquifer and the Eastern Principal Aquifer) or the shallower of the low groundwater elevation observed in Fall 2015 and the top of the Corcoran Clay (for the Western Lower Principal Aquifer). The MT for the Western Lower Principal Aquifer prevents inadvertently setting the MT below the top of the Corcoran Clay if local water levels have declined below that contact (recognizing the data gap regarding water levels in the Western Lower Principal Aquifer – see **Section 4.4**). As explained in **Section 6.7.2**, the Western Lower Principal Aquifer is the area most likely to experience significant future land subsidence in the Turlock Subbasin. In the southern San Joaquin Valley, adverse impacts from land subsidence have been caused by groundwater extraction below the Corcoran Clay that has depressurized or dewatered compressible layers within that zone. Managing water levels above historic low levels will be protective against land subsidence. By ensuring that the MT is set above the Corcoran Clay for the Western Lower Principal Aquifer, the MT ensures that any land subsidence that may have already been triggered in the aquifer will not be exacerbated.

These additional sustainability indicators are also analyzed separately in subsequent subsections of **Chapter 6** as referenced in **Table 6-4**. Additional information on how the MTs avoid undesirable results is provided below along with a summary of the process by which the MTs were selected for context.

The interrelatedness of all of the sustainability indicators is recognized throughout the discussions on sustainable management criteria in **Chapter 6**; potential impacts from the land subsidence MT on the remaining applicable [33]sustainability indicators is summarized below.

- The land subsidence MTs are the same MTs used for the chronic lowering of water levels MTs and the reduction of groundwater in storage (see **Section 6.3.2** and **Section 6.4.2**), with an additional backstop of using the top of the Corcoran Clay if shallower than the water level MT. These criteria will affect Subbasin operations

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[33] Seawater intrusion indicator is not applicable to the inland Turlock Subbasin and no sustainable management criteria are assigned.

similarly, and MTs for either of the two sustainability indicators do not interfere with management of the other.

- The MTs for reduction of groundwater is storage are identical to the chronic lowering of water levels (see above). As such, the land subsidence MTs do not present conflicts for sustainable management of groundwater in storage (**Section 6.4**).
- The MT for land subsidence supports the degraded water quality indicator. By maintaining water levels at or close to the 2015 water levels, constituents of concern that have increasing concentrations with depth can be avoided (**Section 6.6**).
- The MT for land subsidence is also supportive of the interconnected surface water MTs (**Section 6.8**). The MTs for the two sustainability indicators are based on the same water levels (Fall 2015) along the San Joaquin River and the Tuolumne River. For interconnected surface water along the lower reach of the Merced River, MTs in the Western Upper Principal Aquifer are slightly higher (based on Spring 2014 levels), than MTs in the same area for land subsidence (Fall 2015 levels). However, water levels are sufficiently similar (less than 10 feet) such that water levels could be managed to meet the higher MTs for closely-spaced wells in each GSP monitoring program. In addition, higher water levels would be more protective for potential land subsidence impacts.

These additional sustainability indicators are analyzed separately in subsequent sections of **Chapter 6** as noted above. Additional information on the land subsidence indicator is provided below.

Technical information relating to sustainable management criteria for land subsidence was reviewed by the Joint TACs with an initial public presentation on February 26, 2020, and additional focused discussions on June 25, 2020, meeting where recent InSAR data were available. A draft technical memorandum was prepared for the TACs in July to provide additional details on sustainability indicators including details on land subsidence and associated regulatory requirements. Relevant information from the memorandum has been updated and incorporated into this GSP.

6.7.2.3. Impacts of MTs on Adjacent Subbasins

Regulations require consideration of how Turlock Subbasin MTs impact the ability of an adjacent subbasin to achieve its sustainability goal. Through a series of coordination meetings with adjacent subbasin representatives and review of draft and completed GSPs, the Turlock TACs considered the MTs selected for land subsidence in the three adjacent subbasins including the Merced Subbasin to the south, the Delta-Mendota Subbasin to the west, and the Modesto Subbasin to the north. In brief, the Turlock Subbasin MTs are not expected to either cause undesirable results or affect implementation of adjacent subbasin GSPs as summarized below.

6.7.2.3.1. Merced Subbasin

As documented in its GSP (W&C, 2019), the highest rates of land subsidence in the Merced Subbasin occurred in the southwest, about 25 miles south of the Turlock Subbasin. Subsidence in that area was thought to be caused primarily by groundwater extraction and compaction of clay layers beneath the Corcoran Clay (W&C, 2019). Although the Corcoran Clay is present in the western subbasin adjacent to the Turlock Subbasin, rates of subsidence are much lower. As illustrated in the Merced Subbasin GSP (Figure 2-79 in W&C, 2019) and reproduced in the Turlock Subbasin GSP as **Figure 4-59**, similar rates of subsidence (<0.15 feet/year) occur in each subbasin along both sides of the Merced River. The Merced Subbasin GSP did not set MTs for the lower rates of land subsidence in areas adjacent to the Turlock Subbasin (W&C, 2019).

For the Turlock Subbasin, water levels will be maintained generally above historic low levels (at Spring 2014 levels) adjacent to the Merced Subbasin boundary in accordance with the sustainable management criteria for interconnected surface water (see **Section 6.8**). Even though MTs for land subsidence are slightly lower further inland in the Turlock Subbasin, the higher water levels along the Merced River are protective of land subsidence in both the Turlock Subbasin as well as the Merced Subbasin. Therefore, the land subsidence MTs will not adversely impact the ability of the Merced Subbasin to implement its GSP.

6.7.2.3.2. Delta Mendota Subbasin

As documented in the Northern & Central Delta-Mendota GSP, the Delta-Mendota Subbasin has not experienced significant land subsidence along the shared San Joaquin River boundary with the Turlock Subbasin (see Figure 5-113 *in* W&C and P&P, 2019). For that GSP, land subsidence MTs in the management area adjacent to the Turlock Subbasin were based on an acceptable loss in distribution capacity to be determined in a future study (W&C and P&P, 2019). One close subsidence monitoring station was identified (03-006) adjacent to the Turlock Subbasin on the San Joaquin River, but the MT had not yet been quantified. However, given the protective MTs established for the Turlock Subbasin, no land subsidence would be triggered in the Delta-Mendota Subbasin by Turlock Subbasin MTs.

In addition, both subbasins have set chronic lowering of groundwater levels MTs at or near 2015 levels along the subbasin boundary. In the Delta-Mendota Subbasin, the MTs for chronic lowering of water levels are based on either the historic low water level at representative wells (Upper Principal Aquifer) or 95 percent of the historic low water level (Lower Aquifer). At the time of its GSP (2019), those historic low water levels were typically reached in 2015. As discussed in **Section 6.3.2**, MTs for chronic lowering of water levels are also set at 2015 low water levels in the Turlock Subbasin. By setting these levels to a consistent time period, GSAs can be sure that aquifer conditions can support hydraulic gradients across the boundary similar to gradients in 2015.

Finally, as discussed in **Section 6.3.2.3.2**, the sustainable yield modeling analysis (**Section 5.3**) indicates that a net subsurface outflow occurs from the Turlock Subbasin into the Delta Mendota Subbasin of about 3,500 AFY. This net outflow provides additional evidence that

MTs in the Turlock Subbasin will not adversely impact GSP implementation in the adjacent Delta-Mendota Subbasin.

6.7.2.3.3. Modesto Subbasin

Both the Turlock Subbasin and Modesto Subbasin have approved MTs for interconnected surface water that are based on Fall 2015 water levels along both sides of the Tuolumne River (see **Section 6.8**). In that manner, the two GSPs are coordinating on MTs and avoiding undesirable results for streamflow depletion. Accordingly, MTs in the Turlock Subbasin for land subsidence will not have an adverse impact on GSP implementation in the Modesto Subbasin.

6.7.2.4. Effects of MTs on Beneficial Uses and Users of Groundwater

The setting of MTs is protective with respect to the avoidance of undesirable results. However, the MTs place operational constraints on agricultural wells or other water supply wells, especially during long-term multi-year droughts. Agricultural wells in the Western Upper Principal Aquifer have a problem with shallow groundwater and require pumping to drain fields and allow access for farming. Given the small fluctuations in these wells, maintaining water levels at MTs may impose restrictions on drainage well pumping; a management action is being considered to allow shallow groundwater to be pumped in these areas for beneficial uses.

Notwithstanding the constraints placed on various well owners, groundwater users would benefit from the control and mitigation of potential impacts from land subsidence in the future. Those impacts could negatively affect agricultural or urban land uses or other beneficial uses of groundwater as explained in **Section 6.7.1** above.

6.7.2.5. Consideration of State, Federal, or Local Standards in MT Selection

GSP regulations require that GSAs consider how the selection of MTs might differ from other regulatory standards. For land subsidence, the MT consists of managing water levels in each representative monitoring well, which would not conflict with other regulatory standards.

6.7.2.6. Quantitative Measurement of Minimum Thresholds

As stated above, the MTs for land subsidence will be monitored by quantitatively measuring water levels as a proxy in representative monitoring well networks for each applicable Principal Aquifer as described in **Chapter 7** (Monitoring Network) of this GSP. Monitoring will occur on a semi-annual basis, in Spring and Fall, to represent the seasonal high and low water level and adhere to water level sampling protocols (**Chapter 7**).

For land subsidence, supplemental monitoring is also planned. To provide a backstop for the uncertainties associated with future rates and extents of land subsidence, the GSAs also intend to monitor the Subbasin annually using the DWR-published InSAR data that covers the entire subbasin. Additional analysis would be needed to determine whether any InSAR-indicated land subsidence, especially small rates within the uncertainty of the method, represent actual inelastic land subsidence associated with groundwater extraction in the Subbasin. Data from existing GPS stations will also be incorporated in the annual analysis as available. Collectively, these supplemental monitoring analyses will serve as screening tools to identify optimal locations for future GPS stations to be added to the GSP monitoring network, as needed.

6.7.3. Measurable Objectives for Land Subsidence

The same approach for setting MOs for chronic lowering of water levels is used for land subsidence MOs, which are also established at the same representative monitoring sites. That approach involves the midpoint between the MT and the historical high water level (WY 1991 – WY 2015). An additional qualifier is added to the MO definition for the Western Lower Principal Aquifer and applies to all representative monitoring wells that use the top of the Corcoran Clay as the MT (when 2015 groundwater elevations are lower than the top of the Corcoran Clay - see **Section 6.7.2** above).

In that case, the average between the top of the Corcoran Clay and an estimated historic high groundwater level may result in a MO closer than 20 feet from the top of the Corcoran Clay. As a more protective measure for land subsidence in the Western Lower Principal Aquifer – the aquifer most susceptible for causing land subsidence – the MO is designated to be no lower than 20 feet above the clay.

Based on this information the definition of measurable objectives for the land subsidence sustainability indicator is as follows.

Table 6-14: Measurable Objectives for Land Subsidence

	Measurable Objectives	Principal Aquifer(s)
Land Subsidence	Measurable objectives are the midpoint between the MT and the high groundwater elevation observed over the historical study period WY 1991 – WY 2015 at each representative monitoring site for each principal aquifer. For any future representative monitoring site with an MT set at the top of the Corcoran Clay (when shallower than the 2015 water level), the MO will be set as above, but no less than 20 feet above the MT.	All

6.8. Depletion of Interconnected Surface Water

SGMA defines an undesirable result for the interconnected water sustainability indicator as "depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water." (§10721 (x)(6)). For the Turlock Subbasin, the Tuolumne, Merced, and San Joaquin rivers are all interconnected surface water. Along these boundary rivers, groundwater occurs above the channel invert elevation on an average basis, allowing groundwater to interact with surface water (**Figure 6-1**).

Beneficial uses of these rivers are provided in the Basin Plan for the Sacramento River Basin and the San Joaquin River Basin (CVRWQCB, 2018). All three rivers are associated with almost all categories of beneficial uses including municipal (potential uses), agricultural, and/or industrial supply; recreation; freshwater habitat, migration, and spawning; and wildlife habitat. The rivers also support large riparian corridors. A preliminary evaluation of vegetative and wetland areas mapped by TNC as natural communities commonly associated with groundwater indicates potential GDEs along most of the river reaches in the Turlock Subbasin (DWR, 2018d) (see **Section 4.3.8**).

For the Tuolumne and Merced rivers, GSA member agencies TID and Merced ID operate upstream reservoirs and hold surface water rights on these rivers, respectively. The districts provide local management of surface water resources including diversions and conveyance, primarily for agricultural irrigation. Agency experience was used to guide the analysis of streamflow depletions and undesirable results. Both TID and Merced ID contributed to the information and data used in the integrated surface water-groundwater modeling (C2VSimTM) of streamflow depletion under historical, current, and projected future water budgets (see **Chapter 5**).

The undesirable results, including causes and impacts to beneficial uses, are described in **Section 6.8.1** below, with a definition of undesirable results at the end of the section, along with additional criteria to quantify where and when undesirable results occur. **Section 6.8.2** describes the quantification of minimum thresholds (MTs). **Section 6.8.3** provides the approach and selection of measurable objectives (MOs). Interim milestones that cover all of the sustainability indicators are described in **Section 6.9**.

6.8.1. Undesirable Results for Interconnected Surface Water

Analyses of groundwater conditions and water budget modeling in the Turlock Subbasin highlight the linkages between groundwater extractions, reduction of groundwater in storage, and interconnected surface water. In its Water Budget BMP, DWR notes that increases in groundwater extraction will initially result in a decline in groundwater in storage. However, over time, this decline in storage will be ultimately balanced by decreases in groundwater flow to streams (DWR, December 2016). This condition induces groundwater recharge from the rivers. Although beneficial to water levels and storage, this increase in recharge removes water from the rivers, leading to potential impacts on beneficial uses of surface water including surface water rights holders, instream habitat, and potential GDEs.

The model has demonstrated the linkage between streamflow depletions and declining water levels in water supply wells near the river. This linkage indicates that water levels can be used as a proxy for monitoring surface water-groundwater interaction over time.

Although these interactions are best measured with a series of shallow monitoring wells adjacent to and transitioning away from the river, such monitoring wells do not currently exist along the Tuolumne and Merced rivers (see **Section 7.1.6**, **Table 7-2**, and **Figure 7-5**). However, current GSP monitoring wells have been demonstrated to be connected directly to the rivers and are screened in aquifers where extractions have led to streamflow depletion. As such, current wells, when combined with coordinated annual groundwater modeling, are likely to be sufficient for monitoring surface water-groundwater conditions in the short term. A management action to improve the monitoring network provides for additional shallow monitoring wells to be installed along the rivers over time (**Chapter 8**).

6.8.1.1. Causes of Undesirable Results

In the Turlock Subbasin, groundwater extractions have created a cone of depression in the east-central Subbasin that caused most of the decline in groundwater in storage under historical conditions (see **Figure 6-1**; see also **Table 5-6** and **Figure 4-30a**). Over time, the cone has expanded to the north and south toward the Tuolumne and Merced river boundaries, intercepting groundwater that would otherwise have flowed toward the rivers. This condition is exacerbated with local groundwater pumping from wells along the river. As the cone of depression expands along the river boundaries (especially along the Merced River), lower water levels are predicted to induce additional recharge from the rivers, which increases the depletion of streamflow.

The combination of local pumping near the rivers and the expansion of the cone of depression that intercepts the rivers have caused the potential for future undesirable results along both the Tuolumne and the Merced rivers. If not arrested, the groundwater system could become disconnected from the rivers, especially along the Merced River where water levels are low compared to the river channel. This change for each of the three river boundaries is presented in **Table 5-7**, where the net seepage from the rivers (which represents streamflow depletion) increases from an overall negative number (groundwater contributions to the river) for the Tuolumne River and San Joaquin River to a positive number on those rivers, reflecting an increase in recharge and streamflow depletion. The Merced River is already a net losing river (positive number) under both historical and projected future conditions (compare gains from and discharges to the Merced River on **Table 5-17**).

Operations of the river have become more difficult with increases in streamflow depletion. Merced ID notes that more water will have to be released to meet the same downstream flows at the compliance point on the Merced River than in the recent past. Both TID and Merced ID noted concerns over decreases in baseflow during low flow conditions in the river and potential impacts to habitat and other environmental uses. The Ad Hoc Committee recommended, and the Joint TACs agreed, that disconnection from the groundwater system would be an undesirable result and noted potential resulting adverse impacts on riparian vegetation, habitat, and GDEs.

GSAs are not required to correct undesirable results that occurred prior to January 1, 2015. Conditions leading to undesirable results for this indicator in the Turlock Subbasin resulted from the overall increases in Subbasin pumping that have occurred over time in the Subbasin. The Joint TACs want to keep these conditions from getting worse in the future. In this manner, future streamflow depletion will be less than predicted and connection between the groundwater and surface water system will be maintained along each of the three river boundaries.

6.8.1.2. Potential Effects on Beneficial Uses

As noted above, the future projected increases in streamflow depletion would have negative impacts on both surface water rights holders and environmental beneficial uses. Operation of the river would become more difficult, especially during low-flow conditions. Riparian habitat and GDEs would be negatively affected. If the rivers became disconnected GDEs would lose their water supply and other downstream beneficial uses reliant on flow requirements could also be adversely impacted.

6.8.1.3. Turlock Subbasin Definition of Undesirable Results

Based on the discussion of undesirable results above and information in the basin setting, a definition of undesirable results has been developed for interconnected surface water in the Turlock Subbasin.

Regulations also require that the undesirable result definition include quantitative criteria used to define when and where groundwater conditions can cause an undesirable result (§354.26(b)(2)). These criteria address the number of monitoring sites and events that an MT can be exceeded before causing an undesirable result. This framework builds on the narrative definition and recognizes that a single MT exceedance at one monitoring site may not indicate an undesirable result. This framework also allows clear identification for when an undesirable result is triggered under the GSP.

The definition of undesirable results along with the quantitative combination of MT exceedances that cause undesirable results are provided as follows.

Table 6-15: Undesirable Results for Interconnected Surface Water

	Undesirable Results Definition	Principal Aquifer(s)
Interconnected Surface Water	Undesirable results for interconnected surface water are defined as significant and unreasonable adverse impacts on the beneficial uses of surface water caused by groundwater extractions. An undesirable result will occur on one of the three monitored rivers when 50% of the representative monitoring sites for that river exceed the MT in two consecutive Fall monitoring events. The 50% criterion is based on the relatively small number of wells in the initial GSP monitoring network; additional wells are planned. The criterion may be adjusted downward after the number of interconnected surface water monitoring sites has been finalized.	All

As indicated above, MT exceedances of one half of the representative monitoring wells on each river will constitute an undesirable result. As noted, the 50 percent criterion is used because of the relatively small number of representative monitoring wells available for the GSP network along each river. The total number of current wells and the number of MT exceedances is summarized below and shown on **Figure 7-5**.

- San Joaquin River: 3 wells (50% - 2 wells)
- Tuolumne River: 3 wells (50% - 2 wells)
- Merced River: 6 wells (50% - 3 wells)

Additional wells are planned for interconnected surface water monitoring. A Management Action to improve the GSP monitoring networks (**Chapter 8**) includes plans for installation of shallow wells along the river and inland to establish local gradients. Once these wells are installed, the 50 percent criterion may be adjusted.

The limitation for exceeding the MT is limited to two consecutive Fall events (semi-annual monitoring). Spring events will be monitored but not used in the criterion because of the increase in water levels associated with Spring events would not be representative of potential negative impacts during low flows on the rivers.

6.8.2. Minimum Thresholds for Interconnected Surface Water

GSP regulations require the MTs to be “the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results" (§354.28(c)(6)). As explained in **Section 6.8.2.1**, the predicted increase in streamflow depletion is caused by lowering of water levels. Therefore, specific water levels can be directly correlated to levels of streamflow depletion as a proxy for interconnected surface water MTs.

The increase in streamflow depletions from historical conditions (average WY 1991 through WY 2015) to sustainable yield conditions is approximately 48,000 AFY, only about two percent of the total surface water outflows from the Subbasin (see **Section 5.3** and **Tables 5-7 and 5-17**). By selecting MTs at or above 2015 conditions, as was tested in the sustainable yield modeling, the increase in streamflow depletions to avoid undesirable results can be tracked with groundwater elevation monitoring. As discussed in more detail in **Section 5.3**, sustainable yield modeling controlled groundwater elevations at Spring 2014 levels for the Merced River and at Fall 2015 levels for the San Joaquin and Tuolumne rivers as indicated in the table as follows.

Table 6-16: Minimum Thresholds for Interconnected Surface Water

	Minimum Thresholds	Principal Aquifer(s)
Interconnected Surface Water	For the Merced River, the MT will be expressed as the groundwater elevation observed in Spring 2014 at each representative monitoring site. For the Tuolumne River and San Joaquin River, the MT will be expressed as the low groundwater elevation observed in Fall 2015 at each representative monitoring site.	Western Upper and Eastern Principal Aquifers

6.8.2.1. Justification and Support for Minimum Thresholds

GSP regulations require that the MTs be supported by:

- Location, quantity, and timing of depletions of interconnected surface water
- A description of the groundwater and surface water model used to quantify surface water depletion (§354.28(c)(6)(A)(B)).

The location, quantity, and timing of deletions were analyzed using the integrated surface water-groundwater model C2VSimTM. The local model is based on the regional C2VSim model, which has been revised to include local water budget data for both the Turlock and Modesto subbasins. In addition, local detailed data used for the GSP in the Merced Subbasin was also incorporated into the modeling analysis. These revisions provided increased ability and accuracy for modeling interconnected surface water across Turlock Subbasin north and south river boundaries. The documentation of the revised C2VSimTM model is provided in **Appendix D** of this GSP; interconnected surface water analysis is described in **Chapter 5**. Background information for the interconnected surface water analysis is provided in **Section**

4.3.7, followed by a preliminary analysis of potential GDEs, which occur along the river boundaries (**Section 4.3.8** and **Figure 4-64**).

Interconnected surface water was analyzed with historical, current, and future projected water budgets (**Chapter 5**) including separate average annual water budgets for the Turlock Subbasin surface water systems (see **Table 5-2**). Total surface water inflows to the Subbasin historically have averaged about 2,342,500 AFY with an estimated 2,563,800 AFY inflow under future projected water budget conditions (**Table 5-2**).

Sustainable yield modeling (**Section 5.3**) was conducted to test the groundwater level MTs selected for interconnected surface water (Fall 2015 levels for the Tuolumne and San Joaquin rivers and Spring 2014 for the Merced River). Model results indicated that the San Joaquin and Tuolumne rivers remained net gaining rivers over the implementation and planning horizon. In addition, all three rivers remained interconnected with the groundwater system with the MTs selected above. The MTs improved surface water conditions over the projected future water budgets.

The comparison of streamflow depletions in the projected future conditions and the sustainable yield conditions are summarized in **Table 6-17** below. For this presentation, positive numbers represent the net amount of water that is depleted from the surface water (net seepage to groundwater) on an average annual basis. Negative numbers represent contributions of groundwater to the surface water system (baseflow).

Table 6-17: Sustainable Yield Improvements to Interconnected Surface Water compared to Projected Future Baseline Conditions

Turlock Subbasin Surface Water	Projected Future Conditions (AFY)	Sustainable Yield Conditions (AFY)	Improvement* of Projected Conditions	
			(AFY)	(%)
Total GW-SW Interaction	38,400	-8,900	47,300	123%
San Joaquin	-28,100	-33,800	5,700	20%
Tuolumne	6,200	-16,200	22,400	361%
Merced	60,300	41,100	19,200	32%

Positive numbers represent a net recharge from surface water (SW) to groundwater (GW) (i.e., streamflow depletion) over average hydrologic conditions.
Negative numbers represent a net contribution to surface water (SW) from groundwater (GW) (i.e., net baseflow, also referred to as a net gaining river) over average hydrologic conditions.
**"Improvement" means less streamflow depletion under sustainable yield conditions.*

As shown in the table, streamflow depletion in the Turlock Subbasin rivers is estimated at 38,400 AFY under the projected future conditions with most of the depletion occurring on the Merced River. Under sustainable yield conditions, which incorporated the MTs, the streamflow depletion of 38,400 AFY is eliminated, and the overall surface water system becomes a net gaining (negative number) system with a larger contribution from groundwater than recharge to groundwater. Sustainable yield shows an improvement of 47,300 AFY (see more details in **Section 5.3**).

The largest improvement for sustainable yield conditions over projected future conditions is for the Tuolumne and Merced rivers, both of which see about 20,000 AFY less streamflow depletion than projected under future conditions.

6.8.2.2. Relationship between MTs of Each Sustainability Indicator

Regulations require a description of the relationship between the MTs for each sustainability indicator and how the GSAs have determined that basin conditions at each MT will avoid undesirable results (§354.28(b)(2)). **Table 6-4** summarizes the MTs for all sustainability indicators for reference.

The use of water levels as a proxy for interconnected surface water correlates well with the other sustainability indicators, most of which are also tied to water levels. The relationship between the MTs for interconnected surface water and the other MTs are summarized below:

- MTs for interconnected surface water are the same as those selected for the chronic lowering of water levels along the San Joaquin River and Tuolumne River and more protective along the Merced River. As such, MTs for chronic lowering of water levels and the San Joaquin and Tuolumne rivers are based on the same groundwater elevation surface (**Figure 6-1**). Although the higher MTs on the Merced River may be more difficult to maintain, the criteria provide sufficient flexibility so as to not cause conflicts for compliance (see **Section 6.3.2.2** and **Table 6.4**). The monitoring wells for chronic lowering of water levels and interconnected surface water do not overlap, allowing for a relatively smooth transition from MTs in the inland Subbasin to MTs along the rivers (see monitoring networks for both indicators in **Chapter 7**).
- MTs for reduction of groundwater in storage are the same as those for the chronic lowering of water levels and interact with MTs for interconnected surface water in the same manner as discussed above (see also **Section 6.5**).
- MTs have not been selected for the Seawater Intrusion indicator because it is not applicable to the inland Turlock Subbasin (see **Section 6.5**).
- MTs for interconnected surface water will not affect water quality and, as such, will not conflict with degraded water quality MTs. In addition, by maintaining water levels at or above the historic low levels along the rivers, groundwater will continue to contribute fresh water to the rivers and will not be degraded by lower quality water at depth. (**Section 6.6**).

- The MTs for chronic lowering of water levels are used as a proxy for land subsidence. As such, the interaction between the MTs for land subsidence and interconnected surface water are the same as the interaction described for chronic lowering of groundwater levels MTs described in the first bullet above (see also **Section 6.7**).

Projected water budgets were developed for the Subbasin with data and assistance from TID and Merced ID on water availability, reservoir operations, and surface water use over the 50-year implementation and planning horizon. GDEs were evaluated concurrently and presented to the Joint TACs at a public meeting November 5, 2020. Results from the projected water budget analysis indicate future increases in streamflow depletion, especially along the Merced River.

The Ad Hoc Committee focused on interconnected surface water to determine the potential for future undesirable results. Merced ID and TID assisted the committee and the technical team with operational considerations, information on undesirable results, and the selection of MTs. The committee determined that streamflow depletion associated with the projected future conditions for the Tuolumne and Merced rivers would be an undesirable result. The committee also wanted to avoid future disconnection between the surface water and groundwater beneath the Merced River. Water levels were linked to projected depletions and were discussed as a proxy for avoiding disconnection. The technical team conducted several modeling simulations to develop and test various MTs along the rivers and the selected MTs were found to significantly reduce future streamflow depletions . MTs were recommended for use in the GSP by the Joint TACs at a public meeting on June 10, 2021.

6.8.2.3. Impacts of MTs on Adjacent Subbasins

Regulations require consideration of how Turlock Subbasin MTs impact the ability of adjacent subbasins to achieve its sustainability goal. Through a series of coordination meetings with adjacent subbasin representatives and review of draft and completed GSPs, the Turlock TACs considered the MTs selected for interconnected surface water in the three adjacent subbasins including Merced Subbasin to the south, Delta-Mendota Subbasin to the west, and Modesto Subbasin to the north. In brief, the Turlock Subbasin MTs are not expected to either cause undesirable results or affect implementation of adjacent subbasin GSPs as summarized below.

6.8.2.3.1. Merced Subbasin

In the Merced Subbasin GSP, the sustainable management criteria for chronic lowering of groundwater levels are used as a proxy for interconnected surface water. Accordingly, the MT, MO, and undesirable result definition are all the same as chronic lowering of water levels. As mentioned in **Section 6.4.2.3.1** above, the MTs closest to the Turlock Subbasin boundary are generally lower than the MTs in the Turlock Subbasin.

The Turlock Subbasin TACs coordinated with Merced ID, as the holder of surface water rights on the Merced River, to determine acceptable levels of streamflow depletion. Based on input from Merced ID, Spring 2014 groundwater levels were selected as MTs for interconnected surface water along the Merced River in the Turlock Subbasin. Sustainable yield modeling indicated a 32 percent improvement in streamflow depletion compared to projected future conditions (**Table 6-2**).

The sustainable yield modeling analysis (**Section 5.3**) indicates a net subsurface inflow of 12,300 AFY into the Turlock Subbasin from the Merced Subbasin under sustainable management conditions (compare Merced Subbasin inflows and outflows for sustainable conditions on **Table 5-17**). However, that amount is much less than under historical conditions, which indicated a net inflow into the Turlock Subbasin of 45,000 AFY from the Merced Subbasin. Collectively, the improved condition of subsurface flow, as well as the Turlock Subbasin MTs that set water levels higher along the Merced River for interconnected surface water, indicate that the Turlock Subbasin will not prevent successful GSP implementation by the Merced Subbasin.

6.8.2.3.2. Delta-Mendota Subbasin

The Delta-Mendota Northern & Central GSP defines undesirable results for interconnected surface water as a percentage increase in streamflow depletions that is to be determined within the first five years of GSP implementation. A quantitative MT is not set due to insufficient data. The data to be incorporated into the evaluation will be collected from two wells along the San Joaquin River adjacent to the Turlock Subbasin (see wells 03-001 and 03-003 on GSP Figure 6-7 *in* W&C and P&P, 2019). In the interim, the GSP selects a narrative MO, which states “no increased depletions of surface water occur as a result of groundwater pumping.” (W&C and P&P, 2019).

In the absence of a quantitative MT for interconnected surface water, the MT for the Turlock Subbasin seems sufficiently high as not to prevent the Delta-Mendota Subbasin from achieving its sustainability goal. As mentioned previously, MTs for chronic lowering of water levels have been set similarly in both subbasins adjacent to the San Joaquin River. Sustainable yield modeling shows that MTs for the San Joaquin River in the Turlock Subbasin are correlated to conditions that contribute net baseflow volumes to the river of 33,800 AFY (**Table 6-2**), an amount within 12 percent of the average historical net baseflow of 38,500 AFY (subtract outflows from inflow for the San Joaquin River on **Table 5-6**); this represents an improvement of about 20 percent over future projected baseline conditions estimate of 28,100 AFY of baseflow (see **Table 6-2**). With this contribution to baseflow and MTs from 2015 conditions on both sides of the river, the MT for interconnected surface water in the Turlock Subbasin would not be expected to negatively impact implementation of the Delta-Mendota Northern & Central GSP.

6.8.2.3.3. Modesto Subbasin

The TAC in the Modesto Subbasin has approved using Fall 2015 water levels as the MT for interconnected surface water in coordination with the Turlock Subbasin. Sustainable yield modeling in both subbasins indicate similar net contributions to baseflow on both sides of the river (16,200 AFY from Turlock Subbasin and 11,000 AFY from Modesto Subbasin).

6.8.2.4. Effects of MTs on Beneficial Uses and Users of Groundwater

The setting of MTs is protective with respect to the avoidance of undesirable results. By arresting groundwater level declines along the river boundaries, future projected streamflow depletions can be partially mitigated, and long-term use of groundwater can become more sustainable. Environmental uses of surface water and groundwater would be supported.

However, there will be consequences on current uses of groundwater. The MTs will not be able to be achieved without sufficient projects or management actions to raise and maintain water levels along the Subbasin river boundaries. This will require significant investment in projects to replenish the groundwater basin. Property interests would be impacted if significant demand reduction is required to meet the Subbasin sustainability goal.

6.8.2.5. Consideration of State, Federal, or Local Standards in MT Selection

GSP regulations require that GSAs consider how the selection of MTs might differ from other regulatory standards. For interconnected surface water, the MT consists of water levels quantified for each representative monitoring well. Surface water rights holders – Merced ID for the Merced River and TID for the Tuolumne River – estimate that the MTs set will not adversely impact surface water rights and will allow for compliance with state and federal requirements. Accordingly, there are no conflicts with regard to other regulatory standards.

6.8.2.6. Quantitative Measurement of Minimum Thresholds

As stated above, the MTs for interconnected surface water will be monitored by quantitatively measuring water levels in representative monitoring well networks for each applicable Principal Aquifer as described in **Chapter 7** (Monitoring Network) of this GSP (see **Section 7.1.6**, **Table 7-2,** and **Figure 7-5**). Monitoring will occur on a semi-annual basis, in Spring and Fall, to represent the seasonal high and low water level and adhere to water level sampling protocols (**Chapter 7**).

6.8.3. Measurable Objectives for Interconnected Surface Water

As used for other sustainability indicators above, the MO for interconnected surface water is set as the midpoint between the high groundwater elevation and the MT in each of the representative monitoring wells established for this indicator. As explained in **Section 6.3.3**, the MTs represents a “floor” for maintenance of low water levels, with allowance for short-term exceedances during droughts. Accordingly, water levels will be managed over an operational range generally occurring between the MT (with temporary exceedances in drought) and anticipated high water levels that occur during wet periods.

Table 6-18: Measurable Objectives for Interconnected Surface Water

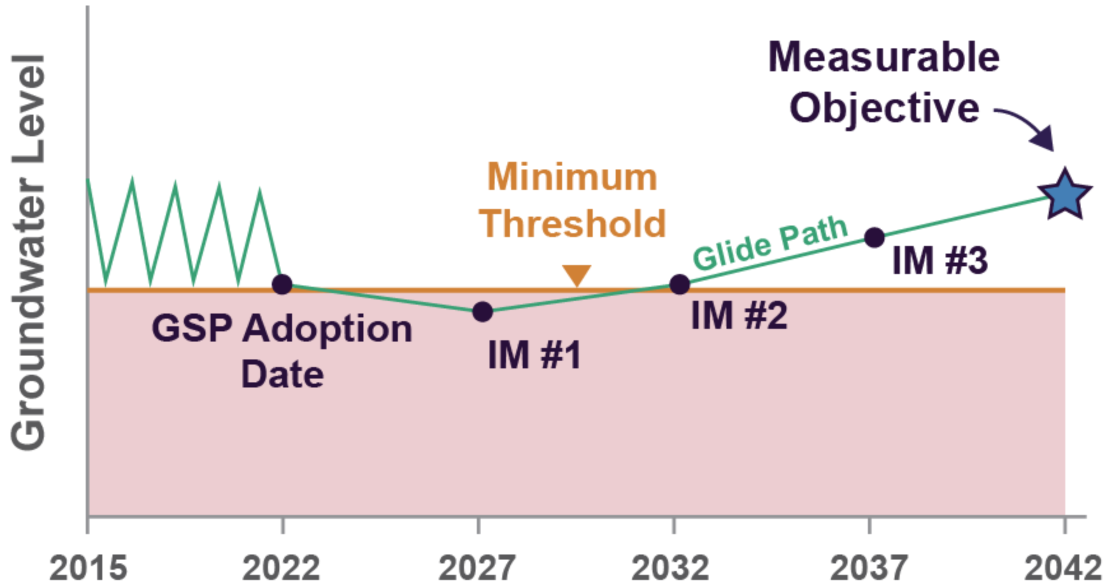
	Measurable Objectives	Principal Aquifer(s)
Interconnected Surface Water	Measurable objectives are established at the midpoint between the MT and the high water level observed over the historical Study Period WY 1991 – WY 2015 at each representative monitoring site for each river boundary.	Western Upper and Eastern Principal Aquifers

6.9. Interim Milestones

GSP regulations define interim milestones (IM) as "a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan." For the Turlock Subbasin, water levels are used as a metric for the IMs, consistent with the metric being used for MTs and MOs for all sustainability indicators except degraded water quality.

IMs provide a glide path for the Turlock Subbasin to reach its sustainability goal. The incremental approach recognizes that the path to sustainability is determined by the timing and effectiveness of GSP implementation, including projects and management actions designed to manage water levels to avoid undesirable results. For the Turlock Subbasin, a glide path provides needed flexibility for areas of the Subbasin that will continue to decline – at rates dependent on future hydrologic conditions – until projects and management actions are implemented.

The following graphic prepared by DWR illustrates the concept of how IMs relate to the MT and MO. As shown, the IMs provide a glide path to sustainable management whereby MTs and MOs are maintained to avoid undesirable results.



In this conceptual graphic, the pink area represents water levels below the MT for a representative monitoring well (i.e., an MT exceedance). In this example, water levels are expected to continue to decline after the GSP is adopted as projects are being brought online. This concept acknowledges that the aquifer response to projects and management actions will take time. Interim milestones are illustrated in increments of five years following Plan adoption to define the glide path from undesirable results to the MO and achieving sustainable management by 2042.

In the Turlock Subbasin, long-term declines have occurred in the Eastern Principal Aquifer where groundwater has been the primary source of agricultural water supply (**Figure 6-1**). In addition, a few wells in the western principal aquifers have not yet fully recovered from 2014-2017 drought conditions and may be below or fall below MTs during GSP implementation. Accordingly, 2027 target values below the MT have been developed for all wells in the Eastern Principal Aquifer and selected wells in the western principal aquifers, as needed.

The amount of the anticipated declines between adoption and 2027 is dependent on future unknown hydrologic conditions. Since the establishment of 2014 or 2015 water levels as the MTs (depending on the sustainability indicator), dry hydrologic conditions have persisted in the Subbasin. Water year types as categorized by the DWR San Joaquin Valley indices since 2014 are summarized in the following table.

Table 6-19: Water Year Hydrologic Classification Indices Since 2015

Water Year	Water Year Type San Joaquin Valley Water Year Index
2014	Critically Dry
2015	Critically Dry
2016	Dry
2017	Wet
2018	Below Normal
2019	Wet
2020	Dry

Source: https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST

As shown in the table, five out of seven water years between WY 2014 and WY 2020 have been categorized as below normal, dry, or critically dry. Water level declines associated with the last seven years may continue if hydrologic conditions do not improve, and/or if the aquifer response to GSP project implementation is delayed.

In order to plan for a worst-case scenario, a 2027 IM has been developed for Eastern Principal Aquifer wells based on the declines observed over the last seven years. By 2032, project implementation is expected to support water level recovery and the 2032 IM is set as the MT. If needed, the IM for 2037 is defined as the halfway point between the MT and MO. This trajectory is similar to the DWR conceptual diagram illustrated above. The 2027 IMs are provided in **Chapter 7** (see **Tables 7-1** and **7-2**) and shown on the hydrographs in **Appendix G**.

Most wells in the western principal aquifers have already recovered above the MTs and do not appear to need the flexibility for IMs to be set below the MT. While it is possible that continual declines in some areas might affect wells that have already recovered, it will take some time for the ongoing declines to propagate across the Subbasin. In the interim, one GSP project is anticipated to support water levels in the Western principal aquifers because it allows urban pumping to be immediately decreased as treated surface water is supplied for municipal drinking water.

This project, referred to as the Regional Surface Water Supply Project, has been in development for several years and is already being implemented (details of this project are in **Chapter 8**). Water supply is scheduled to begin in 2023 (SRWA, 2021). This project will raise water levels in the western principal aquifers and provide protection for avoiding undesirable results until water levels in the Eastern Principal Aquifer can respond to additional GSP projects.

IMs have been designated conservatively on an as needed basis but will not be used to defer implementation of GSP projects or management actions. Other projects and/or management actions may also be needed during the first five years of GSP implementation to avoid undesirable results near wells if water levels reach the IMs. Project development has been expedited, with a Programmatic CEQA analysis already underway for environmental compliance.

6.10. Sustainable Management Criteria and Adaptive Management

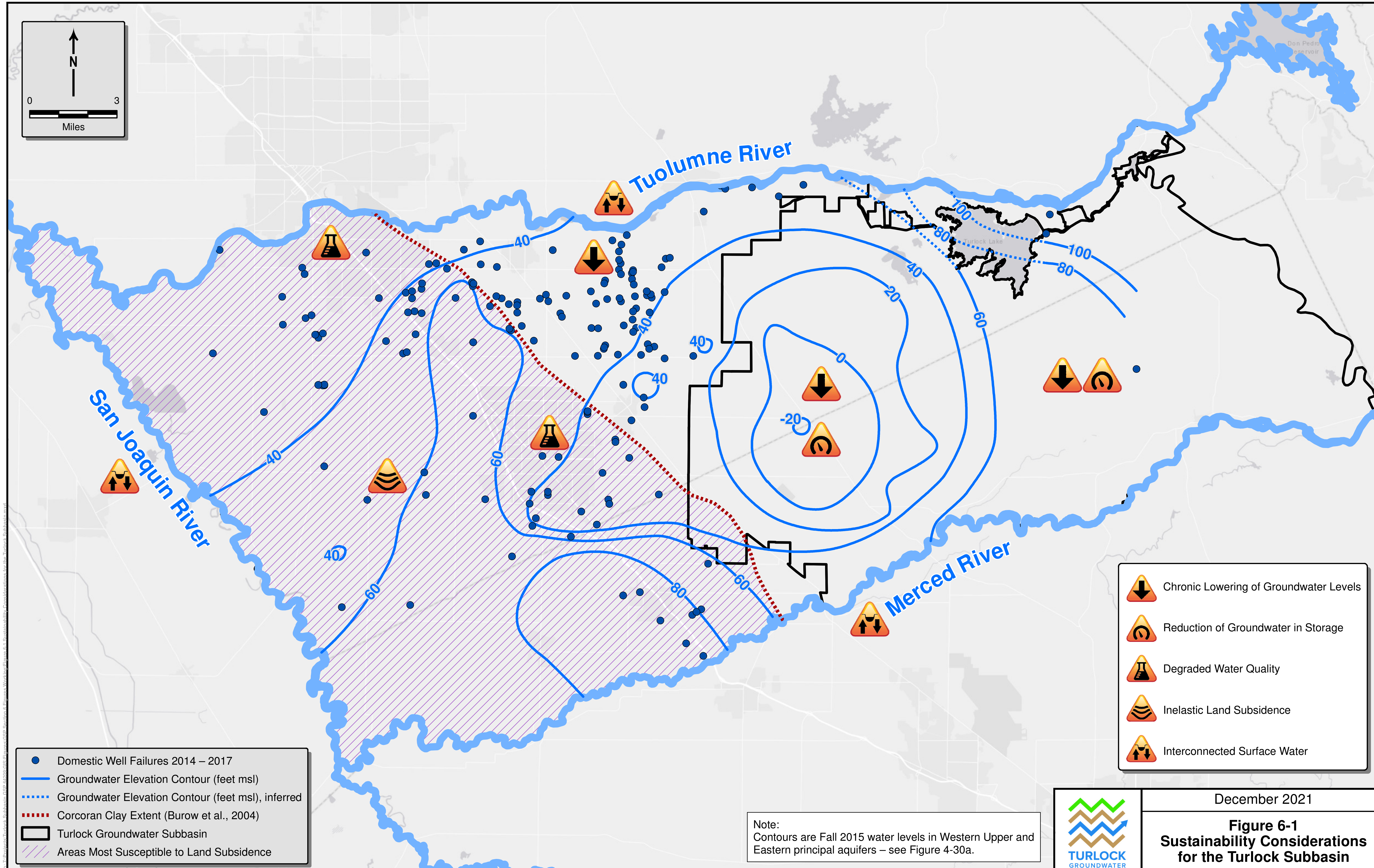
Collectively, the sustainable management criteria discussed in the sections above provide a robust set of criteria to avoid undesirable results and achieve the Turlock Subbasin sustainability goal. Sustainable management criteria are summarized in **Table 6-20**, including the definition of undesirable results, minimum thresholds (MTs) and measurable objectives (MOs) for all sustainability indicators applicable to the Turlock Subbasin GSP.

Turlock Subbasin GSAs note that this initial sustainable management criteria employs new SGMA terminology and represents reasonable estimates for sustainable management of groundwater through the planning horizon. Nonetheless, it is recognized that sustainable management criteria – including the definition of undesirable results – may require adjustment in the future.

Improvements to the GSP monitoring network including new installations of monitoring wells are incorporated into this GSP. As the GSAs implement the GSP and monitoring network, additional information will be routinely compiled and analyzed to evaluate aquifer response to the initial sustainable management criteria. GSAs recognize that monitoring results may indicate that the initial undesirable results definition and MTs require adjustment in the future. Actual MTs that lead to undesirable results may be higher or lower than those selected in **Table 6-20** as projects and management actions are implemented. Consistent with the concept of adaptive management, the GSAs will re-evaluate the criteria in the five-year assessment of the GSP and make appropriate adjustments to ensure that the Subbasin meets its sustainability goal within the GSP implementation period as required.

Table 6-20: Sustainable Management Criteria Summary

Sustainability Indicator	Undesirable Result Definition		Minimum Thresholds (MTs)	Measurable Objectives (MOs)	Principal Aquifers	GSP Section
	Narrative	Quantitative				
Chronic Lowering of Water Levels	An undesirable result is defined as significant and unreasonable groundwater level declines such that water supply wells are adversely impacted during multi-year droughts in a manner that cannot be readily managed or mitigated.	An undesirable result for each principal aquifer will occur when at least 33% of representative monitoring wells exceed the MT for that principal aquifer in 3 consecutive Fall semi-annual monitoring events.	Low groundwater elevation observed in Fall 2015 at each representative monitoring site for each principal aquifer.	Midpoint between the MT and the high groundwater elevation observed over the historical Study Period WY 1991 - WY 2015 at each representative monitoring site for each principal aquifer.	All Principal Aquifers	6.3
Reduction of Groundwater in Storage	An Undesirable result is defined as significant and unreasonable reduction of groundwater in storage that would occur if the volume of groundwater supply is at risk of depletion and/or may not be accessible for beneficial use. An Undesirable Result is also defined as long-term overdraft, based on projected water use and average hydrologic conditions.	An undesirable result will occur for each principal aquifer when at least 33% of representative monitoring wells exceed the MT for that principal aquifer in 3 consecutive Fall semi-annual monitoring events.	Low groundwater elevation observed in Fall 2015 at each representative monitoring site for each principal aquifer.	Midpoint between the MT and the high groundwater elevation observed over the historical Study Period WY 1991 - WY 2015 at each representative monitoring site for each principal aquifer.	All Principal Aquifers	6.4
Seawater Intrusion	Not applicable to the Turlock Subbasin (N/A)	N/A	N/A	N/A	N/A	6.5
Degraded Water Quality	An Undesirable Result is defined as significant and unreasonable adverse impacts to groundwater quality caused by GSA projects, management actions, or management of groundwater levels or extractions such that beneficial uses are affected and well owners experience an increase in operational costs.	An undesirable result will occur when a new (first-time) exceedance of an MT is observed in a potable water supply well in the representative monitoring network that is caused by GSA management activities as listed at left.	Minimum thresholds are set as a new (first-time) exceedance of a drinking water quality standard (primary or secondary MCL) in a potable supply well in the representative Monitoring network for any of the Subbasin constituents of concern as listed below: Nitrate (as N) - 10 mg/L Arsenic - 10 ug/L Uranium - 20 pCi/L Total dissolved solids - 500 mg/L 1,2,3-TCP - 0.005 ug/L PCE - 5 ug/L.	No increase above the maximum historical concentration for any constituent of concern in a potable water supply well in the GSP monitoring program caused by GSA management activities.	All Principal Aquifers	6.6
Land Subsidence	An Undesirable Result is defined as significant and unreasonable inelastic land subsidence, caused by groundwater extraction and associated water level declines, that adversely affects land use or reduces the viability of the use of critical infrastructure.	An undesirable result will occur in the Western Upper Principal Aquifer when 33 percent of representative monitoring wells exceed the MT in 3 consecutive Spring monitoring events.	Low groundwater elevation observed in Fall 2015 at each representative monitoring site.	Midpoint between the MT and the high groundwater elevation observed over the historical Study Period WY 1991 - WY 2015 at each representative monitoring site.	Western Upper Principal Aquifer	6.7
		An undesirable result will occur in the Western Lower Principal Aquifer when 33 percent of representative monitoring wells exceed the MT in 2 consecutive Spring monitoring events.	Low groundwater elevation observed in Fall 2015 or the elevation on the top of the Corcoran Clay, whichever is shallower, at each representative monitoring site.	Midpoint between the MT and the historical high groundwater elevation at each representative monitoring site as above. If MT is set as the top of the Corcoran Clay (when shallower than the 2015 water level MT), the MO will be set as above, but no less than 20 feet above the Corcoran Clay.	Western Lower Principal Aquifer	6.7
		An undesirable result will occur in the Western Upper Principal Aquifer when 33 percent of representative monitoring wells exceed the MT in 3 consecutive Fall monitoring events.	Low groundwater elevation observed in Fall 2015 at each representative monitoring site.	Midpoint between the MT and the high groundwater elevation observed over the historical Study Period WY 1991 - WY 2015 at each representative monitoring site.	Eastern Principal Aquifer	6.7
Interconnected Surface Water	An Undesirable Result is defined as significant and unreasonable adverse impacts on the beneficial uses of surface water caused by groundwater extraction.	An undesirable result will occur on one of the three monitored rivers when 50 percent of representative monitoring wells for that river exceed the MT in two consecutive Fall monitoring events. The 50 percent criterion is based on the limited number of monitoring wells in the current monitoring network; additional wells are planned for the future. The percent criterion may be adjusted downward when the network has been finalized.	For the **San Joaquin River**, low groundwater elevation observed in Fall 2015 at each representative monitoring site.	Midpoint between the MT and the high groundwater elevation observed during the historical Study Period SY 1991 - WY 2015 at each representative monitoring site.	Western Upper Principal Aquifer	6.8
			For the **Tuolumne River**, low groundwater elevation observed in Fall 2015 at each representative monitoring site.		Eastern Principal Aquifer and Western Upper Principal Aquifer	6.8
			For the **Merced River**, the groundwater elevation observed in Spring 2014 at each representative monitoring site.		Eastern Principal Aquifer and Western Upper Principal Aquifer	6.8



December 2021

Figure 6-1
Sustainability Considerations for the Turlock Subbasin

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7. MONITORING NETWORKS

The overall objective of the monitoring network for this Groundwater Sustainability Plan (GSP) is to yield representative information about groundwater conditions to guide and evaluate GSP implementation. Specifically, the GSP monitoring network is designed to:

- Evaluate groundwater conditions relative to sustainability indicators.
- Monitor for minimum thresholds to avoid undesirable results.
- Track interim milestones and measurable objectives to demonstrate progress on reaching sustainability goals for the Subbasin.
- Expand the existing monitoring network to better represent the entire Subbasin and address data gaps.
- Reduce uncertainty and provide better data to guide management actions, document the water budget, and improve understanding of the interconnection of surface water and groundwater.
- Identify and track potential impacts on beneficial uses and users of groundwater.

This GSP builds on existing monitoring programs with the intent to provide sufficient data for demonstrating short-term, seasonal, and long-term trends in groundwater levels. Existing monitoring programs include the CASGEM monitoring program, public water supplier groundwater monitoring programs in the cities and community service districts, agricultural area monitoring programs, and the Irrigated Lands Regulatory Program. These existing monitoring programs are described in **Section 2.4**. Additional monitoring wells to address data gaps and improve the GSP network will be added as described in **Section 7.1**. Further refinements to the monitoring networks may be made as data become available during implementation as discussed in **Chapter 8**.

The following sections summarize the monitoring network. **Section 7.1** describes the monitoring network for each sustainability indicator. **Section 7.2** provides protocols for data collection and monitoring. **Section 7.3** describes how the monitoring network will be assessed and improved. **Section 7.4** summarizes the data management system (DMS) for data collected from the monitoring network. Figures and tables for **Chapter 7** are provided at the end of the text to minimize interruption and facilitate multiple references to each table or figure.

7.1. DESCRIPTION OF MONITORING NETWORK

Groundwater level monitoring networks were developed for the chronic lowering of groundwater levels, reduction of groundwater in storage, land subsidence, and depletions of interconnected surface water. The applicability and rationale for using groundwater elevations to monitor each of these four sustainability indicators is discussed in **Chapter 6**, Sustainable Management Criteria. The monitoring networks are composed of representative monitoring wells that will be used to monitor sustainable management criteria for these sustainability indicators during the GSP implementation and planning horizon. Accordingly, groundwater elevations have been selected for a minimum threshold (MT) and measurable objective (MO) for each well in the monitoring network.

As described in **Chapter 6**, 2027 Interim Milestones (IMs) were developed for monitoring network wells in the Eastern Principal Aquifer and a few wells in the Western Principal Aquifers. The IMs are 2027 target values that provide a buffer to allow water levels to drop below the MT between 2022 and 2027, recognizing that water levels in these wells may continue to decline after the GSP is adopted as projects are being brought online. This concept acknowledges that the aquifer response to projects and management actions will take time. IM values are based on the assumption that recent water level declines will continue at similar rates between 2022 and 2027.

As described in **Chapter 6**, the monitoring network for degradation of water quality will be based on wells monitored by others and available at the State Water Resources Control Board (SWRCB) GeoTracker website. This network consists of drinking water supply wells, regulated facilities, and regional water quality programs such as GAMA. When combined with additional data from regulated water quality coalitions, this collective dataset represents a comprehensive network for tracking and evaluating water quality with respect to the sustainable management criteria. Additional information on this monitoring network is provided in **Section 7.1.4** below.

A monitoring network was not developed for the seawater intrusion sustainability indicator. As discussed in **Chapter 6**, the GSAs found that seawater intrusion, as defined by GSP regulations, is not applicable to the inland Turlock Subbasin. Specifically, the GSAs determined that seawater intrusion is not present in the Subbasin and is not likely to occur in the future (see **Section 6.5**). In accordance with GSP regulations, no sustainable management criteria have been assigned to this indicator, and no monitoring network has been established (§354.34(j)).

The monitoring network is composed of both existing and proposed wells. Existing wells include selected CASGEM wells, municipal multi-completion wells in the Cities of Ceres and Turlock and the town of Denair, USGS monitoring wells, a City of Ceres inactive irrigation well, and a series of active and inactive production wells and monitoring wells in the eastern Subbasin developed as part of the ETSGSA monitoring program. The monitoring network also anticipates incorporation of new monitoring wells that will be constructed in Winter 2021/2022, with Proposition 68 grant funding from DWR. Additional new monitoring network wells are planned for construction within ETSGSA in calendar years 2022 and 2023, funded through the DWR Technical Support Services (TSS) program.

The monitoring networks are illustrated on **Figures 7-1** through **7-5.** The figures show locations of the wells in each monitoring network and the MT and MO for each well. **Figure 7-6** presents a summary of all the monitoring network wells in the Subbasin.

The additional monitoring wells proposed to be installed by the GSAs in 2022 and 2023 are not shown on the figures in this chapter because locations have not been chosen. These include shallow monitoring wells along the river boundaries, and multi-completion monitoring wells within the Western Principal Aquifers and in the northwestern Eastern Principal Aquifer.

Summaries of the monitoring networks are provided in **Tables 7-1** and **7-2**. Information on these tables include the well ID, State Well Number, CASGEM identification number where applicable, well type, Principal Aquifer and GSA in which the well is located, location coordinates, well depth, screen interval depths, the MT and MO and a brief summary of how the MT and MO were developed, and the IM where applicable.

Hydrographs for each monitoring network well are provided in **Appendix G**. The hydrographs include well screen interval, ground surface elevation, the MT and MO for each well, and the IM where applicable. Hydrograph presentation meets the data and reporting standards for hydrographs in Article 3 of the GSP regulations (§352.4(e)).

In addition to the representative wells in the monitoring network, the GSAs will measure groundwater elevations in more than 50 additional wells. These wells are designated as SGMA monitoring wells and will not be used to monitor the sustainability indicators, and therefore do not have MTs and MOs. However, the groundwater elevation data collected from the SGMA monitoring wells will be used for monitoring overall groundwater hydraulic conditions. These data will be used to support analyses for annual reports. In the five-year update to the GSP, the groundwater level data from the SGMA monitoring wells will be evaluated along with the data from representative monitoring wells as part of the monitoring network assessment required by GSP regulations (§354.38(a)). The SGMA monitoring wells, as of the adoption of this GSP, are summarized in **Table 7-3** and illustrated on **Figure 7-6**.

Some of the SGMA monitoring wells, additional wells that are identified during future evaluations, or additional new monitoring wells may be added to the representative monitoring network in the future, if needed to reduce uncertainty. Additional wells may also be monitored as SGMA wells depending on access, well attributes, and need.

Improvements to the monitoring network are already being addressed with the installation of new monitoring wells in Fall 2021 and the negotiation of access agreements. A GSP Implementation Support Activity (ISA) has been incorporated into the GSP to identify and address data gaps and to identify potential improvements to the current GSP monitoring network (see **Section 9.2**).

The monitoring networks for each sustainability indicator are described in the following sections.

7.1.1. Chronic Lowering of Groundwater Levels

The monitoring network for chronic lowering of groundwater levels for each of the three principal aquifers is presented on **Figures 7-1, 7-2** and **7-3.** The wells in this monitoring network are summarized in **Table 7-1**.

Well density was an important consideration in identifying monitoring network wells for this sustainability indicator. DWR guidance (DWR, 2016a, see Table 1) generally recommends between one and ten monitoring wells per 100 square miles. This monitoring network is consistent with this guidance.

The following is a description of the monitoring network for each principal aquifer for chronic lowering of groundwater levels.

7.1.1.1. Western Upper Principal Aquifer

The monitoring network for the Western Upper Principal Aquifer is illustrated on **Figure 7-1**. The monitoring network is composed of 18 wells, including 16 CASGEM wells and 2 wells that will be constructed in Winter 2021/2022 with Proposition 68 grant funding. Well information is summarized in **Table 7-1**.

The wells in this monitoring network were chosen based on the following scientific rationale:

- Known locations and construction, with screen intervals above the Corcoran Clay (in the Western Upper Principal Aquifer).
- Spatial distribution and density of wells throughout the Western Upper Principal Aquifer.
- Length, completeness, and reliability of historical groundwater level record.
- Accessibility for future water level measurement.

The two monitoring wells that will be constructed with Proposition 68 grant funding in Winter 2021/2022 (WTS-1 Shallow and WTS-2 Shallow) will be completed and screened above the Corcoran Clay (**Figure 7-1**).

Hydrographs for the CASGEM wells in this monitoring network are presented in **Appendix G**. The CASGEM wells have historical water level records, many with water level data throughout the GSP study period of WY 1991 to WY 2015. As described in **Chapter 6**, the MT for the chronic lowering of groundwater level sustainability indicator is the low groundwater elevation observed in Fall 2015 and the MO is the midpoint between the historical high groundwater elevation and the MT. For each of the CASGEM wells in the monitoring network, measured water level data were available in Fall 2015. Therefore, the MTs and MOs were based on direct measurements in each well.

Static groundwater elevations will be measured twice a year in these monitoring wells to represent seasonal high and seasonal low groundwater conditions.

There are SGMA monitoring wells in the Western Upper Principal Aquifer that will be monitored semi-annually. Future water level data from these wells will be evaluated, and some of these wells, additional wells that are identified during future evaluations, or additional new monitoring wells may be added to the monitoring network during the GSP five-year update, if warranted. More SGMA monitoring wells may also be added when available.

7.1.1.2. Western Lower Principal Aquifer

The monitoring network for the Western Lower Principal Aquifer contains eight wells as illustrated on **Figure 7-2** and summarized in **Table 7-1**. The monitoring network includes multi-completion monitoring wells in the Cities of Ceres and Turlock and the town of Denair, a USGS well, and three wells that will be constructed in Winter 2021/2022 with Proposition 68 grant funding. The Subbasin GSAs are working with the USGS to obtain ownership and access to the USGS monitoring well. As described in **Section 9.2** coordination between the GSAs and the USGS to gain access to these monitoring wells is included in the GSP as an Implementation Support Activity (ISA 2) see **Section 9.2.4.2**).

The wells in this monitoring network were chosen because they have known locations and construction, with discrete screen intervals in the Western Lower Principal Aquifer (below the Corcoran Clay), and because they can be accessed for water level measurement in the future. The three wells that will be constructed in Winter 2021/2022 with Proposition 68 grant funding will be completed and screened below the Corcoran Clay (see wells with red symbols on **Figure 7-2**).

The multi-completion wells located within the Cities of Ceres and Turlock and the town of Denair consist of three or four discretely-screened wells at each location, all of which are screened in the Western Lower Principal Aquifer. One representative well was chosen for the monitoring network from each multi-completion cluster based on a review of the water level data, lithologic logs, and geophysical logs for each of the wells in the cluster. The multi-completion wells chosen for the monitoring network are screened in conductive sand or gravel units and have similar water levels to most, if not all of the other wells in the same cluster. The remaining wells in these clusters are SGMA monitoring wells and are summarized in **Table 7-3** and illustrated on **Figure 7-6**. Future water level data from the SGMA monitoring wells will be evaluated, and if warranted, some of these wells may be added to the monitoring network during the GSP five-year update.

As shown on **Figure 7-2**, most of the wells in the monitoring network are in the eastern region of the Western Lower Principal Aquifer, with the two Proposition 68 wells in the western/southwestern region of the aquifer. There is a data gap of wells screened in the central/northwestern Western Lower Principal Aquifer. This data gap of groundwater elevations in the Western Lower Principal Aquifer is identified in **Section 4.4**. Further improvements to the monitoring network are described in an Implementation Support Activity incorporated into the GSP in **Chapter 9** (**Section 9.2.1**).

Hydrographs for wells in this monitoring network are presented in **Appendix G**. There are no measured data in Fall 2015 at any of these monitoring network wells. As noted in **Table 7-1**, the MTs selected for the Western Lower Principal Aquifer wells are based on estimates from the Fall 2015 groundwater elevation contour map (see **Figure 4-30a**), or for the USGS well, Fall 2015 model groundwater elevation contours. The MOs are based on the available measured data at the well. The MTs and MOs for the Proposition 68 monitoring wells will be established after the wells are constructed. MTs and MOs will be established for any additional monitoring wells that are constructed in the future and added to the monitoring network.

Static groundwater elevations will be measured twice a year in these monitoring wells to represent seasonal high and seasonal low groundwater conditions.

7.1.1.3. Eastern Principal Aquifer

The monitoring network for the Eastern Principal Aquifer consists of 21 wells, as shown on **Figure 7-3**. The monitoring network includes a CASGEM well, a multi-completion well in the City of Turlock, ETSGSA monitoring program wells, Proposition 68 monitoring wells and future TSS monitoring wells. Well information is summarized in **Table 7-1**. The TSS monitoring wells will be multi-completion well clusters, with multiple wells at each location. However, well construction has not been determined yet, and therefore the TSS wells are listed once per location on **Table 7-1**.

The wells were chosen for this monitoring network based on their representative locations and known construction, accessibility for future water level measurement, and because they have good spatial distribution throughout the Eastern Principal Aquifer. The ETSGSA monitoring program wells are a mixture of inactive irrigation wells, active domestic and fertigation wells, and monitoring wells. Access agreements have been established between the well owners and ETSGSA to allow for long-term monitoring. Electronic pressure transducers for water level data collection have been installed in most of the ETSGSA monitoring program wells.

The monitoring network wells provide good spatial distribution throughout the Eastern Principal Aquifer, with the exception of the northwest portion of the aquifer between the communities of Hughson, Denair, and Hickman (see **Figure 7-3**). Although monitoring wells do not extend to the easternmost edge of the Eastern Principal Aquifer, the network covers almost all of the developed irrigated agriculture (see **Figure 2-4**) and is capable of monitoring the effects of future groundwater extraction on the aquifer in this area of the Subbasin. The WTSGSA plans to install an additional monitoring well in the northwest region of the Eastern Principal Aquifer. A specific location has not been chosen, but this well will be funded by the WTSGSA during either the current (2021-2022) or the following (2022-2023) fiscal year.

The ETSGSA monitoring program wells in the easternmost Eastern Principal Aquifer address a data gap described in **Section 4.4**, where historical water level data were lacking south and southeast of Turlock Lake. Proposition 68 and TSS well locations were chosen to augment the existing ETSGSA monitoring program in other areas of sparse data.

Hydrographs for wells in this monitoring network are presented in **Appendix G**. Several methods were used to develop MTs and MOs, based on available data. For wells with a sufficient record of historical water levels, measured data were used to select the MT and MO. For wells without historical or Fall 2015 measured water level data, MTs were developed based on nearby wells with historical water level records (e.g., DWR WDL wells) or estimated from the Fall 2015 groundwater elevation contour map (see **Figure 4-30a**). In several ETSGSA monitoring program wells, the rate of change of available measured water levels were used to estimate Fall 2015 groundwater elevations (e.g., ETSGSA-09). MOs were based on either measured historic high groundwater levels, estimates from the Spring 1998 contour map (see **Figure 4-29**), or based on trends in available measured data extrapolated to Spring 1998. A summary of the MT/MO development method for each well in the monitoring network is provided in **Table 7-1**. Estimated MT and MO values may require adjustment when future groundwater elevation data are collected.

Static groundwater elevations will be measured twice a year in these monitoring network wells to represent seasonal high and seasonal low groundwater conditions.

As summarized on **Table 7-3**, there are SGMA monitoring wells in the Eastern Principal Aquifer that will be monitored on a semi-annual basis. Some of these are already outfitted with transducers for collecting water level data. Future water level data from these wells will be evaluated, and some of these wells, additional wells that are identified during future evaluations, or additional new monitoring wells may be added to the monitoring network during the GSP five-year update, if warranted. More SGMA monitoring wells may also be added when available.

7.1.2. Reduction of Groundwater in Storage

As described in **Section 6.4**, the sustainable management criteria for chronic lowering of groundwater levels will be used as a proxy for the reduction of groundwater in storage indicator. Accordingly, the monitoring network for the reduction of groundwater in storage is the same as the monitoring network for the chronic lowering of groundwater levels. This monitoring network is described above in **Section 7.1.1**, summarized in **Table 7-1**, and illustrated on **Figures 7-1, 7-2,** and **7-3**.

Static groundwater elevations will be measured twice a year in these monitoring network wells to represent seasonal high and low groundwater conditions.

In addition to the required reporting of groundwater levels over time, regulations also require that the GSP annual reports provide an annual estimation of the change in groundwater in storage (§354.34(c)(2)). As described in **Chapters 5** and **6**, the historical reduction of groundwater in storage is estimated at about 63,900 AFY. As discussed in **Section 6.4.1.3**, both the change in groundwater in storage and corresponding water levels in the Subbasin will be documented annually in the GSP annual reports. Collectively, these data will allow the connection between the reduction of groundwater in storage to Subbasin groundwater elevations to be documented on an annual basis, providing further justification for the use of a groundwater elevation proxy for this indicator.

7.1.3. Seawater Intrusion

As described in **Section 6.5**, the Turlock Subbasin GSAs found that seawater intrusion is not an applicable sustainability indicator for the Turlock Subbasin. Specifically, the GSAs determined that seawater intrusion is not present in the Turlock Subbasin and is not likely to occur in the future. Therefore, neither sustainable management criteria nor a monitoring network has been established for this sustainability indicator (§354.34(j)).

7.1.4. Degraded Water Quality

As summarized in **Section 6.6.1.3**, undesirable results for degraded water quality are defined as significant and unreasonable adverse impacts to groundwater quality caused by GSA projects, management actions, or other management of groundwater such that beneficial uses are affected and well owners experience an increase in operational costs. The MTs are set as a new exceedance of the maximum contaminant level (MCL) at a potable supply well for any of the six constituents of concern (COC): arsenic, nitrate, total dissolved solids (TDS), uranium, 1,2,3-trichloropropane (1,2,3-TCP), and tetrachloroethene (PCE).

The SWRCB and other agencies have the primary responsibility for water quality and the GSAs do not intend to duplicate this authority. Numerous regulated water quality monitoring programs exist in the Turlock Subbasin, providing the GSAs with data from hundreds of monitoring sites over time. Accordingly, the GSP monitoring network for this sustainability indicator will incorporate existing monitoring programs, all of which have been approved by the SWRCB or other water quality regulatory agency. The MTs will be quantitatively monitored by public agencies (and others) in representative monitoring wells in each Principal Aquifer in accordance with other water quality regulatory monitoring program requirements and using regulatory-approved sampling protocols. The GSAs will download water quality data from the State GeoTracker website each year and analyze any new exceedances of the six COCs in potable supply wells. New exceedances will be evaluated in relation to GSA management of water level and groundwater extractions, as well as GSA projects and management actions, to determine whether these exceedances were caused, or exacerbated, by the GSAs. This analysis will be included in the GSP annual reports. Measurable objectives will be tracked by analysis of increases in concentrations for the six COCs.

The monitoring network consists of drinking water supply wells, monitoring wells at regulated facilities, and monitoring sites associated with other regulatory water quality programs such as GAMA. Data from two specific regulatory water quality programs, CV-SALTS and the Nitrate Control Program (implemented by the Valley Water Collaborative – see **Section 2.4.4**), will be compiled separately if not already included in the GeoTracker data. These two programs are regulated through the CVRWQCB and provide water quality data for nitrate and total dissolved solids in groundwater throughout the Subbasin. Collectively, this dataset represents a comprehensive network for ongoing tracking and evaluation of water quality with respect to the sustainable management criteria.

The monitoring network may vary from year-to-year based on regulatory requirements for each water quality program. Water quality data collected in Subbasin wells from January 2020 to May 2021 for the COCs were downloaded from GeoTracker as an initial dataset. Initial water quality monitoring sites are represented on **Figure 7-4** and tabulated in **Appendix H**. During this time, water quality data were collected from over 300 wells in the Subbasin, including municipal and domestic drinking water wells and monitoring wells. Most of the data are from municipal drinking water systems and are therefore clustered in and around the municipalities, many of which include DAC areas (see **Figure 3-1**). Monitoring network wells are also located in areas where most domestic wells are located. As indicated on **Figure 7-4** and tabulated in **Appendix H**, there are more than 30 wells for each of the six COCs, providing sufficient data to track and characterize water quality COCs to meet beneficial uses across the Subbasin. More than 150 domestic wells are included in the network but have been sampled for nitrate only. The SWRCB is planning to expand domestic well sampling to include some of the Turlock Subbasin COCs as well as other constituents. These data will be used to supplement the water quality dataset in annual reports when available.

7.1.5. Land Subsidence

Although impacts from land subsidence have not been documented in the Turlock Subbasin, the potential for future land subsidence cannot be ruled out. Future land subsidence is most likely to occur as a result of the dewatering/depressurization of clays within and below the Corcoran Clay (based on land subsidence impacts in other parts of the San Joaquin Valley). As described in **Section 6.7**, the sustainable management criteria for chronic lowering of groundwater levels will be used as a proxy for land subsidence. Accordingly, the monitoring network for land subsidence is the same as the monitoring network for the chronic lowering of groundwater levels. This monitoring network is described above in **Section 7.1.1**, summarized in **Table 7-1**, and illustrated on **Figures 7-1, 7-2,** and **7-3**.

Static groundwater elevations will be measured twice a year in these network wells to represent seasonal high and seasonal low groundwater conditions.

Remote sensing data of ground surface elevations in the Turlock Subbasin will also be used as a screening tool to evaluate whether land subsidence might be occurring as a supplemental monitoring program, but MTs and MOs will not be assigned to these data. As summarized in **Section 4.3.6**, vertical displacement data has been collected using Interferometric Synthetic Aperture Radar (InSAR) since 2015 by TRE Altamira Inc., under contract with DWR. This data set is available on the SGMA Data Viewer (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub). Data collected from June 2015 to September 2019 in the Turlock Subbasin is illustrated on **Figure 4-61**. As shown on this figure, vertical displacement data covers the full extent of the Turlock Subbasin. Land subsidence will be monitored in the Subbasin by updating and evaluating this InSAR data on an annual basis. This evaluation will be included in the GSP annual reports.

7.1.6. Depletions of Interconnected Surface Water

The monitoring network for depletions of interconnected surface water, summarized in **Table 7-2** and presented on **Figure 7-5**, includes 12 wells along the San Joaquin River, Tuolumne River and Merced River. These wells are screened in the Western Upper Principal Aquifer and the Eastern Principal Aquifer. They include wells from CASGEM, the ETSGSA monitoring program, City of Ceres (1 well), and a future TSS well cluster location likely comprising 4 wells.

Groundwater data will be supplemented with surface water data monitored by others. Data include releases and diversions on the Tuolumne and Merced rivers, coupled with stream gauge data monitored by USGS. These data have been used in model calibration to analyze streamflow depletions in this GSP as documented in **Appendix D** (see **Sections 5.2.3** and **5.3.2** in **Appendix D**).

The wells in this monitoring network were chosen because they are relatively close to the rivers and are accessible for water level measurement into the future. The wells have known locations with screen intervals that should enable monitoring of the unconfined portions of these two aquifers adjacent to the river boundaries. Some of the wells, such as the CASGEM wells, have significant historical water level records.

The following summarizes the monitoring network wells along each of the rivers.

7.1.6.1. San Joaquin River

Three CASGEM wells are part of the monitoring network along the San Joaquin River. These wells are approximately 2 to 3.5 miles from the San Joaquin River and are the closest wells to the river screened in the Western Upper Principal Aquifer that are accessible for future monitoring. These wells have known construction, with discrete screen intervals from just below ground surface to between 71 and 195 ft bgs, within the Western Upper Principal Aquifer (**Table 7-2**). Each of these wells has historical water level data (hydrographs in **Appendix G**).

As shown on **Figure 7-5**, these three wells are relatively evenly spaced along the San Joaquin River. However, there is a gap in well coverage along the upstream reach of the San Joaquin River. This is consistent with the data gap in groundwater conditions along the river boundaries that was identified and described **Section 4.4**. The Subbasin GSAs are evaluating potential locations for constructing new monitoring wells along the San Joaquin River boundary. Specific locations for these future monitoring wells have not yet been chosen, but the GSAs intend to coordinate locations with well installations planned in the adjacent Delta-Mendota Subbasin. Construction of these monitoring wells will be funded by the Subbasin GSAs.

As described in **Section 6.8.2**, the MT for the San Joaquin River is defined as the low groundwater elevation observed in Fall 2015. The MO is the midpoint between the historical high groundwater elevation and the MT (**Table 7-2**). As noted on **Table 7-2**, the

MT and MO are close together (about 10 feet or less), providing relatively small amounts of operational flexibility; however, historical groundwater elevations in this part of the Subbasin have been shallow with relatively small fluctuations. The GSAs have developed an Implementation Support Activity (ISA 2) to allow for control of shallow groundwater to support land uses, as has been done historically in this area (see **Section 9.2.4.3**). The MTs and MOs at each of these wells is based on measured data, as shown on the hydrographs in **Appendix G**.

Static groundwater elevations will be measured twice a year, in spring and fall, to represent seasonal groundwater conditions.

7.1.6.2. Tuolumne River

Three wells are part of the monitoring network along the Tuolumne River. As shown on **Figure 7-5**, these include ETSGSA monitoring program wells to the east and west of Turlock Lake and one City of Ceres well. The ETSGSA monitoring program wells are approximately one mile, or less, from the Tuolumne River. The City of Ceres well is about 500 feet from the Tuolumne River. These wells were chosen for the monitoring network because they are close to the Tuolumne River and will be accessible for future water level monitoring.

ETSGSA-01 and ETSGSA-02 are screened at relatively similar intervals within the Eastern Principal Aquifer: ETSGSA-01 from 223 to 445 ft bgs and ETSGSA-02 from 250 to 350 ft bgs (**Table 7-2**). It is recognized that these screen intervals are relatively deep and measured vertical gradient data are not available, but groundwater elevations in these wells are representative of an unconfined aquifer system connected to shallow groundwater conditions and are likely influenced by surface water seepage. Both of these wells are outfitted with transducers. ETSGSA video logged and installed a transducer in ETSGSA-01, an inactive irrigation well, in October 2021. ETSGSA-02 is a little used domestic supply well installed in 2008. Water levels in ETSGSA-02 were measured in 2008 and have been recorded since October 2019 by transducer and semi-annual hand measurements in the fall and spring (see **Appendix G)**. Future data collection will help improve the understanding of the local conditions for surface water to groundwater interaction. Estimated MT and MO values may require adjustment when future groundwater elevation data are collected. Notwithstanding these limitations, ETSGSA-01 and ETSGSA-02 represent the best available wells for monitoring interconnected surface water along the upper reach of the Tuolumne River at this time.

The City of Ceres Well 36 is an inactive irrigation well near the eastern edge of the Corcoran Clay, screened both above and immediately below the Corcoran Clay. The Corcoran Clay in this area is thin (Wood Rodgers, Inc., 2010). Based on the well log, the clay thickness is 10 feet or less. Well logs from nearby wells across the river indicate thin or absent Corcoran Clay layers. Because this well is close to the thinning eastern extent of the Corcoran Clay and is also screened in the shallow Western Upper Principal Aquifer, the water levels are likely representative of the water table, making it a suitable well for monitoring interconnected surface water.

As shown on **Figure 7-5**, Ceres 36 is the only monitoring network well along the central and western reaches of the Tuolumne River. The Subbasin GSAs have identified groundwater conditions along the river boundaries as a data gap, as described in **Section 4.4**. The GSAs plan to install additional monitoring wells along the river boundaries during this and the following fiscal year. Three monitoring wells are planned along the central and downstream reaches of the Tuolumne River, but specific locations have not yet been chosen. The Turlock Subbasin GSAs intend to coordinate with the neighboring Modesto Subbasin GSAs to construct these shallow monitoring wells across the Tuolumne River from existing shallow monitoring wells in the Modesto Subbasin. In this manner, groundwater-surface water interaction can be more accurately monitored along the Tuolumne River.

As described in **Section 6.8.2**, the MT for the Tuolumne River is defined as the low groundwater elevation observed in Fall 2015. There is a lack of historical measured water level data at these wells, and therefore, the MTs are based on the Fall 2015 groundwater elevation at a nearby DWR WDL well (the method used for ETSGSA-01) and the minimum of recent measured data (the method used for ETSGSA-02). The MT for Ceres 36 is based on water levels in Fall 2015 at a nearby City of Ceres well with a similar screen interval. Estimated MT and MO values may require adjustment when future groundwater elevation data are collected.

Static groundwater elevations will be measured twice a year, in spring and fall, to represent seasonal high and low groundwater conditions.

Data gaps in the monitoring network will be addressed with an Implementation Support Activity (ISA 2) to improve future GSP monitoring (see **Section 9.2.2**).

7.1.6.3. Merced River

As shown on **Figure 7-5**, the monitoring network along the Merced River includes six locations: one CASGEM well, four ETSGSA monitoring program wells, and one future TSS monitoring well cluster location (TSS-4) with a target of 4 vertically discrete monitoring wells in the cluster. These wells were chosen for the monitoring network because they are close to the Merced River, have relatively shallow screen intervals, and will be accessible for future monitoring. Two of the wells, ETSGSA-14 and ETSGSA-21, are further from the Merced River and will provide information about the hydraulic gradient north of the Merced River. Well information is summarized in **Table 7-2**. Since TSS-4 well construction has not been determined yet, it is listed once on this table.

TID 303, ETSGSA-17 and ETSGSA-23 are within one mile of the Merced River and have known screen intervals. CASGEM well TID 303 is screened from 0.5 to 100 ft bgs in the Western Upper Principal Aquifer. ETSGSA-17 and ETSGSA-23 are in the Eastern Principal Aquifer and screened from 146 to 390 ft bgs and 132 to 212 ft bgs, respectively. ETSGSA-17 is a converted irrigation well used for monitoring only and ETSGSA-23 is an active domestic well. Both of these ETSGSA wells are outfitted with electronic pressure transducers to supplement hand measurements and have been recording water levels since October 2019. The future TSS-4 monitoring well cluster will be constructed within a quarter mile of the

Merced River and likely screened at four different intervals, with the shallowest well intended to represent the water table of the Eastern Principal Aquifer.

ETSGSA-14 and ETSGSA-21 are within three miles of the Merced River and screened from 187 to 685 ft bgs and 57 to 283 ft bgs, respectively. Both of these wells are inactive irrigation wells located close to active irrigation wells within the Eastern Principal Aquifer. They are outfitted with electronic pressure transducers to supplement hand-measured data that have been recording water levels since February 2020 (ETSGSA-14) and October 2019 (ETSGSA-21). Their proximity to active irrigation wells makes the electronic data collection extremely valuable in assessing static water levels in these areas further from the Merced River.

As shown on **Figure 7-5**, these wells are spaced apart along the Merced River. However, the locations of the ETSGSA monitoring program wells are limited to existing wells that may not be optimally sited, are screened well below the water table (without direct knowledge of vertical gradients) or have relatively long screen intervals. Notwithstanding these limitations, these wells represent the best available wells for monitoring interconnected surface water along the upper reach of the Merced River at this time. Nevertheless, as stated previously, groundwater conditions along the river boundaries were identified as a data gap in **Section 4.4** and future improvements to the monitoring network are described in an Implementation Support Activity (ISA 2) in **Chapter 9** (**Section 9.2.2**).

In 2003, USGS installed three clusters of monitoring wells (a total of 16 wells) close to TID 303 along a transect roughly oriented in the direction of groundwater flow toward the Merced River. USGS provided data and information on these wells in support of GSP development. The USGS wells have not been routinely monitored and access has not yet been secured to monitor these wells. Discussions between the GSAs and the USGS to gain access to these wells and help address the above-described data gap are in progress. As described in **Section 9.2.4**, coordination between the GSAs and the USGS to gain access to these monitoring wells is an Implementation Support Activity.

All but one of the USGS wells is screened in the Western Upper Principal Aquifer, with one screened in the Western Lower Principal Aquifer. The well in the Western Lower Principal Aquifer (Blum 3-1) is part of the monitoring network for chronic lowering of groundwater levels, assuming that access will be secured (see **Figure 7-2** and **Table 7-1**). Recognizing that TID 303 provides a reasonable monitoring site for this reach in the Western Upper Principal Aquifer, the GSAs intend to continue to explore access for the shallow USGS clusters and will monitor these clusters as additional SGMA monitoring wells, when available (**Table 7-3** and **Figure 7-6**). USGS wells screened in the Western Upper Principal Aquifer will be added to the monitoring network as data are collected and better understood in the context of interconnected surface water.

As described in **Section 6.8.2**, the MT for the Merced River is defined as the groundwater elevation observed in Spring 2014. The MT at TID 303 is the estimated Spring 2014 groundwater elevation, based on the trend of measured data dating back to the earliest measurement in November 2014. The MTs at the ETSGSA wells are based on Spring 2014 measured data at the well (ETSGSA-21), Spring 2014 measured data at a nearby DWR WDL well (ETSGSA-14), and recent (Spring 2021) measured water levels (ETSGSA-17 and ETSGSA-23). Hydrographs with MTs and MOs are in **Appendix G**. Estimated MT and MO values may require adjustment when future groundwater elevation data are collected.

Static groundwater elevations will be measured twice a year, in spring and fall, to represent seasonal high and low groundwater conditions.

7.1.7. Monitoring Network Summary

The monitoring network is composed of 52 representative monitoring wells and 52 SGMA monitoring wells. These well locations are shown on **Figure 7-6**. This figure includes the representative monitoring wells that are summarized on **Tables 7-1** and **7-2**, and illustrated on **Figures 7-1, 7-2, 7-3** and **7-5**, and the SGMA monitoring wells that are summarized in **Table 7-3**.

7.2. Protocols for Data Collection and Monitoring

As required by the GSP regulations, protocols are provided for groundwater elevation monitoring in the representative monitoring wells in the monitoring network. Monitoring protocols considered DWR's best management practices (BMP) and have incorporated applicable portions of the BMP (DWR, 2016b). As required by the regulations, monitoring protocols will be reviewed at least every five years as part of the periodic evaluation of the GSP, and modified as necessary.

Protocols are focused on groundwater elevation monitoring standards because that is the only monitoring method applicable to the monitoring network for the Turlock Subbasin. The justification and rationale for the use of groundwater elevations for applicable sustainability indicators are described in **Chapter 6** (see **Section 6.3.2.2** and **Table 6-4**). As stated above, groundwater elevation monitoring will follow DWR's BMP. If the GSAs develop standard operating procedures (SOPs) for groundwater elevation monitoring in the future, they will be documented in annual reports and incorporated into the five-year updates. As discussed in **Section 7.1.4.**, water quality monitoring will be conducted by others, and therefore water quality sampling protocols are not included in this section.

This section describes general procedures for documenting wells in the monitoring program and for collecting consistent high-quality groundwater elevation data. In general, the methods for establishing location coordinates (and reference point elevations) follow the data and reporting standards described in the GSP Regulations (§352.4) and the guidelines presented by USGS Groundwater Technical Procedures. These procedures are summarized below.

7.2.1. Field Methods for Monitoring Well Surveying

As described previously, new monitoring wells are planned for construction and will be incorporated into the monitoring network. To date, additional new wells have been planned as part of the current Proposition 68 grant, the DWR TSS program, and implementation funding by the GSAs for construction during fiscal years 2021-2022 and 2022-2023. Protocols for these new wells will incorporate GSP requirements, including locational information and survey procedures as follows:

- Pursuant to §8726 of the California Business and Professions code, establishment, reestablishment, or transformation of any surveyed location or elevation data shall be performed by, or under the responsible charge of an individual authorized to perform Land Surveying in the State of California.
- Horizontal positions of new monitoring wells shall be established. Positions so established shall be expressed in latitude and longitude in degrees and decimal degrees to a minimum positional accuracy of 0.5 feet, referenced to NAD83(2011).
- Monitoring well reference point orthometric heights shall be established. Orthometric heights so established shall be expressed in feet and decimals of a foot to a minimum positional accuracy of 0.5 feet, referenced to NAVD88.

7.2.2. Additional Well Standards

Additional standards and information applicable to new and existing wells are also incorporated into the monitoring network as required by the GSP regulations. This information is summarized on **Tables 7-1** and **7-2** and includes the following:

- CASGEM Well ID (as applicable),
- Well location, ground surface elevation and reference point elevation,
- Description of the well use and status (e.g., active drainage well, active irrigation well, monitoring well, etc.),
- Well depth and screen interval depth, and
- Principal Aquifer that is being monitored.

Additional information will be provided on the DWR templates for wells and water levels. For example, well completion report number, well construction diagram and geophysical log will be provided, if available. Additional well details such as boring total depth and well casing diameter, if available, will also be provided on the DWR templates.

The well depths and screen interval depths are known for all of the existing representative wells in the monitoring network (**Tables 7-1** and **7-2**). There is one SGMA monitoring well (ETSGSA-19, in the Eastern Principal Aquifer) for which the screen interval depths are unknown at this time (**Table 7-3**).

7.2.3. Field Methods for Groundwater Elevation Monitoring

Field methods for collecting depth to water measurements at representative monitoring wells in the Turlock Subbasin GSP monitoring network are described below. Groundwater elevations will be monitored by the GSA in which the well is located.

- Active production wells are required to be off when collecting a depth to water measurement.
- The approximate period of time that a well needs to be off before a static measurement is taken is 48 hours; field personnel will attempt to verify the time that the pump last ran and record that time in the field notes.
- To verify that the wells are ready for measurement, the GSAs will coordinate with well operators and/or owners as necessary.
- Each well has a unique manner to access the well bore (e.g., inspection port, sounding tube, hole drilled into the side of the casing).
- Depth to groundwater will be measured relative to the established reference point elevation, which will be marked with a marker or notch in the top of the well casing, sounding tube or access port. In the absence of a mark or notch, the groundwater elevation will be measured from the north side of the well casing and then marked for future measurements.
- If a pressure release is observed when the well cap or sounding port plug is removed, the water level will be allowed to stabilize for a short period of time before the depth to groundwater measurement is taken.
- Depth to groundwater measurements will be collected by electric sounding tape or by steel tape methods. The depth to water measurement methods described in DWR's Groundwater Elevation Monitoring Guidelines will apply to the Turlock Subbasin monitoring network for wells monitored with electric sounding tape or a steel tape (DWR, 2010).
- Most of the ETSGSA monitoring program wells in the monitoring network have electronic pressure transducers. ETSGSA will maintain and periodically download water level data from the transducers. ETSGSA will also measure water levels semi-annually by hand, using either an electric sounding tape or steel tape, and will compare these hand measurements to the electronic water level data.
- Depth to groundwater will be measured and reported in feet to the nearest 0.01 foot relative to the reference point.
- The measurement will be recorded on a field sheet with the date and time the measurement was made. Any factor that may influence the depth to water measurement will be noted, such as well condition or local flooding.
- Where necessary, the well cap or sounding port cap will be placed back on the well, and the well will be secured and locked.

7.2.4. Frequency and Timing of Groundwater Elevation Monitoring

- Semi-annual monitoring is determined to be appropriate to capture the seasonal high and low groundwater elevations associated with the irrigation pumping cycle.

- Groundwater elevations will be measured in monitoring network wells within as short a time as possible, preferably within a 1 to 2 week period (DWR, 2016b), in order to:
    - provide a snapshot of elevations in time to support mapping and management;
    - capture the seasonal high and low elevations in the Subbasin; and
    - meet reporting requirements for semi-annual monitoring data as required by DWR.
- Based on historical data and current land uses in the Turlock Subbasin, the following measurement time intervals are established:
    - Seasonal high: February 1 through April 15 for reporting to DWR by July 1.
    - Seasonal low: October 1 through November 15 for reporting to DWR by January 1. Depending on the hydrology, agricultural fields may be irrigated through early November in the Turlock Subbasin.
- Water level measurement may be adjusted within the time intervals based on hydrologic and land use conditions at that time. The timing for the monitoring events will be coordinated among the GSAs.

7.3. ASSESSMENT AND IMPROVEMENT OF MONITORING NETWORK

As described in **Section 4.4**, data gaps have been identified for groundwater elevations in the Western Lower Principal Aquifer and along the river boundaries. These data gaps are consistent with the gaps in well coverage in the monitoring networks and availability of historical data described in **Section 7.1**. The following specific data gaps have been identified for the GSP monitoring network, by each sustainability indicator:

- Chronic Lowering of Groundwater Levels: Number and location of accessible and representative wells screened in the Western Lower Principal Aquifer and in the northwest region of the Eastern Principal Aquifer. Lack of historical data for establishment of MTs.
- Reduction of Groundwater in Storage: Number and location of accessible and representative wells screened in the Western Lower Principal Aquifer and northwest region of the Eastern Principal Aquifer. Lack of historical data for establishment of MTs.
- Seawater Intrusion: Not applicable.
- Degraded Water Quality: No data gaps (GSAs will rely on a robust water quality monitoring network that combines numerous ongoing monitoring programs conducted by others – see **Section 7.1.4** and **Figure 7-4**).

- Land Subsidence: Number and location of accessible and representative wells screened in the Western Lower Principal Aquifer and northwest region of the Eastern Principal Aquifer. Lack of historical data for establishment of MTs.
- Depletions of Interconnected Surface Water: Number and location of appropriately constructed and accessible wells along various segments of the three river boundaries to measure the water table in the Western Upper Principal Aquifer and Eastern Principal Aquifer. Lack of historical data for establishment of MTs.

The GSAs have adopted an Implementation Support Activity (ISA 2) to evaluate and improve the current wells available for the GSP monitoring network (see **Section 9.2**). A schedule for addressing many of these data gaps has already been developed, and new wells are already planned as summarized below:

- Seven new monitoring wells at five locations with Proposition 68 grant funding. Well construction has begun and will be complete in Winter 2022. Specific locations have been chosen and associated Principal Aquifers have been targeted; well locations are illustrated on **Figures 7-1, 7-2**, and **7-3.**
- Monitoring wells at four locations in ETSGSA will be drilled by the DWR TSS program. These will be multi-completion well clusters in the Eastern Principal Aquifer, with one location next to the Merced River (TSS-4). These wells will likely be constructed in calendar years 2022 and 2023. Specific locations have been chosen and are illustrated on **Figures 7-3** and **7-5**.
- WTSGSA and ETSGSA have plans to site and construct shallow monitoring wells along the rivers to fill data gaps, as discussed in **Section 9.2**
- WTSGSA has plans to construct multi-completion wells in the Western Upper Principal Aquifer and Western Lower Principal Aquifer, and a well in the northwestern region of the Eastern Principal Aquifer. Specific locations for these monitoring wells have not yet been developed.

Collection of data from the current monitoring network wells and SGMA monitoring wells will provide additional data to inform the need for and locations of future wells to fill recognizable data gaps. Improvements to the monitoring network are planned in the first five years of GSP implementation as mentioned above and further described in an Implementation Support Activity (ISA 2) in **Chapter 9** (**Section 9.2)**. Furthermore, the representative monitoring network will be reviewed and evaluated in each five-year assessment in compliance with GSP regulations (§354.38). Estimated MT and MO values may require adjustment when future groundwater elevation data are collected.

7.4. DATA MANAGEMENT SYSTEM

Groundwater elevation data measured in the representative monitoring wells and the additional SGMA wells will be recorded in the data management system (DMS) developed for the GSP, which is described as an Implementation Support Activity (ISA 7) in **Section 9.7**.

The data collected for the GSP from the GSA member agencies, and other sources, currently resides in relational databases, which consist of an Access database, GIS geodatabase, and Excel workbooks. Future upgrades to this DMS are being considered by the GSAs. The DMS will be updated with the monitoring data annually and provided in the GSP annual reports. The data will also be submitted to DWR electronically.

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Table 7-1: Summary of Monitoring Network, Chronic Lowering of Groundwater Levels

Program	Well ID	Existing Well (Y/N)	State Well Number	CASGEM Identification Number	Well Use / Status	Principal Aquifer	WTSGSA	ETSGSA	Latitude (NAD 83)	Longitude (NAD 83)	Ground Surface Elevation (feet)	Reference Point Elevation (feet)	Total Well Depth (feet bgs)	Screen Interval Depths (feet bgs)	Minimum Threshold (MT)	Measurable Objective (MO)	MT/MO Note	Interim Milestone (IM)
CASGEM	TID 010	Y	05S10E04D001M	6516	active drainage well	Western Upper	x		37.53658	-120.88476	99	100.79	45	0.5-25	63	69	based on measured data at the well	53
CASGEM	TID 018	Y	04S10E21E001M	3763	active drainage well	Western Upper	x		37.57460	-120.88350	104.38	104.38	250	0.5-110	44	65	based on measured data at the well	--
CASGEM	TID 022	Y	04S09E36E001M	3031	active drainage well	Western Upper	x		37.54393	-120.93413	86	88.69	49	0.5-27	52	64	based on measured data at the well	--
CASGEM	TID 048	Y	05S09E04C001M	4930	active irrigation well	Western Upper	x		37.53660	-120.98520	67.43	67.43	110	0.5-87	36	47	based on measured data at the well	--
CASGEM	TID 061A	Y	05S09E33R001M	5643	active drainage well	Western Upper	x		37.45272	-120.97657	63	64.61	225	0.5-195	40	49	based on measured data at the well	--
CASGEM	TID 063	Y	05S09E07B001M	4935	active drainage well	Western Upper	x		37.52240	-121.01960	56.41	56.41	110	0.5-71	37	45	based on measured data at the well	--
CASGEM	TID 083	Y	--	48497	active drainage well	Western Upper	x		37.43053	-120.93104	71	74.56	155	50-145	62	64	based on measured data at the well	--
CASGEM	TID 085B	Y	06S11E17C001M	28534	active drainage well	Western Upper	x		37.41791	-120.78794	104	109.08	172	0.5-80	85	93	based on measured data at the well	--
CASGEM	TID 106	Y	05S09E21B001M	5630	active drainage well	Western Upper	x		37.48910	-120.98100	64.37	64.37	157	0.5-100	49	54	based on measured data at the well	--
CASGEM	TID 111	Y	04S08E27H001M	2176	active irrigation well	Western Upper	x		37.56113	-121.06675	57	60.1	212	0.5-164	26	36	based on measured data at the well	--
CASGEM	TID 113A	Y	06S10E15F002M	6602	active drainage well	Western Upper	x		37.41447	-120.86036	91	92.04	136	0.5-136	81	84	based on measured data at the well	76
CASGEM	TID 118	Y	06S10E08H001M	5909	active drainage well	Western Upper	x		37.42986	-120.89066	81	81.29	242	0.5-105	65	69	based on measured data at the well	--
CASGEM	TID 136A	Y	05S11E33N003M	27312	active drainage well	Western Upper	x		37.45070	-120.77410	117.32	117.32	115	0.5-43	79	88	based on measured data at the well	76
CASGEM	TID 139	Y	04S09E19A001M	2877	active drainage well	Western Upper	x		37.57960	-121.01240	74.42	74.42	280	0.5-64, 78-189	40	53	based on measured data at the well	--
CASGEM	TID 175	Y	04S11E21D001M	5396	active drainage well	Eastern	x		37.57740	-120.77020	151.4	151.4	180	36-120	36	56	based on measured data at the well	31
CASGEM	TID 191	Y	04S09E24G001M	26403	active drainage well	Western Upper	x		37.57310	-120.92678	93	93.67	245	0.5-192	53	60	based on measured data at the well	--
CASGEM	TID 199A	Y	05S10E35Q001M	7237	active drainage well	Western Upper	x		37.44930	-120.83540	97.3	98.3	60	40-52	88	92	based on measured data at the well	--
Multi-Completion	Smyrna Park 4/233	Y	--	not applicable	monitoring well	Western Lower	x		37.59878	-120.94534	95.13	97.93	233	218-228	20	30	MT: based on October 2015 groundwater elevation contour map, Western Lower Principal Aquifer; MO: based on historic high of available data (not including 2012 water level - shortly after well construction)	10
Multi-Completion	Denair NW-11 287	Y	--	not applicable	monitoring well	Western Lower	x		37.51456	-120.80738	116.72	116.72	287	257-287	21	29	MT: based on October 2015 groundwater elevation contour map, Western Lower Principal Aquifer - based on elevation at nearby Tur-24; MO: based on 2021 groundwater elevation (no groundwater elevations during study period)	--
Multi-Completion	Ferreira Ranch Park MW-347	Y	--	not applicable	monitoring well	Western Lower	x		37.53495	-120.85554	106	106	347	332-342	20	29	MT: based on October 2015 groundwater elevation contour map, Western Lower Principal Aquifer; MO: based on 2012 water level (high level)	--
Multi-Completion	SWW Reservoir MW-335	Y	--	not applicable	monitoring well	Western Lower	x		37.48876	-120.87563	89	89	335	320-330	20	27	MT: based on October 2015 groundwater elevation contour map, Western Lower Principal Aquifer; MO: based on 2017 water level (only water level during study period)	--

Table 7-1: Summary of Monitoring Network, Chronic Lowering of Groundwater Levels (continued)

Program	Well ID	Existing Well (Y/N)	State Well Number	CASGEM Identification Number	Well Use / Status	Principal Aquifer	WTSGSA	ETSGSA	Latitude (NAD 83)	Longitude (NAD 83)	Ground Surface Elevation (feet)	Reference Point Elevation (feet)	Total Well Depth (feet bgs)	Screen Interval Depths (feet bgs)	Minimum Threshold (MT)	Measurable Objective (MO)	MT/MO Note	Interim Milestone (IM)
Multi-Completion	NE Storm Basin MW-340	Y	--	not applicable	monitoring well	Eastern	x		37.53633	-120.82609	116.0	116.0	340	325-335	45	70	MT: estimated based on October 2015 groundwater elevation contour map; MO: historic high estimated based on March/April 1998 groundwater elevation contour map	20
USGS	Blum 3-1	Y	006S011E30B008M	not applicable	monitoring well	Western Lower	x		37.38773	-120.80275	90.6	90.6	185	170-180	55	65	MT: based on fall 2015 model contours (layer 2); MO: average of historic high (of available measured data) and MT	--
ETSGSA monitoring program	ETSGSA-01	Y	03S12E33N001M	not applicable	inactive pumping well	Eastern		x	37.623844	-120.664164	210.0	199.0	445	223-445	60	86	nearby DWR WDL well 04S12E03G001M - MT: estimated fall 2015 value; MO: based on historic high	38
ETSGSA monitoring program	ETSGSA-02	Y	04S13E03D002M	not applicable	active domestic well	Eastern		x	37.62142	-120.53216	261.0	262.0	350	250-310, 330-350	148	153	no nearby wells, MT: minimum of measured data (fall 2020), MO: historic high of measured data	138
ETSGSA monitoring program	ETSGSA-04	Y	04S12E19P001M	not applicable	non-pumping irrigation well	Eastern		x	37.56813	-120.69452	255.0	258.8	370	90-370	5	29	based on measured data at the well	-7
ETSGSA monitoring program	ETSGSA-05	Y	05S11E01Q001M	not applicable	active domestic well	Eastern		x	37.52200	-120.70766	195.0	196.0	375	275-375	-5	24	based on nearby voluntary well 05S11E01G001M, MT: October 2015 water level, which is similar to April 2021 level at this well (-3 ft msl), MO: based on historic high in March 2006	-17
ETSGSA monitoring program	ETSGSA-06	Y	04S12E07J001M	not applicable	non-pumping irrigation well	Eastern		x	37.60089	-120.68618	194.0	195.9	375	120-244	30	56	no water level data between 2014 and 2019, MT based on Oct 2015 contour map, MO based on historic high	11
ETSGSA monitoring program	ETSGSA-08	Y	04S12E26M001M	not applicable	active pumping fertigation well	Eastern		x	37.55470	-120.62733	272.0	274.0	658	188-474	18	43	nearby CASGEM 04S12E35C001M (EWD 13, old EWD-01): MT: 2015 non-pumping low, MO: historic high	8
ETSGSA monitoring program	ETSGSA-09	Y	04S13E20N001M	not applicable	non-pumping irrigation well	Eastern		x	37.56555	-120.57218	304.0	308.2	334	180-330	44	77	no nearby wells, MT: extrapolate to fall 2015 based on rate of change from fall 2019 to fall 2020 (2 ft/yr), MO: 1998 contour map	19
ETSGSA monitoring program	ETSGSA-12	Y	04S14E31N001M	not applicable	non-pumping irrigation well	Eastern		x	37.53633	-120.47958	296.0	299.4	435	250-430	155	160	MT: based on water level trend between 1975 and 2019, estimated in 2015; MO: based on water level trend between 1975 and 2019, estimated in 1998	86
ETSGSA monitoring program	ETSGSA-13	Y	05S11E22M001M	not applicable	non-pumping irrigation well	Eastern		x	37.48154	-120.75372	178.0	183.7	600	300-600	30	47	nearby DWR WDL well 05S11E22B001M, MT: 2015 low, MO: based on historic high	26
ETSGSA monitoring program	ETSGSA-14	Y	05S12E22F001M	not applicable	non-pumping irrigation well	Eastern		x	37.48497	-120.64256	222.0	225.8	685	187-598, 602-685	14	47	nearby DWR WDL well 05S12E22H001M, MT: 2015 low, MO: based on historic high	-6
ETSGSA monitoring program	ETSGSA-20	Y	05S13E03B001M	not applicable	non-pumping irrigation well	Eastern		x	37.53593	-120.52823	202.0	205.7	580	125-580	55	97	MT: fall 2015 level estimated based on rate of water level decline (3.3 ft/yr) from fall 2017 (48 ft) to fall 2020 (38 ft) ; MO: based on 1998 water level in DWR WDL 4S13E28Q001M (on 1998 contour map)	14
ETSGSA monitoring program	ETSGSA-21	Y	05S13E12D001M	not applicable	non-pumping irrigation well	Eastern		x	37.52058	-120.49899	308.0	312.2	283	57-283	140	180	MT: estimated from available water level data at this well. Note: water levels higher than at nearby ETSGSA wells; based on operational range (~40 ft) between MT and MO at ETSGSA-20	96

Table 7-1: Summary of Monitoring Network, Chronic Lowering of Groundwater Levels

Program	Well ID	Existing Well (Y/N)	State Well Number	CASGEM Identification Number	Well Use / Status	Principal Aquifer	WTSGSA	ETSGSA	Latitude (NAD 83)	Longitude (NAD 83)	Ground Surface Elevation (feet)	Reference Point Elevation (feet)	Total Well Depth (feet bgs)	Screen Interval Depths (feet bgs)	Minimum Threshold (MT)	Measurable Objective (MO)	MT/MO Note	Interim Milestone (IM)
ETSGSA monitoring program	EW3	Y	05S12E19N001M	not applicable	monitoring well	Eastern		x	37.47757	-120.70297	161.6	164.1	170	130-170	10	37	close to DWR WDL well 05S11E25A001M (water level data from 1990-Nov 2011). MT: based on Oct 2015 contour map, between 0 and 20 ft contours; MO: based on historic high at DWR WDL well	-1
ETSGSA monitoring program	Olam R2-4	Y	04S13E11N001M	not applicable	currently an active irrigation well, won't pump in future	Eastern		x	37.59695	-120.51389	255.0	256.0	1680	445-930, 1459-1680	79	114	close to Olam R2-2 (water level data from 11/2006 - 11/2017 provided by Wood Rodgers for GSP); MT: 2015 low (on 2015 contour map), MO: historic high of available data	--
Prop 68	MW-68A	Y	--	not applicable	monitoring well	Western Lower		x	37.44997	-120.72205	150.0	150.0	160	148-158	-	-	will be developed once water level data are collected	--
Prop 68	MW-68B	N	--	not applicable	monitoring well	Eastern		x	37.59467	-120.64586	198.0	198.0	395	370-390	-	-	will be developed once well is constructed and water level data are collected	--
Prop 68	MW-68C	Y	--	not applicable	monitoring well	Eastern		x	37.53927	-120.52199	199.0	199.0	195	180-190	-	-	will be developed once water level data are collected	--
Prop 68	WTS-1 Shallow	Y	--	not applicable	monitoring well	Western Upper	x		37.46297	-120.93019	79.0	79.0	185	160-180	-	-	will be developed once water level data are collected	--
Prop 68	WTS-1 Deep	Y	--	not applicable	monitoring well	Western Lower	x		37.46297	-120.93025	79.0	79.0	340	315-335	-	-	will be developed once water level data are collected	--
Prop 68	WTS-2 Shallow	Y	--	not applicable	monitoring well	Western Upper	x		37.39738	-120.90442	81.0	81.0	145	120-140	-	-	will be developed once water level data are collected	--
Prop 68	WTS-2 Deep	Y	--	not applicable	monitoring well	Western Lower	x		37.39737	-120.90457	81.0	81.0	295	280-290	-	-	will be developed once water level data are collected	--
TSS	TSS-1	N	--	not applicable	monitoring well	Eastern		x	37.60248	-120.70003	-	-	-	-	30	54	MT: estimated from 2015 contour map; MO: based on historic high, estimated from 1998 contour map	--
TSS	TSS-2	N	--	not applicable	monitoring well	Eastern		x	37.49778	-120.64988	-	-	-	-	-5	34	close to DWR WDL 05S12E16R001M (data from 1990 - Nov 2010). MT: estimated based on 2015 contour map; MO: based on historic high at DWR WDL well	--
TSS	TSS-3	N	--	not applicable	monitoring well	Eastern		x	37.55358	-120.46714	-	-	-	-	155	160	close to ETSGSA-12, use same MT/MO (no additional information in this area of the Subbasin)	--

Notes: The field program for the construction of the Proposition 68 (Prop 68) program wells is underway in Winter 2021/2022. MTs/MOs for these wells will be developed once the field program is complete and water levels are measured and analyzed.
Wells being funded by the DWR Technical Support Services (TSS) program are not yet drilled at the time of this GSP. MTs/MOs for the future TSS wells were estimated based on best available data.
IMs were developed for wells in areas where water levels may continue to decline while projects are being brought online.
IMs were not assigned to wells with current water levels consistent with established MTs and MOs.
IMs provided on this table represent 5-year IMs (2027), as described in Section 7.1. The 10-year IMs (2032) are the MTs and the 15-year IMs (2037) are the midpoint between the MT and the MO (see Section 7.1).

Table 7-2: Summary of Monitoring Network, Interconnected Surface Water

Program	Well ID	Existing Well (Y/N)	State Well Number	CASGEM Identification Number	Well Use / Status	Principal Aquifer	WTSGSA	ETSGSA	Latitude (NAD 83)	Longitude (NAD 83)	Ground Surface Elevation (feet)	Reference Point Elevation (feet)	Total Well Depth (feet bgs)	Screen Interval Depths (feet bgs)	Minimum Threshold (MT)	Measurable Objective (MO)	MT/MO Note	Interim Milestone (IM)
San Joaquin River																		
CASGEM	TID 061A	Y	05S09E33R001M	5643	active drainage well	Western Upper	x		37.45272	-120.97657	63.0	64.6	225	0.5-195	40	49	based on measured data at the well	--
CASGEM	TID 063	Y	05S09E07B001M	4935	active drainage well	Western Upper	x		37.52240	-121.01960	56.4	56.4	110	0.5-71	37	45	based on measured data at the well	--
CASGEM	TID 111	Y	04S08E27H001M	2176	active drainage well	Western Upper	x		37.56113	-121.06675	57.0	60.1	212	0.5-164	26	36	based on measured data at the well	--
Tuolumne River																		
City of Ceres	Ceres 36	Y	--	not applicable	non-pumping irrigation well	Western Upper	x		37.62084	-120.96167	88.5	--	230	120-140, 170-230	31	36	MT: Fall 2015 water level at adjacent Ceres Well 34 (similar screened interval); MO: based on measured data	26
ETSGSA monitoring program	ETSGSA-01	Y	03S12E33N001M	not applicable	inactive pumping well	Eastern		x	37.623844	-120.664164	210.0	199.0	445	223-445	60	86	nearby DWR WDL well 04S12E03G001M - MT: estimated fall 2015 value; MO: based on historic high	38
ETSGSA monitoring program	ETSGSA-02	Y	04S13E03D002M	not applicable	active domestic well	Eastern		x	37.62142	-120.53216	261.0	262.0	350	250-310, 330-350	148	153	no nearby wells, MT: minimum of measured data (fall 2020), MO: historic high of measured data	138
Merced River																		
CASGEM	TID 303	Y	05S10E34J001M	48499	active irrigation well	Western Upper	x		37.39668	-120.81349	102.0	99.3	317	0.5-100	85	89	MT: 1 foot below November 2014 (based on data trend); MO: based on historic high	--
ETSGSA monitoring program	ETGSA-14	Y	05S12E22F001M	not applicable	non-pumping irrigation well	Eastern		x	37.48497	-120.64256	222.0	225.8	685	187-598, 602-685	14	47	nearby DWR WDL well 05S12E22H001M, MT: spring 2014, MO: based on historic high	-6
ETSGSA monitoring program	ETSGSA-17	Y	05S12E25H001M	not applicable	non-pumping irrigation well	Eastern		x	37.47300	-120.59615	217.0	221.1	390	146-178, 182-390	96	100	MT: spring 2021 water level; MO: based on measured historic high	86
ETSGSA monitoring program	ETSGSA-21	Y	05S13E12D001M	not applicable	non-pumping irrigation well	Eastern		x	37.52058	-120.49899	308.0	312.2	283	57-283	144	184	MT: estimated from available water level data at this well in spring 2014. Note: water levels higher than at nearby ETSGSA wells; based on operational range (~40 ft) between MT and MO at ETSGSA-20	96
ETSGSA monitoring program	ETSGSA-23	Y	06S12E04G001M	not applicable	active pumping well - home and field	Eastern		x	37.44169	-120.65617	175.0	178.1	228	132-212	71	78	MT: spring 2021 measurement; MO: based on historic high at nearby DWR WDL well 05S12E33N001M	61
TSS	TSS-4	N	05S13E21R001M	not applicable	monitoring well	Eastern		x	37.47941	-120.54404	-	-	-	-	86	100	estimated based on two wells near river and downstream of this location: ETSGSA-17 and DWR WDL 05S12E26N001M. Assumed difference (13 ft) in MT (spring 2014) and MO (1998) between ETSGSA-17 and 05S12E26N001M is same as between ETSGSA-17 and TSS-4	--

Notes: Wells being funded by the DWR Technical Support Services (TSS) program are not yet drilled at the time of this GSP. MTs/MOs for the future TSS wells were estimated based on best available data.
IMs were developed for wells in areas where water levels may continue to decline while projects are being brought online.
IMs were not assigned to wells with current water levels consistent with established MTs and MOs.
IMs provided on this table represent 5-year IMs (2027), as described in Section 7.1. The 10-year IMs (2032) are the MTs and the 15-year IMs (2037) are the midpoint between the MT and the MO (see Section 7.1).

Table 7-3: Summary of SGMA Monitoring Wells

Program	Well ID	Existing Well (Y/N)	State Well Number	CASGEM Identification Number	Principal Aquifer	WTSGSA	ETSGSA	Latitude (NAD 83)	Longitude (NAD 83)	Ground Surface Elevation (feet)	Reference Point Elevation (feet)	Total Well Depth (feet bgs)	Screen Interval Depths (feet bgs)
CASGEM	TID 034	Yes	04S09E30Q001M	26548	Western Upper	x		37.55153	-121.01763	68	69.7	88	0.5-76
CASGEM	TID 082	Yes	05S09E23K001M	5632	Western Upper	x		37.48448	-120.94471	73	73.55	126	0.5-79
CASGEM	TID 92	Yes	04S08E13P001M	2161	Western Upper	x		37.58060	-121.04374	68	69.44	122	32-97
CASGEM	TID 186A	Yes	04S10E21R002M	3764	Western Upper	x		37.56630	-120.86790	111.37	111.37	253	62-172
CASGEM	TID 189	Yes	04S11E32P001M	5403	Eastern	x		37.53678	-120.78475	132	133.96	266	21-168
CASGEM	EWD-01 (identified as EWD-13 in ETSGSA)	Yes	04S12E35C001M	6837	Eastern		x	37.54770	-120.61820	263	264	600	400-600
CASGEM	EWD 03 (identified as EWD-05 in ETSGSA)	Yes	05S12E08K001M	50447	Eastern		x	37.51360	-120.67390	216	217	700	360-700
CASGEM	EWD 04	Yes	05S12E27A001M	9603	Eastern		x	37.47410	-120.63430	192.5	194	581	208-340, 344-581
CASGEM	EWD 05	Yes	05S13E06P001M	50448	Eastern		x	37.52162	-120.58842	202	203	513	135-423, 483-513
Multi-Completion	Smyrna Park 3/275	yes	--	not applicable	Western Lower	x		37.59878	-120.94534	95.13	97.83	275	260-270
Multi-Completion	Smyrna Park 2/293	yes	--	not applicable	Western Lower	x		37.59878	-120.94534	95.13	--	297	288-293
Multi-Completion	Smyrna Park 1/335	yes	--	not applicable	Western Lower	x		37.59878	-120.94534	95.13	97.63	335	320-330
Multi-Completion	Denair NW-11 443	yes	--	not applicable	Western Lower	x		37.51456	-120.80738	116.72	116.72	443	408-443
Multi-Completion	Denair NW-11 605	yes	--	not applicable	Western Lower	x		37.51456	-120.80738	116.72	116.72	605	540-605
Multi-Completion	Ferreira Ranch Park MW-210	yes	--	not applicable	Western Lower	x		37.53495	-120.85554	106.0	106.0	210	195-205
Multi-Completion	Ferreira Ranch Park MW-443	yes	--	not applicable	Western Lower	x		37.53495	-120.85554	106	106	443	428-438
Multi-Completion	Ferreira Ranch Park MW-535	yes	--	not applicable	Western Lower	x		37.53495	-120.85554	106	106	535	520-530
Multi-Completion	SWW Reservoir MW-235	yes	--	not applicable	Western Lower	x		37.48876	-120.87563	89	89	235	220-230
Multi-Completion	SWW Reservoir MW-417	yes	--	not applicable	Western Lower	x		37.48876	-120.87563	89	89	417	402-412
Multi-Completion	NE Storm Basin MW-280	yes	--	not applicable	Eastern		x	37.53633	-120.82609	116	116	280	265-275
Multi-Completion	NE Storm Basin MW-505	yes	--	not applicable	Eastern		x	37.53633	-120.82609	116	116	505	490-500
USGS	Blum 1-4	yes	006S011E30B005M	not applicable	Western Upper	x		37.38777	-120.80273	90.1	--	17	12-14
USGS	Blum 3-2	yes	006S011E30B009M	not applicable	Western Upper	x		37.38777	-120.80273	90.6	--	25	15-20
USGS	Blum 2-2	yes	006S011E30B007M	not applicable	Western Upper	x		37.38777	-120.80273	91.2	--	33	28-30
USGS	Blum 1-3	yes	006S011E30B004M	not applicable	Western Upper	x		37.38777	-120.80273	90.1	--	54	49-51
USGS	Blum 2-1	yes	006S011E30B006M	not applicable	Western Upper	x		37.38774	-120.80280	91.2	--	58	53-55
USGS	Blum 1-2	yes	006S011E30B003M	not applicable	Western Upper	x		37.38774	-120.80280	90.1	--	86	81-83
USGS	Blum 1-1	yes	006S011E30B002M	not applicable	Western Upper	x		37.38773	-120.80275	90.1	--	99	94-96
USGS	Stav 4	yes	006S011E19Q004M	not applicable	Western Upper	x		37.39232	-120.80131	98.8	--	25	15-20
USGS	Stav 3	yes	006S011E19Q003M	not applicable	Western Upper	x		37.39232	-120.80131	98.8	--	47	42-44
USGS	Stav 2	yes	006S011E19Q002M	not applicable	Western Upper	x		37.39232	-120.80131	98.8	--	66	61-63
USGS	Stav 1	yes	006S011E19Q001M	not applicable	Western Upper	x		37.39232	-120.80131	98.8	--	86	81-83
USGS	Balv 4	yes	006S011E19H006M	not applicable	Western Upper	x		37.39737	-120.80035	110.0	--	30	20-25
USGS	Balv 3	yes	006S011E19H005M	not applicable	Western Upper	x		37.39737	-120.80035	110.0	--	50	45-47
USGS	Balv 2	yes	006S011E19H004M	not applicable	Western Upper	x		37.39737	-120.80035	110.0	--	70	65-67
USGS	Balv 1	yes	006S011E19H003M	not applicable	Western Upper	x		37.39737	-120.80035	110.0	--	92	87-89
ETSGSA monitoring program	ETSGSA-03	Yes	04S11E14P001M	not applicable	Eastern		x	37.583721	-120.73011	189.4	190.4	527	197-500
ETSGSA monitoring program	ETSGSA-07	Yes	04S12E21R001M	not applicable	Eastern		x	37.56750	-120.65042	247	249.66	615	335-615
ETSGSA monitoring program	ETSGSA-10	Yes	04S13E35B001M	not applicable	Eastern		x	37.54721	-120.50448	283.0	287.6	550	285-545
ETSGSA monitoring program	ETSGSA-11	Yes	04S14E21P001M	not applicable	Eastern		x	37.56532	-120.43571	268.0	272.1	525	156-192, 227-512
ETSGSA monitoring program	ETSGSA-15	Yes	05S11E11P002M	not applicable	Eastern		x	37.51036	-120.73290	207	207	682	362-482, 602-682
ETSGSA monitoring program	ETSGSA-16	Yes	05S12E10N001M	not applicable	Eastern		x	37.506028	-120.647583	193	195.3	167	157-167
ETSGSA monitoring program	ETSGSA-18	Yes	05S13E08C001M	not applicable	Eastern		x	37.51963	-120.57024	208	209.83	453	213-453
ETSGSA monitoring program	ETSGSA-19	Yes	05S11E27A001M	not applicable	Eastern		x	37.476617	-120.740219	170.6	144	151	-
ETSGSA monitoring program	ETSGSA-22	Yes	04S12E31A001M	not applicable	Eastern		x	37.547466	-120.68668	229.4	230.4	494	296-388, 398-477
ETSGSA monitoring program	ETSGSA-24	Yes	05S11E35R001M	not applicable	Eastern		x	37.450151	-120.72206	147.60000	148.0	464.0	300-452
ETSGSA monitoring program	Turlock Airport Well	Yes	05S12E19P001M	not applicable	Eastern		x	37.48249	-120.69792	158.0	157.0	160	120-160
ETSGSA monitoring program	EW2	Yes	05S12E19E001M	not applicable	Eastern		x	37.48553	-120.70307	164.0	167.0	170	130-170
ETSGSA monitoring program	Olam R3-4	Yes	04S13E24P001M	not applicable	Eastern		x	37.571437	-120.49910	239.00000	240.0	655.0	239-339, 469-509, 519-599, 606-646
ETSGSA monitoring program	Olam R2-6	Yes	04S13E14E001M	not applicable	Eastern		x	37.589167	-120.51728	289.00000	290.0	452.0	285-335, 342-382, 402-442
ETSGSA monitoring program	Olam R3-5	Yes	04S13E24D001M	not applicable	Eastern		x	37.577285	-120.49690	263.00000	264.0	562.0	212-292, 463-483, 497-557
ETSGSA monitoring program	Olam R2-7	Yes	04S13E10B001M	not applicable	Eastern		x	37.608422	-120.52277	239.00000	240.0	310.0	178-258, 285-300

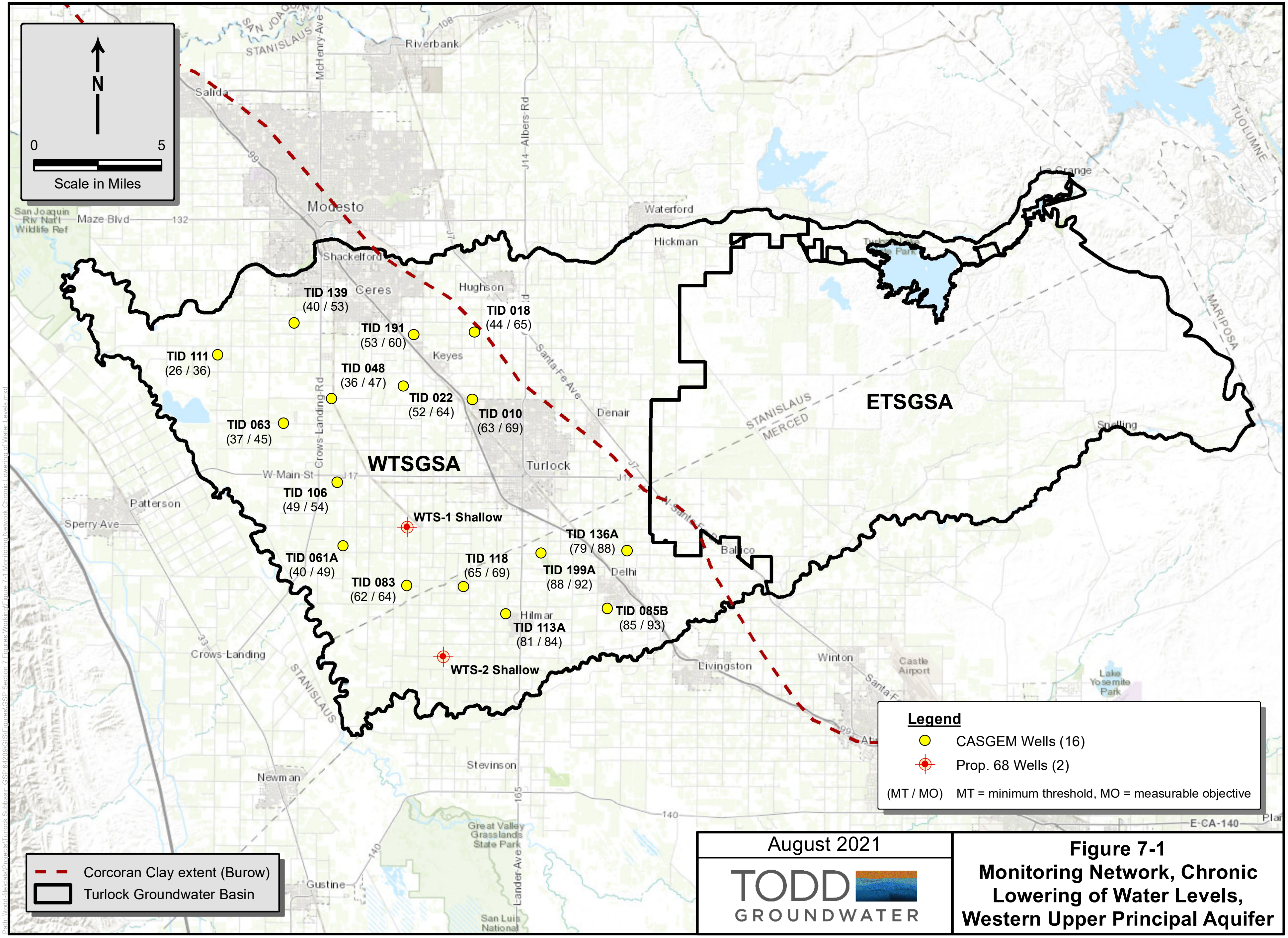
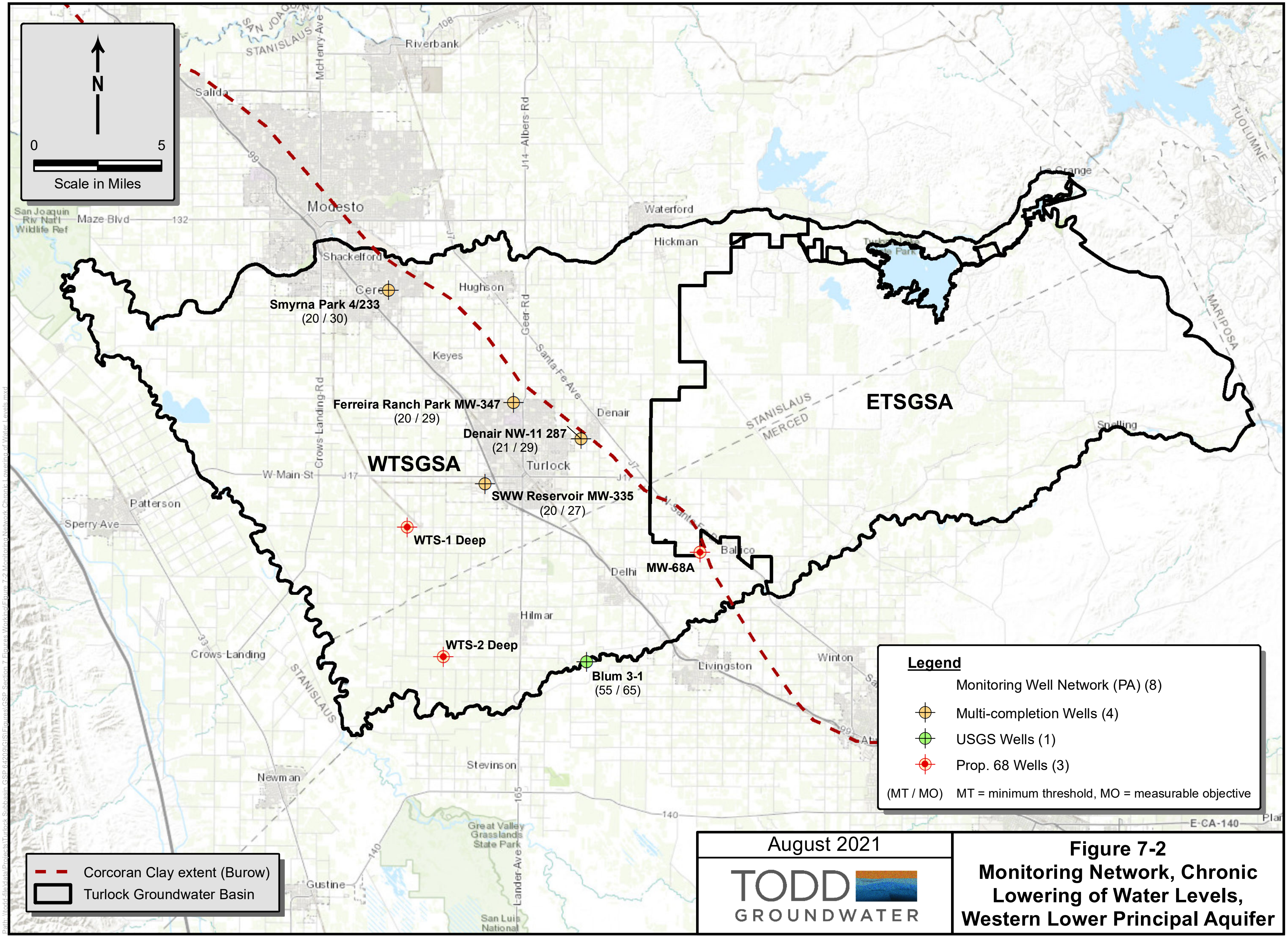


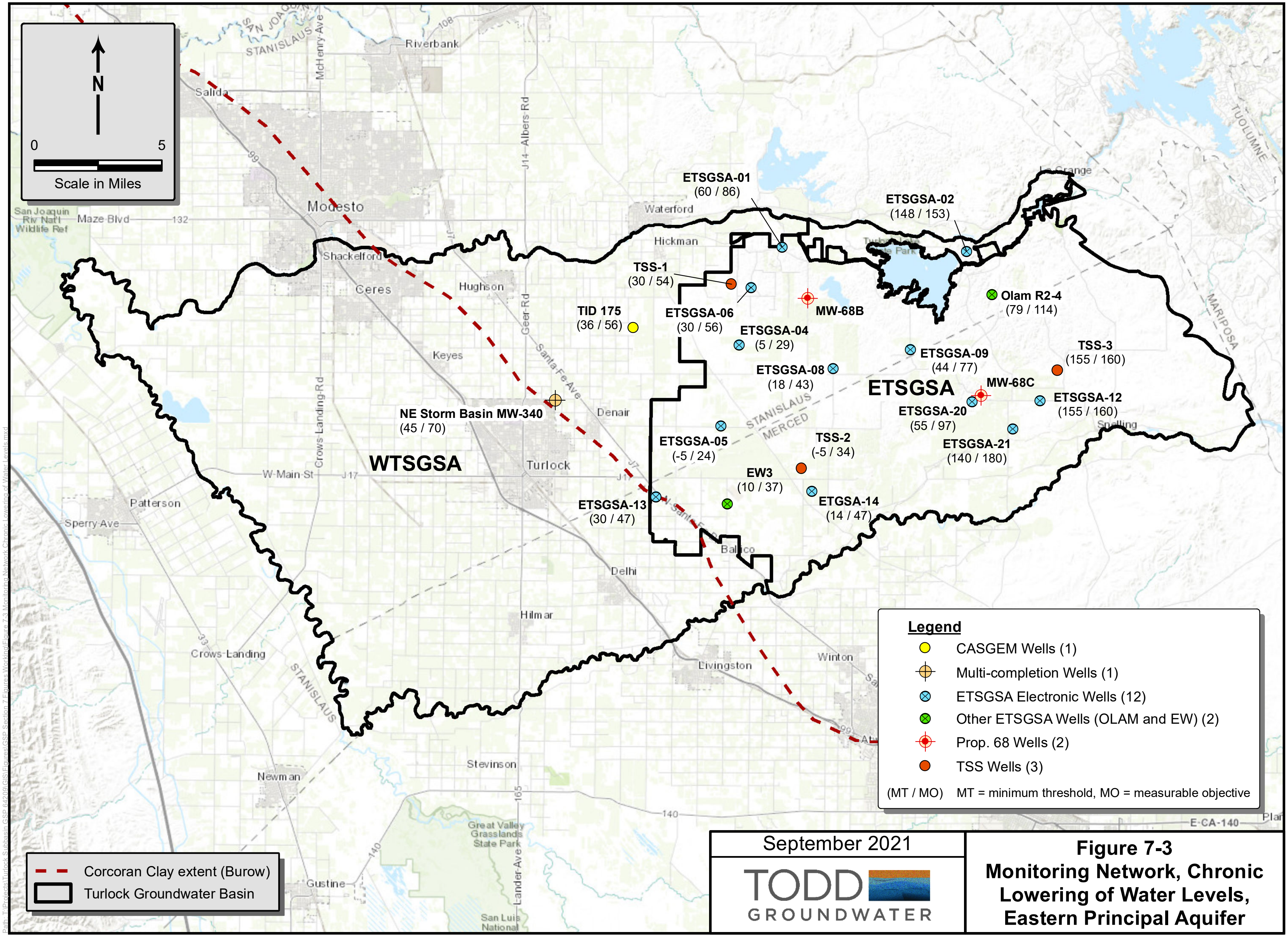
Figure 7-1
Monitoring Network, Chronic Lowering of Water Levels, Western Upper Principal Aquifer



August 2021

TODD GROUNDWATER

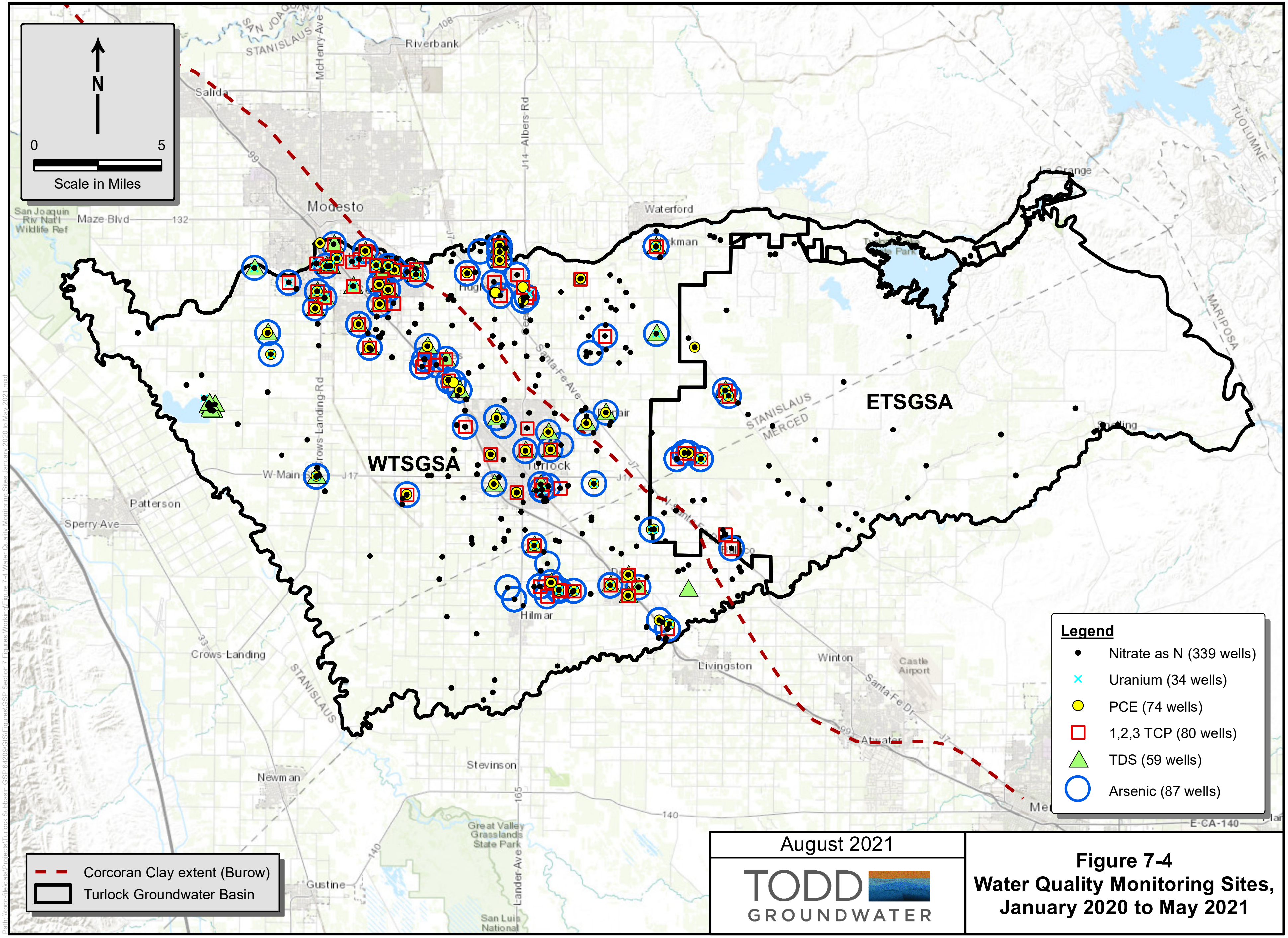
Figure 7-2
Monitoring Network, Chronic Lowering of Water Levels, Western Lower Principal Aquifer



September 2021

TODD GROUNDWATER

Figure 7-3
Monitoring Network, Chronic Lowering of Water Levels, Eastern Principal Aquifer



August 2021

TODD GROUNDWATER

Figure 7-4
Water Quality Monitoring Sites, January 2020 to May 2021

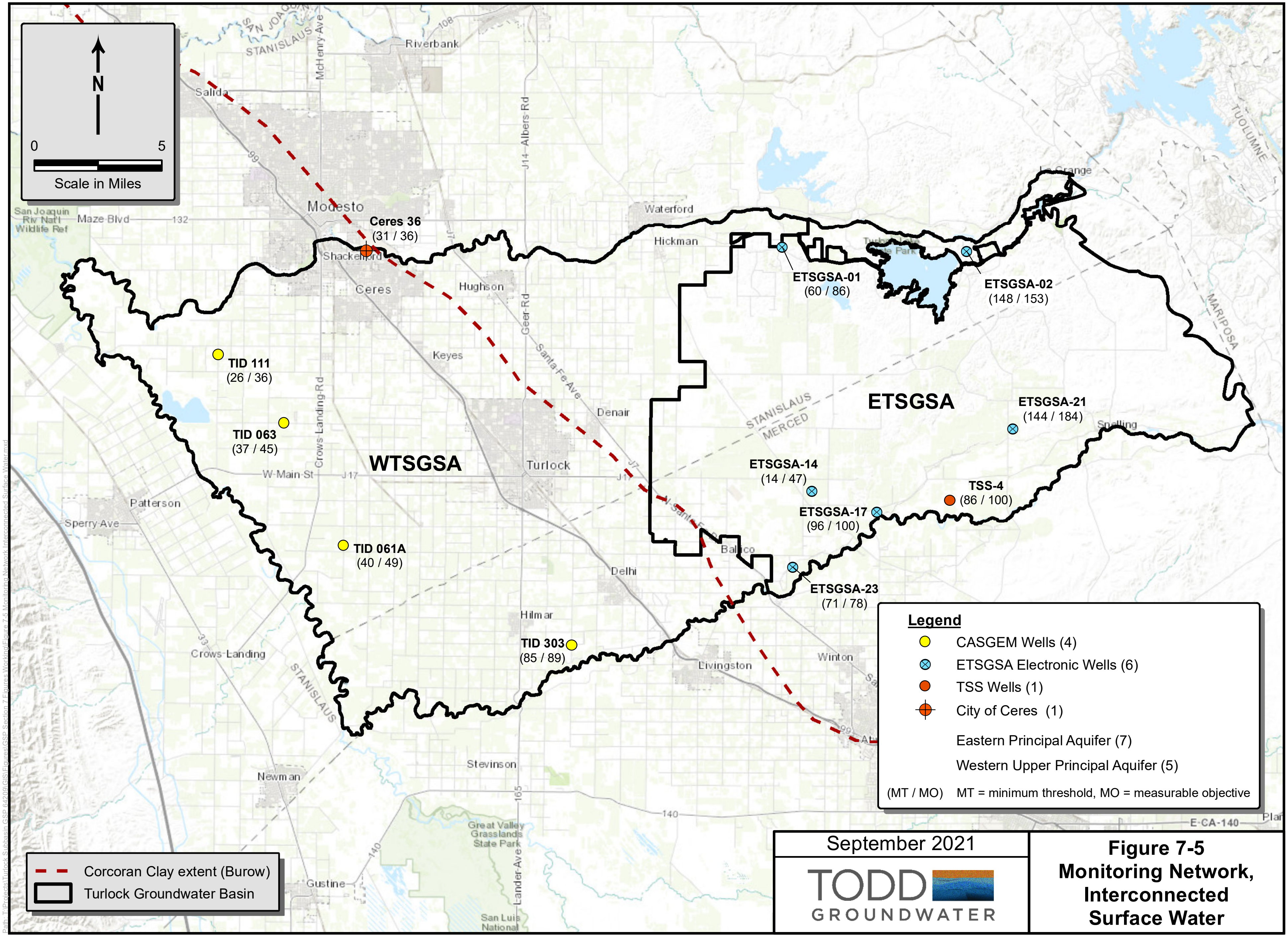
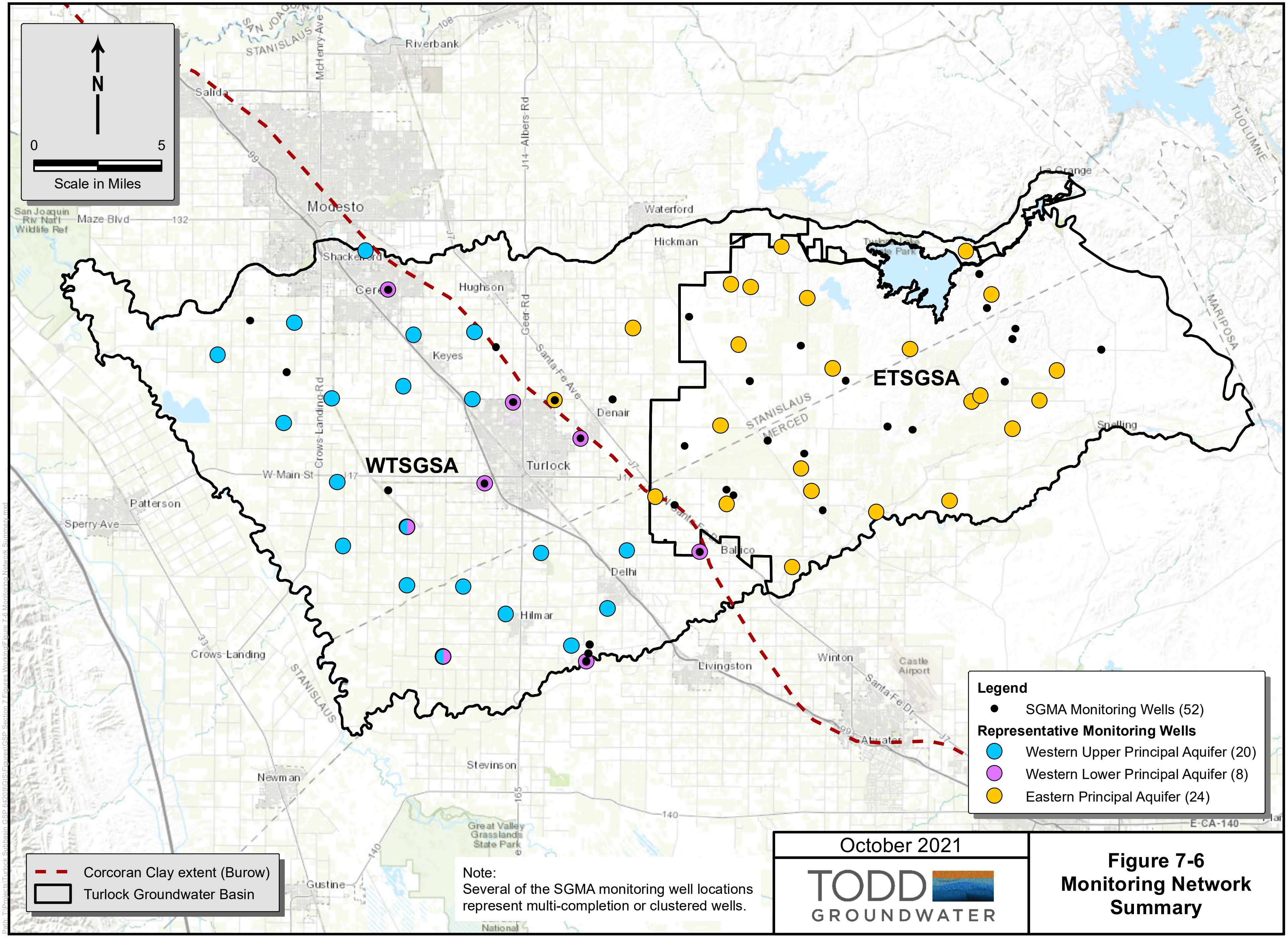


Figure 7-5
Monitoring Network, Interconnected Surface Water



October 2021

Figure 7-6
Monitoring Network Summary

8. PROJECTS AND MANAGEMENT ACTIONS

To achieve the sustainability goals for the Turlock Subbasin by 2042, and to avoid undesirable results over the remainder of a 50-year planning horizon, as required by SGMA regulations, multiple Projects and Management Actions (PMAs) have been identified and considered by the Turlock Subbasin Groundwater Sustainability Agencies (GSAs) in this Groundwater Sustainability Plan (GSP).

A description of PMAs that will contribute to the achievement of sustainability goals in the Turlock Subbasin is provided herein. PMAs are described in accordance with §354.42 and §354.44 of the SGMA regulations. An evaluation of the benefits and/or impacts of various planned projects on groundwater levels and storage volumes is also provided.

"Projects" generally refer to physically constructed (structural) features whereas "Management Actions" generally refer to the non-structural programs or policies designed to incentivize actions that result in improvements in sustainability of the Subbasin, including reductions in groundwater pumping or optimization of management of groundwater. The PMAs discussed in this Chapter are intended to help the GSAs progress toward meeting the sustainability goals and Measurable Objectives (MOs), as well as avoid violation of MTs and causing undesirable results as identified for the Subbasin in **Chapter 6**, Sustainable Management Criteria. Plans for implementation of the PMAs and implementing the GSP are discussed in **Chapter 9**, Implementation Support Activities.

Recognizing the GSP data gaps and uncertainties in the Basin Setting (per §354.44(d)), development and implementation of PMAs in the Turlock Subbasin utilizes an adaptive management approach informed by continued monitoring of the groundwater conditions throughout the Subbasin and over time. This adaptive approach includes two categories:

1 **PMAs developed for near-term implementation** that would help to achieve and maintain groundwater sustainability while supporting other local goals. These PMAs include:
   - PMAs that are in place and will continue to be implemented by project proponents and partners that will support groundwater management and GSP implementation.
   - PMAs that are currently in planning stage and will be developed and implemented by project proponents and partners, and which will contribute to attainment of the Subbasin sustainability goals and will support the GSP implementation

2 **Other PMAs to be implemented as needed** to gather and evaluate monitoring and investigation data as well as achieve and maintain long-term sustainable groundwater management across the Turlock Subbasin. These potential PMAs will be managed adaptively with further evaluation during GSP implementation if respective GSAs find that established Interim Milestones (IMs) or MOs cannot be achieved and/or if MTs are being approached.

A range of PMAs is presented to allow both the ETSGSA and the WTSGSA flexibility in their response to changing groundwater conditions and as new and better information becomes available. However, it is anticipated that not all the PMAs will need to be implemented, or that some PMAs will be implemented by one GSA and not the other. Adaptive implementation of PMAs will be informed by ongoing monitoring of groundwater conditions using the monitoring network and methods described in the GSP (**Chapter 7**). Any adverse groundwater conditions or challenges in maintaining groundwater sustainability will be addressed by scaling and implementing PMAs in a targeted and proportional manner, consistent with conditions observed in the Subbasin.

Implementation and operation of PMAs will be periodically assessed during the GSP implementation period. As planning is at varying early stages of development, complete information on construction requirements, operations, costs, schedule, permitting requirements, and other details are not uniformly available for all the PMAs. Schedule, cost, and funding opportunities for each PMA are provided under each PMA when available. Other implementation and funding efforts will be determined and reported if/when the PMA is evaluated and selected for implementation. This information will be reported in GSP Annual Reports and Five-Year Assessment Reports. For more detailed information regarding the funding of GSP implementation activities, refer to **Chapter 9**: Implementation Support Activities.

8.1. PROJECTS OVERVIEW

This section describes the Projects that are in place, planned, or may be considered for implementation in the Turlock Subbasin. In accordance with 23 CCR §354.44, Projects were developed to help achieve and maintain the Subbasin sustainability goal by 2042 and avoid undesirable results over the GSP planning and implementation period. Broadly, Projects provide tools that can be used to achieve and maintain groundwater sustainability.

Projects were developed, where possible, to be aligned with State grant program preferences and the Governor's Water Action Plan, by providing multiple benefits, embracing innovation and new technologies, and benefitting disadvantaged communities (DACs) and environmental water users. This Plan prioritizes Projects that contain multi-benefit approaches that address multiple needs and stress the utilization of natural infrastructure, including the basin itself for storage and the natural waterways and floodplains as recharge areas. Additionally, the Plan emphasizes coordination among users, the GSAs within the Subbasin, and neighboring basins to improve the region's groundwater condition and achieve sustainability.

Projects were identified in the Turlock Subbasin through several months of collaborative effort between the Turlock Subbasin GSP Ad-Hoc Committee, the Turlock Subbasin Technical Advisory Committee, Board of Directors of each GSA, and technical consultants to the GSAs. Project information was provided by the GSAs and proponent agencies (which are generally member agencies of the GSAs) and compiled into a draft list. The initial set of projects was reviewed further, and a final list of 24 possible projects was identified for inclusion in the GSP, representing a variety of project types including direct and in-lieu recharge, water recycling, and advancements to metering infrastructure. Projects are classified into three groups based on project status: Group 1, Group 2, and Group 3, as defined below.

- Group 1 – Projects that are in place and will continue to be implemented by specific participating agencies within the Turlock Subbasin to support groundwater management and GSP implementation.
- Group 2 – Projects that are currently planned and will be implemented by specific participating agencies within the Turlock Subbasin which will contribute to attainment of SMC and will support GSP implementation.
- Group 3 – Projects which have been identified and may occur in the Turlock Subbasin in the future, would provide benefits in contributing to the attainment of the sustainability goal and SMC, and would otherwise support GSP implementation.

Group 1 and Group 2 Projects are summarized in **Section 8.2**: Projects Developed for Near-Term Implementation. These Projects were analyzed as part of scenarios using the C2VSimTM model to estimate their benefit to the groundwater system over the projected planning period. The results of the model scenarios are discussed in **Section 8.5**: Plan for Achieving Sustainability.

Group 3 Projects are summarized in **Section 8.3:** Other Projects to be Implemented as Needed. Group 3 Projects are currently not evaluated in detail, and are described at a more general level, reflecting their conceptual nature and planning status at this time. Additional feasibility studies and details for these Projects will be developed in the future, as needed.

The proposed Projects identified in this Chapter will be either directly funded and implemented by GSAs of the Turlock Subbasin, the respective project proponents with coordination with the GSAs, or will be subject of grant funding requests through state and federal funding opportunities. Project proponents are listed in **Table 8-1**.

Each individual Project proponent will manage the permitting and other specific implementation oversight for its own Projects. It is the intent of the GSAs that projects and actions implemented by project proponents and/or GSAs will benefit those project proponents and/or GSAs. An accounting mechanism will be developed, as described under Implementation Support Activities (**Chapter 9**) that will dictate how the water within the subbasin will be shared and allocated moving forward. This will inform the implementation, needs, and responsibilities of PMAs in the future. In addition, pursuant to the Memorandum of Agreement between the GSAs, specific Project Agreements may be used to assist with implementation of joint projects in the future

Inclusion of Projects in this GSP does not forego any obligations regarding individual project implementation under local, state, or federal regulatory programs. While the GSAs do have an obligation to oversee progress towards groundwater sustainability, they are not the primary regulator of land use, water quality, or environmental project compliance. It is the responsibility of the implementing agencies of planned Projects to ensure that they are collaborating with outside entities and responsible regulatory agencies to ensure their Projects comply with all applicable laws and permitting requirements.

To facilitate the efficient environmental review of Projects under the California Environmental Quality Act (CEQA), a Programmatic Environmental Impact Report (PEIR) is being prepared as a joint Implementation Support Activity as described in **Chapter 9**.

The GSAs will collaborate with project proponents and project partners to track progress and support project implementation. The implementation of PMAs will be enhanced by the development of clear policy and guidance by the GSAs that lay out applicable sustainable management criteria (SMC, as described in **Chapter 6**: Sustainable Management Criteria) as well as PMA-specific monitoring and reporting frameworks to facilitate adaptive management toward Subbasin protection and sustainability. The GSP implementation will include guidelines and protocols to coordinate implementation of Projects in such a way that the Subbasin sustainability is achieved in a coordinated environment among the GSAs, the Project proponents and sponsors, and other stakeholders.

Table 8-1 shows the Group 1 and 2 Projects with their respective groups. **Table 8-2** shows the Group 3 Projects with their respective groups. Together, these lists represent an initial list of Projects that will be further refined as additional Projects are identified during GSP implementation, with updates included in Annual Reports and the GSP updates, as appropriate. A description of each Project in more detail is provided in **Sections 8.2** [Projects Developed for Near-Term Implementation (Groups 1 and 2)] and **8.3** [Other Projects to be Implemented As Needed (Group 3)].

Table 8-1 and **Table 8-2** provide a snapshot of Projects as required by 23 CCR §354.44(b). However, Implementation Support Activity 11 (see **Section 9.11**) proposes to expand the existing East Stanislaus IRWM Region Opti Database to include PMAs listed in this GSP. The database is already used by both the Turlock and Modesto Subbasins to store a living list of projects for the IRWM as well as the Stanislaus Multi-Agency Regional Storm Water Resource Plan. The database will be maintained and updated as a living list of GSP PMAs, reflecting the current status of each Project and continually adjusting as needed to meet changing basin conditions. The database would represent an extension of the DMS specifically as it relates to containing a list of the GSP's PMAs. When revised, the PMA list will be approved by the Turlock Subbasin GSAs or other body, as appropriate, following updating. As such, the list of PMAs maintained in the database is considered to be the official Turlock GSP PMA list; no formal GSP adoption or re-adoption will be required for PMA list updating.

Table 8-1: List of Projects (Group 1 and Group 2)

Number	Proponent(s)	Project Name	Primary Mechanism(s)[1,2]	Partner(s)	Group	Included in Modeling Scenarios
WTSGSA – Urban and Municipal Projects						
1	Cities of Turlock and Ceres	Regional Surface Water Supply Project	In-lieu Groundwater Recharge	Turlock Irrigation District	1	×
2	Community of Hickman	Waterford/Hickman Surface Water Pump Station and Storage Tank	In-lieu Groundwater Recharge	City of Modesto, Modesto Irrigation District	2	×
3	City of Turlock	Dianne Storm Basin	Direct Groundwater Recharge	Turlock Irrigation District	2	×
4	California State University - Stanislaus	Stanislaus State Stormwater Recharge	Direct Groundwater Recharge	N/A	2	×
5	City of Modesto	Advanced Metering Infrastructure Project (AMI)	Water Conservation	N/A	2	×
WTSGSA – Agricultural Water Supply Projects						
6	Turlock Irrigation District	TID On-Farm Recharge Project (in WTSGSA)	Direct or In-lieu Groundwater Recharge	N/A	2	×
7	Turlock Irrigation District	Recycled Water from City of Turlock	In-lieu Groundwater Recharge	City of Turlock	2	×
8	Turlock Irrigation District	TID Ceres Main Regulating Reservoir	In-lieu Groundwater Recharge	N/A	2	×
ETSGSA - Agricultural Water Supply Projects						
9	Eastside Water District	Agricultural Recharge Project (in ETSGSA)	Direct or In-lieu Groundwater Recharge	Turlock Irrigation District	2	×
10	Eastside Water District	Mustang Creek Flood Control Recharge Project	Direct Groundwater Recharge	Stanislaus County	2	×
11	Eastside Water District	Upland Pipeline Project	Direct or In-lieu Groundwater Recharge	Merced Irrigation District	2	×

[1]The primary mechanism of the Project as conceptualized. Projects may be used for multiple functions to support groundwater sustainability and multiple other benefits during implementation.

[2] Demand Management is a category of Management Action strategies described in **Section 8.4**. This action will be implemented as needed, along with PMAs within each GSA to achieve sustainability.

Table 8-2: Projects (Group 3)

Number	Proponent(s)	Project Name	Primary Mechanism(s)[1]	Partner(s)
WTSGSA – Group 3 Urban and Municipal Water Supply Projects				
12	City of Modesto	San Joaquin River Flood Diversions	Direct or In-Lieu Groundwater Recharge	N/A
WTSGSA – Group 3 Agricultural Water Supply Projects				
13	Turlock Irrigation District	La Grange Recharge Project (Within TID Irrigation Service Area)	Direct Groundwater Recharge	N/A
14	Turlock Irrigation District	TID Lateral 5 ½ Regulating Reservoir	In-Lieu Groundwater Recharge	N/A
15	Turlock Irrigation District	Additional TID Regulating Reservoirs	Direct or In-Lieu Groundwater Recharge	N/A
16	Turlock Irrigation District	Recharge from TID Conveyance System	Direct Groundwater Recharge	N/A
17	Turlock Irrigation District	Intertie Projects	In-Lieu Groundwater Recharge	N/A
ETSGSA – Group 3 Agricultural Water Supply Projects				
18	Eastside Water District	Rouse Lake Pipeline Project	Direct and In-Lieu Groundwater Recharge	TBD
19	Eastside Water District	Sand Creek Watershed Runoff Recharge	Direct Groundwater Recharge	N/A
20	Eastside Water District	Conveyance Improvements Project	Direct or In-Lieu Groundwater Recharge	Merced ID
21	Eastside Water District	Development of Diffused Stormwater Project	Direct or In-Lieu Groundwater Recharge	TBD
22	Eastside Water District	Dry Creek Watershed Recharge	Direct Groundwater Recharge	N/A
23	Eastside Water District	Direct Recharge in Agriculture Areas	Direct Groundwater Recharge	TBD

[1]The primary mechanisms of the Project as conceptualized. Projects may be used to support groundwater sustainability and other benefits during implementation.

Figure 8-1 shows a map of approximate Group 1 and Group 2 project locations. **Figure 8-2** shows a map of approximate Group 3 project locations.

Figure 8-1: Group 1 and Group 2 Projects Location Map

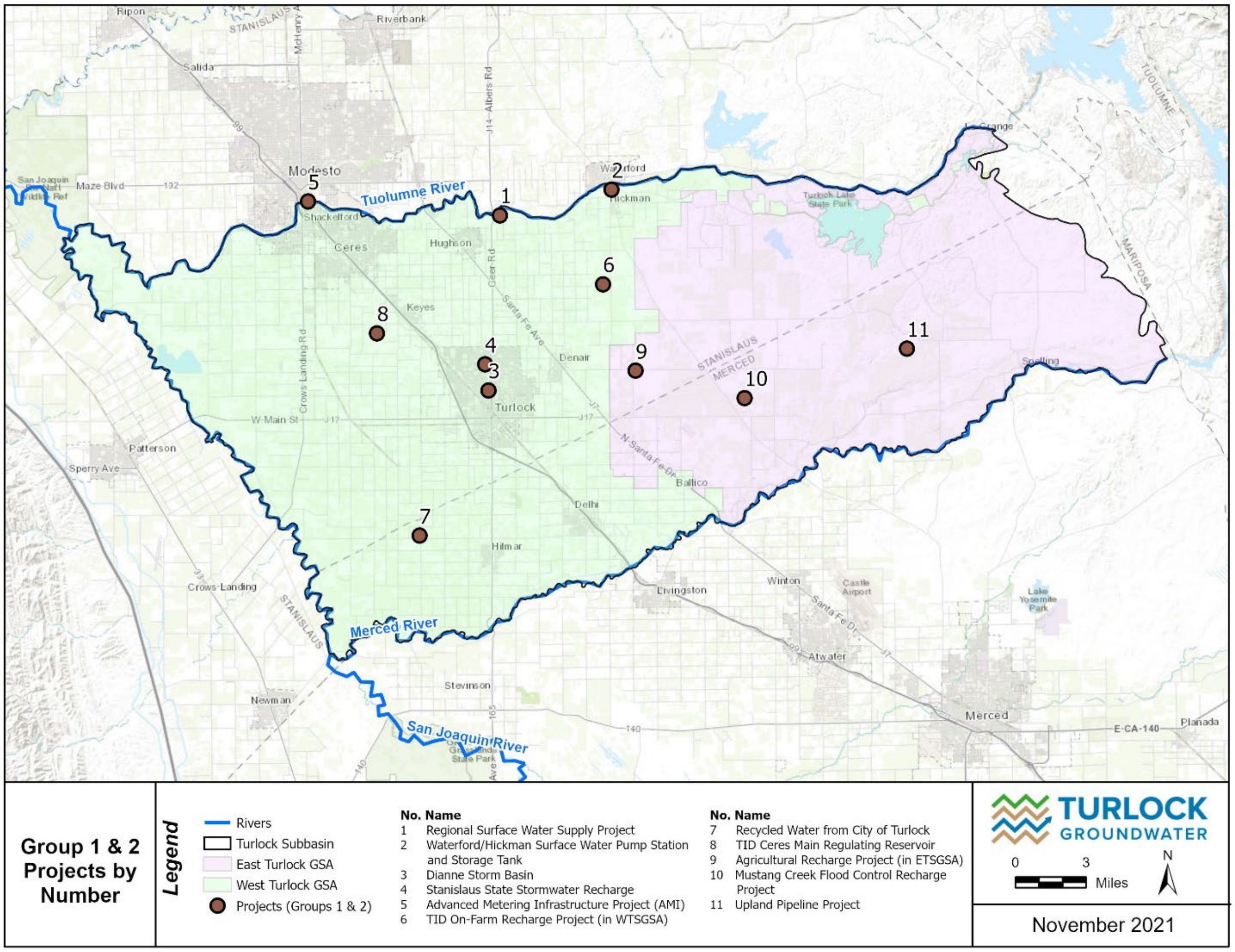
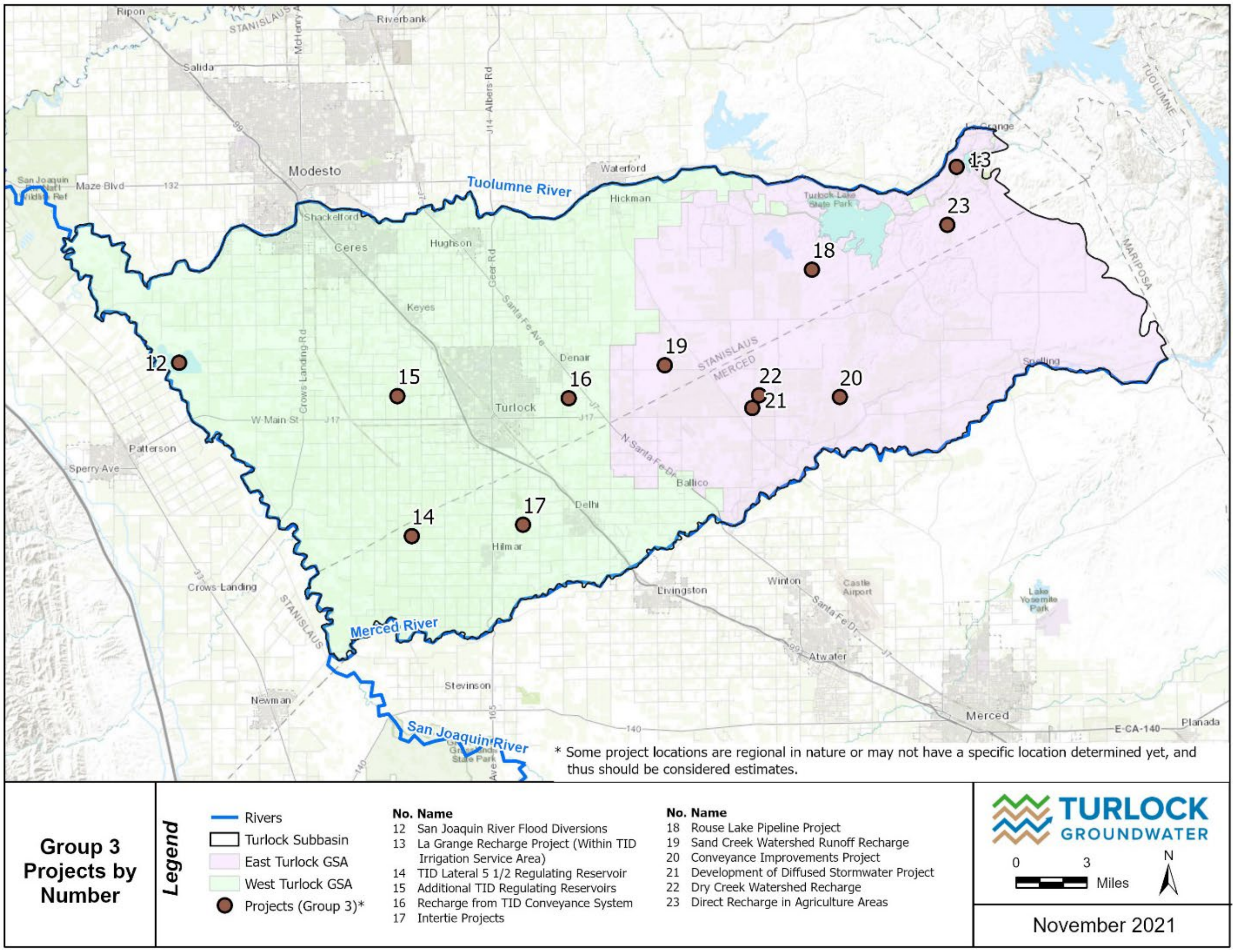


Figure 8-2: Group 3 Projects Location Map



In addition, there are existing projects that have been identified as part of the Integrated Regional Water Management Planning process and are included in the East Stanislaus IRWMP project database[1]. These are considered to be potential projects to support GSP implementation but represent alternative options that are not directly analyzed in this Chapter.

To facilitate implementation of the identified Group 2 and Group 3 Projects and develop other Projects for potential implementation, the GSAs are developing a Groundwater Recharge Assessment Tool (GRAT) for the Subbasin. The Turlock Subbasin GRAT will be used to help select optimal areas for recharge and assess their effectiveness and yield for Subbasin sustainability. Each GSA may develop additional project evaluation and prioritization tools as needed to progress projects through conceptual design and feasibility

[1] http://www.eaststanirwm.org/projects/

analysis, front-end engineering design, procurement of permits and entitlements, and construction.

8.2. PROJECTS DEVELOPED FOR NEAR-TERM IMPLEMENTATION (GROUPS 1 AND 2)

This section describes the Projects that were developed for near-term implementation in the Turlock Subbasin, organized by proponent. This includes all Projects identified in **Table 8-1**. These Projects are either:

- Currently in place and will continue to be implemented by proponents and partner agencies, or are
- Currently planned and will be implemented or started by proponents and partner agencies in the next five years.

The Projects developed for near-term implementation were modeled using the C2VSimTM to estimate their potential benefit to the groundwater system over the projected conditions. Applicable assumptions used to model each Project are described in each Project description. The results of these model scenarios are discussed in **Section 8.5**: Plan for Achieving Sustainability.

Table 8-3 lists all Group 1 and Group 2 Projects described in the subsections that follow. Each Project description is organized to address the applicable regulatory requirements:

- **Project Description**: 23 CCR §354.44(b)
- **Public Notice**: 23 CCR §354.44(b)(1)(B)
- Permitting and Regulatory Process: 23 CCR §354.44(b)(3)
- **Expected Benefits**: 23 CCR §354.44(b)(4), §354.44(b)(5)
- **Implementation Criteria, Status, and Plan**: 23 CCR §354.44(b)(1)(A); §354.44(b)(4); §354.44(b)(6)
- Water Source and Reliability: 23 CCR §354.44(b)(6)
- **Legal Authority**: 23 CCR §354.44(b)(7)
- Estimated Costs and Funding Plan: 23 CCR §354.44(b)(8)
- Management of Groundwater Extractions and Recharge: 23 CCR §354.44(b)(9)

Summary of Criteria for Project Implementation (23 CCR §354.44(b)(1)(A))

As described above, the Group 1 and Group 2 Projects described in this section are either currently in place or are planned to be implemented prior to 2042. Those Projects that are currently in place will continue to be implemented over this same period.

Table 8-3: List of Projects Developed for Implementation in the Turlock Subbasin

Location (Proponent)	#	Project Name	Primary Mechanism(s)[1]
WTSGSA Urban and Municipal (Cities of Turlock and Ceres)	1	Regional Surface Water Supply Project	In-lieu Groundwater Recharge
WTSGSA Urban and Municipal (Community of Hickman)	2	Waterford/Hickman Surface Water Pump Station and Storage Tank	In-lieu Groundwater Recharge
WTSGSA Urban and Municipal (City of Turlock)	3	Dianne Storm Basin	Direct Groundwater Recharge
WTSGSA Urban and Municipal (California State University - Stanislaus)	4	Stanislaus State Stormwater Recharge	Direct Groundwater Recharge
WTSGSA Urban and Municipal (City of Modesto)	5	Advanced Metering Infrastructure Project (AMI)	Water Conservation
West Turlock Subbasin GSA (Turlock Irrigation District)	6	TID On-Farm Recharge Project (in WTSGSA)	Direct or In-Lieu Groundwater Recharge
	7	Recycled Water from City of Turlock	In-lieu Groundwater Recharge
	8	TID Ceres Main Regulating Reservoir	In-lieu Groundwater Recharge
East Turlock Subbasin GSA (Eastside Water District)	9	Agricultural Recharge Project (in ETSGSA)	Direct or In-Lieu Groundwater Recharge
	10	Mustang Creek Flood Control Recharge Project	Direct Groundwater Recharge
	11	Upland Pipeline Project	Direct and/or In-Lieu Groundwater Recharge

[1]The primary mechanism of the Project as conceptualized, although during implementation, Projects may be used for multiple purposes to support groundwater sustainability and provide multiple benefits beyond groundwater recharge.

8.2.1. Urban and Municipal Proponents (WTSGSA)

Projects developed for implementation by urban and municipal proponents in the Turlock Subbasin are summarized in the sections below.

8.2.1.1. Regional Surface Water Supply Project (Project 1)

8.2.1.1.1. Project Description

The Regional Surface Water Supply Project (Project) is an effort led by the Stanislaus Regional Water Authority (SRWA) to provide treated drinking water from the Tuolumne River to supplement both the City of Ceres and the City of Turlock's existing groundwater supplies.

The Project will divert surface water from the Tuolumne River through an existing river intake constructed in the early 2000s, a new raw water pump station, and new raw water pipeline. The raw water pump station includes a wet well element, constructed in early 2020. These elements of the Project are located adjacent to the Tuolumne River near Fox Grove Park just north of the intersection of Geer Road and Hatch Road.

Raw water from the pipelines will be treated to drinking water standards at a new water treatment plant, located just east of Fox Grove Park. The City of Ceres and City of Turlock will be required to integrate this new source of water into their existing drinking water distribution system. TID may also use the raw water facilities for emergency purposes or to deliver irrigation water to agricultural users after acquiring required environmental permits.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of the Project.

8.2.1.1.2. Public Noticing

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through SRWA outreach. SRWA hosts monthly Board meetings and Board meeting agendas and minutes are posted to their website (https://stanrwa.com/). The SRWA also provides regular construction updates and road closures through a webpage, interactive map, and email message for those that sign up for updates. The SRWA also provides frequent updates though social media (Facebook, Instagram, and Twitter), although these platforms are not used for official public noticing. Any other potential activities including planning, implementation, construction, and other actions will be posted on their website with a description of actions that will be taken.

Public and/or inter-agency noticing may be facilitated through SRWA board meetings, the SRWA and/or City of Turlock and City of Ceres websites, inter-basin coordination meetings, other public meetings hosted by the SRWA, GSP annual reports and five-year updates, public scoping meetings, and/or environmental/regulatory permitting notification processes.

8.2.1.1.3. Permitting and Regulatory Process

The SRWA has obtained CEQA clearance and has posted their Final Environmental Impact Report on January 2019 to their website. There are a range of additional specific permitting and regulatory processes that may potentially affect the construction of project-related infrastructure which include, but are not limited to:

- Electrical power service during construction and for constructed facilities (as applicable)
- Telephone and broadband internet service during construction and for constructed facilities (as applicable)
- County and City road right-of-way encroachment permit(s) (as applicable)
- Compliance with the California Building Standards Code, including applicable building, plumbing, mechanical, electrical and fire codes and applicable Fire Marshall approvals
- National Pollutant Discharge Elimination System (NPDES)/State Water Resources Control Board (SWRCB) storm water discharge permits (as applicable)
- Central Valley Regional Water Quality Control Board (RWQCB)/NPDES Permit and/or Waste Discharge Requirements for disposal of construction dewatering and acceptance test water
- SWRCB Division of Drinking Water (DDW) Domestic Water Supply Permit
- San Joaquin Valley Air Pollution Control District permits (as applicable)
- The Division of Occupational Safety and Health (Cal/OSHA) construction activity permits (as applicable)
- Material hauling and landfill disposal permits (as applicable)
- Risk Management and Prevention Programs (RMPPs)
- Compliance with federal and state Endangered Species Acts
- California Department of Fish and Wildlife Streambed Alteration Agreement
- Various pre-development and CEQA compliance/mitigation measures
- Burlington Northern Santa Fe Railroad encroachment permit
- California Wildlife Conservation Board/Stanislaus County Department of Parks and Recreation Fox Grove Park Access permit
- Central Valley Flood Protection Board encroachment permit

8.2.1.1.4. Expected Benefits

Benefits to Sustainability Indicators

The use of surface water for the City of Ceres and City of Turlock urban demands is expected to offset urban groundwater pumping demands, with in-lieu groundwater recharge benefits to the Subbasin. Beyond the existing scope of the Project, it could potentially provide water to other future regional participants, further reducing the need for groundwater. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, and interconnected surface water. All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The Project will provide several benefits to the City of Ceres and City of Turlock, which are both classified as DACs (Places, 2018). Both cities currently rely entirely on groundwater as their source of drinking water. Some of this groundwater contains contaminants that currently require or will require treatment processes to remove these impurities prior to consumption. Additionally, the existing groundwater supply is insufficient to meet future urban demands. The additional surface water supply through this Project allows the city to:

- Diversify their water supply portfolios
- Provide clean, safe, reliable drinking water
- Improve water quality of drinking water supplies (reduced hardness) and more-easily comply with drinking water quality regulations
- Increase municipal water supplies to meet increasing demands

In general, the majority of communities in the Turlock Subbasin are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Benefits to Environmental Beneficial Uses

As documented in the Project's 2018 Draft Environmental Impact Report (DEIR), benefits to the environment have also been incorporated into the Project approach (Horizon, 2018). A key Project objective is listed as follows:

- Provide a benefit to Tuolumne River fish and other aquatic resources by increasing seasonal releases from La Grange Dam to accommodate proposed project diversions downstream at TID's infiltration gallery northeast of Hughson.

A specific study on the operational releases and diversions incorporated into the Project demonstrated these beneficial effects on aquatic resources. The Project allows water that would otherwise be diverted at the La Grange Dam to remain in the river for an additional 26 miles, thereby increasing flows and reducing water temperatures through salmon spawning areas. Downstream of the infiltration gallery diversions, FERC flows would continue to be met, habitat suitability would remain unchanged, and there would be no adverse effects (Horizon, 2018).

Further, an additional release of 24 cfs of cold water during Phase 1 of the Project could also benefit salmonid habitat conditions in the lower Tuolumne River. Although the effect would be minimal during high winter and spring flows, additional flows of 24 cfs during the summer and early fall low-flow conditions are predicted to beneficially decrease water temperatures (Horizon, 2018).

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the Project was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

The Project is expected to provide up to 30 TAF/yr of surface water to the Subbasin (20 TAF/yr to the City of Turlock and 10 TAF/ty to the City of Ceres) during full allocation years, phased in over time. Surface water supplies will be reduced proportional to TID's allocation reduction in dry hydrologic years. While approximately 30 TAF/yr of surface water is anticipated to be utilized each year by completion of the Project, the precise availability may vary between days and years as municipal water use also varies.

Evaluation of benefits will be based on analysis of without-project and with-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and other parameters to be determined. Modeling will be done with the C2VSimTM model used for GSP development.

8.2.1.1.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

This Project will be implemented by SRWA. SRWA is a JPA between the City of Ceres and City of Turlock, in cooperation with TID.

The project implementation strategy and timeline are as follows:

Environmental Process and Planning

- 2016 – Planning; wet well design; funding strategy
- 2017 – Environmental; land acquisition; predesign; funding applications

Project Design

- 2018 – Environmental/permitting; procurement; land Acquisition; predesign; funding applications; wet well construction; water rights modification
- 2019 – Environmental/permitting; procurement; land Acquisition; water rights modification; funding applications; wet well construction; local facilities design
- 2020 – Procurement; financing; funding applications; water rights modification; permitting; design

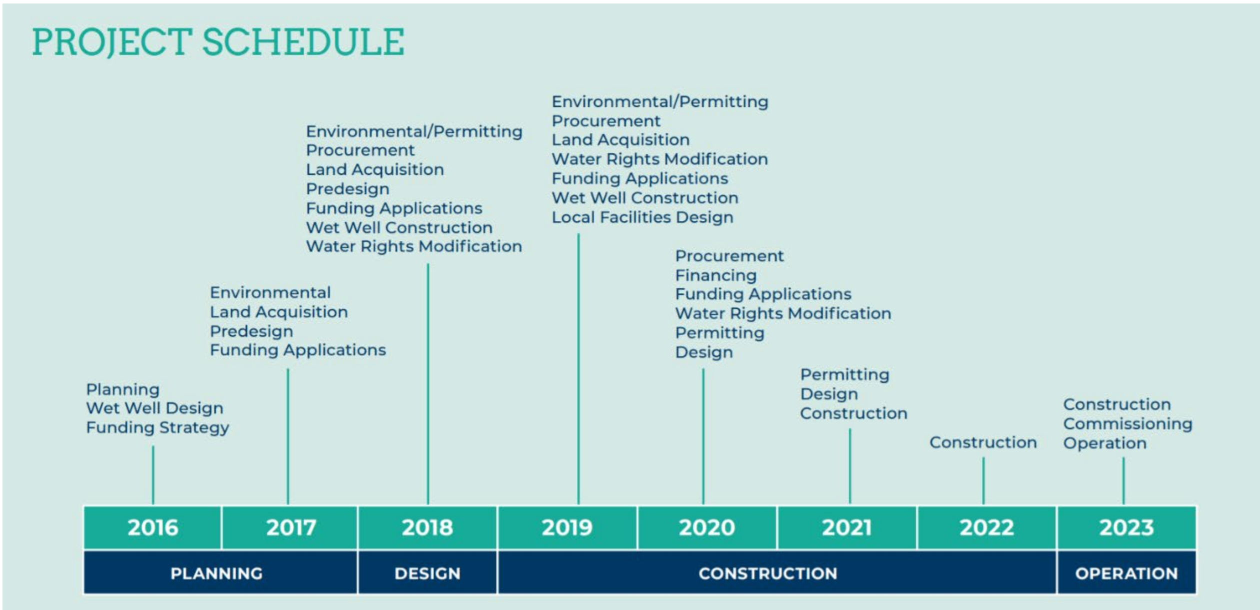
Project Construction

- 2021 – Permitting; design; construction
- 2022 – Construction
- 2023 – Construction; commissioning; operation

Project Implementation

The Project will achieve phases of surface water deliveries, delivering up to 17,375 AFY at the beginning of implementation (2023), up to 30,000 AFY of surface water at full operation (assumed to be 2035). **Figure 8-3** shows the project schedule (Stanislaus Regional Water Authority, n.d.).

Figure 8-3: Regional Surface Water Supply Project Schedule



Implementation Assumptions for Modeling

The Project has been modeled in the C2VSimTM model. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Water source: Reservoir operations for the SRWA project were simulated using the Tuolumne Reservoir Simulation (TRS) model. Under this modeling scenario, the water supply is discharged from La Grange Dam into the Tuolumne River and then diverted from the river at the project site as illustrated in the project description.
- Volume of surface water deliveries:
    - The City of Turlock receives two-thirds, and the City of Ceres receives one-third of the total surface water deliveries.

Simulation Years	Surface Water Provided
1-7	0 AFY
8-10	Up to 17,375 AFY
11-19	Up to 20,160 AFY
20-50	Up to 30,000 AFY

- Offset pumping: Offset pumping is water that is pumped by the City of Turlock and City of Ceres in years of water allocation reduction to provide to TID for irrigation demands.[1]

- Based on TID's operations modeling, it is anticipated that agricultural surface water deliveries will be reduced by an average of 3,600 AFY over the 50-year simulation period. This volume will be counterbalanced by municipal offset pumping as described above, and the Recycled Water from City of Turlock Project (Project 7).

8.2.1.1.6. Water Source and Reliability

The Project will use surface water diverted from the Tuolumne River. SRWA will obtain the water supply from TID, as detailed in the Water Sales Agreement (TID, 2015). A combination of existing TID infrastructure and newly-constructed intake structure, pump stations, pipelines, and a water treatment plant will reliably deliver drinking water to the City of Turlock and City of Ceres. Surface water is expected to be available for this Project in all water year types, with potential reductions in dry and critical hydrologic years. Tuolumne River releases from New Don Pedro Dam will be reoperated as to provide surface water to both existing TID customers and the Project. In approximately half of the years since the construction of New Don Pedro Dam, the Tuolumne River watershed has produced more water than can be stored or beneficially used by existing customers. Recognizing that water supply availability could be impacted by climate change or regulatory requirements, the Project will be implemented using adaptive management.

8.2.1.1.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies. TID has the authority to sell surface water to the SRWA.

[1] The 2,000 AF of recycled water from the City of Turlock to TID that is included in the Offset water outlined in the Water Sales Agreement is modeled and described separately in **Section 8.2.2.2** (Recycled Water from City of Turlock (Project 7))

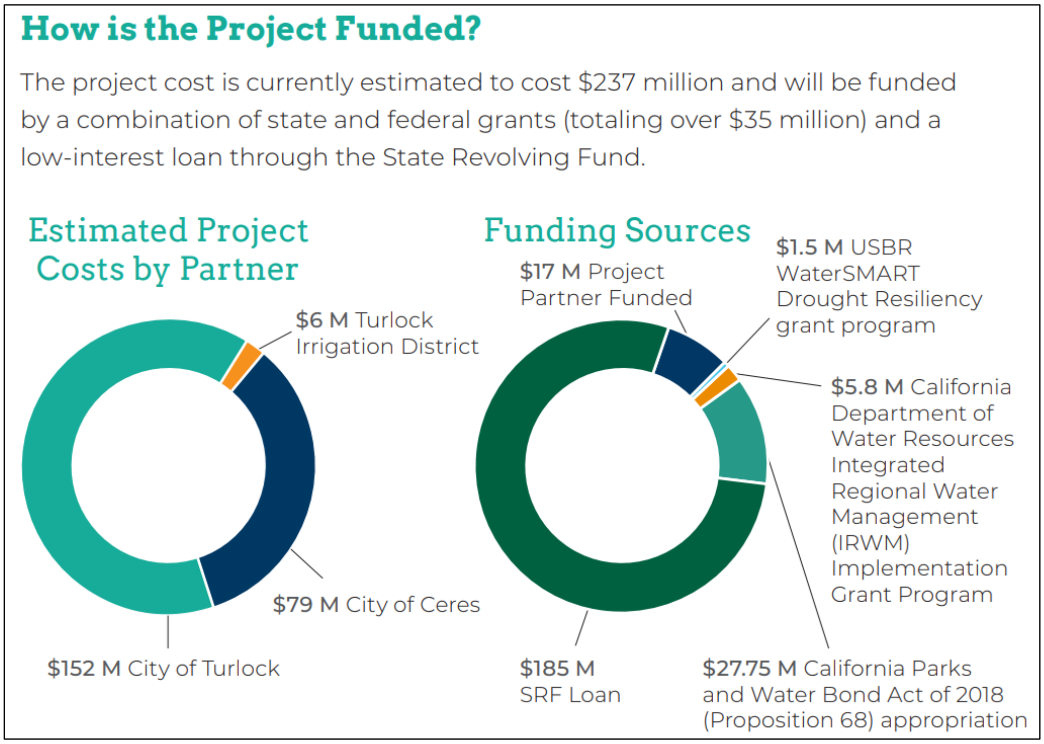
8.2.1.1.8. Estimated Costs and Funding Plan

Currently, the Project is estimated to cost $237 million, which includes the design and construction of the Project facilities and local improvements required by both Cities to integrate this new supply into their existing water systems. Ceres' portion of this cost is approximately $79 million, and Turlock's portion is approximately $152 million. An additional $6 million will be contributed by the TID for its portion of the Project.

In late 2017, the Cities of Ceres and Turlock both increased water rates to pay for the construction and ongoing operation of the Project and other water system needs. Those rates are intended to collect the necessary revenue to pay for debt service on borrowed money and for annual operational costs. The SRWA secured a grant for $750,000 towards the Ceres Finished Water Transmission Main and was recently awarded an additional $750,000 towards the Turlock Finished Water Transmission Main. The Project is also slated to receive an almost $28 million grant from Proposition 68, the Parks, Environment, and Water Bond. The SRWA has applied to other funding programs and continues to seek other sources of funding to reduce the Project's impacts on the ratepayers. These efforts include both State and federal grants and low-interest loans. The SRWA also sought and received legislative approval to utilize the Design-Build method to maximize the efficiencies of the design and construction process to ensure the most cost-effective process for completing the Project.

Figure 8-4 outlines the project costs and funding sources of the Project (Stanislaus Regional Water Authority, n.d.).

Figure 8-4: Regional Surface Water Supply Project Funding



8.2.1.1.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all projects developed for implementation are expected to maintain the balance of groundwater extractions and recharge to ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, in-lieu recharge benefits of this Project are expected to increase the use and recharge of available surface water supplies, helping to offset any potential increases in groundwater pumping during drought when surface water supplies are limited.

8.2.1.2. Waterford/Hickman Surface Water Pump Station and Storage Tank (Project 2)

8.2.1.2.1. Project Description

The Waterford/Hickman Surface Water Pump Station and Storage Tank (Project) entails connecting the City of Waterford (Waterford) and Hickman to Modesto Irrigation District's (Modesto ID) surface water supply. The Project includes several components, described in order of the flow of the surface water. Surface water will be diverted from Modesto ID's distribution network at a pipeline turn-out located at the corner of Tim Bell and Vineyard Road, northeast of the Waterford. The surface water will be piped into a one-million-gallon storage tank that will be constructed at this intersection. A pump station at this location and transmission line will also be constructed that transports the water to Yosemite Boulevard in Waterford.

As part of a separate project, the Waterford and Hickman systems are in the process of being connected and should be completed by the end of 2023. Once the two water systems are connected and the surface water conveyance, storage, and pump station are complete, then Hickman, located in the Subbasin, can utilize surface water from Modesto ID through existing transmission lines.

8.2.1.2.2. Public Notice

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing may be facilitated through the WTSGSA board meetings and/or TID board meetings, the Turlock Subbasin and/or TID website(s), the TID newsletter, inter-basin coordination meetings, other public meetings hosted by the WTSGSA and/or TID, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and/or environmental/regulatory permitting notification processes.

8.2.1.2.3. Permitting and Regulatory Process

Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but are not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County of Stanislaus, and CARB. Specific permitting and regulatory processes that may potentially affect the construction of project-related infrastructure include, but are not limited to:

- USACE Section 404 Permits (potential exemption under Section 404(f)(1)(C) of Clean Water Act)
- RWQCB Section 401 Water Quality Certification (not required if exempt from USACE Section 404)
- SWRCB Construction General Permit and Storm Water Pollution Prevention Plan (SWPPP)
- State Historic Preservation Office (SHPO) and National Historic Preservation Act (NHPA) Section 106 Coordination
- CEQA Environmental Review Process
- California Endangered Species Act (CESA) Consultation

- Endangered Species Act (ESA) Compliance
- National Environmental Policy Act (NEPA) Compliance (expected to require either an Environmental Impact Report and Negative Declaration or Mitigated Negative Declaration)

8.2.1.2.4. Expected Benefits

Benefits to Sustainability Indicators

Utilization of surface water for urban water demands in Hickman is expected to offset groundwater pumping demands, with in-lieu groundwater recharge benefits to the Subbasin. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, interconnected surface water, and possibly land subsidence. All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The Waterford/Hickman Surface Water Pump Station and Storage Tank Project directly benefits Waterford and Hickman, both classified as a DACs, by supplementing and diversifying their drinking water supply. This Project will provide an alternate drinking water source in case of infrastructure or contamination concerns with the communities' groundwater production wells. The additional surface water supply will also reduce groundwater pumping and increase groundwater levels near the communities which can reduce pumping costs and potentially mitigate some groundwater quality concerns. Additionally, benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the Waterford/Hickman Surface Water Pump Station and Storage Tank was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

It is assumed that Modesto ID will provide up to 900 AF/year to Waterford and Hickman, except for critical years which will provide a partial allotment (approximately 750 AF/year in critical years). The impact of this project on the Turlock Subbasin alone would be of 100 AF/year on average over the 50-year simulation period.

Evaluation of benefits will be based on analysis of without-project and with-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and other parameters to be determined. Modeling will be done with the C2VSimTM model used for GSP development.

8.2.1.2.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

The Waterford/Hickman Surface Water Pump Station and Storage Tank will be implemented by the City of Waterford. Waterford will oversee the Project financing and funding, permitting, and construction. The Project will require an agreement between Modesto ID and the City of Modesto to purchase treated surface water. Negotiations are underway for the water sales agreement but have not been concluded. Once negotiations are finalized and financing is secured, then design and subsequent construction will begin. This PMA is currently in the early conceptual stage. Thus, the start and completion dates for this PMA have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Current estimates are that the initial portion of the project to install a pipeline between Waterford and Hickman will be completed within 2 years while the next portion of the project to install a pump station and storage tank for surface water deliveries would be completed within 5 years.

Once the Project construction is complete, it is expected that Modesto ID would provide 900 AF/year to Waterford and Hickman in all water years except critical years which will provide a partial allocation.

Implementation Assumptions for Modeling

The Waterford/Hickman Surface Water Pump Station and Storage Tank has been modeled in the C2VSimTM model. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Estimated volume of surface water deliveries: Proportional to the Modesto ID irrigation water allotment based on water year type, not to exceed 900 AF/yr. The surface water deliveries are distributed throughout the months proportional to monthly urban demands.
- Area receiving surface water deliveries: Surface water is delivered to the jurisdictional extent of the Hickman and Waterford communities, consistent with the extent in the historical C2VSimTM model. Surface water is distributed between Waterford and Hickman proportional to urban demands.
- Water source: It is assumed that all surface water is diverted from Modesto ID's distribution system, with no adjustment to modeled Modesto ID diversions, spillage, and seepage.
- Groundwater pumping: It is assumed that groundwater production is reduced by the volume of surface water deliveries which is distributed proportionally among all wells in Waterford and Hickman.

8.2.1.2.6. Water Source and Reliability

The Waterford/Hickman Surface Water Pump Station and Storage Tank will use water diverted from Modesto ID's surface water distribution network. Modesto ID has existing water rights on the Tuolumne River and existing storage and conveyance facilities. Surface water is expected to be available for this Project in all hydrologic years, proportional to Modesto ID irrigation allotment, while still meeting the demand of existing Modesto ID customers and City of Modesto.

8.2.1.2.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies, after addressing required regulations. Modesto ID and the City of Modesto have the authority to sell surface water to the City of Waterford.

8.2.1.2.8. Estimated Costs and Funding Plan

Costs of this Project include right of way purchase, environmental permitting, design, construction, and project management costs. The initial portion of the project to install a pipeline between Waterford and Hickman is estimated at $1 million, while the next portion of the project to install a pump station and storage tank for surface water deliveries is estimated at approximately $4 million. The total estimated cost at this time is $5 million. However, this Project is currently in the early conceptual stage and a more refined cost can be reported in GSP Annual Reports and Five-Year Assessment Reports when known. It is anticipated that Waterford would identify grant funding sources to cover project costs as part of project development.

8.2.1.2.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are expected to maintain the balance of groundwater extractions and recharge to ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, in-lieu recharge benefits of this Project are expected to increase the use and recharge of available surface water supplies, helping to offset any potential increases in groundwater pumping during drought when surface water supplies are limited.

8.2.1.3. Dianne Storm Basin (Project 3)

8.2.1.3.1. Project Description

This Project will recharge water into the existing Dianne Storm Drain basin. The Dianne Storm Drain basin is located on the western edge of the City of Turlock, north of the Turlock wastewater treatment plant, on West Canal Drive. The basin is 26 acres and can hold 105 AF of water.

The Dianne Storm Drain basin receives storm water from Fulkerth Road which includes roughly a third of the storm water captured in the City of Turlock. There is potential to supplement the water in the basin with surface water in TID's distribution network for additional aquifer recharge.

Once the basin reaches approximately 75% to 80% of capacity, it is pumped out of the basin into TID's Lateral #4 for conveyance to the river. This Project could upgrade the Dianne Storm Drain basin to expand the capacity of the basin and/or install ASR wells. Both approaches would enhance the volume of water that can recharge into the aquifer. Additionally, it could alleviate stress on the storm drain system.

8.2.1.3.2. Public Notice

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing may be facilitated through the WTSGSA board meetings and/or City of Turlock Council meetings, the WTSGSA and/or City of Turlock website(s), inter-basin coordination meetings, other public meetings hosted by the WTSGSA, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and/or environmental/regulatory permitting notification processes.

8.2.1.3.3. Permitting and Regulatory Process

Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies that may be consulted for this Project include, but are not limited to: DWR, SWRCB, the California Department of Fish and Wildlife (CDFW), the Central Valley Flood Protection Board (Flood Board), RWQCBs, the United States Bureau of Reclamation (Reclamation or USBR), the United States Army Corps of Engineers (USACE), the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), Local Agency Formation Commissions (LAFCO), the County of Stanislaus, and the California Air Resources Board (CARB).

8.2.1.3.4. Expected Benefits

Benefits to Sustainability Indicators

The Dianne Storm Drain project would supply direct groundwater recharge to the Subbasin by enhancing infiltration and impoundment of storm water in dry wells. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, and interconnected surface water. All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

This Project would increase groundwater levels near the City of Turlock, which is classified as a DAC (2018 Places). Additionally, it would relieve stress on the storm drain system, mitigate flood potential, and reduce storm loads to the wastewater treatment plant.

The majority of communities in the Turlock Subbasin are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the Dianne Storm Drain project was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

On average, the Project is expected to provide five million gallons of recharged water per storm event, which averages to approximately 22.5 AF/yr of recharged water in the Turlock Subbasin. These benefits are expected to occur during storm events which are more frequent during wet and above normal hydrologic conditions. Additional recharge could occur in the basin if it was supplemented with surface water from TID's system, however that was not included in this analysis and will be evaluated in future reports.

Evaluation of benefits will be based on analysis of without-project and with-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and other parameters to be determined. Modeling will be done with the C2VSimTM model used for GSP development.

8.2.1.3.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

This Project would be implemented by the City of Turlock. The Project would enhance the Dianne Storm Drain basin through expansion and/or installation of ASR wells. On average, it is expected that five million gallons of water can be captured and recharged per storm event. If TID provides supplemental water to recharge in the basin, an agreement with TID would be necessary.

This PMA is currently in the early planning stage. Thus, the start and completion dates for this PMA have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. However, once project implementation begins, it is expected that the City of Turlock would recharge storm water during all years in which water is available from storm events, tentatively assumed to be all years. The City of Turlock hopes to complete the project in the next five years (by 2027), contingent upon grant funding for implementation.

Implementation Assumptions for Modeling

The Dianne Storm Drain project has been modeled in the C2VSimTM model. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Estimated volume of recharged water: five million gallons per storm event, or 22.5 AFY, distributed between November and April of each year recharged at the existing Dianne Storm Drain basin.
- Source of water: Recharged storm water from the City of Turlock. TID deliveries are unaffected.

8.2.1.3.6. Water Source and Reliability

This Project would use storm water captured from the City of Turlock. The intensity and frequency of storm water events fluctuate by water year type. It is assumed that five million gallons can be recharged per storm event which occur in the winter and spring months. The exact volume of recharge capacity will be refined during future project development and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.

8.2.1.3.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies.

8.2.1.3.8. Estimated Costs and Funding Plan

Potential costs of this Project include enhancement of the basin and potentially purchase or exchange of water from TID. This PMA is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Early high-level estimates are approximately $5 million. It is anticipated that the City of Turlock would identify funding sources to cover project costs as part of project development. These may include grants (e.g., Prop 1, Prop 68, NRCS), fees, local cost share, loans, and other assessments.

8.2.1.3.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are expected to maintain the balance of groundwater extractions and recharge to ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, direct recharge benefits of this Project are expected to increase the use and recharge of storm water, helping to offset any declines in groundwater levels from groundwater pumping during drought when surface water supplies are limited.

8.2.1.4. Stanislaus State Stormwater Recharge (Project 4)

8.2.1.4.1. Project Description

The Stanislaus State Stormwater Recharge project (Project) entails constructing French drains or other recharge basins/infrastructure to recharge storm water runoff on the California State University (CSU) Stanislaus campus. Currently, storm water runoff in excess of the on-campus ponds is released into an irrigation pipe which then flows to a canal and is typically discharged in the river. This Project aims to capture most of the storm water runoff for groundwater recharge.

8.2.1.4.2. Public Noticing

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing may be facilitated through the WTSGSA board meetings, the WTSGSA website, inter-basin coordination meetings, other public meetings hosted by the WTSGSA, GSP annual reports and five-year updates, public scoping meetings, and/or environmental/regulatory permitting notification processes.

8.2.1.4.3. Permitting and Regulatory Process

Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies that may be consulted for this Project include, but are not limited to: DWR, SWRCB, the California Department of Fish and Wildlife (CDFW), the Central Valley Flood Protection Board (Flood Board), RWQCBs, the United States Bureau of Reclamation (Reclamation or USBR), the United States Army Corps of Engineers (USACE), the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), Local Agency Formation Commissions (LAFCO), the County of Stanislaus, and the California Air Resources Board (CARB).

8.2.1.4.4. Expected Benefits

Benefits to Sustainability Indicators

The Stanislaus State Stormwater Recharge project would supply direct groundwater recharge to the Subbasin by enhancing infiltration and impoundment of storm water in French drains or other recharge basins/infrastructure. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, and interconnected surface water. All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

This Project would increase groundwater levels near the City of Turlock and the CSU Stanislaus campus, which are classified as a DAC (2018 Places). Additionally, it would potentially mitigate flooding on the campus and connected canal distribution system in DAC areas.

The majority of communities in the Turlock Subbasin are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the Stanislaus State Stormwater Recharge project was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

On average, the Project is expected to provide 460 AFY of recharged storm water from the CSU Stanislaus campus occurring between November and April each year.

Evaluation of benefits will be based on analysis of without-project and with-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and other parameters to be determined. Modeling will be done with the C2VSimTM model used for GSP development.

8.2.1.4.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

This Project would be implemented by CSU Stanislaus. The Project would enhance recharge from storm water collected on the CSU Stanislaus campus through French drains and/or other recharge infrastructure. On average, it is expected that 460 AFY can be captured and recharged.

Research and design, including a survey, soil test, and percolation test, are being conducted in 2021 and 2022. Since this Project is still early in the planning stage, the timeline of project design completion, funding acquisition, construction, and implementation are yet to be determined. The project proponent is currently actively pursuing grant funding, and contingent upon funding, plans to construct the project within 3 years (by 2025). Updates will be provided in GSP annual reports and five-year updates when known. However, once project implementation begins, it is expected that CSU Stanislaus would recharge storm water during all years in which water is available from storm events, tentatively assumed to be all years.

Implementation Assumptions for Modeling

The Stanislaus State Stormwater Recharge project has been modeled in the C2VSimTM model. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Estimated volume of recharged water: 460 AFY distributed between November and April of each year recharged on the CSU Stanislaus campus.
- Source of water: Recharged storm water from the CSU Stanislaus campus.

8.2.1.4.6. Water Source and Reliability

This Project would use storm water captured from the CSU Stanislaus campus. The intensity and frequency of storm water events fluctuate by water year type. It is assumed that 460 AFY of storm water can be collected and captured between November and April each year. The exact volume of recharge capacity will be refined during future project development and will be reported in GSP annual reports and five-year updates when known.

8.2.1.4.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies.

8.2.1.4.8. Estimated Costs and Funding Plan

Potential costs of this Project include initial research, design, and testing and construction and materials for installing the French drains/recharge infrastructure. The preliminary research is estimated to cost approximately $90,000 and the total Project approximately $1.5 million. The Project is still under development, so the anticipated costs may change and would be updated in GSP annual reports and five-year updates. Potential funding and grants are yet to be determined.

8.2.1.4.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are expected to maintain the balance of groundwater extractions and recharge to ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, direct recharge benefits of this Project are expected to increase the use and recharge of storm water, helping to offset any declines in groundwater levels from groundwater pumping during drought when surface water supplies are limited.

8.2.1.5. Advanced Metering Infrastructure Project (AMI) (Project 5)

8.2.1.5.1. Project Description

The City of Modesto is planning on upgrading 75,000 meters to AMI smart meters to support water reduction goals. Smart meters will assist the City in providing analytical tools to manage water usage better, such as identifying leaks sooner and providing customers more usable and user friendly data to manage their water usage. Examples include the City being able to notify customers of leaking pipes.

8.2.1.5.2. Public Noticing

Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.

8.2.1.5.3. Permitting and Regulatory Process

Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County of Stanislaus, and CARB.

8.2.1.5.4. Expected Benefits

Benefits to Sustainability Indicators

The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water.

Benefits to Disadvantaged Communities

This Project would apply to and benefit all water customers in the City of Modesto, most of which is considered a DAC or SDAC.

Volumetric Benefits to the Subbasin Groundwater System

This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. However, the Project is expected to reduce water use in the City of Modesto to meet future water use mandates and conservation goals.

Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project is evaluated as part of a scenario and the C2VSimTM is used to assess the benefits and impacts on the Subbasin sustainability.

8.2.1.5.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

Project planning is expected to occur in 2022 and 2023, with implementation expected from 2024 to 2026. Additional updates on the project schedule will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in all years beginning the first year of project implementation.

Implementation Assumptions for Modeling

The Advanced Metering Infrastructure Project has been modeled in the C2VSimTM model. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Modeled as part of scenario of ongoing conservation efforts within the City of Modesto. Simulated change includes the reduction of urban water demand from 228 gallons per person per day (GPCD) (2015 City of Modesto UWMP) to 175 GPCD (2020 City of Modesto UWMP).

8.2.1.5.6. Water Source and Reliability

This Project would not directly use a water source but would help to manage and enhance use of existing water City of Modesto water supplies.

8.2.1.5.7. Legal Authority

The GSA, Districts, and individual project proponents have the authority to plan and implement projects.

8.2.1.5.8. Estimated Costs and Funding Plan

This Project is currently in the early conceptual stage but an initial estimate for the total cost is $20 million. Updated cost estimates will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.2.1.5.9. Management of Groundwater Extractions and Recharge

This Project would not directly use a water source (e.g., no groundwater extraction or recharge is involved) but would help to manage and enhance use of existing water City of Modesto water supplies.

8.2.2. West Turlock Subbasin GSA - Agriculture

Agricultural Projects developed for implementation in the West Turlock Subbasin GSA (WTSGSA) are summarized in the sections below.

8.2.2.1. TID On-Farm Recharge Project (in WTSGSA) (Project 6)

8.2.2.1.1. Project Description

In the Turlock Irrigation District (TID) On-Farm Recharge Project (in WTSGSA) Project (Project), TID will work with growers within its irrigation service area to identify parcels that would be willing to participate in the On-Farm Recharge Project and have suitable conditions to support recharge. TID plans to utilize the Groundwater Recharge Assessment Tool (GRAT) to identify areas and fields within TID that are suitable for on-farm recharge projects, as determined based on cropping, soil characteristics, and other pertinent parameters considered in the GRAT.

For purposes of analysis and GSP development, it is assumed that participating fields will comprise 25 percent of non-permanent crop lands within TID's existing irrigation service area along canals and laterals downstream of Turlock Lake in the eastern portion of the WTSGSA where the recharge potential is highest (including the Main Canal, Highline Canal, Turlock Main Canal, Upper Laterals, and Upper Stevinson). It is expected that on-farm recharge will apply, on average, approximately 2 AF per acre each year that the Project occurs, and that sufficient water will be available for this Project only in wet and above normal hydrologic years (approximately 50 percent of years historically). Subsequent analysis of water availability, actual annual application rates, application timing, and extent of participating lands will be necessary as Project development continues and implementation begins.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of the TID on-farm recharge project.

8.2.2.1.2. Public Notice

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing may be facilitated through the WTSGSA board meetings and/or TID board meetings, the WTSGSA and/or TID website(s), the TID newsletter, inter-basin coordination meetings, other public meetings hosted by the WTSGSA and/or TID, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and/or environmental/regulatory permitting notification processes.

8.2.2.1.3. Permitting and Regulatory Process

Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Surface water would be diverted for this Project by TID through existing water rights. Governing agencies that may be consulted for this Project include, but are not limited to: the SWRCB, the County(ies) of Stanislaus and/or Merced, and DWR.

If necessary for field flooding, the project proponent will obtain land grading permits from the County(ies).

Recharge projects may also require an environmental review process under CEQA. A Programmatic Environmental Impact Report will be prepared for this GSP which will assist in meeting this requirement.

8.2.2.1.4. Expected Benefits

Benefits to Sustainability Indicators

Surface water deliveries during the non-irrigation season are expected to provide direct groundwater recharge to the Subbasin. For fields that are irrigated using groundwater, surface water deliveries during the irrigation season are expected to offset groundwater demand and provide in-lieu groundwater recharge benefits. In both cases, the sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, interconnected surface water, and land subsidence (depending on where recharge occurs). All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The TID on-farm recharge project is expected to provide direct or in-lieu recharge within the existing TID irrigation service area. The majority of communities in the Turlock Subbasin, particularly the TID irrigation service area, are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). Depending on which specific parcels receive surface water deliveries, this Project may directly benefit specific DACs in the TID irrigation service area. In addition, maintenance or improvement of groundwater levels may help to protect beneficial groundwater use by rural domestic wells from potential adverse impacts related to chronic groundwater level decline. Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the TID on-farm recharge project was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

On average across all years, the TID on-farm recharge project is expected to provide approximately 4,000 AF/yr of recharge benefit to the Turlock Subbasin. These benefits would accrue in years with wet or above normal hydrologic conditions when sufficient water is expected to be available for on-farm recharge (approximately 50 percent of years historically). In those years, approximately 8,000 AF/yr of groundwater recharge is expected to occur.

Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project is evaluated as part of a scenario and the C2VSimTM is used to assess the benefits and impacts on the Subbasin sustainability.

8.2.2.1.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

The TID on-farm recharge project would be implemented by TID using existing TID surface water supplies and infrastructure to support on-farm recharge on fields within the existing TID irrigation service area. At the initiation of this Project and on an ongoing basis, TID plans to identify fields that are most suitable for groundwater recharge using the GRAT. It is expected that fields with non-permanent crops, permeable soils, and existing flood irrigation infrastructure will be most suitable for project participation.

This PMA is currently in the early conceptual stage. Thus, the start and completion dates for this PMA have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Current estimates are that the pilot program would be developed by the 2023 irrigation season followed by a build to full implementation within five years.

However, once project implementation begins, it is expected that TID would deliver surface water for on-farm recharge during wet and above normal hydrologic years (approximately 50 percent of years historically) when sufficient water is available for field flooding and on-farm recharge. TID would deliver surface water to participating fields found to be suitable for recharge in the GRAT, and irrigators would use that water to flood their fields for recharge. It is expected that approximately 2 AF per acre of water would be applied to participating fields, on average, during years when on-farm recharge occurs. Subsequent analysis of projected water availability, actual annual application rates, and extent of participating lands will be necessary as project development continues and implementation begins. While GSP modeling (described below) focuses on deliveries for this purpose between January and February, as the program is further developed it may include additional deliveries for on-farm recharge during the irrigation season.

Implementation Assumptions for Modeling

The TID on-farm recharge project has been modeled in the C2VSimTM model and will be modeled in the GRAT. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Estimated volume of on-farm recharge deliveries: Applied 8,000 AFY (during January and February) to participating areas in years with wet or above-normal hydrologic conditions, averaging 3,800 AFY over the simulation period.
- Area receiving on-farm recharge deliveries: Applied water to areas that are primarily represented by non-permanent crops within the north-eastern portion of the existing TID irrigation service area along the Main Canal, Highline Canal, Turlock Main Canal, Upper Laterals, and Upper Stevinson. Sufficient area was simulated to apply the full estimated volume of on-farm recharge deliveries (approximately 4,000 acres, resulting in approximately 2 AF per acre).
- Implementation of this project is anticipated to increase canal seepage by 2,950 AFY in wet and above normal years, averaging to 1,400 AFY over the simulation period. The additional recharge is due to operational seepage losses in the TID conveyance network, which are not managed at this level in winter months.
- Assumed that all surface water is diverted from the Tuolumne River and conveyed through the existing TID distribution system, with adjustment to modeled TID diversions, seepage in winter months, and Tuolumne River stream flows, including flood flows and other releases from Don Pedro Reservoir, as applicable.

8.2.2.1.6. Water Source and Reliability

The TID on-farm recharge project would use water diverted from the Tuolumne River. TID has existing water rights on the Tuolumne River. TID also has existing storage and conveyance facilities to reliably deliver replenishment water to participating parcels. Surface water is expected to be available for this Project in wet and above normal hydrologic years. In approximately half of the years since the construction of New Don Pedro Dam, the Tuolumne River watershed has produced more water than can be stored or beneficially used by existing customers. Recognizing that water supply availability could be impacted by climate change or regulatory requirements, the project will be implemented using adaptive management.

8.2.2.1.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies.

8.2.2.1.8. Estimated Costs and Funding Plan

Potential costs of this Project may include: project coordination and administration, financial, or other incentives to encourage on-farm recharge, field preparation to enhance flooding, and other potential on-field monitoring equipment. Costs per site may vary depending on changes in project implementation and incentives. Slightly higher costs per site would likely be incurred in the first year an irrigator participates, as more coordination and site preparation may be required. The total costs of the Project will vary over time, depending on the number of sites receiving water, the extent to which irrigators require coordination and support, and any applicable Project incentives.

This Project is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. However, high-level initial estimates are on the order of $160,000 per year for years that are hydrologically wet or above normal. It is anticipated that TID would identify funding sources to cover project costs as part of project development. These may include grants (e.g., Prop 1, Prop 68, NRCS, others), fees, and loans.

8.2.2.1.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, in-lieu and direct recharge benefits of this Project are expected to increase the use and recharge of available surface water supplies during wetter years, helping to offset potential increases in groundwater pumping during drought when surface water supplies are limited.

8.2.2.2. Recycled Water from City of Turlock (Project 7)

8.2.2.2.1. Project Description

This Project will divert recycled water from the City of Turlock to the TID irrigation conveyance system and deliver that water to irrigated fields in the western portion of the TID irrigation service area. The recycled water supplies will be blended with existing supplies in the canal and used to offset existing groundwater pumping demand, providing in-lieu recharge benefits to the Turlock Subbasin. It is expected that approximately 2,000 AF/yr of recycled water will be available, or approximately two million gallons per day (MGD), during the irrigation season.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of the Project for Recycled Water from City of Turlock.

8.2.2.2.2. Public Notice

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing may be facilitated through the WTSGSA board meetings and/or TID board meetings, the Turlock Subbasin and/or TID website(s), the TID newsletter, inter-basin coordination meetings, other public meetings hosted by the WTSGSA and/or TID, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and/or environmental/regulatory permitting notification processes.

8.2.2.2.3. Permitting and Regulatory Process

The RWQCB approved the discharge of the City of Turlock's recycled water into TID's canal system, contingent upon the approval of the TID Board of Directors and the RWQCB's Executive Director. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but are not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, Counties of Merced and/or Stanislaus, and CARB. Specific permitting and regulatory processes that may potentially affect the construction of project-related infrastructure include, but are not limited to:

- USACE Section 404 Permits (potential exemption under Section 404(f)(1)(C) of Clean Water Act)
- SWRCB Wastewater Change Petition under CWC §1211: Change in Point of Discharge, Place of Use or Purpose of Use
- Modification of City of Turlock's wastewater NPDES permit
- RWQCB Section 401 Water Quality Certification (not required if exempt from USACE Section 404)
- SWRCB Construction General Permit and Storm Water Pollution Prevention Plan (SWPPP)
- State Historic Preservation Office (SHPO) and National Historic Preservation Act (NHPA) Section 106 Coordination
- CEQA Environmental Review Process
- California Endangered Species Act (CESA) Consultation
- Endangered Species Act (ESA) Compliance
- National Environmental Policy Act (NEPA) Compliance (expected to require either an Environmental Impact Report and Negative Declaration or Mitigated Negative Declaration)

Additionally, the RWQCBs regulate the production and use of recycled water in a manner that protects public health and the environment. Project implementation will comply with all applicable state regulations for recycled water use, and any necessary permits required to use treated municipal wastewater for non-potable uses (e.g., water reclamation requirements) will be obtained.

8.2.2.2.4. Expected Benefits

Benefits to Sustainability Indicators

Utilization of recycled water for irrigation in the western portion of the TID irrigation service area is expected to offset groundwater pumping demands, with in-lieu groundwater recharge benefits to the Subbasin. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, interconnected surface water, and land subsidence (depending on where recharge occurs). All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

TID's use of recycled water from the City of Turlock is expected to provide in-lieu recharge benefits directly within the western portion of the TID irrigation service area. The majority of communities in the Turlock Subbasin, particularly the TID irrigation service area, are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). This Project is expected to directly benefit those communities in the TID irrigation service area. Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the recycled water from City of Turlock Project was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

On average across all years, the recycled water from City of Turlock Project is expected to provide approximately 2,000 AF/yr of benefit to the Turlock Subbasin. Benefits are expected to accrue in all years recycled water is used in available following project initiation, tentatively assumed to be every year. While approximately two MGD of recycled water is anticipated to be available each day during the irrigation season, the precise availability may fluctuate slightly as municipal water use also varies.

Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project is evaluated as part of a scenario and the C2VSimTM is used to assess the benefits and impacts on the Subbasin sustainability.

8.2.2.2.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

This Project would be implemented by TID through a partnership with the City of Turlock. The Project would divert recycled water from facilities operated by the City of Turlock into the existing TID conveyance system, and deliver the recycled water, comingled with other irrigation water within the canal system, to irrigated fields in the western portion of the TID irrigation service area. On average, it is expected that approximately 2,000 AF of recycled water will be available in all years, or approximately two million gallons per day (MGD) during the irrigation season. Deliveries of recycled water during the irrigation season would be used to irrigate crops, offsetting groundwater pumping demand.

This PMA is currently in the early planning stage. Thus, the start and completion dates for this PMA have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Based on an assumption that recycled water permitting will be the schedule driver, the project is estimated to be completed by December 2026. However, once project implementation begins, it is expected that TID would deliver recycled water for in-lieu recharge during all years when water is available from the City of Turlock, tentatively assumed to be all years.

Implementation Assumptions for Modeling

The recycled water from City of Turlock Project has been modeled in the C2VSimTM model. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Estimated volume of recycled water deliveries: 2,000 AFY will be made available in all year types throughout the simulation period. The recycled water is delivered in conjunction with TID surface water as to offset some of the agricultural water supply impacts from the Regional Surface Water Supply Project (Project 1).
- Area receiving recycled water deliveries: Applied water to areas in the western portion of the existing TID irrigation service area.

8.2.2.2.6. Water Source and Reliability

This Project would use available recycled water from the City of Turlock. Municipal water supply and demand are considered to be reliable and are expected to reliably provide 2,000 AF/yr of recycled water for this Project. The precise reliability of available recycled water would be refined during future project development and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.

8.2.2.2.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies. The City of Turlock has the authority to supply recycled water to TID and TID has the authority to deliver recycled water to its customers, subject to certain regulatory and permitting requirements.

8.2.2.2.8. Estimated Costs and Funding Plan

This PMA is currently in the early conceptual stage. However, a high-level cost of the project has been estimated at $50,000. More detailed costs will be reported in GSP Annual Reports and Five-Year Assessment Reports when confirmed. It is anticipated that TID would identify funding sources to cover project costs as part of project development. These may include grants (e.g., Prop 1, Prop 68, NRCS), fees, local cost share, loans, and other assessments.

8.2.2.2.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, in-lieu recharge benefits of this Project are expected to increase the use and recharge of available surface water supplies during wetter years and reduce groundwater pumping in the lower portions of TID's distribution system, helping to offset potential increases in groundwater pumping during drought when surface water supplies are limited.

8.2.2.3. TID Ceres Main Regulating Reservoir (Project 8)

8.2.2.3.1. Project Description

In this Project, TID will construct a new regulating reservoir in the TID distribution system, located along the Ceres Main Canal near the head of Lower Lateral 3. The reservoir would absorb operational fluctuations in the Ceres Main Canal caused by upstream flow adjustments and would maintain a constant pool elevation upstream of the drop where it is constructed. This reservoir is expected to provide numerous benefits to the operation of TID's distribution system and to the level of service offered to TID's irrigation customers, with cascading benefits to the Turlock Subbasin.

The proposed reservoir design would have an operational storage capacity of approximately 220 AF, a maximum storage capacity of 253 AF, and a design inflow/outflow capacity of 100 cubic feet per second (CFS). To facilitate reservoir operation, four existing in-canal level control structures, known as drop structures, would be modified and automated with new flume gates and telemetry.

The location of the new reservoir along the Ceres Main Canal is strategically positioned to capture and store a large portion of the operational fluctuations in the canal system downstream of its location. By capturing and allowing later use of water that would have otherwise spilled from the canal system, the Ceres Main regulating reservoir conserves surface water supplies for irrigation and provides in-lieu recharge benefits to the Subbasin.

The location of the new reservoir along the Ceres Main Canal also affords WDOs greater flexibility in delivering surface water to customers while also reducing unexpected lower than ordered flows at the bottom ends of the canal system below the reservoir. This reduces the need for supplemental local groundwater pumping to maintain required irrigation flow rates in the canals below the reservoir. The TID distribution system was constructed to supply higher-volume (15-20 CFS) deliveries for flood irrigation; however, the increased use of drip and micro sprinkler irrigation systems in recent years has increased demand for "microhead" deliveries with lower, varying flow rates and longer durations. Accommodating these microheads is challenging for WDOs due to their varying flow rates, start times, and end times. The added challenges of these microheads result in greater difficulty for WDOs to “level” demands by arranging the sequence of deliveries. The Ceres Main regulating reservoir will support WDOs in responding to these challenges and maintain high levels of irrigation service to customers. These features are expected to encourage continued use of surface water for irrigation and conserves surface water supplies, both of which would provide in-lieu recharge benefits to the Subbasin.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of the TID Ceres Main regulating reservoir Project.

8.2.2.3.2. Public Notice

The public and other agencies will continue to be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing may be facilitated through the WTSGSA board meetings and/or TID board meetings, the Turlock Subbasin and/or TID website(s), the TID newsletter, inter-basin coordination meetings, other public meetings hosted by the WTSGSA and/or TID, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and/or environmental/regulatory permitting notification processes.

8.2.2.3.3. Permitting and Regulatory Process

Required permitting and regulatory review has been initiated through consultation with applicable governing agencies. TID has already initiated environmental permitting and regulatory processes. As of fall 2021, TID has prepared an Initial Study in accordance with the California Environmental Quality Act (CEQA) and has completed a Mitigated Negative Declaration for CEQA compliance. TID will continue consultation and initiation of any remaining permitting and regulatory processes through consultation with applicable governing agencies. Governing agencies that may be consulted for this Project include, but are not limited to: the SWRCB, the County(ies) of Stanislaus and/or Merced, and DWR.

8.2.2.3.4. Expected Benefits

Benefits to Sustainability Indicators

As described in the Project Description section, the TID Ceres Main regulating reservoir is expected to support TID’s WDOs in maintaining high levels of irrigation service and delivery flexibility to customers. The reservoir is also expected to conserve surface water supplies that may have otherwise spilled and make that water available for irrigation. Both features are expected to provide in-lieu groundwater recharge benefits to the Subbasin by enhancing the availability of surface water for irrigation instead of groundwater. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, interconnected surface water, and land subsidence (depending on where recharge occurs).

This Project may also benefit water quality, to the extent that surface water is used for irrigation and percolates to the groundwater system. The surface water supply for TID originates as snowmelt from the Sierra Nevada Mountains and is of very high quality,[1] with lower TDS relative to groundwater.

All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The TID Ceres Main regulating reservoir is expected to provide in-lieu recharge benefits throughout the TID irrigation service area. The majority of communities in the Turlock Subbasin, particularly the TID irrigation service area, are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). This Project is expected to directly benefit those communities in the TID irrigation service area. Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin

Volumetric Benefits to the Subbasin Groundwater System

The expected benefit of the TID Ceres Main regulating reservoir to the Turlock Subbasin was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

On average across all years, the TID Ceres Main regulating reservoir Project is expected to:

- Reduce spillage losses from the TID distribution system by an average of approximately 10,000 AFY (net volume conserved would be held in Don Pedro Reservoir for future beneficial use in TID), and
- Reduce groundwater pumping along Lower Lateral 3 by approximately 575 AFY (deliveries previously met by groundwater pumping would instead be met by surface water stored in the Ceres Main regulating reservoir).

Benefits are expected to accrue throughout the irrigation season in all years following construction. The precise benefits will vary between years as the volume of surface water

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[1] Water quality is regularly tested at Turlock Lake as part of TID's Ag Suitability monitoring program. Results of these tests show that source water diverted from the Tuolumne River has an average TDS of 38 parts per million (ppm), nitrate concentration of less than 2 ppm, phosphorus concentration of less than 0.04 ppm, and potassium concentration of less than 2 ppm. (TID, 2021)

supplies and deliveries varies with water availability, hydrologic conditions, and irrigation demand.

Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project is evaluated as part of a scenario and the C2VSimTM is used to assess the benefits and impacts on the Subbasin sustainability.

8.2.2.3.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

This Project is currently planned for construction and implementation in the near future, pending funding, and would be implemented by TID. As of fall 2021, TID has acquired land at the head of Lower Lateral 3 for the proposed regulating reservoir. TID has also prepared an Initial Study in accordance with CEQA and has completed a mitigated negative declaration for CEQA compliance. As part of this process, TID has completed reservoir design and is currently seeking grant funding to support project construction.

The proposed reservoir would be constructed on a 38-acre parcel owned by TID, located approximately a quarter of a mile south of Keyes Road and a half mile west of Prairie Flower Road, east of the Township of Keyes in Stanislaus County, California. The reservoir design would have an operational storage capacity of approximately 220 AF, a maximum storage capacity of 253 AF, and a design inflow/outflow capacity of 100 CFS. Inflows to the reservoir would be conveyed through a reinforced concrete inlet pipe on the Ceres Main Canal, and outflows from the reservoir would be conveyed back to the Ceres Main through four steel and PVC pump lines and to LL3 (below Drop 1) through a separate steel and PVC pump line. The inlet/outlet structure on the Ceres Main Canal includes a broad crested spillway capable of passing 100 CFS from the reservoir to the Ceres Main Canal if design water storage levels are exceeded by more than 1 foot.

The timing of construction is uncertain and will depend on funding. The completion date for this PMA is estimated to be February 2023, contingent on grant funding, and will be updated in GSP Annual Reports and Five-Year Assessment Reports when confirmed. Once construction is complete, it is expected that TID would operate this reservoir in all years over the GSP implementation and planning horizon, up to the 50-year expected life of the reservoir components.

Implementation Assumptions for Modeling

The TID Ceres Main regulating reservoir Project has been modeled in the C2VSimTM model and will be modeled in the GRAT. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

The following general information and assumptions were used to simulate implementation of the Project:

- Volume of spillage reduction: Reduced spillage by an average of 10,000 AFY, distributed across the following sites: Faith Home (along the Ceres Main Canal), Hodges (along the Ceres Main Canal), Lateral 1, Lower Lateral 2, Lower Lateral 2 ½, Lower Lateral 3, Lower Lateral 4, and Lateral 4 ½.
- Volume of groundwater pumping reduction: Reduced groundwater pumping by TID-operated pumps along Lower Lateral 3 by 575 AFY.
- Assumed that the net volume of spillage reduction conserved by the reservoir may instead be stored in Don Pedro Reservoir for future beneficial use by TID.

8.2.2.3.6. Water Source and Reliability

The TID Ceres Main regulating reservoir project would conserve surface water diverted from the Tuolumne River. TID has existing water rights on the Tuolumne River. This Project will support ongoing management of these supplies to benefit groundwater sustainability in the Turlock Subbasin; however, this Project will not directly use additional surface water supplies.

8.2.2.3.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies. TID has the authority to construct and operate a regulating reservoir in its irrigation distribution system, subject to applicable regulatory requirements.

8.2.2.3.8. Estimated Costs and Funding Plan

This Project has gone through the preliminary planning and design stage, and TID is currently seeking grant funding to support construction. Total estimated project costs as of September 2021 are approximately $8,800,000. These costs include reservoir construction costs and indirect permitting costs. Initial project implementation cost estimates developed in February 2019 estimate the annual reservoir operating costs as approximately $32,000 per year. The precise costs of this Project will be refined through additional project development. Updated costs will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. TID is identifying potential funding sources to cover project costs as part of project development. These may include grants (e.g., Prop 1, Prop 68, WaterSMART), fees, local cost share, loans, and other assessments. As of fall 2021, TID is actively applying to grant opportunities to fund this Project.

8.2.2.3.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, this conservation and conjunctive use project is expected to increase the use and recharge of available surface water supplies during wetter years (in-lieu recharge), helping to offset potential increases in groundwater pumping during drought when surface water supplies are limited.

8.2.3. East Turlock Subbasin GSA - Agriculture

Projects developed for implementation in the East Turlock Subbasin GSA (ETSGSA) are summarized in the sections below.

8.2.3.1. Agricultural Recharge Project (in ETSGSA) (Project 9)

8.2.3.1.1. Project Description

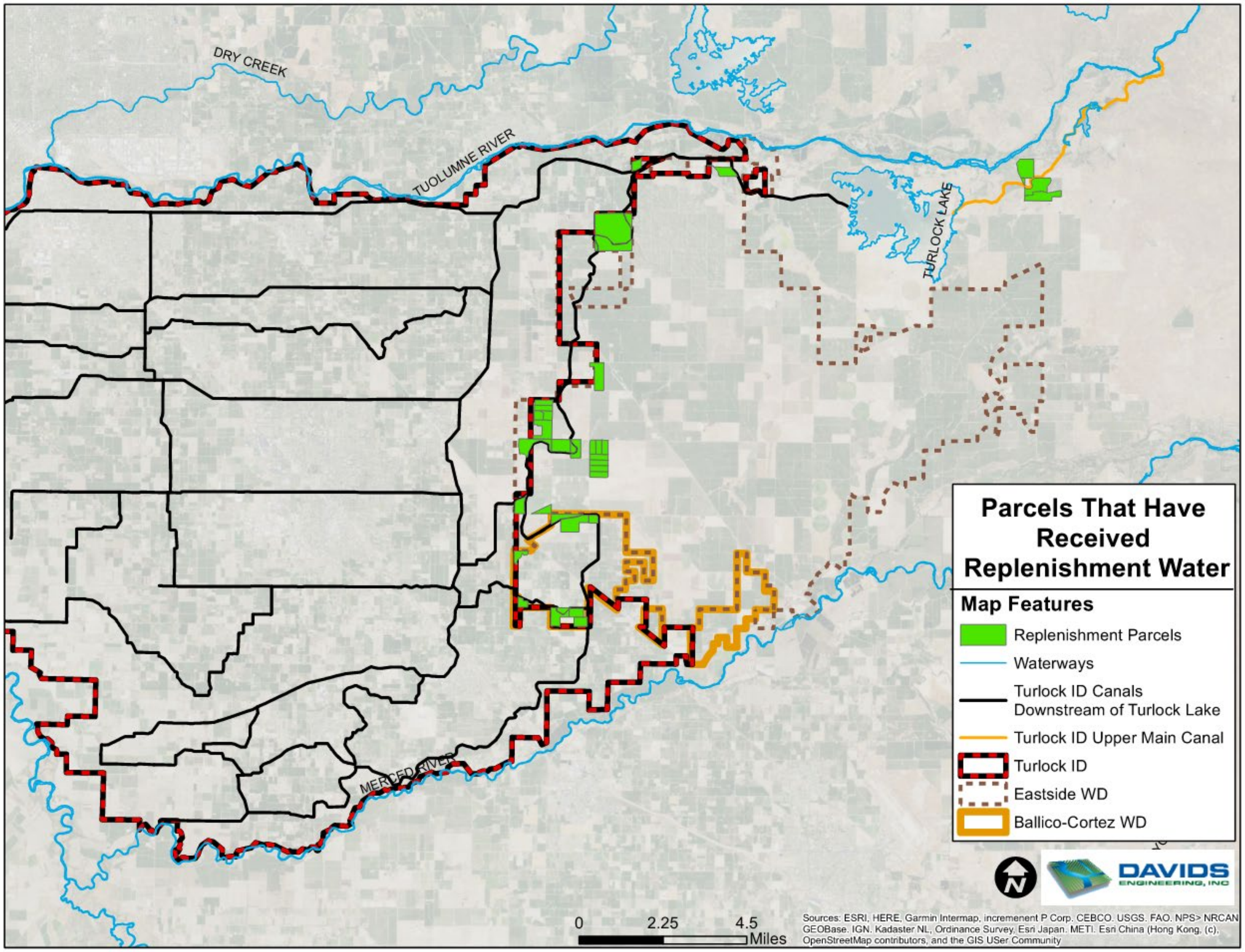
In certain wet years when sufficient surface water is available, Turlock Irrigation District (TID) promotes direct and in-lieu recharge through the provision of "replenishment water" to irrigators outside of, but adjacent to TID's irrigation service area. Historically, the bulk of the replenishment water sales have gone to irrigators east of TID's irrigation service area as a substitute for groundwater pumping or in-lieu groundwater recharge.

The Agricultural Recharge Project (in ETSGSA) (Project) would continue and potentially expand upon these replenishment water deliveries through a partnership between Eastside Water District (EWD) and TID. In this Project, TID would deliver water to land within EWD and the East Turlock Subbasin Groundwater Sustainability Agency (ETSGSA) in years when sufficient water supplies exist. Annual operation of this Project would be informed by the Tuolumne Reservoir Simulation (TRS) model, which TID currently uses to estimate the volume of surface water available each year.

Replenishment water deliveries will help maximize the utility of available water supplies to support groundwater sustainability in the Turlock Subbasin. During the irrigation season, replenishment water delivered through this Project would be used to offset demand for groundwater pumping and provide in-lieu recharge benefits to the Subbasin. During the non-irrigation season, water delivered through this Project would be used for field flooding to provide direct recharge benefits to the Subbasin.

This Project is expected to begin with deliveries during the irrigation season to parcels that have received replenishment water in the past and may expand deliveries to those same parcels during the non-irrigation season months depending on surface water availability. Additional parcels may be considered in the future to expand the recharge capacity of the Project when water is available.

Figure 8-5: Parcels Outside the TID Irrigation Service Area that Have Received Replenishment Water Deliveries (1995-2019)



This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of the Agricultural Recharge Project.

8.2.3.1.2. Public Notice

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.

8.2.3.1.3. Permitting and Regulatory Process

Water would be diverted for this Project by TID through conservation and/or existing water rights. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies that may be consulted for this Project include, but are not limited to, the SWRCB and the County(ies) of Stanislaus and/or Merced.

If necessary for field flooding or the development of new delivery infrastructure, the project proponent will obtain land grading and construction permits from the County(ies). Recharge projects that expand water delivery to new locations may also require an environmental review process under CEQA.

8.2.3.1.4. Expected Benefits

Benefits to Sustainability Indicators

This Project would deliver water to lands outside the TID irrigation service area that have historically used groundwater for irrigation. Water deliveries during the irrigation season are expected to offset groundwater demand and provide in-lieu groundwater recharge benefits. Water deliveries during the non-irrigation season are expected to provide direct groundwater recharge to the Subbasin. In both cases, the sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, interconnected surface water, and land subsidence (depending on where recharge occurs). All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The majority of communities in the Turlock Subbasin are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). Depending on which specific parcels receive replenishment water deliveries, this Project may directly benefit specific DACs located in EWD and the ETSGSA along the TID irrigation service area boundary.[1] In addition, maintenance or improvement of groundwater levels may help to protect beneficial groundwater use by rural domestic

[1] Specific DACs in EWD and the ETSGSA along the TID service area boundary include census block groups (2018) 060990036044 and 060470002011, and 060470002012, and census tract group (2018) 06047000201.

wells from potential adverse impacts related to chronic groundwater level decline. Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the Project was estimated by simulating two implementation phases for this Project in the C2VSimTM model:

1. Irrigation season deliveries to parcels in EWD and the ETSGSA that have historically received replenishment water deliveries, and
2. Non-irrigation season deliveries to parcels in EWD and the ETSGSA that have historically received replenishment water deliveries.

General information and assumptions used to simulate these two implementation phases are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability. The expected yield of each phase is summarized in **Table 8-4.**

On average, irrigation season deliveries to parcels in the ETSGSA that have historically received replenishment water is expected to provide 3,400 AFY of benefit to the Turlock Subbasin. These benefits are expected to accrue in years with wet or above normal hydrologic conditions when the TID Board of Directors allows deliveries to these areas.

Non-irrigation season replenishment water deliveries are expected to provide an average of 1,600 AFY of additional benefit to the Turlock Subbasin. If and when this phase of Project implementation occurs, these benefits are also expected to accrue in years with wet or above normal hydrologic conditions when the TID Board of Directors allows the delivery of replenishment water.

Evaluation of benefits will be based on analysis of without-project and with-project measurements potentially supported by modeling as needed. Measured parameters will include surface water deliveries, groundwater levels, and other parameters to be determined.

Table 8-4: Estimated Average Annual Benefits of the Agricultural Recharge Project by Project Implementation Phase

Project Implementation Phase	Estimated Yield, Projected Future Water Budget (AFY)
Irrigation season deliveries to parcels in EWD and the ETSGSA that have historically received replenishment water deliveries	3,400
Non-irrigation season deliveries to parcels in EWD and the ETSGSA that have historically received replenishment water deliveries	1,600

8.2.3.1.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

The Project would be implemented through a partnership between EWD and TID. In this Project, TID would deliver water to land within EWD and the ETSGSA in years when sufficient water supplies exist. Annual operation of this Project would be informed by the TRS model, which TID uses to estimate the volume of water available each year.

Three implementation phases of this Project are being considered:

1. Existing and expanded irrigation season deliveries to parcels in EWD and the ETSGSA that have historically received replenishment water deliveries,
2. Non-irrigation season deliveries to parcels in EWD and the ETSGSA that have historically received replenishment water deliveries, and
3. Future recruitment of additional parcels into the Project to increase recharge capacity when water is available.

Other than existing irrigation season deliveries that have historically taken place, future phases are currently in the early conceptual stage. Thus, the start and completion dates for those phases have yet to be determined but will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. The Project is expected to expand within the next five years. Any future changes in project implementation will be communicated with the public and other agencies and will be documented in GSP Annual Reports and Five-Year Assessment Reports.

Implementation Assumptions for Modeling

All phases of the Project have been modeled in the C2VSimTM model and will be modeled in the GRAT. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

In general, information and assumptions used to simulate implementation of the three Project phases include:

- Estimated volume of deliveries:
- Phase 1, Irrigation season deliveries: The volume of deliveries was estimated as the required volume needed during the irrigation season to satisfy all irrigation water demands of parcels in the potential area receiving deliveries (below). Based on preliminary analysis, this project can supply up to 8,800 AFY of in-lieu recharge, averaging 3,400 AFY over the 50-year planning horizon.
- Phase 2, Non-irrigation season deliveries: The volume of deliveries was estimated at up to 3,000 acre-feet per month in January and February when flood flows were available from Don Pedro Reservoir, a long-term average of 1,600 AFY. This volumetric capacity of this project was estimated assuming 2 AF per acre and a 50 percent participation rate across the potential area receiving deliveries (below).
- Phase 3, Recruitment of Additional Parcels: The recruitment of additional parcels to increase the recharge capacity of the Project is anticipated in the future, but the implementation schedule

and capacity changes are uncertain. Therefore, this phase has not been evaluated in the modeling analysis.

- Potential area receiving deliveries: All parcels that have historically received replenishment water deliveries (**Table 8-4**).
- Assumed that all replenishment water is diverted from the Tuolumne River and conveyed through the existing TID distribution system. It is anticipated that in-lieu recharge during the irrigation season will have minimal effect on the simulated operations. Deliveries outside of the irrigation season for direct recharge, were limited by water availability and conveyance seepage is assumed to be in the total diversion amount and is included in the recharge.

8.2.3.1.6. Water Source and Reliability

The Project would use water diverted from the Tuolumne River and/or other supplies available to TID. TID has existing water rights on the Tuolumne River. TID also has existing storage and conveyance facilities to reliably deliver replenishment water to participating parcels. Water is expected to be available for this Project in wet and above normal hydrologic years. In approximately half of the years since the construction of New Don Pedro Dam, the Tuolumne River watershed has produced more water than can be stored or beneficially used by existing customers. Up to 6,000 AFY is anticipated to be available and able to be delivered using TID infrastructure; however, at this time, it is assumed that the Project capacity during Phase 1 and 2 will be limited to 4,000 AFY during above normal and wet years. Up to 2,000 AFY of additional water during above normal and wet years may be made available if Project capacity is expanded during Phase 3. Recognizing that water supply availability could be impacted by climate change or regulatory requirements, the project will be implemented using adaptive management.

8.2.3.1.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies.

8.2.3.1.8. Estimated Costs and Funding Plan

Potential costs of this Project may include project coordination and administration, financial incentives to encourage use of replenishment water, purchase of surplus water, field preparation to enhance flooding, and other potential on-field monitoring equipment. Costs per site may vary depending on changes in Project implementation and incentives. The total costs of the Project will likely vary over time, depending on the number of parcels receiving water from year to year and the extent of any applicable project incentives. Additional costs may apply in the case of a FloodMAR-type project related to potential expansion of laterals and delivery systems; these costs are not known at this time and will be developed and reported when known.

Costs of phase 1 are not reported at this time but are expected to be relatively modest. Phase 2 of this Project is currently in the planning stage. Thus, the anticipated costs have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Project proponents in the ETSGSA will identify funding sources to cover Project costs as part of Project development. These may include grants (e.g., Prop 1, Prop 68, NRCS), fees, local cost share, loans, and other assessments.

8.2.3.1.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, in-lieu and direct recharge benefits of this Project are expected to increase water recharge during wetter years, helping to offset the impact of groundwater pumping during drought when surface water supplies are limited.

8.2.3.2. Mustang Creek Flood Control Recharge Project (Project 10)

8.2.3.2.1. Project Description

Flood water from the Mustang Creek watershed is currently held in a primary detention basin that was constructed in 1973 and is located northeast of the intersection of Oakdale Road and East Avenue in Merced County. The primary detention basin has a total flood water impoundment area of approximately 170 acres and a maximum rated flood control capacity of 650 AF. EWD is exploring opportunities to enhance recharge in the primary detention basin by overcoming the near surface low permeability layers and increasing the impoundment water storage.

The Mustang Creek Flood Control Recharge Project (Project) would recharge flood water from the primary detention basin through seven new dry wells within the flood footprint of the primary detention basin. These dry wells would be installed approximately 250 feet apart, varying in depth from approximately 65 feet to 110 feet. Three dry wells were installed recently as part of a pilot project and have a recharge capacity of approximately 1 AF per day per well. The new wells would likely have a similar recharge capacity.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of the Mustang Creek Flood Control Recharge Project.

8.2.3.2.2. Public Notice

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.

8.2.3.2.3. Permitting and Regulatory Process

Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies that may be consulted for this Project include, but are not limited to: DWR, SWRCB, the California Department of Fish and Wildlife (CDFW), the Central Valley Flood Protection Board (Flood Board), RWQCBs, the United States Bureau of Reclamation (Reclamation or USBR), the United States Army Corps of Engineers (USACE), the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), Local Agency Formation Commissions (LAFCO), the County of Stanislaus and/or Merced, and the California Air Resources Board (CARB). Specific permitting and regulatory processes that may potentially affect the construction of project-related infrastructure include, but are not limited to:

- USACE Section 404 Permits (potential exemption under Section 404(f)(1)(C) of Clean Water Act)
- RWQCB Section 401 Water Quality Certification (not required if exempt from USACE Section 404)
- SWRCB Water Rights Petition
- SWRCB Construction General Permit and Storm Water Pollution Prevention Plan (SWPPP)
- State Historic Preservation Office (SHPO) and National Historic Preservation Act (NHPA) Section 106 Coordination
- CEQA Environmental Review Process
- California Endangered Species Act (CESA) Consultation
- Endangered Species Act (ESA) Compliance
- National Environmental Policy Act (NEPA) Compliance (expected to require either an Environmental Impact Report and Negative Declaration or Mitigated Negative Declaration)

8.2.3.2.4. Expected Benefits

Benefits to Sustainability Indicators

This Project would supply direct groundwater recharge to the Subbasin by enhancing infiltration and impoundment of storm water in dry wells. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, and interconnected surface water. All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The majority of communities in the Turlock Subbasin are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin. In addition, maintenance or improvement of groundwater levels may help to protect beneficial groundwater use by rural domestic wells from potential adverse impacts related to chronic groundwater level decline.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the Project was estimated by simulating the Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

On average, the Project is expected to provide approximately 600 AF/yr of benefit to the Turlock Subbasin. These benefits are expected to accrue in years with wet or above normal hydrologic conditions when flood flows occur along Mustang Creek.

Evaluation of benefits will be based on analysis of without-project and with-project measurements supported by modeling as needed. Measured parameters will include surface water deliveries, groundwater levels, and other parameters to be determined.

8.2.3.2.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

The Project would be implemented by EWD in partnership with Stanislaus County. Other potential project partners would be determined during later project development and implementation, as applicable.

Seven new Dry Wells are scheduled to be installed in 2024. Additional details will be provided in Annual Reports when known.

Implementation Assumptions for Modeling

The Project has been modeled in the C2VSimTM model and will be modeled in the GRAT. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

- Estimated volume of recharge: volumetric supply of recharge water was estimated based on the water year index, distributed on a monthly-timestep based on local precipitation.

	Wet	Above Normal	Below Normal	Dry	Critical	Average
Mustang Creek	980	600	495	325	265	583

- Area receiving recharge: recharge is anticipated to occur at the project location as described above.

8.2.3.2.6. Water Source and Reliability

This Project would enhance recharge of flood water in the Mustang Creek watershed and could also capture and recharge agricultural return flows. Flood water is available for this Project during flood events, typically in wet and above normal hydrologic years, and agricultural return flows are available seasonally during the irrigation season. The precise reliability and return period of available water would be refined during future project development and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.

8.2.3.2.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies, following the applicable permitting and regulatory processes described above.

8.2.3.2.8. Estimated Costs and Funding Plan

There are seven new Dry Wells scheduled to be installed on the property after the completion of the current pilot monitoring studies. Each well has an estimated cost of $50,000 for a total project cost of $350,000.

EWD will be working to identify funding sources to cover project costs as part of continued project development. These may include grants (e.g., Prop 1, Prop 68, NRCS), fees, local cost share, loans, and other assessments.

8.2.3.2.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, direct recharge benefits of this Project are expected to increase the recharge of available surface water supplies during wetter years.

8.2.3.3. Upland Pipeline Project (Project 11)

8.2.3.3.1. Project Description

The Upland Pipeline Project (Project) will install a new piped conveyance system to supply water to EWD from Merced Irrigation District (Merced ID). Water would be diverted from the Merced ID Northside Canal to a stock pond on lands adjoining the Northside Canal at Keyes Road just east of Fields Road. From that point water would flow down the southernmost branch of Dry Creek, providing ambient recharge in the streambed (expected to be 9 cubic feet per second, prior to enhancement). The Project involves constructing a new upland pipeline intake off Dry Creek and into a portion of the Mustang Creek watershed. This movement of the supplied water from Merced ID then enables diverting water for:

- in-lieu recharge via surface water deliveries to irrigated parcels from the pipeline intake off Dry Creek to the Mustang Creek primary floodwater detention basin constructed by the USDA Soil Conservation Service and operated by EWD,
- direct recharge in dry wells constructed in the primary floodwater detention basin, and
- direct recharge at a secondary detention basin along Mustang Creek by the Turlock Municipal Airport, designed and constructed by the U.S. Army Corps of Engineers with controlled inflow and outflow.

Fundamentally, this Project allows for the conveyance of surface water from Merced ID to either:

- ambient recharge via the Dry Creek streambed,
- the direct-recharge in existing Mustang Creek detention basin and off-stream sumps and/or,
- in-lieu recharge along the Upland Pipeline alignment from Dry Creek to the primary detention basin on Mustang Creek.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of the Upland Pipeline Project.

8.2.3.3.2. Public Notice

The public and other agencies will be notified of the planned or ongoing implementation of PMA activities through the outreach and communication channels identified in the GSP, during the preparation process of the PEIR, and during updates presented at regularly scheduled GSA meetings. Noticing will occur as potential activities are being considered for implementation, and as ongoing and planned activities are implemented. Noticing will inform the public and other agencies that the proponent is considering or will be implementing the PMA and will provide a description of the actions that will be taken.

Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.

8.2.3.3.3. Permitting and Regulatory Process

Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies that may be consulted for this Project include, but are not limited to: DWR, SWRCB, CDFW, the Flood Board, RWQCBs, USBR, USACE, USFWS, NMFS, LAFCO, the County of Stanislaus and/or Merced, and CARB. Specific permitting and regulatory processes that may potentially affect the construction of project-related infrastructure include, but are not limited to:

- USACE Section 404 Permits (potential exemption under Section 404(f)(1)(C) of Clean Water Act)
- RWQCB Section 401 Water Quality Certification (not required if exempt from USACE Section 404)
- SWRCB Water Rights Petition as required
- SWRCB Construction General Permit and Storm Water Pollution Prevention Plan (SWPPP)
- State Historic Preservation Office (SHPO) and National Historic Preservation Act (NHPA) Section 106 Coordination
- CEQA Environmental Review Process
- California Endangered Species Act (CESA) Consultation
- Endangered Species Act (ESA) Compliance
- National Environmental Policy Act (NEPA) Compliance (expected to require either an Environmental Impact Report and Negative Declaration or Mitigated Negative Declaration)

8.2.3.3.4. Expected Benefits

Benefits to Sustainability Indicators

This Project would supply direct and in-lieu groundwater recharge to the Subbasin by importing additional surface water from Merced ID for irrigation and recharge. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, interconnected surface water, and land subsidence (depending on where recharge occurs). All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The majority of communities in the Turlock Subbasin are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin. In addition, maintenance or improvement of groundwater levels may help to protect beneficial groundwater use by rural domestic wells from potential adverse impacts related to chronic groundwater level decline.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield of the Project was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**: Plan for Achieving Sustainability.

The Project is expected to provide up to 1,770 AF/yr of Merced River water for direct recharge during non-irrigation season in wet and above normal years. Additional water can potentially be available depending on the water availability from the Merced River and Merced Irrigation District.

Evaluation of benefits will be based on analysis of the Project water supplies using the C2VSimTM model.

8.2.3.3.5. Implementation Criteria, Status, and Strategy

Implementation Strategy and Timeline

The Project would be implemented by EWD in partnership with Merced ID. This Project has gone through the preliminary planning and design stage, and EWD is currently seeking bids for construction. The precise start and completion dates for this Project have yet to be determined but will be provided in Annual Reports when known. The current estimated schedule of activities over 2-3 years is:

- Year 1 – Acquiring easements from landowners and necessary permitting
- Year 2 – Construction
- Year 3 – Operational with existing water supply available from Merced ID

Implementation Assumptions for Modeling

The Project has been modeled in the C2VSimTM model and will be modeled in the GRAT to optimize water distribution. Additional information about project-related modeling is described in **Section 8.5**: Plan for Achieving Sustainability.

- Estimated volume of recharge: volumetric supply of recharge water was estimated based on the water year index, distributed on a monthly-timestep based on local precipitation.

	Wet	Above Normal	Below Normal	Dry	Critical	Average
Upland Pipeline Project	1,770	1,770	900	400	400	1,098

- Area receiving recharge: recharge is anticipated to occur at the project location as described above.

8.2.3.3.6. Water Source and Reliability

This Project would utilize Merced River water purchased from the Merced I, as may be made available. Water would potentially be available for this Project seasonally during the irrigation season. The precise reliability and return period of available water would be refined during future project development.

Note from Merced ID: Local project sponsor, Eastside Water District, anticipates that surface water sourced from the Merced ID may be available through water purchase and sale agreements and may serve as a water supply for the project(s). It is understood that the Board of Directors for the Merced ID has and shall retain full and absolute discretion regarding whether and when it will enter into water purchase and sale agreement(s), if any, and further, nothing contained in this document creates in any party or parties any right to water controlled by the Merced ID, whether it be surface or groundwater. Any transfer made available by Merced ID shall be limited by the terms and conditions contained in any respective water purchase and sale agreement.

8.2.3.3.7. Legal Authority

GSAs, Districts, and individual project proponents have the authority to plan and implement projects through consultation with applicable governing agencies.

8.2.3.3.8. Estimated Costs and Funding Plan

This Project has completed the preliminary planning and design stage, and EWD is currently seeking bids for construction. A $2.5 million construction proposal has been made at the time of GSP development. The precise costs of this Project have yet to be determined but will be refined through additional project development. Updated costs will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. It is anticipated that EWD would identify funding sources to cover Project costs as part of Project development. These may include grants (e.g., Prop 1, Prop 68, NRCS), fees, local cost share, loans, and other assessments.

8.2.3.3.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, direct recharge and in-lieu recharge benefits of this Project are expected to increase the use and recharge of available surface water supplies during wetter years, helping to offset groundwater pumping.

8.3. OTHER PROJECTS TO BE IMPLEMENTED AS NEEDED (GROUP 3)

This section describes potential Projects that would be implemented where determined to be necessary to decrease the need for pumping reduction or address future conditions in the Turlock Subbasin. These Projects include all Group 3 Projects identified in **Table 8-2**Error! Reference source not found. that have been identified and may occur in the Turlock Subbasin in the future. While these Projects would also contribute to attainment of the sustainability goal and support GSP implementation, these Projects are at the conceptual or early planning stage at this time, with no specific implementation timeline established.

To the extent that future monitoring indicates the occurrence of undesirable results in the Subbasin, additional Projects will be implemented to address these changing conditions. Each GSA will develop processes and procedures as needed to identify and progress projects through the feasibility study phase, through planning and front-end engineering design, and to permitting, procurement of entitlements, and construction. As additional project development occurs for the projects included in **Table 8-5** or other projects identified in the future, updates will be documented and reported in subsequent GSP Annual Reports and Five-Year Assessment Reports. **Table 8-5** lists the potential Projects described in the subsections that follow, organized by both the GSA and the proponent.

Summary of Criteria for Project Implementation (23 CCR §354.44(b)(1)(A))

As described above, the Projects described in this section are either in the early planning stage or in the concept development stage. These potential Projects could be implemented, as needed, to achieve and maintain long-term sustainable groundwater management. The potential for implementing Projects would also be evaluated alongside potential Management Actions if, based on data gathered during GSP implementation, the GSAs find that established IMs and MOs cannot be maintained and/or if MTs are being approached. This adaptive approach of executing PMAs will be informed by monitoring groundwater conditions using the monitoring network and methods described in the GSP. This initial list of Projects will likely be supplemented with additional projects as they are identified and would be described and reported through Annual Reports and Five-Year Assessment Reports of the GSP.

Table 8-5: List of Other Projects to be Implemented as Needed in the Turlock Subbasin

Location (Proponent)	#	Project Name	Primary Mechanism(s)[1]
WTSGSA Urban and Municipal (City of Modesto)	12	San Joaquin River Flood Diversions	Direct or In-Lieu Groundwater Recharge
West Turlock Subbasin GSA (Turlock Irrigation District) – Agriculture	13	La Grange Recharge Project (Within TID Irrigation Service Area)	Direct Groundwater Recharge
	14	TID Lateral 5 1/2 Regulating Reservoir	In-Lieu Groundwater Recharge
	15	Additional TID Regulating Reservoirs	Direct or In-Lieu Groundwater Recharge
	16	Recharge from TID Conveyance System	Direct Groundwater Recharge
	17	Intertie Projects	In-Lieu Groundwater Recharge
East Turlock Subbasin GSA (Eastside Water District) - Agriculture	18	Rouse Lake Pipeline Project	Direct or In-Lieu Groundwater Recharge
	19	Sand Creek Runoff Recharge	Direct Groundwater Recharge
	20	Conveyance Improvements Project	Direct or In-Lieu Groundwater Recharge
	21	Development of Diffused Stormwater Project	Direct or In-Lieu Groundwater Recharge
	22	Dry Creek Watershed Recharge	Direct Groundwater Recharge
	23	Direct Recharge in Agricultural Areas	Direct Groundwater Recharge

[1]The primary mechanism of the Project as conceptualized, although during implementation Projects may be used for multiple functions to support groundwater sustainability and multiple other benefits.

8.3.1. Group 3 Urban and Municipal Proponents (WTSGSA)

Other potential Projects that would be implemented by urban and municipal proponents, as needed, are summarized below.

8.3.1.1. San Joaquin River Flood Diversions (Project 12)

This Project is proposed by the City of Modesto and would divert flood water from the San Joaquin River into storage ponds for use in the Turlock Subbasin. The City of Modesto has storage ponds located at 7001 Jennings Road, Modesto, CA, that hold up to 7,830 AF of water. These ponds have been underutilized since the City of Modesto moved to tertiary treatment of the wastewater and began selling the recycled wastewater to the Del Puerto Water District. It is expected that these storage ponds are partially available to capture and store urban storm water and flood flows from the San Joaquin River, although the exact amount of storage available and period of availability has yet to be determined. The current project is focused on analyzing flood flows from the San Joaquin River but could be expanded to include to storage and use of urban storm water. The occurrence and volume of flows available for diversion into the ponds would also need to be determined. This Project is currently in the early conceptual stage. The precise reliability of available water would be identified if/when the Project is evaluated and selected for implementation. This information will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.

Water stored in the ponds could be used to irrigate 2,530 acres of ranch owned by the City of Modesto. The majority of the infrastructure necessary to store and deliver water to the ranch land already exists (including the storage ponds, pipes, pumps, a reservoir, and valves for conveyance). The remaining infrastructure that would need to be constructed is a conduit to divert water from the San Joaquin River into the storage ponds. The ponds are in close proximity to the San Joaquin River, less than 600 feet away from some reaches. This Project would complete an on-site evaluation of the existing outfall and old pumps used for pumping irrigation water from the river, along with consideration of possible alternate methods.

A summary of the Projects is provided in **Table 8-6**.

Table 8-6: San Joaquin River Flood Diversions: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	This Project would divert flood water from the San Joaquin River into storage ponds for direct and in-lieu recharge in the Turlock Subbasin. The Project would utilize storage ponds owned by the City of Modesto, as well as other available infrastructure for conveying flood flows to irrigated ranch land. This Project would require construction or rehabilitation of infrastructure to convey flood water from the San Joaquin River to the ponds. This Project is proposed for implementation by the City of Modesto. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in wet and above normal hydrologic years when flood water is available for use, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would use available flood water from the San Joaquin River. This Project is currently in the early conceptual stage. The precise reliability of available water would be identified if/when the Project is evaluated and selected for implementation. This information will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.

Item in GSP Regulations	Description
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project may be evaluated as part of a scenario and the C2VSimTM would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.2. WTSGSA – Group 3 Agricultural Water Supply Projects

Other potential Projects that would be implemented in the WTSGSA, as needed, are summarized below.

8.3.2.1. La Grange Recharge Project (Within TID Irrigation Service Area) (Project 13)

This Project would develop recharge opportunities in the La Grange area, upstream of Turlock Lake and within TID's existing irrigation service area. Recharge opportunities would focus on areas where the recharge potential is found to be high. On-farm flood irrigation in excess of crop water requirements would likely be done to purposefully recharge the aquifer.

A summary of the Project is provided in **Table 8-7**.

Table 8-7: La Grange Recharge Project (Within TID Irrigation Service Area): Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	The La Grange recharge project (within the TID irrigation service area) would develop recharge opportunities in the La Grange area, upstream of Turlock Lake and within TID's existing irrigation service area. Recharge opportunities would focus on areas where the recharge potential is found to be high. This Project is proposed for implementation by TID. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in wet and above normal hydrologic years when sufficient water is available for on-farm recharge, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would use water diverted by TID using existing water rights on the Tuolumne River. Surface water is expected to be available for this Project in wet and above normal hydrologic years. In approximately half of the years since the construction of New Don Pedro Dam, the Tuolumne River watershed has produced more water than can be stored, beneficially used by existing customers. This Project is currently in the early conceptual stage. Recognizing that water supply availability could be impacted by climate change or regulatory requirements, the Project will be implemented using adaptive management. The precise reliability of available water would be identified and reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes,	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will

Item in GSP Regulations	Description
and regulatory control (§354.44(b)(3); §354.44(b)(7))	be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County of Stanislaus, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Expected yield of the project will be determined as the project is further developed.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.2.2. TID Lateral 5 1/2 Regulating Reservoir (Project 14)

This Project would construct a new regulating reservoir on Lateral 5 1/2, with 140 AF of operating capacity. Water would be pumped to the reservoir from Harding Drain and would be pumped out to Lateral 5 1/2. The reservoir may be operated to reduce spillage and to supply deliveries and alleviate capacity constraints along Lateral 5 1/2, enhancing delivery service especially to customers along the lower reaches of Lateral 5 1/2. The reservoir may also help to reduce pumping along Lateral 5 1/2 that has historically occurred to compensate for limited surface water supplies stemming from capacity constraints. This Project may also benefit water quality, to the extent that surface water deliveries offset groundwater pumping requirements. The surface water supply for TID originates as snowmelt from the Sierra Nevada Mountains and is of very high quality with lower TDS relative to groundwater.

The reservoir would be designed to minimize excavation and off-haul of dirt over the Project area and would be constructed in close proximity to the City of Turlock's recycled water pipeline. TID would consider adding a connection to route 2,000 AF/yr of recycled water from the City of Turlock (uses same recycled water described in Project 7, described earlier in **Section 8.2.2.2**) into the Lateral 5 1/2 reservoir, providing additional water supplies to customers along Lateral 5 1/2.

As a secondary benefit of the reservoir, and pending the final design, in addition to site specific hydrogeology, the reservoir may also be able to be used to store storm water during the non-irrigation season for direct or in-lieu groundwater recharge purposes. The frequency and magnitude of storm water retention would require further analysis.

A summary of the Project is provided in **Table 8-8**.

Table 8-8: TID Lateral 5 ½ Regulating Reservoir: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	This Project would construct a new regulating reservoir on Lateral 5 1/2 with 140 AF of operating capacity. The reservoir would be operated to capture spillage, alleviate capacity constraints on Lateral 5 1/2, improve delivery service to customers, and potentially reduce groundwater pumping requirements along Lateral 5 1/2. The reservoir may also be constructed with a connection to the City of Turlock's recycled water pipeline to provide additional water supplies to customers along Lateral 5 1/2. This Project is proposed for implementation by TID. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. If sustainable levels are not reached following implementation of other PMAs, this project may be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue throughout the irrigation season in all years following construction. The precise benefits will vary between years as the volume of surface water supplies and deliveries varies with water availability, hydrologic conditions, and irrigation demand.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would primarily help to manage and enhance deliveries of surface water diverted from the Tuolumne River. TID has existing water rights on the Tuolumne River. The proposed reservoir may also store recycled water available from the City of Turlock. Municipal water supply and demand are considered to be reliable in all years. This Project is currently in the early conceptual stage. The precise reliability of water would be identified and reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes,	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable

Item in GSP Regulations	Description
and regulatory control (§354.44(b)(3); §354.44(b)(7))	governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County of Stanislaus, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project may be evaluated as part of a scenario and the C2VSimTM would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.2.3. Additional TID Regulating Reservoirs (Project 15)

This Project would construct new regulating reservoirs in the TID conveyance system to better manage mismatches in supply and demand, improve customer response time, and decrease existing groundwater pumping downstream of the reservoirs. As a secondary benefit of the reservoirs and pending the final design of each reservoir in addition to site specific hydrogeology, the reservoirs may also be able to be used to store storm water during the non-irrigation season for direct or in-lieu groundwater recharge purposes. The frequency and magnitude of storm water retention would require further analysis.

A summary of the Project is provided in **Table 8-9**.

Table 8-9: Additional TID Regulating Reservoirs: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	This Project would construct new regulating reservoirs in the TID conveyance system, primarily to improve system operation and enhance surface water deliveries. The reservoirs would help to better manage mismatches in supply and demand, improve customer response time, and decrease existing groundwater pumping downstream of the reservoirs. Pending further analysis, the reservoirs may also be used to store storm water during the non-irrigation season for direct or in-lieu groundwater recharge purposes. This Project is proposed for implementation by TID. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. If sustainable levels are not reached following implementation of other PMAs, this Project may be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits of improved system operation and enhanced surface water deliveries are expected to accrue throughout the irrigation season in all years following construction. Potential benefits of storm flow capture are also expected to accrue in wet and above normal hydrologic years when storm flows occur. The precise benefits will vary between years as the volume of surface water supplies and deliveries varies with water availability, hydrologic conditions, and irrigation demand.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would primarily help to manage and enhance deliveries of surface water diverted from the Tuolumne River. TID has existing water rights on the Tuolumne River. This Project is currently in the early conceptual stage. The precise reliability of water would be identified and reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes,	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will

Item in GSP Regulations	Description
and regulatory control (§354.44(b)(3); §354.44(b)(7))	be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project may be evaluated as part of a scenario and the C2VSimTM would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.2.4. Recharge from TID Conveyance System (Project 16)

This Project would develop new recharge opportunities downstream of Turlock Lake where the recharge potential is found to be high. This Project is envisioned to occur in areas downstream of Turlock Lake, potentially within or outside the existing TID irrigation service area that can be served by existing TID facilities.

As one potential option, water could be diverted into existing open channels in the eastern portion of TID to facilitate direct recharge during the non-irrigation season. Subsequent analysis is necessary as project development continues to identify potential infiltration rates and to identify additional recharge opportunities (recharge basins, aquifer storage and recovery (ASR), dry wells, expansion of on-farm recharge, etc.).

A summary of the Project is provided in **Table 8-10**.

Table 8-10: Recharge from TID Conveyance System: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	This Project would develop new recharge opportunities downstream of Turlock Lake in areas that can be served by existing TID facilities, potentially within or outside the existing TID irrigation service area. Recharge opportunities would focus on areas where the recharge potential is found to be high. This Project is proposed for implementation by TID. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. If sustainable levels are not reached following implementation of other PMAs, this project may be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue primarily in wet and above normal hydrologic years when sufficient water is available to facilitate direct recharge, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would use water diverted by TID using existing water rights on the Tuolumne River. Surface water is expected to be available for this Project in wet and above normal hydrologic years. In approximately half of the years since the construction of New Don Pedro Dam, the Tuolumne River watershed has produced more water than can be stored or beneficially used by existing customers. Recognizing that water supply availability could be impacted by climate change or regulatory requirements, the Project will be implemented using adaptive management. This Project is currently in the early conceptual stage. The precise reliability of available water would be identified and reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes,	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable

Item in GSP Regulations	Description
and regulatory control (§354.44(b)(3); §354.44(b)(7))	governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project may be evaluated as part of a scenario and the C2VSimTM would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.2.5. Intertie Projects (Project 17)

Intertie projects (Project) are proposed to connect various canal segments in the TID conveyance system, particularly from canals with sufficient capacity to other canal segments downstream of capacity constraints that otherwise limit surface water deliveries. Interties would benefit the Subbasin by potentially reducing the need for groundwater pumping along capacity-constrained canals, resulting in in-lieu recharge benefits and improved water quality. Intertie projects may also be coupled with future regulating reservoirs (Project 15), when appropriate, to further improve operational flexibility and expand water conservation and in-lieu recharge opportunities. This Project is currently conceptual in nature and would require further development and analysis to identify specific intertie projects of interest. Additional information on specific Intertie projects would be included in GSP Annual Reports and Five-Year Assessment Reports as information becomes available.

A summary of the Project is provided in **Table 8-11**.

Table 8-11: Intertie Projects: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	This Project would identify and construct interties to connect various canal segments in the TID conveyance system, particularly between canals with sufficient capacity and other canal segments downstream of capacity constraints that otherwise limit surface water deliveries. This Project is proposed for implementation by TID. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. If sustainable levels are not reached following implementation of other PMAs, this project may be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits of improved system operation and enhanced surface water deliveries are expected to accrue throughout the irrigation season in all years following construction. The precise benefits will vary between years as the volume of surface water supplies and deliveries varies with water availability, hydrologic conditions, and irrigation demand.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would primarily help to manage and enhance deliveries of surface water diverted from the Tuolumne River. TID has existing water rights on the Tuolumne River. However, this Project will not directly use additional surface water supplies.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.

Item in GSP Regulations	Description
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project may be evaluated as part of a scenario and the C2VSimTM would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.3. ETSGSA – Group 3 Agricultural Water Supply Projects

Other potential Projects that would be implemented in the ETSGSA, as needed, are summarized below.

8.3.3.1. Rouse Lake Pipeline Project (Project 18)

The Rouse Lake Pipeline Project would install a new piped conveyance system that connects through the area of Rouse Lake into other portions of the ETSGSA. The pipe would extend into the Rouse Lake and Mustang Creek watersheds. Water could be taken directly onto irrigated parcels adjoining the Rouse Lake Pipeline to develop in-lieu recharge during the irrigation season as well as to direct recharge water in the off-season to facilities such as drywells and possibly Ag-ASR wells. In addition, water could be conveyed into the watercourse of Mustang Creek with the principal goal of direct recharge using drywells constructed in those watersheds for Mustang Creek Flood Control Recharge Project (Project 10). A subsequent phase of this Project that conveys water to the west would enable in-lieu recharge and direct recharge to adjoining parcels and into the Sand Creek watercourse where drywells or other direct surface water recharge enhancements might be constructed as part of Sand Creek Watershed Runoff Recharge (Project 19).

A summary of the Project is provided in **Table 8-12**.

Table 8-12: Rouse Lake Pipeline Project: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	The Rouse Lake Pipeline Project would install a new piped conveyance system around Rouse Lake, and into the Sand Creek and Mustang Creek watersheds with the goal of conveying flood and/or surface water from Rouse Lake for direct and in-lieu recharge. This Project is proposed for implementation by EWD. The Project would be monitored and quantified with respect to groundwater conditions, as needed. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in wet and above normal hydrologic years when flood water and/or sufficient surface water is available for use, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would use available flood and/or surface water from Rouse Lake. This Project is currently in the conceptual stage. The precise reliability of available water would be identified if/when the project is evaluated and selected for implementation. This information will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.

Item in GSP Regulations	Description
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. C2VSimTM or another suitable assessment tool would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.3.2. Sand Creek Watershed Runoff Recharge (Project 19)

This Project would capture available storm water runoff from the Sand Creek watershed for direct recharge. Recharge could be done directly in the Sand Creek channel or by other means on land adjacent to the creek. This is a conceptual project, and a feasibility analysis is the next step.

A summary of the Project is provided in **Table 8-13**.

Table 8-13: Sand Creek Watershed Runoff Recharge: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	The Sand Creek Watershed Runoff Recharge project would capture available storm water runoff from the Sand Creek watershed for direct recharge. This Project is proposed for implementation by EWD. The Project will be implemented, and would be monitored, and quantified with respect to groundwater conditions, as needed. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status	This Project is currently in the conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in wet and above normal hydrologic

Item in GSP Regulations	Description
(§354.44(b)(4))	years when runoff is available for use, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would use available runoff from the Sand Creek watershed. This Project is currently in the conceptual stage. The precise reliability of available water would be identified if/when the Project is evaluated and selected for implementation. Those will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. C2VSimTM or another suitable assessment tool would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.3.3. Conveyance Improvements Project (Project 20)

In the Conveyance Improvements Project (Project), Merced ID and other conveyance and delivery infrastructure would be improved and/or constructed to serve areas within the ETSGSA. This Project would increase the capacity and/or construct conveyance facilities for delivering excess flows, particularly during flood flow events, and otherwise within the Merced ID water rights purview. The Project would also support direct and in-lieu recharge in EWD. This Project is currently being analyzed by the responsible agencies and will be further developed over time.

A summary of the Project is provided in **Table 8-14**.

Table 8-14: Conveyance Improvements Project: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	The Conveyance Improvements Project would improve and construct conveyance and delivery infrastructure to serve areas within the ETSGSA. This Project would increase the capacity and/or construct conveyance facilities for delivering excess flows, particularly during flood flow events. The Project would also support direct and in-lieu recharge in ETSGSA. This Project is proposed for implementation by EWD, through potential partnership with Merced ID. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early planning stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in wet and above normal hydrologic years when excess flows are available for use, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would use excess flows, particularly flood flows, in the Merced ID conveyance system. This Project is currently in the early planning stage. The precise reliability of available water would be identified if/when the Project is evaluated and selected for implementation. Those will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.

Item in GSP Regulations	Description
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early planning stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. C2VSimTM or another suitable analysis tool would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early planning stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.3.4. Development of Diffused Stormwater Project (Project 21)

This Project would support the development of direct recharge, in-lieu recharge, and flood managed aquifer recharge (FloodMAR) activities in locations in the ETSGSA where storm flows are available, or where existing surface water facilities can be utilized to direct and control surface water for various beneficial uses. Components of this Project would be developed privately or as coordinated district efforts. Necessary infrastructure would be installed to connect existing delivery systems to newly developed direct recharge, in-lieu recharge, and FloodMAR activities. This is a conceptual project and has not benefited from a feasibility analysis or any subsequent design.

A summary of the Project is provided in **Table 8-15**.

Table 8-15: Development of Diffused Stormwater Project: Summary (23 CCR §354.44(b)).

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	This Project would support the development of direct recharge, in-lieu recharge, and flood managed aquifer recharge (FloodMAR) activities in locations in and surrounding EWD where storm water flows are available, or where existing surface water facilities can be utilized to direct and control surface water for various beneficial uses. This Project is proposed for implementation by ETSGSA, through potential partnerships with other districts. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in wet and above normal hydrologic years when storm flows or other excess flows are available for use, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project is currently in the early conceptual stage. The precise source and reliability of storm flows or other excess flows would be identified if/when the Project is evaluated and selected for implementation. Those will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.

Item in GSP Regulations	Description
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. C2VSimTM or another suitable tool would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.3.5. Dry Creek Watershed Recharge (Project 22)

This Project would develop recharge opportunities and capabilities along Dry Creek in areas where there is favorable recharge potential. The Project would capture runoff from the Dry Creek watershed. Recharge could be done directly in the Dry Creek channel or by other means on land adjacent to the creek. This is a conceptual project and has not benefited from a feasibility analysis or any subsequent design.

A summary of the Project is provided in **Table 8-16**.

Table 8-16: Dry Creek Watershed Recharge: Summary (23 CCR §354.44(b)).

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	This Project would develop recharge opportunities and capabilities along Dry Creek in areas where there is favorable recharge potential. This Project is proposed for implementation by EWD. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status (§354.44(b)(4))	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Benefits are expected to accrue in wet and above normal hydrologic years when runoff is available for use, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project would use available runoff from the Dry Creek watershed. This Project is currently in the early conceptual stage. The precise reliability of available water would be identified if/when the Project is evaluated and selected for implementation. Those will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and/or Merced, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP

Item in GSP Regulations	Description
	Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. C2VSimTM or another suitable assessment tool would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.3.3.6. Direct Recharge in Agriculture Areas (Project 23)

The Direct Recharge in Agriculture Areas project (Project) would develop recharge capabilities on land within the ETSGSA in areas where there is good recharge potential, sufficient storage capacity in the aquifer, and to which water can be conveyed from the La Grange area for underground storage. This is a preliminary conceptual project, and a feasibility analysis will need to be developed.

A summary of the Project is provided in **Table 8-17**.

Table 8-17: Direct Recharge in Agriculture Areas: Summary (23 CCR §354.44(b))

Item in GSP Regulations	Description
Implementation Strategy and Criteria (§354.44(b)(1)(A); §354.44(b)(6))	The Direct Recharge in Agriculture Areas project would develop recharge facilities on agricultural land where there is good recharge potential and adequate underground storage capacity. Existing water conveyance facilities may be used such as canals and outlet gates; however, new conveyance and recharge infrastructure is envisioned in the project concepts. This Project is proposed for implementation by ETSGSA. The Project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed. This will be done in the context of SMC to ensure sustainable operation of the Turlock Subbasin.
Timeline and Implementation Status	This Project is currently in the early conceptual stage. Thus, the start and completion dates for this Project have yet to be determined and will be provided in GSP Annual Reports and Five-Year Assessment Reports when

Item in GSP Regulations	Description
(§354.44(b)(4))	known. Benefits are expected to accrue in wet and above normal hydrologic years when runoff is available for use, potentially beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.
Water source & reliability (§354.44(b)(6))	This Project is currently in the early conceptual stage. The precise reliability of available water would be identified if/when the Project is evaluated and selected for implementation. Those will be reported in GSP Annual Reports and Five-Year Assessment Reports when known.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County(ies) of Stanislaus and Merced, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage. There may be a benefit to the sustainability indicator for, and depletion of interconnected surface water. This Project is currently in the early conceptual stage. Thus, the expected yield of this Project has yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. C2VSimTM or another suitable assessment tool would be used to assess the benefits and impacts on the Subbasin sustainability.
Costs (§354.44(b)(8))	This Project is currently in the early conceptual stage. Thus, the anticipated costs of this Project have yet to be determined and will be reported in GSP Annual Reports and Five-Year Assessment Reports when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

8.4. MANAGEMENT ACTIONS

This Section identifies and describes proposed Management Actions that may be undertaken by the Turlock Subbasin GSAs as an element of GSP implementation. Management Actions generally refer to non-structural programs or policies designed to incentivize actions and strategies to support the sustainability of the groundwater Subbasin, including reductions in groundwater pumping and optimization of groundwater use in the Subbasin. This includes required actions as well as incentivization of voluntary actions.

Table 8-18 shows a list of the seven Management Actions organized into three categories:

1. Demand Reduction Strategies (**Section 8.4.1**)
2. Pumping Management Framework (**Section 8.4.2**)
3. Domestic Well Mitigation Program (**Section 8.4.3**)

Demand Reduction Strategies are a broad and strategic set of actions intended to reduce water demand, some of which may be incentivized by State programs or policies, or by Management Actions in the Pumping Management Framework. The Pumping Management Framework provides a suite of administrative procedures, programs, and policies that describe how the GSAs plan to manage and monitor groundwater extractions.

As described in **Section 6.3.1,** the Subbasin has experienced overdraft conditions. Per § 354.44(b)(2), the GSP must describe Projects or Management Actions, including a quantification of demand reduction or other methods, for mitigation of overdraft. Several Projects identified earlier in this Chapter would increase the available water in the Subbasin through increased recharge or use of alternate supplies, but they are not expected to reduce the groundwater deficit sufficiently to achieve the Subbasin's sustainability goal. Additional projects (identified as Group 3 projects) will be implemented to further decrease this deficit, but Management Actions are expected to be necessary to mitigate overdraft and achieve the sustainability goal. A modeling analysis to assess the effectiveness of the current Group 1 and Group 2 projects (**Section 8.5**) and the need for additional demand reduction indicates up to an additional 25% reduction in net groundwater use may be required after these projects are implemented.

It is understood that the projections of future groundwater conditions using the C2VSimTM model are based on the current understanding of the Subbasin, which can be further refined as more information becomes available. The 50-year projection of groundwater conditions using C2VSimTM is based on assumptions that has uncertainties in hydrologic and climatic conditions, agricultural crop mix and patterns, irrigation practices, population growth patterns and urban development trends, land use plans, and environmental regulations. However, the C2VSimTM is currently the best available analysis tool to assist in evaluation of project benefits and impacts, not in an absolute sense, but in a relative scale. The use of C2VSimTM is intended to compare benefits and impacts of a group of projects relative to a "No-Project" or "No-Action" Baseline condition. The results of this analysis are then compared to MTs to estimate the approximate amount of additional net demand reduction that will be needed to meet the sustainability goal of the Subbasin. This gap in net demand reduction can be met through the implementation of additional projects or through management actions to promote water conservation or require pumping reduction.

The C2VSimTM model is therefore used for assessment of the scenarios which include Group 1 and 2 projects, as well as the remaining gap which is currently assumed to be met by demand reduction after implementation of these projects. Group 3 projects and voluntary demand reduction management actions are not assessed using the model due to significant uncertainties in the scale and definition of these projects and actions. The extent and effectiveness of the Group 3 projects that will be implemented in the future, and of the water conservation management actions described in **Section 8.4.1** is not yet known. Modeling analyses were performed with a number of scenarios to assess options to evaluate the potential need for demand reduction within the Subbasin. Given the modelled projections of the benefits of project Groups 1 and 2, a 25% net demand reduction gap in the ETSGSA is estimated on a preliminary basis and used for planning purposes to meet the sustainability goals of the Subbasin and address the key sustainability indicators. As discussed previously, this modeling analysis is subject to inherent uncertainties and may be refined as more reliable information and data become available. In addition, it is anticipated that when Group 3 projects and demand reduction Management Actions are developed at a level to be evaluated and implemented, the scale of the net demand reduction that remains to be met will be reduced. The GSAs therefore intend to implement demand reduction using the adaptive management approach as discussed in **Section 8.4.2**.

This section describes potential Management Actions that could be implemented in the Subbasin. While the tools described in this section will be available for implementation at the Subbasin level, implementation will be determined based upon need within each GSA separately, and in a coordinated manner to ensure that the Subbasin sustainability goals are achieved within the scheduled timeframe. PMAs implemented in one GSA represent that GSA's contributions to Subbasin sustainability and, as such, it is anticipated that each GSA will implement PMAs in proportion to its need to address overdraft and comply with SMC within its jurisdiction.

A range of Management Actions is presented to allow the GSAs flexibility in their response to changing groundwater conditions and as data gaps and uncertainties are addressed during GSP implementation. However, it is anticipated that not all Management Actions will need to be implemented, or that individual Management Actions may be implemented by one GSA but not by the other. In addition, implementation of Management Actions will be based on adaptive management strategies informed by ongoing monitoring of groundwater conditions using the monitoring network and methods described in the GSP. A key component of this strategy is a Management Action for pumping reduction, which will be implemented by each GSA as necessary to mitigate overdraft or other issues effecting the ability to meet sustainability goals. Monitoring data will be used to assess the need for PMAs in the Subbasin as a whole, in the individual GSAs, and at particular locations. This will occur incrementally as monitoring data become available, the effectiveness of prior PMAs is established, and knowledge of the Subbasin improves over time. The advent or threat of undesirable results and the performance or failure of the Subbasin to meet IMs or MOs will serve as triggers for scaling and implementing both PMAs in a targeted and proportional manner, consistent with conditions observed in the Subbasin. At this time, it is anticipated that the Demand Reduction Strategies Management Actions will need to be implemented in the ETSGSA; however, future changes in supplies or conditions may necessitate additional projects or programs in the WTSGSA to ensure sustainability goals are met. Thus, tools need to be available basin wide, with the ability to implement them adaptively as needed. Current plans for implementation of Management Actions within each GSA are described in this Section and will be updated within Annual Reports and Five-Year Assessment Reports of the GSP.

Table 8-18 lists the Management Actions described in the subsections that follow. Each Management Action description is organized to address the applicable regulatory requirements:

- **Management Action Description:** 23 CCR §354.44(b)
- **Public Notice:** 23 CCR §354.44(b)(1)(B)

  Permitting and Regulatory Process: 23 CCR §354.44(b)(3)

- **Expected Benefits:** 23 CCR §354.44(b)(4), §354.44(b)(5)
- **Implementation Criteria, Status, and Plan:** 23 CCR §354.44(b)(1)(A); §354.44(b)(4); §354.44(b)(6)

  How the Management Action will be Accomplished: 23 CCR §354.44(b)(6)

- **Legal Authority:** 23 CCR §354.44(b)(7)
- Estimated Costs and Funding Plan: 23 CCR §354.44(b)(8)
- Management of Groundwater Extractions and Recharge: 23 CCR §354.44(b)(9)

Summary of Criteria for Project Implementation (23 CCR §354.44(b)(1)(A))

Most of the Management Actions described in this section are presented as frameworks and will be fully developed into implementation plans during the first years of GSP implementation as indicated in the subsequent sections. These potential Management Actions will be implemented by each GSA as needed to achieve and maintain long-term sustainable groundwater management within their respective jurisdictions and subsequently across the Turlock Subbasin. They would be evaluated and selected for implementation if, based on data gathered during GSP implementation, the GSAs find that established IMs and MOs cannot be maintained and/or if MTs are being approached. This adaptive approach will be informed by continued monitoring of groundwater conditions, using the monitoring network and methods described in the GSP.

Table 8-18: List of Management Actions

Category	Number	Proponent[2]	Management Action	Primary Mechanism(s)[1]
Demand Reduction Strategies	1	WTSGSA and/or ETSGSA	Voluntary Conservation and/or Land Fallowing	Conservation/ Land Fallowing
	2	WTSGSA and/or ETSGSA	Conservation Practices	Conservation
Pumping Management Framework	3	WTSGSA and/or ETSGSA	Groundwater Extraction Reporting Program	Pumping Reduction
	4	WTSGSA and/or ETSGSA	Groundwater Allocation and Pumping Management Program	Pumping Reduction
	5	WTSGSA and/or ETSGSA	Groundwater Extraction Fee	Pumping Reduction
	6	WTSGSA and/or ETSGSA	Groundwater Pumping Credit Market and Trading Program	Pumping Reduction
Domestic Well Mitigation	7	WTSGSA and/or ETSGSA	Domestic Well Mitigation Program	(multiple)

[1]The primary mechanism of the Management Action as conceptualized. Management Actions may support groundwater sustainability through multiple mechanisms during implementation.

[2] It is anticipated that Management Actions will be implemented by each GSA as needed to mitigate overdraft within their jurisdictional areas and assure that the SMC adopted in **Chapter 6** are met.

8.4.1. Demand Reduction Strategies

Several demand reduction strategies will be developed to decrease agricultural and urban water demands in the Subbasin. These strategies would be implemented as needed in conjunction with projects to decrease the Subbasin's projected groundwater storage deficit. They could be implemented in the form of voluntary conservation and/or land fallowing (see **Section 8.4.1.1**) or other urban and agricultural conservation practices (see **Section 8.4.1.2**). While conservation practices are well established and expected to be implemented consistent with state law throughout the Subbasin, the Voluntary Conservation and/or Land Fallowing program is in preliminary stages of development. Since current modeling suggests demand management within the ETSGSA will be needed to achieve sustainability goals, it is anticipated that ETSGSA will implement Management Action 1. WTSGSA may decide to pursue this Management Action in the future if needed to address conditions within its jurisdiction.

8.4.1.1. Voluntary Conservation and/or Land Fallowing (Management Action 1)

8.4.1.1.1. Management Action Description

Voluntary Conservation and/or Land Fallowing covers several strategies that can be designed to achieve both temporary and permanent water demand reduction. Should one or both of the Turlock Subbasin GSAs decide that pursuing such strategies is necessary to achieve the Subbasin sustainability goals within their jurisdiction, this Management Action would assess options and develop a program to enact voluntary conservation and/or fallowing strategies in close coordination and collaboration with the landowners within their jurisdiction. Examples of this strategy could include repurposing of lands growing lower value crops to be dry farmed, fallowed in rotation, or used for recreation, habitat restoration, groundwater recharge, solar power generation, or other uses.

Public programs to assist landowners to participate in such programs are available. Assembly Bill (AB) 252 is a good example that can provide support for such program implementation. AB 252 establishes the Multi-benefit Land Repurposing Program to assist GSAs in critically overdrafted basins in achieving their groundwater sustainability goal by providing grants to public and private agencies and entities for projects and programs that reduce groundwater use. Projects and programs supported by AB 252 may create incentives to repurpose, or convert, irrigated agricultural land to new uses that both reduce groundwater demand and provide some other measurable benefits to the environment or broader community. Although the Turlock Subbasin is not critically overdrafted, the Turlock Subbasin may be eligible to benefit from future similar programs.

Temporary or permanent land fallowing could also be combined with recharge projects through the application of surplus surface water supplies to the fallowed lands.

8.4.1.1.2. Public Notice

A successful Voluntary Conservation and/or Land Fallowing program will require a comprehensive and strategic outreach effort, including multiple public workshops and meetings, potential website and/or email announcements, along with other public notices for the workshops. The outreach will be targeted to both potential participants of the program (landowners) as well as other stakeholders who may be impacted by changes to land and water use.

8.4.1.1.3. Permitting and Regulatory Process

Preparation of a CEQA evaluation for a fallowing program will identify potential environmental impacts and identify feasible alternatives or feasible mitigation measures. Establishment of a voluntary land fallowing program is expressly authorized under SGMA (CWC, §10726.2(c)). The fallowing program, including program standards, will be developed and undergo CEQA review as necessary.

8.4.1.1.4. Expected Benefits

Benefits to Sustainability Indicators

Sustainability indicators that could benefit from Voluntary Conservation and/or Land Fallowing include:

- Chronic lowering of groundwater levels – By reducing groundwater demand, this Management Action would reduce pumping and pumping-related contributions to chronic lowering of groundwater levels.
- Reduction of groundwater storage – Reduced pumping throughout the Subbasin contributes to a smaller rate of reduction in groundwater storage.
- Degraded water quality – Fallowing of crop lands can reduce agricultural water use and associated nutrient loading, thereby improving groundwater quality.
- Land subsidence – Depending on the location of land fallowing or conservation, reduced pumping stress on local aquifer(s) will reduce the potential for subsidence.
- Depletion of interconnected surface water – Voluntary conservation and/or land fallowing in areas reliant upon groundwater can reduce groundwater pumping. In areas where groundwater demand may be depleting interconnected surface water, such an action can reduce impacts to interconnected surface water.

Benefits to Disadvantaged Communities

Benefits to disadvantaged communities overlap with the benefits described above for sustainability indicators. Land repurposing can also provide other ancillary benefits to local communities, such as recreation.

Volumetric Benefits to Subbasin Groundwater System

The volumetric benefit to the groundwater system would depend on the extent to which a Voluntary Conservation and/or Land Fallowing program is adopted and would be further studied when the program is implemented by the GSAs.

8.4.1.1.5. Implementation Criteria, Status, and Plan

Temporary fallowing is a quick way to reduce demand with no capital costs or infrastructure needed. Because it can be relatively inexpensive, it can be implemented earlier and quicker while other long-term solutions like land repurposing are investigated. The Turlock Subbasin GSAs may explore options for encouraging voluntary and temporary fallowing during GSP implementation as necessary while developing a more structured program and exploring funding opportunities.

The Voluntary Conservation and/or Land Fallowing program is in preliminary stages of development. Should either of the Turlock Subbasin GSAs decide to pursue a program in the future, the program would be further developed and implemented as necessary in a targeted and proportional manner consistent with conditions observed in the Subbasin and within their respective jurisdictional boundaries. It is anticipated that, if implemented, a program would be developed by ETSGSA within the first five years of GSP implementation. An actual implementation timeline has yet to be determined but would be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Any future changes in implementation would be communicated with the public and other agencies and would be documented in GSP Annual Reports and Five-Year Assessment Reports.

8.4.1.1.6. How the Management Action will be Accomplished

This Management Action does not rely on the availability of water supplies because it is a planning effort that will result in conservation. It will be implemented through landowner and stakeholder outreach and voluntary participation and supported through organized implementation and incentives. It will support overall supply reliability by reducing overdraft in the Subbasin and moving the Subbasin towards sustainability.

8.4.1.1.7. Legal Authority

It is the established policy of the State of California "to facilitate the voluntary transfer of water and water rights where consistent with the public welfare" (CWC, §109(a)). "The Legislature hereby finds and declares that voluntary water transfers between water users can result in a more efficient use of water, benefitting both the buyer and the seller" (CWC, §475).

In addition, each of the members of the GSA has independent legal authority to implement water transfer programs in their respective jurisdictions under existing law. Under SGMA, the GSA has authority to "authorize temporary and permanent transfers of groundwater extraction allocations within the [GSA's] boundaries, if the total quantity of groundwater extracted in any water year is consistent with the provisions of the [GSP]" CWC, §10726.4(a)(3). The GSA also has authority to "provide for a program of voluntary fallowing of agricultural lands or validate an existing program" (CWC, §10726.2(c)).

This Management Action carries forward the policy of the state and satisfies SGMA requirements by establishing a voluntary program that encourages water within the Subbasin to be transferred to beneficial uses of water in a manner designed to achieve the sustainability goals and to protect against undesirable results.

8.4.1.1.8. Estimated Costs and Funding Plan

The Voluntary Conservation and/or Land Fallowing program is in preliminary stages of development. Therefore, no costs have been estimated for its development and implementation. Such costs would be developed should the Turlock Subbasin GSAs decide to pursue a program in the future. Separately, multiple potential funding programs and mechanisms exist as a potential source of revenue for individual landowners looking at options for voluntary land repurposing, including (EDF, 2021):

- Mitigation or Conservation Banks
- Conservation Easements
- Solar Rental Agreements
- Grazing Leases
- Converting to Low Water Intensity Crops
- Federal and State Grant Funding Programs

8.4.1.1.9. Management of Groundwater Extractions and Recharge

This Management Action encourages the conservation of water and does not directly involve management of groundwater extraction or recharge. The measure will be applicable during both drought and non-drought conditions.

8.4.1.2. Conservation Practices (Management Action 2)

8.4.1.2.1. Management Action Description

This Management Action would create a program to support the use of conservation practices in both urban and agricultural sectors. This program would be implemented within each GSA as necessary to address overdraft within its jurisdiction or to ensure the sustainability goals are met.

Urban water suppliers are already obligated to consider demand reduction and conservation efforts during dry periods. These demand management actions are described in their respective Urban Water Management Plans (UWMPs). These include:

- City of Modesto Urban Water Management Plan

  https://www.modestogov.com/860/Urban-Water-Management-Plan

- City of Turlock Urban Water Management Plan

  https://www.cityofturlock.org/watersewergarbageservice/waterconservation/urbanwatermanagementplan.asp

- City of Ceres Urban Water Management Plan

  https://www.ci.ceres.ca.us/169/City-of-Ceres-Water-System-Historical-In

In addition, SB 606 and AB 1668, both signed into law in May 2018, are laws that introduce conservation mandates that cap indoor residential use and set a target for efficient outdoor landscape irrigation based on local climate and size of landscaped areas. Urban water suppliers will be required to report on progress to meeting urban water use objectives beginning in 2023 and comply with them beginning in 2028.

Agricultural water suppliers serving more than 25,000 irrigated acres must adopt an Agricultural Water Management Plan (AWMP) that includes reports on the implementation status of specific Efficient Water Management Practices required by the Water Conservation Act of 2009 (SB X7-7). Agencies that have developed AWMPs include:

- Turlock Irrigation District Agricultural Water Management Plan

  https://www.tid.org/irrigation/irrigation-information/ag-water-management-plan/

- Merced Irrigation District Agricultural Water Management Plan

  http://mercedid.org/index.cfm/water/ag-water-management-plan-awmp/

Under this Management Action, the Turlock Subbasin GSAs may choose to evaluate the existing UWMPs and AWMPs within their jurisdiction in the Subbasin and either expand upon minimum requirements to increase the impact of such programs or implement similar conservation practice programs in other areas of the Subbasin that may not be covered under an UWMP or AWMP.

Notably, conservation practices must be considered in the greater context of the Subbasin water budget, especially at the nexus between on-farm water use and groundwater sustainability. In areas where groundwater is the primary or sole water supply, conservation practices that reduce water demand also directly reduce groundwater consumption, but conservation practices in other areas have a more complex relationship with water conservation and sustainable groundwater management. Applying less water to an area and reducing the gap between irrigation and consumptive use also reduces deep percolation and seepage to the groundwater system in that area. The benefits and drawbacks of conservation will be evaluated as the program evolves. In areas with access to surface water where landowners have implemented more advanced irrigation practices (i.e., drip/micro irrigation) utilizing groundwater for convenience or to increase yields, programs may be developed to further conjunctive use programs by encouraging landowners to utilize surface water when available to reduce groundwater demand and increase recharge, while utilizing drip/micro in dry years when surface water supplies are limited. Other consequences may stem from behavioral responses and changes in irrigation resulting from these technologies and policies. If less water can be used to produce the same amount of a crop product, growers may be inclined to use the same amount of water and produce more (Lankford, et al., 2020). Additional considerations on the promises, pitfalls, and paradoxes of irrigation efficiency in water management planning are described by Lankford et al. (2020).

Further details on any expansion of the Conservation Practices program are preliminary as of the time of publishing and would need to be developed and refined further during GSP implementation.

8.4.1.2.2. Public Notice

The Turlock Subbasin GSAs anticipate that public outreach and education on the potential structure of the Conservation Practices program, as well as feasible monitoring and enforcement mechanisms, would be necessary to enable a successful program. Outreach may include public notices, meetings, potential website presence and email announcements. Initial program implementation will focus on voluntary compliance while the GSAs consider the necessary elements to begin enforcing the program by 2027 (five years after adopting and submitting the GSP).

8.4.1.2.3. Permitting and Regulatory Process

Development of a Conservation Practices program is not a project as defined by the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) and would therefore not trigger either.

8.4.1.2.4. Expected Benefits

Benefits to Sustainability Indicators

Sustainability indicators benefitting from Conservation Practices include:

- Chronic lowering of groundwater levels – By reducing groundwater demand, this Management Action would reduce pumping and pumping-related contributions to chronic lowering of groundwater levels.
- Reduction of groundwater storage – Reduced pumping throughout the Subbasin contributes to a smaller rate of reduction in groundwater storage.

- Degraded water quality – This Management Action does not address this sustainability indicator.
- Land subsidence – Depending on the location of Conservation Practices, reduced pumping stress on local aquifer(s) will reduce the potential for subsidence.
- Depletion of interconnected surface water – Conservation in areas reliant upon groundwater would reduce groundwater pumping. To the extent that the groundwater pumping may be impacting interconnected surface water, conservation practices may reduce that impact.

Benefits to Disadvantaged Communities

Benefits to disadvantaged communities overlap with the benefits described above for sustainability indicators. Depending on how they're structured, urban conservation programs may also provide a financial benefit to individual users who reduce their water consumption, either via a lower water bill or reduced demand on a domestic well.

Volumetric Benefits to Subbasin Groundwater System

The volumetric benefit to the groundwater system will depend on the extent to which a Conservation Practices program is implemented and will be further studied when the program is developed by the GSAs.

8.4.1.2.5. Implementation Criteria, Status, and Plan

The Conservation Practices Management Action is expected to commence shortly after the adoption of the GSP and a formal program is expected to be developed and implemented during the first five years of GSP implementation and to continue in an ongoing fashion throughout the implementation of the GSP. The implementation timeline has yet to be determined but would be provided in GSP Annual Reports and Five-Year Assessment Reports when known. Any future changes in implementation would be communicated with the public and other agencies and would be documented in GSP Annual Reports and Five-Year Assessment Reports.

8.4.1.2.6. How the Management Action will be Accomplished

This Management Action does not rely on water supplies because it is a planning effort that will result in conservation benefits. It will be implemented through irrigation district, landowner and stakeholder outreach and voluntary planning and participation initially. A formal program is expected to be developed and implemented within the first five years of GSP implementation. It will support overall supply reliability by reducing groundwater demand in the Subbasin and moving the Subbasin towards sustainability.

8.4.1.2.7. Legal Authority

The Turlock Subbasin GSAs have the authority to develop a Conservation Practices program and may perform implementation and enforcement of practices, if deemed to be warranted, via implementation of fees for noncompliance or through metering or other methods to quantify groundwater use. If deemed necessary, mechanisms for enforcement would be outlined in the Conservation Practices program once developed and are expected to be enforced by the Turlock Subbasin GSAs and/or member agencies.

8.4.1.2.8. Estimated Costs and Funding Plan

Costs for UWMP and AWMP report preparation and submittals are ongoing for urban and agricultural water suppliers, respectively. Any future costs related to additional programming or program enforcement are not yet developed. Such costs will be dependent on the scope of the program and will be reported in future GSP updates or Annual Reports.

8.4.1.2.9. Management of Groundwater Extractions and Recharge

This Management Action encourages the conservation of water; which may result in decreased groundwater extraction. This will be applicable during both wet and dry conditions.

8.4.2. Pumping Management Framework

The Pumping Management Framework consists of four Management Actions that will be implemented in an adaptive manner as determined by the Turlock Subbasin GSAs to meet the Subbasin's sustainability goal. Not all Management Actions may be needed or may not be implemented by each GSA depending on their assessment of conditions and strategy effectiveness within their jurisdictional boundaries in the Subbasin. The Pumping Management Framework includes the following Management Actions:

1. Groundwater Extraction Reporting Program (Management Action 3) – see **Section 8.4.2.1**
    - To facilitate implementation of pumping management, a reporting program is needed first. Based on experience in other San Joaquin Valley subbasins, a voluntary program is likely to achieve significant response. Therefore, the reporting will be initially implemented on a voluntary basis and then a decision will be made how best to expand the program either through mandatory reporting or by supplementation using consumptive use data derived from analysis of remote sensing data.
2. Groundwater Allocation and Pumping Management Program (Management Action 4) – see **Section 8.4.2.2**
    - Either GSA may implement pumping management within their jurisdictions. Different categories of pumping management will be defined and allocated to pumpers, including the following:
        - Sustainable Pumping (pumping within a parcel's assigned share of the designated sustainable yield)
        - Unsustainable Pumping (pumping in excess of a parcel's share of the designated sustainable yield, to be phased out over time to achieve the sustainability goal of the Subbasin)
        - Carry-Over Pumping (pumping in excess of the sustainable yield that is carried over from pumping below the sustainable yield in prior years or offset by pumping below the sustainable yield in subsequent years).
    - Pumping reduction would be implemented in phases to provide the aquifer response necessary to address the net groundwater deficit remaining after implementation of feasible projects and water conservation measures. Pumping reduction would be

increased incrementally in response to monitoring data to meet the IMs and MOs established in **Chapter 6**.

3. Groundwater Extraction Fee Program (Management Action 5) – see **Section 8.4.2.3**
    - Either GSA may decide to implement a tiered groundwater extraction fee program for Unsustainable Pumping and/or Carry-Over Pumping that is not offset. Fees assessed under this program could be used to fund projects or the procurement of replenishment water.
4. Groundwater Pumping Credit Market and Trading Program (Management Action 6) – see **Section 8.4.2.4**
    - Either GSA may decide to implement a program that allows trading or sale of unused Sustainable Pumping or Carry-Over Pumping credits in order to allow operational flexibility and apply market forces and opportunities as Unsustainable Pumping allocations are scaled back.

The figures below illustrate how the Pumping Management Framework would function.

Figure 8-6 illustrates conceptually how average Sustainable Pumping and Unsustainable Pumping will be managed over time to achieve groundwater management within the sustainable yield over time. The values shown present percent estimates of sustainable yield that are not certain or absolute because of limitations and uncertainties in the 50-year projection, including the hydrologic and climatologic conditions, land and water use conditions, water supplies, population growth and development trends, as well as uncertainties in the C2VSimTM model. These uncertainties can be decreased as more data and information become available through monitoring and addressing data gaps. Although the projected project benefits, project impacts, and demand reduction are consistent with the best available estimates at this time, they are presented as conceptual values for the purposes of this graph. It should also be noted that the actual values will vary from year to year based on hydrologic and climatic conditions, varying surface water availability, and varying crop water demands and irrigation decisions. The long-term averages are shown for illustrative purposes. **Figure 8-6** shows the following implementation phases for the Groundwater Allocation and Pumping Management Program (Management Action 4):

- Phase 1 (GSP Implementation Years 1 to 5) - During the first Phase of the Pumping Management Program, information will be gathered to better assess Subbasin trends, water budget information, and the Subbasin response to hydrologic and climatic conditions and projects. In addition, projects will begin to be implemented and will offset a portion of the Unsustainable Pumping. The amount of the offset is dependent on the yield of the individual projects and their effectiveness to mitigate overdraft in different portions of the Subbasin. This information would be assessed to develop a Pumping Management Plan based on an adaptive management approach to phase in pumping reductions sequentially as needed to address overdraft and achieve sustainability goals. In **Figure 1-4**, only the Group 1 and Group 2 projects discussed earlier in this section are assumed to be implemented. The GSAs may choose to begin implementation of pumping reduction during the latter part of this period.
- Phase 2 (GSP Implementation Years 6 to 10) - During this period, pumping reductions would begin to be phased in or would be escalated based on comparison of monitoring data to the IMs established in **Chapter 6**. The Subbasin response to project, climatic, and pumping conditions

would continue to be monitored and adjustments would be made to the pumping reduction strategy as needed.

- Phase 3 (GSP Implementation Years 11 to 15) - At this point, the projects are assumed to be fully phased in, and the Demand Management Plan would be updated to include the final pumping reductions needed to maintain pumping within the sustainable yield of the Subbasin by the end of the period. The Subbasin response to project, climatic, and pumping conditions would continue to be monitored and adjustments would be made to the pumping reduction strategy as needed.

- Phase 4 (GSP Implementation Years 16 to 20) - The Subbasin would be operated within its long-term average sustainable yield. The groundwater level response to project, climatic, and pumping conditions would continue to be monitored and adjustments would be made to the pumping reduction strategy as needed.

Figure 8-7 shows the same general phases as **Figure 8-6**; however, it includes the conceptual effects of implementing Group 3 projects and the Demand Reduction Strategies Management Actions discussed in **Section 8.4.1** (Management Actions 1 and 2). As illustrated in **Figure 8-7**, the implementation of these additional recharge and water conservation measures could have a substantial impact in terms of reducing the amount of pumping reduction needed to achieve sustainable management. As the increased effectiveness of the additional collective PMAs is realized and confirmed by monitoring, adaptive management would decrease pumping reduction in response to the effectiveness of these measures. The actual yield and effect of the projects and Demand Reduction Strategies Management Actions are not known at this time; however, it is expected to be measurable and significant as illustrated in the conceptual graph and would be confirmed by monitoring.

Figure 8-8 shows the conceptual application of Carry-Over Pumping, pumping credit markets and trading, and fees for Unsustainable Pumping. These are described below:

- **Carry-Over Pumping** – **Figures 8-6** and **8-7** show long-term average pumping rates, but SGMA recognizes that sustainable pumping is the result of average demands over a period of years, including both wet and dry periods. In addition, due to climatic variability and other factors, the amount of irrigation demand of an agricultural operation will vary from year to year. Carry-Over Pumping is intended to allow groundwater pumpers operational flexibility to respond to these changes and would allow pumping in excess of the designated sustainable yield as long as it is offset by pumping less groundwater in prior or subsequent years. This concept is in the early development stages and would begin with the adoption of Carry-Over Pumping rules adapted to best serve the management of the Subbasin. For example, Carry-Over Pumping could be balanced over a period of two year or three years, or Carry-Over Pumping in excess of sustainable yield could be allowed for a percentage of the offset pumping.

- **Recharge Credits** - A program could be implemented to provide pumping credits to property owners that implement recharge projects on their land. These credits could be utilized on the property or sold or traded on the water markets discussed below.

- **Unsustainable Pumping Fees** - A fee structure could be applied to pumping over the sustainable yield or carry-over pumping that is not offset. Charging fees for Unsustainable Pumping would provide an incentive to pump less groundwater and the funds obtained could be used to fund additional projects or procure replenishment water for recharge.

- **Markets and Trading** - Markets and platforms could be established for trading, exchange, or sale of pumping allocations and credits to provide additional incentives for pumpers to decrease their groundwater demand, while providing operational flexibility to obtain additional pumping allocations when needed. Market forces would have a mediating effect on the reduction of Unsustainable Pumping over time.

The process of providing annual reports to DWR and five-year GSP updates will allow GSAs to update the Pumping Management Framework and adjust the implementation course as needed based on changing conditions.

Figure 8-6: Implementation of Pumping Reduction Framework: Adaptive Management with Implementation of Group 1 and 2 Projects

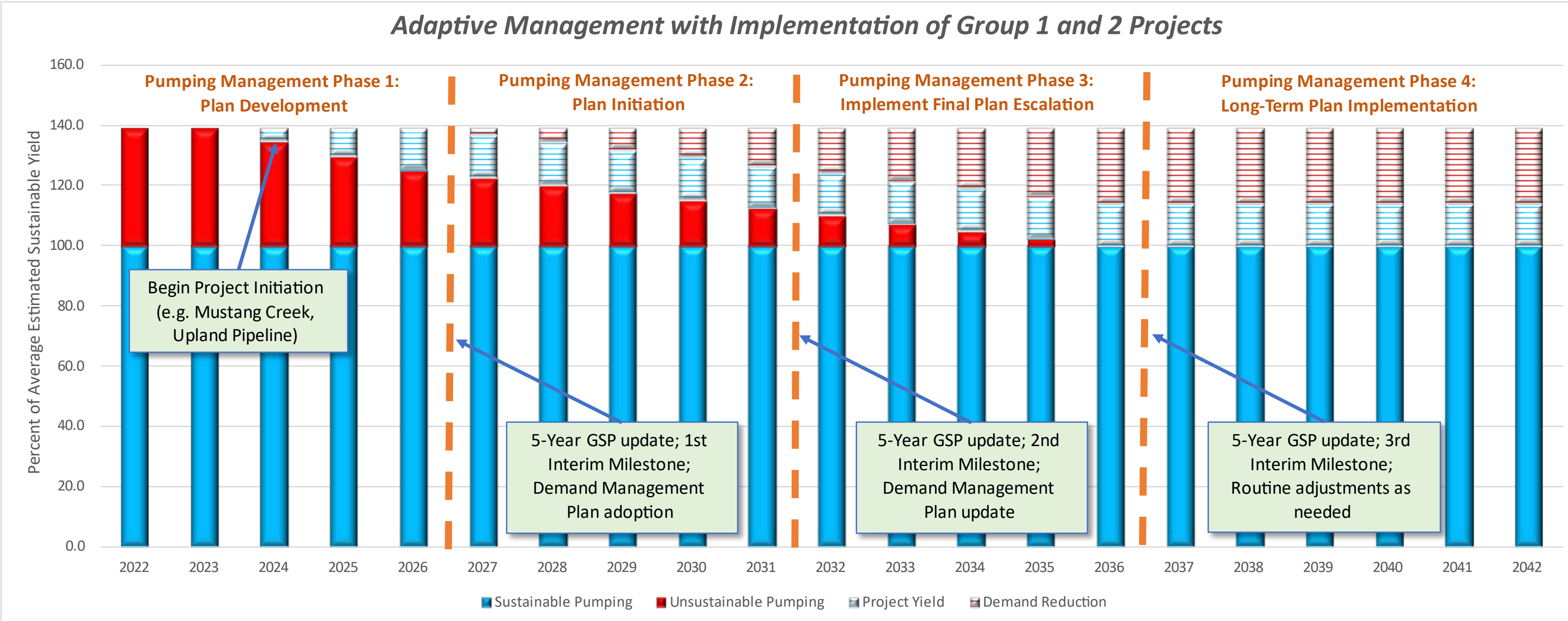


Figure 8-7: Implementation of Pumping Management Framework: Adaptive Management with Implementation of Group 1, 2, and 3 Projects & Demand Reduction Strategies Management Actions

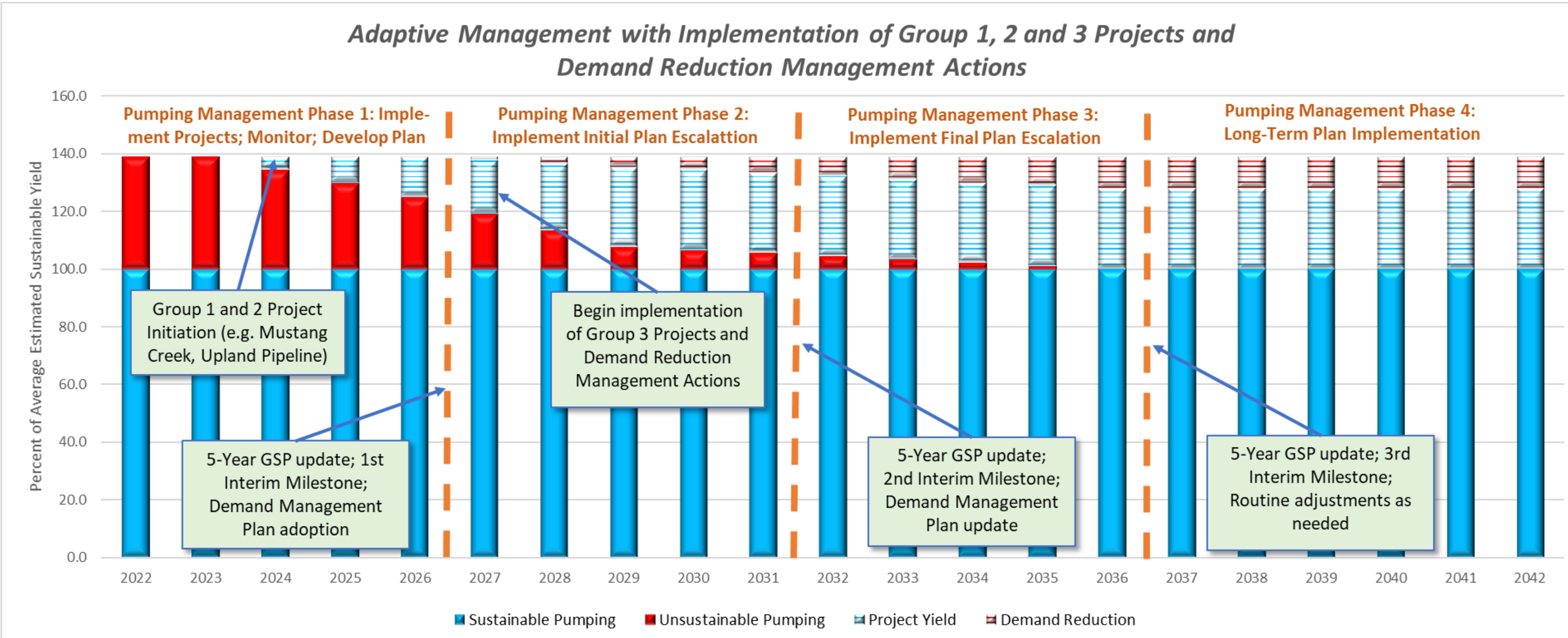
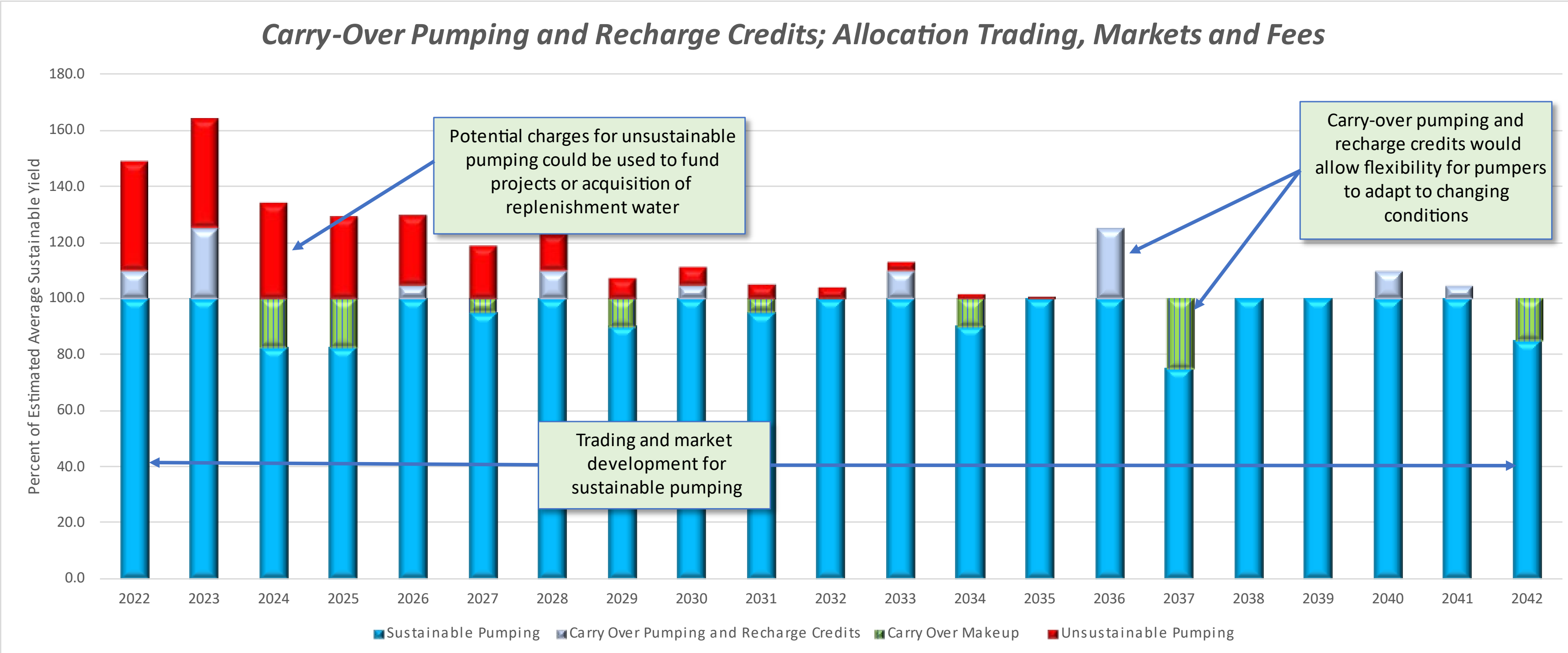


Figure 8-8: Implementation of Pumping Reduction Framework: Operations Flexibility and Incentives including Carry-Over Pumping and Recharge Credits, Allocation Trading, Markets and Fees



8.4.2.1. Groundwater Extraction Reporting Program (Management Action 3)

8.4.2.1.1. Management Action Description

The Groundwater Extraction Reporting Program would be implemented in two phases: an initial voluntary program followed by a comprehensive program:

1. Voluntary Extraction Reporting - This phase of the program is intended to provide voluntary annual reporting of groundwater use by agricultural and private well owners. A survey and registration form will be sent to the fee title holders of all parcels in each GSP advising them of the program and requesting registration to participate in metering and annual reporting of groundwater extractions from their wells. Additional public outreach will be conducted introducing the program. The DMS will be set up with appropriate input data forms for voluntary reporting of groundwater use as well as other relevant information, such as irrigated acreage, crop type, and sources of water.

2. Comprehensive Extraction Reporting - This phase of the program is intended to address data gaps that may remain after implementation of the voluntary program. Implementation of this phase will occur by one of two methods selected by the GSAs: (1) Consumptive water use will be estimated annually for each parcel through the use of remote sensing imagery to calculate the evapotranspiration of crops and subtract surface water deliveries; or (2) Installation of meters and annual reporting will be made mandatory for all non *de minimis* production wells.

The Groundwater Extraction Reporting Program would exclude *de minimis* extractors that pump less than 2 AFY.

8.4.2.1.2. Public Notice

Successful implementation of either component of this program would require the support and coordination of member agencies, well owners throughout the Subbasin, and other stakeholders.

The voluntary program would be noticed via public outreach and education about the logistics of participating in the program as well as the purpose and importance of doing so, as well as the potential alternatives that would be implemented during the second phase of the program. Outreach may include public notices, meetings, potential website presence and email announcements prior to each phase of the program.

8.4.2.1.3. Permitting and Regulatory Process

The Groundwater Extraction Reporting Program is not expected to require any permitting, or other regulatory involvement.

8.4.2.1.4. Expected Benefits

Benefits to Sustainability Indicators

Direct measurement of groundwater extractions may not have direct impacts on sustainability indicators but would improve future water budget and sustainable yield refinement. The accurate and widespread collection of extraction data will provide the Turlock Subbasin GSAs with critical information to assist in management of the Subbasin, development of additional Management Actions, and monitoring the success of the GSP against the SMC.

Benefits to Disadvantaged Communities

The Groundwater Extraction Reporting Program would exclude *de minimis* extractors.

Volumetric Benefits to Subbasin Groundwater System

Measurement of groundwater extractions provides a vast improvement to the refinement of water budgets and basin storage calculations.

8.4.2.1.5. Implementation Criteria, Status, and Plan

A specific plan for the implementation of voluntary groundwater extraction reporting is anticipated to be developed shortly after the GSP is submitted and reported in the First Annual Report for GSP implementation. The effectiveness of this program would be evaluated during the first year of implementation and a Comprehensive Groundwater Extraction Plan will be prepared and reported on during the Second Annual Report for GSP implementation. Reporting of extraction volumes will continue annually in all future years in accordance with the comprehensive programs adopted by each GSA.

8.4.2.1.6. How the Management Action will be Accomplished

Voluntary extraction reporting programs have achieved widespread participation other subbasins and could be readily supplemented with consumptive use estimates for agricultural parcels derived from remote sensing data. This program does not rely on the availability of water supplies because it is a planning effort that will support overall supply reliability by providing additional information for better management of the Subbasin and moving the Subbasin towards sustainability.

8.4.2.1.7. Legal Authority

SGMA provides GSAs with the authority to require registration of groundwater extraction facilities (CWC §10725.6) and authorizes a GSA to require metering and reporting of groundwater extraction (CWC §10725.8).

8.4.2.1.8. Estimated Costs and Funding Plan

The estimated costs for the Groundwater Extraction Reporting Program would vary depending on the components that are implemented:

- The costs for the voluntary component are minimal and include:
- One-time costs for initial public outreach and setup of tools and procedures to receive and compile voluntary submitted data
- Ongoing annual administrative costs to review and compile the voluntarily submitted data as well as continued outreach
- The costs for implementing the more comprehensive program would be larger as they may include:
- One-time costs for initial public outreach and setup of tools and procedures for comprehensive groundwater extraction assessment
- Procurement of annual ET data derived from publicly-available satellite data and analysis to supplement reported pumping information at a parcel scale Ongoing annual administrative costs to review and compile the submitted data and remote sensing-derived data (if applicable) as well as continued outreach

The Groundwater Extraction Reporting Program is in preliminary stages of development. Therefore, no costs have been estimated for its development and implementation. Such costs will be developed prior to implementation by each GSA.

8.4.2.1.9. Management of Groundwater Extractions and Recharge

This program would not directly impact groundwater extractions or recharge but would develop and expand the reporting of groundwater extractions, including during both dry and wet periods, to support better management of the Subbasin.

8.4.2.2. Groundwater Allocation and Pumping Management Program (Management Action 4)

8.4.2.2.1. Management Action Description

This strategy entails development of a Groundwater Allocation and Pumping Management Program that would assign groundwater extractions into categories, assign pumping allocations to groundwater users, and manage pumping as needed to stay within the Subbasin's sustainable yield. The Management Action would be implemented by each GSA as necessary and desired for management of groundwater pumping within its jurisdictional boundaries.

Outlined here is a framework for how the Turlock Subbasin GSAs would develop and define pumping allocations and implement management in the Subbasin based on the estimated sustainable yield and the magnitude of projected overdraft. It is expected that the preliminary estimates of sustainable yield and overdraft developed by the current version of the C2VSimTM model will be updated as additional data are gathered and projects are implemented, so this Management Action will be implemented using an adaptive management approach informed by ongoing groundwater monitoring.

There are six key steps to defining pumping allocations within the GSAs where this Management Action is implemented:

1. Determine the sustainable yield of the Basin (see **Section 5.3** of this GSP) and its division between the GSAs. This determination may be updated periodically as new and more reliable information and data become available.
2. Allocate Sustainable Pumping using a method to be developed by the GSAs in consultation with stakeholders.
3. Allocate Unsustainable Pumping for each parcel by subtracting Sustainable Pumping from the reported or calculated pumping from the Groundwater Extraction Reporting Program (Management Action 3). This represents the difference between actual pumping and Sustainable Pumping and will be phased out over time as discussed in **Section 8.4.2**.
4. Define Carry-Over Pumping as a temporary exceedance of Sustainable Pumping that is/can be offset by pumping below the Sustainable Pumping allocation in prior or subsequent years. Carry-Over Pumping will be allocated on an annual basis.
5. Define Recharge Credits for the owner-implemented recharge projects. These credits could be used by a grower or traded/sold on a water market and would provide an incentive for implementation of dispersed recharge projects.
6. Define, characterize, and allocate any additional pumping types or credits, such as allocations of the yield of specific projects, as appropriate, and determine how new/additional supplies would be allocated.

The Groundwater Allocation and Pumping Management Program has been developed at a conceptual level at this time and will be further refined as summarized below. Where implemented, groundwater allocation and pumping management is anticipated to be implemented in phases as follows.

Phase 1: Program Establishment and Data Gathering (GSP Implementation Years 1 to 5)

- During the first five years, information will be gathered to better assess Subbasin trends, water budget information, and the basin response to climatic conditions and projects. Gaps in the monitoring networks will be addressed, MTs/MOs may be refined, and the Subbasin groundwater flow model will be updated and used to develop a refined understanding of sustainable yield and overdraft in the Subbasin.
- Group 1 and 2 projects will begin to be implemented and are expected to offset a portion of the Unsustainable Pumping. Group 3 projects will be developed and implemented as possible, and additional project opportunities may be identified and implemented. In addition, it is anticipated that further reductions in net groundwater demand would be achieved through voluntary water conservation, land fallowing and other demand reduction actions during implementation of Management Actions 1 and 2.

- The effectiveness of PMAs to mitigate overdraft will be discussed in Annual Reports.
- A Pumping Management Plan will be prepared, describing the methods and schedule for the first phase of demand reductions needed to achieve the Subbasin's 10-year IMs. The demand reductions would be scaled based on monitoring data using the updated C2VSimTM model to assess the amount of demand reduction needed. The Pumping Management Plan will be appended to the GSP Five-Year Assessment Report.
- The GSAs may decide to implement an initial increment of pumping reduction during this phase during the latter portion of this period.
- If an undesirable result is documented based on the criteria established in **Chapter 6**, Implementation Support Activity 5 (see **Section 9.5**) will be implemented.

Phase 2: Initial Pumping Reduction (GSP Implementation Years 6 to 10)

- The Pumping Management Plan would be implemented starting in Year 6 of GSP implementation. Monitoring data will be gathered to allow assessment of the Subbasin response to demand reduction and the Subbasin groundwater flow model may be further refined updated as appropriate. Additional data gaps may be assessed, and MTs/MOs may be further refined.
- Group 1, 2 and 3 projects will continue to be implemented and additional projects may be developed and implemented, and further reductions in net groundwater demand may be achieved through voluntary water conservation, land fallowing, and other demand reduction actions during continued implementation of Management Actions 1 and 2.
- If an undesirable result is documented based on the criteria established in **Chapter 6**, Implementation Support Activity 5 (see **Section 9.5**) will be implemented.
- The effectiveness of PMAs, including pumping reduction, to mitigate overdraft would be discussed in Annual Reports.
- In Year 10, the Pumping Management Plan will be updated to refine the methods and schedule for the second phase of demand reductions needed to achieve the Subbasin's 15-year IMs and phase out all Unsustainable Pumping. The demand reductions would be scaled based on monitoring data using the updated C2VSimTM model to assess the amount of demand reduction needed. The updated Pumping Management Plan will be appended to the GSP 10-Year Update.

Phase 3: Final Pumping Reduction (GSP Implementation Years 11 to 15)

- At this point, projects are assumed to be fully phased in, and pumping reductions will be further phased in as needed to maintain pumping within the sustainable yield of the Subbasin by the end of the period and achieve the 15-year IM.
- The Subbasin response to project, climatic, and pumping conditions will continue to be monitored and adjustments will be made to the pumping reduction strategy as needed.

- If an undesirable result is documented based on the criteria established in **Chapter 6**, Implementation Support Activity 5 (see **Section 9.5**) will be implemented.
- The effectiveness of PMAs to mitigate overdraft and any adjustments to the program will be discussed in Annual Reports and Five-Year Assessment Reports.

Phase 4: Long-Term Program Operation (Years 16 forwards)

- The Subbasin response to PMAs, climatic, and pumping conditions would continue to be monitored and adjustments would be made to the pumping reduction strategy as needed.
- If an undesirable result is documented based on the criteria established in **Chapter 6**, Implementation Support Activity 5 (see **Section 9.5**) will be implemented.
- The effectiveness of PMAs to mitigate overdraft and any adjustments to the program will be discussed in Annual Reports and Five-Year Assessment Reports.

8.4.2.2.2. Public Notice

Development of a Groundwater Allocation and Pumping Management Program would require substantial public, landowner, and other stakeholder input to understand the potential impacts of groundwater pumping reduction and baseline needs that should be accounted for, and to establish a workable program with broad community support. The Turlock Subbasin GSAs anticipate that public outreach would include multiple public workshops and meetings, potential website and/or email announcements, along with other public notices for the workshops. The Groundwater Allocation and Pumping Management Program would be circulated for public comment before finalized, though final approval of the plan would be made by the Turlock Subbasin GSAs for their jurisdictions as they deem appropriate, in partnership with their respective member agencies.

8.4.2.2.3. Permitting and Regulatory Process

Development of a Groundwater Allocation and Pumping Management Program would not require any permitting but would require consideration of existing water rights and applicable permits and regulations associated with groundwater pumping in the Subbasin. Further investigation for possible permitting requirements will need to be performed.

8.4.2.2.4. Expected Benefits

Benefits to Sustainability Indicators

Sustainability indicators benefitting from the Groundwater Allocation Program include:

- Chronic lowering of groundwater levels – By reducing groundwater demand, this Management Action would reduce pumping and pumping-related contributions to chronic lowering of groundwater levels and would be implemented for the purpose of meeting groundwater level IMs and avoiding undesirable results.

- Reduction of groundwater storage – Reduced pumping throughout the Subbasin contributes to a smaller rate of reduction in groundwater storage and would be implemented for the purpose of brining the basin into balance over time.
- Degraded water quality – This Management Action does not address this sustainability indicator.
- Land subsidence – Reduced groundwater pumping would reduce the risk of subsidence associated with lowering of groundwater levels.
- Depletion of interconnected surface water – Reduced pumping would reduce the potential for negative impacts to surface water flows associated with lowering groundwater levels.

Benefits to Disadvantaged Communities

Benefits to disadvantaged communities overlap with the benefits described above for sustainability indicators.

Volumetric Benefits to Subbasin Groundwater System

The volumetric benefit to the groundwater system cannot be accurately estimated using the tools and project information available at this time. It is anticipated that this Management Action will lead to a long-term balanced water budget and recovery of groundwater storage in areas where groundwater levels are currently below the MTs. The extent of recovery will be further studied when a Groundwater Reduction Plan is prepared by one or both GSAs.

8.4.2.2.5. Implementation Criteria, Status, and Plan

This Management Action would be based on one or more implementation plans developed based on data gathered during initial implementation of the GSP and adjusted as needed to meet the SMC established in **Chapter 6**. The Turlock Subbasin GSAs will develop Annual Reports to evaluate progress toward meeting the sustainability goal and document Groundwater Pumping Management Plans and amendments in Five-Year Assessment Reports. If monitoring efforts demonstrate that the PMAs being implemented are not effective in achieving stated targets, the GSAs will convene a working group to evaluate the implementation of additional supply-side and demand-side actions, such as the adaptive management approaches in the Pumping Management Framework.

8.4.2.2.6. How the Management Action will be Accomplished

This Management Action would be developed using a transparent, stakeholder-driven approach, but ultimately adopted and implemented as a requirement under the authority of the GSPs. This program does not rely on groundwater supplies from outside the Subbasin because it is a planning and management effort that will result in pumping reductions. It will support overall supply reliability by reducing overdraft in the Subbasin and moving the Subbasin towards sustainability.

8.4.2.2.7. Legal Authority

Under SGMA, GSAs have authority to establish and enforce groundwater extraction allocations. Specifically, SGMA authorizes GSAs to control groundwater by "…regulating, limiting, or suspending extractions from individual wells or extractions in the aggregate…or otherwise establishing groundwater extraction allocations" (CWC §10726.4(a)). SGMA and GSPs adopted under SGMA cannot alter water rights.

8.4.2.2.8. Estimated Costs and Funding Plan

Development and initiation of an allocation program is expected to include upfront costs to conduct the analysis, set up the tracking system, and conduct outreach. Costs to implement the plan would depend on the level of enforcement required to achieve allocation targets and the level of outreach required annually to remind users of their allocation for a given year. The Groundwater Allocation and Pumping Management Program would also include an annual cost that covers ongoing enforcement and implementation. Because the Groundwater Allocation Program is in preliminary stages of discussion and possible consideration, no costs have been estimated. Such costs will be developed should either or both Turlock Subbasin GSAs decide to pursue such programs in the future.

8.4.2.2.9. Management of Groundwater Extractions and Recharge

The Groundwater Allocation and Pumping Management Program would include provisions for the recovery of groundwater levels and groundwater storage during non-drought periods.

8.4.2.3. Groundwater Extraction Fee Program (Management Action 5)

8.4.2.3.1. Management Action Description

This strategy entails setting up a Groundwater Extraction Fee Program structure for Unsustainable Pumping by a groundwater user. The fee structure could work in conjunction with the groundwater pumping reduction and reporting programs (Management Actions 3 and 4), such that a fee is implemented that serves as an incentive to discontinue Unsustainable Pumping. Revenues from the fee could be used to fund additional projects, procure replenishment water, and/or purchase and permanently fallow marginally-productive agricultural lands dependent on groundwater. This strategy may be implemented within one or both GSAs as needed to achieve the sustainability goals.

8.4.2.3.2. Public Notice

Development of a Groundwater Extraction Fee Program would require substantial public input to understand the potential impacts and needs that should be accounted for. The Turlock Subbasin GSAs anticipate that public outreach would include multiple public workshops and meetings, potential website and/or email announcements, along with other public notices for the workshops. The Groundwater Extraction Fee framework would be circulated for public comment before being finalized, though final approval of the plan would be made by the Turlock Subbasin GSAs preparing to implement this program in partnership with its member agencies.

Additional noticing for the public would be conducted consistent with permitting and other regulatory requirements in the case of the enactment of fees. GSA outreach may include public notices, meetings, website or social media presence, and email announcements. Prior to implementing any fee or assessment program, the GSAs would complete a rate assessment study or other analysis if required by the regulatory requirements.

Per CWC §10730, prior to imposing or increasing a fee, a groundwater sustainability agency shall hold at least one public meeting, at which oral or written presentations may be made as part of the meeting. Notice of the time and place of the meeting shall include a general explanation of the matter to be considered and a statement that the data required by this section is available. The notice shall be provided by publication pursuant to §6066 of the Government Code, by posting notice on the Internet Web site of the groundwater sustainability agency, and by mail to any interested party who files a written request with the agency for mailed notice of the meeting on new or increased fees. A written request for mailed notices shall be valid for one year from the date that the request is made and may be renewed by making a written request on or before April 1 of each year. At least 20 days prior to the meeting, the groundwater sustainability agency shall make available to the public data upon which the proposed fee is based. Any action by a groundwater sustainability agency to impose or increase a fee shall be taken only by ordinance or resolution.

8.4.2.3.3. Permitting and Regulatory Process

Fees imposed pursuant to CWC §10730 shall be adopted in accordance with subdivisions (a) and (b) of §6 [property-related fees] of Article XIII D of the California Constitution [Prop.218]. Post-GSP adoption, fees are required to comply with the requirements for Proposition 218, except for the voter approval requirement.

A fee or charge shall not be extended, imposed, or increased by any agency unless it meets all of the following requirements:

- Revenues derived from the fee or charge shall not exceed the funds required to provide the property related service.
- Revenues derived from the fee or charge shall not be used for any purpose other than that for which the fee or charge was imposed.
- The amount of a fee or charge imposed upon any parcel or person as an incident of property ownership shall not exceed the proportional cost of the service attributable to the parcel.
- No fee or charge may be imposed for a service unless that service is actually used by, or immediately available to, the owner of the property in question. Fees or charges based on potential or future use of a service are not permitted. Standby

charges, whether characterized as charges or assessments, shall be classified as assessments and shall not be imposed without compliance with **Section 4**.

- No fee or charge may be imposed for general governmental services including, but not limited to, police, fire, ambulance or library services, where the service is available to the public at large in substantially the same manner as it is to property owners.

Procedural requirements include the following:

- The parcels upon which a fee or charge is proposed for imposition shall be identified. The amount of the fee or charge proposed to be imposed upon each parcel shall be calculated. The agency shall provide written notice by mail of the proposed fee or charge to the record owner of each identified parcel upon which the fee or charge is proposed for imposition, the amount of the fee or charge proposed to be imposed upon each, the basis upon which the amount of the proposed fee or charge was calculated, the reason for the fee or charge, together with the date, time, and location of a public hearing on the proposed fee or charge.
- The agency shall conduct a public hearing upon the proposed fee or charge not less than 45 days after mailing the notice of the proposed fee or charge to the record owners of each identified parcel upon which the fee or charge is proposed for imposition. At the public hearing, the agency shall consider all protests against the proposed fee or charge. If written protests against the proposed fee or charge are presented by a majority of owners of the identified parcels, the agency shall not impose the fee or charge.

8.4.2.3.4. Expected Benefits

Benefits to Sustainability Indicators

Collection of groundwater extraction fees incentivizes the use of supplemental or alternative water supplies where fees can also fund activities/projects that increase groundwater supplies, such as groundwater recharge, thus reducing declines in groundwater elevations and groundwater storage. Other sustainability indicators benefitting from the Groundwater Extraction Fee program include:

- Chronic lowering of groundwater levels – A fee would incentivize reductions in Unsustainable Pumping. By reducing groundwater demand, this Management Action would reduce pumping and pumping-related contributions to chronic lowering of groundwater levels.
- Reduction of groundwater storage – A fee would incentivize reductions in Unsustainable Pumping. Reduced pumping throughout the Subbasin contributes to a smaller rate of reduction in groundwater storage.
- Degraded water quality – This Management Action does not address this sustainability indicator.

- Land subsidence – A fee would incentivize reductions in Unsustainable Pumping. Reduced groundwater pumping would reduce the risk of subsidence associated with lowering of groundwater levels.
- Depletion of interconnected surface water – A fee would incentivize reductions in Unsustainable Pumping. Reduced pumping would reduce the potential for negative impacts to surface water flows associated with lowering groundwater levels.

Benefits to Disadvantaged Communities

Per CWC, §10730(a), a groundwater fee programs must exclude *de minimis* extractors.

Volumetric Benefits to Subbasin Groundwater System

The volumetric benefit to the groundwater system would depend on the framework of the fee implemented and would be further studied as a Groundwater Extraction Fee Program is developed by the GSAs.

8.4.2.3.5. Implementation Criteria, Status, and Plan

If this Management Action is implemented, it would be adopted using a publicly noticed process in compliance with application regulations and requirements. Implementation would be documented and tracked by each GSA and included in their audited financial statements. Implementation status would be reported in the Annual Reports and Five-Year Assessment Reports.

8.4.2.3.6. How the Management Action Will be Implemented

This Management Action would be developed using a transparent, stakeholder-driven approach, in accordance with the appropriate process for adoption of fees by a public agency. This action does not rely on groundwater supplies from outside the Subbasin because it is a planning and management effort that will result in pumping reductions and make funds available for recharge projects or replenishment water procurement. It will support overall supply reliability by reducing overdraft in the Subbasin and moving the Subbasin towards sustainability. The Groundwater Extraction Fee Program would apply in both drought and non-drought periods.

8.4.2.3.7. Legal Authority

GSAs possess the legal authority to implement special taxes, assessments, and user fees within the project proponent service area or area of project benefit. Fees imposed include fixed fees and fees charged on a volumetric basis, including, but not limited to, fees that increase based on the quantity of groundwater produced annually, the year in which the production of groundwater commenced from a groundwater extraction facility, and impacts to the basin.

8.4.2.3.8. Estimated Costs and Funding Plan

While there are certain administrative costs anticipated with the development and implementation of a Groundwater Extraction Fee, the Groundwater Extraction Fee itself is a potential mechanism to fund the costs of groundwater management. This includes, but is not limited to, the following:

- Administration, operation, and maintenance, including a prudent reserve
- Acquisition of lands or other property, facilities, and services
- Supply, production, treatment, or distribution of water
- Other activities necessary or convenient to implement the plan

8.4.2.3.9. Management of Groundwater Extractions and Recharge

This program, in conjunction with the Groundwater Extraction Reporting Program (Management Action 3) and the Groundwater Allocation and Pumping Management Program (Management Action 4), would directly develop and expand the reporting of groundwater extractions, including during both drought and non-drought periods, to support better management of the Subbasin, would incentivize groundwater pumping reductions, and could be used to help fund groundwater supply and recharge projects.

8.4.2.4. Groundwater Pumping Credit Market and Trading Program (Management Action 6)

8.4.2.4.1. Management Action Description

This program would establish rules for the use of Carry-Over Pumping Allocations and establishes operational flexibility for a groundwater pumper to exceed their allocated Sustainable Pumping in a given year if the exceedance is offset in prior or subsequent years. It could also establish groundwater credit markets and trading programs that facilitate reductions in Unsustainable Pumping. Groundwater credit markets and trading programs would be considered to exchange, trade or sell the Sustainable Pumping or Carry-Over Pumping allocation of groundwater use by each landowner within each GSA, or among the GSAs as a whole within each Subbasin, and would provide additional operational flexibility and mediate the effects of pumping reduction requirements through market forces. This strategy is contingent upon implementation of the groundwater reporting, allocation and management programs (Management Actions 3 and 4), so that the credit and trading market can monitor the exchange of groundwater allocations among the landowners and/or the GSAs. Should the Turlock Subbasin GSAs decide to pursue a program in the future, the Turlock Subbasin GSAs would seek guidance from experts with experience in water markets to identify options for communications and outreach with stakeholders, program design, and mechanisms to ensure that non-participating stakeholders are not adversely impacted by the program.

8.4.2.4.2. Public Notice

Development and implementation of a Groundwater Pumping Credit Market and Trading Program would require substantial public input to understand the potential impacts and nuances or implementing such a program. The Turlock Subbasin GSAs anticipate that public outreach would include multiple public workshops and meetings, potential website and/or email announcements, along with other public notices for the workshops. The program plan would be circulated for public comment before finalized, though final approval of the plan would be made by a Turlock Subbasin GSA or GSAs in partnership with its/their member agencies.

8.4.2.4.3. Permitting and Regulatory Process

Permitting and other regulatory compliance issues will be identified and addressed when the program is further explored and developed, consistent with CWC §10726.4 (a) (3 & 4).

8.4.2.4.4. Expected Benefits

Benefits to Sustainability Indicators

Sustainability indicators benefitting from the Groundwater Pumping Credit Market and Trading Program include:

- Chronic lowering of groundwater levels – By facilitating reduction of groundwater demand, this Management Action would reduce pumping and pumping-related contributions to chronic lowering of groundwater levels.
- Reduction of groundwater storage – Facilitation of reduced pumping throughout the Subbasin contributes to a smaller rate of reduction in groundwater storage.
- Degraded water quality – This Management Action does not address this sustainability indicator.
- Land subsidence – Facilitation of reduced groundwater pumping would reduce the risk of subsidence associated with lowering of groundwater levels.
- Depletion of interconnected surface water – Facilitation of reduced pumping would reduce the potential for negative impacts to surface water flows associated with lowering groundwater levels.

Benefits to Disadvantaged Communities

Benefits to disadvantaged communities overlap with the benefits described above for sustainability indicators.

Volumetric Benefits to Subbasin Groundwater System

The volumetric benefit to the groundwater system will depend on the framework of the credit market and trading program implemented and will be further studied when the program is developed by the GSAs.

8.4.2.4.5. Implementation Criteria, Status, and Plan

A legally-documented framework would be used for the trade, exchange and sale of Sustainable and Carry-Over allocations. All transactions would be documented using an auditable process. The function of the trading and markets program would be documented in Annual Reports.

8.4.2.4.6. How the Management Action Will be Implemented

If this Management Action is implemented, it would be developed using a stakeholder-driven process facilitated by an expert in the development of water markets. An agreed upon framework and platform would be developed for the tracking of Carry-Over Pumping allocations and for the trade, exchange and sale of Sustainable and Carry-Over allocations. The Subbasin area will be the source of groundwater and will be limited by the hydrology of the region.

8.4.2.4.7. Legal Authority

CWC §10726.4 (a) (3 & 4) provide legal authority for groundwater transfer and accounting programs.

8.4.2.4.8. Estimated Costs and Funding Plan

The Groundwater Pumping Credit Market and Trading Program is in preliminary stages of discussion and possible consideration. Therefore, no costs have been estimated for its development and implementation. Such costs will be developed should the Turlock Subbasin GSAs or an individual GSA decide to pursue a program in the future. Costs could include additional staffing required to administer the program and would be borne by the participants.

8.4.2.4.9. Management of Groundwater Extractions and Recharge

The implementation of a Groundwater Pumping Credit Market and Trading Program would facilitate reductions in groundwater pumping and the recovery of groundwater levels and groundwater storage during non-drought periods.

8.4.3. Domestic Well Mitigation Program (Management Action 7)

8.4.3.1. Management Action Description

Background Conditions for Domestic Wells in the Turlock Subbasin

There are approximately 4,840 domestic wells that have been drilled in the Turlock Subbasin as of October 2021 (DWR Well Completion Reports database). Exact locations and current status are unknown for many of the domestic wells. It is reasonable to assume that many older wells have been replaced, but data are not sufficiently detailed to match older well records to new wells that have likely replaced them.

In addition, construction data (including well depths) are not available for about 6.5% of the wells (316 wells). Pump settings are generally not included in the construction data. Finally, local examinations of small neighborhoods on a parcel by parcel basis indicate that records are not available for many active wells.

Approximately 165 wells (about 4 percent of the estimated total wells drilled at that time) were reported to have failed during the drought conditions during 2015 – 2017. Stanislaus County officials note that many failed wells were shallow (less than 100 feet deep) and older wells (more than 50 years old), and as a result, many of the failures may not have been due solely to drought conditions.

Since 2015, about 483 new domestic wells have been drilled in the Subbasin, almost 3 times the number of previously failed wells (DWR Well Completion Reports, October 2021). When plotted with the locations of the failed wells, it appears that most of the new wells were drilled close to or at the same locations as the failed wells. Overall, new wells were drilled to deeper depths than previous wells in the same area. Given these conditions, it is reasonable to assume that most, if not all of the original reported 165 failed wells during the drought conditions in 2015 – 2017 have been replaced.

Since 2016, no additional failed wells have been reported on the DWR Household Water Supply Shortage Reporting System (Household Water Supply Shortage Reporting System (ca.gov)). Stanislaus County reports a few additional calls from well owners but causes of the few new well issues have not been determined. Nonetheless, without knowing current well status, construction, pump setting, and accurate locations, it is not possible to determine how many domestic wells in the Turlock Subbasin remain at risk of failure due to even modest water level declines.

Sustainable Management Criteria and Potential Impacts to Domestic Wells

The current MTs are set at 2015 levels – or higher – for all of the sustainability indicators in the Subbasin. The definition of undesirable results allows for some water level declines for a third of the representative monitoring wells during 3 consecutive dry years, but water levels are required to recover following this short-term decline. Water level declines during multi-year droughts have typically been less than 30 feet in areas of the previously failed wells and less than 20 feet in areas where most failures occurred.

However, wells in the Eastern Principal Aquifer and a few in the western principal aquifers have been assigned an IM, allowing for continuing water level declines during the first five years of GSP implementation while projects are brought online. Given the uncertainty associated with well status and construction, some wells could be affected. This program includes various steps for addressing conditions to mitigate impacts to domestic wells during GSP implementation.

Steps for Domestic Well Mitigation Program

1. **Coordinate with Existing Programs.** Many drinking water quality programs are being implemented in the Turlock Subbasin to ensure the Human Right to Water is met. These programs have varying objectives and include Nitrate Control Program, Drought Emergency, Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS), County Well Owner Assistance Programs[38], and Safe Affordable Funding for Equity and Resilience (SAFER), among others. The coordination of these various

[38] Both Stanislaus and Merced counties have developed programs to respond to well owner needs such as provision of temporary water tanks, trucked water, and other measures.

programs will be an integral part of the Turlock Subbasin Domestic Well Mitigation Program. Each program is gathering information about domestic wells and providing services to meet their own charges. Turlock Subbasin GSAs will engage with those entities and identify additional data gaps and services that might benefit from basin-wide activities.

2. **Assess the need for a Well Registration Program for Domestic Wells.** As mentioned previously, current datasets do not accurately reflect location, construction, or status of domestic wells in the Subbasin. Various other programs, including those listed above, are developing datasets to meet program-specific objectives. Some of these datasets are likely to contain more accurate information for domestic wells. For example, as part of the Nitrate Control Program, the Valley Water Collaborative has initiated a domestic well survey and outreach regarding nitrate concentrations in homeowners' wells. This program is reportedly developing accurate locations to interface with geographical information software (GIS).

   A potential approach for developing a database of GSP-relevant information regarding domestic wells is provided below for consideration during GSP implementation in the Turlock Subbasin.

   a. Determine how other programs are collecting and managing data on Subbasin domestic wells. Beginning with a database that incorporates domestic well information from DWR Well Completion Reports and County well permits, add relevant information from datasets available from other programs.

   b. Identify data gaps from existing data. Based on specific Subbasin needs, consider development of a Turlock Subbasin-specific questionnaire for domestic well owners to complete. Questionnaires would include information on well location, construction, and status. Examples of information would include, when available:

      i. Well location (APN and GPS)

      ii. Construction including boring and casing depth, well screen intervals, pump setting and capacity

      iii. Other well appurtenances such as water tanks or other supplemental storage

      iv. Whether it serves as the sole source of water supply for one household or multiple households

      v. DWR well completion report, if available.

   c. Incorporate questionnaire data into the domestic well database, linking likely duplicates and associated wells on the same parcel where data allow. Database can be maintained as a component of the GSP Data Management System for the Subbasin.

   d. Institute an outreach program encouraging domestic well owners to register their wells and provide key information on which to base groundwater management decisions.

   e. Work with Counties on well permit applications as they are submitted. Deny well permits that are likely to be insufficient to provide water supply during multi-year droughts or encourage modifications to ensure sufficient supplies in multi-year droughts.

   f. Monitor the DWR website (Household Water Supply Shortage Reporting System (ca.gov)) periodically and identify areas where wells have reported shortages. Coordinate these efforts with County officials, who are automatically notified when wells are recorded on the website.

3. Develop an Education and Outreach Program

   a. Share information with local drinking water programs and well drillers on anticipated water levels in various portions of the Subbasin so that well owners can be informed of, and plan for, possible future changes in water levels.

   b. Outreach and coordination with land use planning agencies regarding groundwater supplies and availability.

   c. Outreach to domestic well owners. Activities could include educating new well owners about MTs and MOs and how they relate to their well, the importance of spacing wells to avoid potential well interference, and other information to help well owners plan their wells to reduce the likelihood of problems in the future.

4. Monitor Areas of Domestic Well Information Gaps.

   a. Areas of previously-failed wells are being monitored by local representative monitoring wells, which provide good coverage across the Western Upper Principal Aquifer.

   b. Areas of previously-failed wells in the Eastern Principal Aquifer are targeted for additional monitoring well installation, including currently-budgeted new wells in the northeastern area of the WTSGSA.

5. Target GSP Projects in Areas of Potentially Vulnerable Wells.

   a. The Regional Surface Water Supply Project will provide surface water for drinking water supply to cities of Ceres and Turlock by 2023, resulting in less pumping in areas near domestic wells. Modeling analyses predict higher water levels adjacent to city wellfields near areas of previously-failed wells.

   b. The GSAs have initiated identification of areas of recharge using the Groundwater Recharge Assessment Tool (GRAT). Modeling demonstrates the ability to quickly raise water levels in localized areas with targeted on-farm recharge.

c. In the Modesto Subbasin, the Stanislaus & Tuolumne Rivers Groundwater Basin Association (STRGBA) GSA is implementing a GSP project to bring surface water supply to the City of Waterford, located just across the Tuolumne River from the disadvantaged community of Hickman. Reduction of groundwater pumping in this critical area will provide some protection for a concentrated area of local domestic wells in the Turlock Subbasin.

6. Develop a three-tiered Corrective Action Plan for Potential Domestic Well Mitigation. A possible framework for consideration is included in **Table 8-19** as an example (see following page). The program will be further developed during GSP implementation.

8.4.3.2. Public Notice

Development and implementation of a Domestic Well Mitigation Program would require substantial public input to understand the potential impacts and nuances or implementing such a program. The Turlock Subbasin GSAs anticipate that public outreach would include multiple public workshops and meetings, potential website and/or email announcements, along with other public notices for the workshops. The program plan would be circulated for public comment before finalized, though final approval of the plan would be made by a Turlock Subbasin GSA or GSAs in partnership with its/their member agencies.

8.4.3.3. Permitting and Regulatory Process

Permitting and other regulatory compliance issues will be identified and addressed when the program is further explored and developed, consistent with CWC §10726.4 (a) (3 & 4).

8.4.3.4. Expected Benefits

Benefits to Sustainability Indicators

This Management Action includes various steps for addressing conditions to mitigate impacts to domestic wells during early years of GSP implementation.

Benefits to Disadvantaged Communities

Benefits to disadvantaged communities overlap with the benefits described above for sustainability indicators.

Volumetric Benefits to Subbasin Groundwater System

The volumetric benefit to the groundwater system will depend on the framework of the Domestic Well Mitigation Program and will be further studied when the program is developed by the GSAs.

Table 8-19: Potential Corrective Action Plan for Potential Domestic Well Mitigation

Triggers	Groundwater Conditions	Quantifiable Measures	Potential Corrective Actions
Green Light	Groundwater levels at or above MTs	In compliance with MTs and MOs	None
Yellow Light	Groundwater levels below MTs in areas of concentrated domestic wells	Domestic wells have failed due to low water levels; additional domestic wells are projected to go dry with current groundwater trends (metrics to be further developed along with program specifics).	• Identify impacted areas; determine causes • Coordinate with local programs and water quality regulatory agencies • Coordinate with available assistance programs to provide initial or temporary solutions until more durable solutions can be identified or implemented. • If impacts are due to water level declines - re-assess current pumping patterns and/or consider localized projects/actions • Encourage surface water use (when available) by local growers, in-lieu of groundwater from nearby agricultural wells.
Red Light	Groundwater elevations reach undesirable results	Analyses demonstrate domestic wells have failed due to water level declines and undesirable results; other wells projected to fail. (metrics to be further developed along with the program specifics)	• Identify impacted areas; determine causes if possible. • Coordinate with local programs and water quality regulatory agencies • Coordinate with available assistance programs to provide initial or temporary solutions until more durable solutions can be identified or implemented. • If impacts are due to water level declines – reassess current pumping patterns and/or consider localized projects/actions • Encourage surface water use (when available) by local growers, in-lieu of groundwater from nearby wells. • Consider restrictions on pumping • Identify long-term solutions / programs, such as consolidations with other water systems

8.4.3.5. Implementation Criteria, Status, and Plan

These components are described under the heading “Steps for Domestic Well Mitigation Program” within **Section 8.4.3.1**.

8.4.3.6. Water Source and Reliability

If certain groundwater conditions are met, corrective actions are proposed to respond to the situation. The program will operate in both drought and non-drought conditions.

8.4.3.7. Legal Authority

No additional legal authority is needed for the implementation of this action. The potential corrective actions will be based on water availability, funding, and coordination with corrective actions being taken by other regulatory and land use agencies, such as the counties, and regulated water quality coalitions.

8.4.3.8. Estimated Costs and Funding Plan

The Domestic Well Mitigation Program is in preliminary stages of development. Therefore, no costs have been estimated for its development and implementation. Such costs will be developed prior to implementation by each GSA. Program details are scheduled for development during the first two years of the GSP.

8.4.3.9. Management of Groundwater Extractions and Recharge

This program includes various steps for addressing conditions to mitigate impacts to domestic wells during these early years of GSP implementation. It includes provisions for developing a Corrective Action Plan that organizes a response to certain groundwater conditions.

8.5. PLAN FOR ACHIEVING SUSTAINABILITY

8.5.1. Integrated Modeling Scenarios

To evaluate the effects of PMAs in meeting the sustainability goals of the Turlock Subbasin, Group 1 and 2 Projects have been analyzed using the C2VSimTM model. C2VSimTM is a fully integrated surface and groundwater flow model capable of analyzing the effects of the PMAs on the land surface, stream, and groundwater systems of the Turlock Subbasin.[39] The C2VSimTM model is used to develop the GSP's water budget estimates for historical, current, and projected conditions, as well as basin groundwater levels, streamflow, and interconnected surface water bodies under historical, baseline, and various project conditions. It is understood that the projections of future groundwater conditions using the C2VSimTM model are based on the current understanding of the Subbasin, which can be further refined as more information becomes available. The 50-year projection of groundwater conditions using C2VSimTM is based on assumptions that has uncertainties in hydrologic and climatic conditions, agricultural crop mix and patterns, irrigation practices, population growth patterns and urban development trends, land use plans, and environmental regulations. However, the C2VSimTM is currently the best available analysis

[39] This is based on the best available information at this time, but the GSAs acknowledge that the model will be refined as more and better data becomes available.

tool to assist in evaluation of project benefits and impacts, not in an absolute sense, but in a relative scale.

The analysis below evaluates the proposed projects relative to the C2VSimTM Projected Conditions Baseline. The results of this analysis are then compared to MTs to estimate the approximate amount of additional net demand reduction that will be needed to meet the sustainability goal of the Subbasin. This gap in net demand reduction can be met through the implementation of additional projects, through management actions to promote water conservation, or by requiring pumping reduction. The Projected Conditions Baseline applies the projected water supply and demand conditions under the 50-year hydrologic period of WYs 1969-2018. A total of eleven (11) Group 1 and 2 Projects and one (1) management action were grouped into five (5) scenarios based on their use-sector and GSA. **Table 8-20** shows a matrix of the simulated projects and their respective scenarios. Each of these projects are described in detail in **Section 8.2**, with modeling assumptions outlined in sub-section 5 for each project.

Table 8-20: Projects and Management Actions Analyzed Using C2VSimTM Model

	Urban and Municipal Projects (WTSGSA)	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
1	Regional Surface Water Supply Project	X	X	X	X	X
2	Waterford/Hickman Surface Water Pump Station and Storage Tank	X	X	X	X	X
3	Dianne Storm Basin	X	X	X	X	X
4	Stanislaus State Stormwater Recharge	X	X	X	X	X
5	Advanced Metering Infrastructure Project (AMI)	X	X	X	X	X
WTSGSA – Agricultural Projects						
6	TID On-Farm Recharge Project (in WTSGSA)		X		X	X
7	Recycled water to TID from City of Turlock		X		X	X
8	TID Ceres Main Regulating Reservoir		X		X	X
ETSGSA – Agricultural Projects						
9	Agricultural Recharge Project (in ETSGSA)			X	X	X
10	Mustang Creek Flood Control Recharge Project			X	X	X
11	Upland Pipeline Project			X	X	X
WTSGSA- and/or ETSGSA (as needed) – Demand Management Actions						
12	Net Demand Reduction					X

Scenario 1: Urban and Municipal Surface Water Supply

Scenario 1 includes the five urban and municipal projects as proposed by their respective agencies. These projects, shown in **Table 8-21** total an average net-recharge of 16,080 AFY over the 50-year simulation period. Impacts to the subbasin were simulated by adjusting the simulated Tuolumne River operations, municipal demand and pumping schedules, and incorporating additional recharge facilities in specified areas. **Table 8-21** below summarizes the individual and cumulative impacts of each project within this scenario.

Table 8-21: Scenario 1 Project Summary

	Project	Direct Recharge	In-Lieu Recharge	Pumping Reduction
WTSGSA Urban and Municipal Projects	Regional Surface Water Supply Project		17,500	-3,600[2]
	Waterford/Hickman Surface Water Pump Station and Storage Tank[1]		100	
	Dianne Storm Basin	20		
	Stanislaus State Stormwater Recharge	460		
	City of Modesto Additional Conservation[1]			1,600
	All Urban and Municipal Projects	480	17,600	-2,000
All Scenario 1 Projects		480	17,600	-2,000

Notes: All Units are in acre-feet

[1] The Waterford/Hickman Surface Water Pump Station and Storage Tank and City of Modesto additional conservation Projects include beneficiaries in both the Turlock and Modesto Subbasin. The volumes in this table represent an estimated fraction of the effective contribution to the Turlock Subbasin

[2] This includes 2,200 AFY of increased pumping by the cities to provide off-set water supply to TID for agricultural water use, per the SRWA agreement. Additionally, it includes 1,400 AFY of increased private agricultural pumping due to reduction in surface water supply by TID to the growers. A negative number in this field indicates an increase in GW pumping.

Scenario 1 projects are expected to reduce net groundwater pumping in the subbasin by 16,080 AFY. The net benefit to groundwater storage is to reduce the projected average annual groundwater storage deficit from 5,500 AFY under the Baseline conditions to 2,700 AFY with these projects, resulting in a net savings of 2,800 AFY of groundwater in storage. Details are shown in **Table 8-25**.

Principally, Scenario 1 projects were implemented to mitigate lowering groundwater levels, depletions of interconnected surface water systems, and potential subsidence near the urban centers within the Turlock Subbasin. **Section 8.1.2** presents the simulated groundwater conditions under both the projected conditions baseline and each of the PMA scenarios.

Scenario 1 is anticipated to be implemented in conjunction with multiple other agriculturally based projects to further improve and project aquifer conditions. See the descriptions of the following scenarios for information on the cumulative impacts to the system.

Scenario 2: WTSGSA Agricultural Water Supply Projects

Scenario 2 builds on the benefits of Scenario 1 to incorporate all WTSGSA projects. The addition of agricultural projects to this scenario increases the net simulated contribution to the groundwater system from an average of 17,480 AF to 24,280 AFY. The WTSGSA proposed three agricultural Group 2 projects to be evaluated for benefits to the aquifer system. The proposed projects include:

(1) TID On-Farm Recharge Project, providing up to 8,000 AFY of direct recharge and 2,950 AFY of additional conveyance recharge in wet and above normal years (5,200 AFY on average)

(2) Recycled Water from the City of Turlock which facilitates 2,000 AFY of in-lieu recharge in all water year types

(3) Construction of the Ceres Main Regulating Reservoir, which will provide both 400 AFY of direct recharge in all water year types and whose operations will also all allow TID to pump 600 acre-feet less from the aquifer system each year.

Table 8-22: Scenario 2 Project Summary

	Project	Direct Recharge	In-Lieu Recharge	Pumping Reduction
WTSGSA Urban and Municipal Projects	Regional Surface Water Supply Project		17,500	-3,600[2]
	Waterford/Hickman Surface Water Pump Station and Storage Tank[1]		100	
	Dianne Storm Basin	20		
	Stanislaus State Stormwater Recharge	460		
	City of Modesto Additional Conservation[1]			1,600
	All Urban and Municipal Projects	***480***	***17,600***	***-2,000***
WTSGSA Ag. Projects	TID On-Farm Recharge Project (in WTSGSA)	5,200		
	Recycled Water from City of Turlock		2,000	
	TID Ceres Main Regulating Reservoir	400		600
	All WTSGSA Agricultural Projects	***5,600***	***2,000***	***600***
All Scenario 2 Projects		**6,080**	**19,600**	**-1,400**

Notes: All Units are in acre-feet

[1] The Waterford/Hickman Surface Water Pump Station and Storage Tank and City of Modesto additional conservation Projects include beneficiaries in both the Turlock and Modesto Subbasin. The volumes in this table represent an estimated fraction of the effective contribution to the Turlock Subbasin.

[2] This includes 2,200 AFY of increased pumping by the cities to provide off-set water supply to TID for agricultural water use, per the SRWA agreement. Additionally, it includes 1,400 AFY of increased private agricultural pumping due to reduction in surface water supply by TID to the growers. A negative number in this field indicates an increase in GW pumping.

Scenario 2 projects are expected to reduce net groundwater pumping in the subbasin by 24,280 AFY. The net benefit to groundwater storage is to reduce the projected average annual groundwater storage deficit from 5,500 AFY under the Baseline conditions to 1,500 AFY with these projects, resulting in a net savings of 4,000 AFY of groundwater in storage. Details are shown in **Table 8-25**.

Scenario 3: ETSGSA Agricultural Water Supply Projects

Scenario 3 adds three ETSGSA agricultural projects to the urban and municipal projects of Scenario 1. The three projects include following:

1) ETSGSA Agricultural Recharge Project brings both direct and in-lieu surface water to the GSA in wet and above normal years. During the irrigation season it is estimated that up to 8,800 acre-feet can be made available with a long-term average of 3,400 AFY. Additionally, outside of the irrigation season this project can utilize up to 6,000 AFY of flood flows with a long-term average of 1,600 AFY

2) Mustang Creek Flood Control Recharge Project can recharge up to 980 AFY in wet years, averaging nearly 600 AFY across the simulation period

3) Upland Pipeline Project is a direct and in-lieu recharge project designed to be able to recharge up to 1,770 AFY in wet and above normal years, with lesser volumes based on water availability in drier conditions, and a long-term average of 1,100 AFY.

As presented in **Table 8-23** below, the total average annual impacts of the ETSGSA agricultural projects simulated in Scenario 3 total 6,700 AFY, including 3,300 AFY of direct recharge and 3,400 of in-lieu recharge.

Scenario 3 projects are expected to reduce net groundwater pumping in the Subbasin by 22,780 AFY. The net benefit to groundwater storage is to reduce the projected average annual groundwater storage deficit from 5,500 AFY under the Baseline conditions to 1,600 AFY with these projects, resulting in a net savings of 3,900 AFY of groundwater in storage. Details are shown in **Table 8-25**.

Table 8-23: Scenario 3 Project Summary

	Project	Direct Recharge	In-Lieu Recharge	Pumping Reduction
WTSGSA Urban and Municipal Projects	Regional Surface Water Supply Project		17,500	-3,600[2]
	Waterford/Hickman Surface Water Pump Station and Storage Tank[1]		100	
	Dianne Storm Basin	20		
	Stanislaus State Stormwater Recharge	460		
	City of Modesto Additional Conservation[1]			1,600
	All Urban and Municipal Projects	***480***	***17,600***	***-2,000***
ETSGSA Ag. Projects	Agricultural Recharge Project (in ETSGSA)	1,600	3,400	
	Mustang Creek Flood Control Recharge Project	600		
	Upland Pipeline Project	1,100		
	ETSGSA Projects	***3,300***	***3,400***	***0***
All Scenario 3 Projects		**3,780**	**21,000**	**-2,000**

Notes: All Units are in acre-feet

[1] The Waterford/Hickman Surface Water Pump Station and Storage Tank and City of Modesto additional conservation Projects include beneficiaries in both the Turlock and Modesto Subbasin. The volumes in this table represent an estimated fraction of the effective contribution to the Turlock Subbasin

[2] This includes 2,200 AFY of increased pumping by the cities to provide off-set water supply to TID for agricultural water use, per the SRWA agreement. Additionally, it includes 1,400 AFY of increased private agricultural pumping due to reduction in surface water supply by TID to the growers. A negative number in this field indicates an increase in GW pumping.

Scenario 4: WTSGSA and ETSGSA Agricultural Water Supply Projects

Scenario 4 is designed to compile all Group 1 and 2 designated projects into a single simulation and evaluate the beneficial impacts to the aquifer system. The total long-term simulated operational contribution to the groundwater system under Scenario 4 is an average of 30,980 AFY. This includes the 16,080 AFY from WTSGSA urban and municipal projects, 8,200 AFY from WTSGSA agricultural projects, and 6,700 AFY from ETSGSA agricultural projects. Over the 50-year simulation period, the cumulative effect of these projects is generally broken down to include 9,380 AFY of direct recharge, and 23,000 AFY of In-lieu recharge. A breakdown of the recharge in each project under Scenario 4 is presented in **Table 8-24**.

Table 8-24: Scenario 4 Project Summary

	Project	Direct Recharge	In-Lieu Recharge	Pumping Reduction[2]
Urban and Municipal Projects	Regional Surface Water Supply Project		17,500	-3,600[2]
	Waterford/Hickman Surface Water Pump Station and Storage Tank[1]		100	
	Dianne Storm Basin	20		
	Stanislaus State Stormwater Recharge	460		
	City of Modesto Additional Conservation[1]			1,600
	All Urban and Municipal Projects	***480***	***17,600***	***-2,000***
WTSGSA Ag. Projects	TID On-Farm Recharge Project (in WTSGSA)	5,200		
	Recycled Water from City of Turlock		2,000	
	TID Ceres Main Regulating Reservoir	400		600
	All WTSGSA Agricultural Projects	***5,600***	***2,000***	***600***
ETSGSA Ag. Projects	Agricultural Recharge Project (in ETSGSA)	1,600	3,400	
	Mustang Creek Flood Control Recharge Project	600		
	Upland Pipeline Project	1,100		
	ETSGSA Projects	***3,300***	***3,400***	***0***
All Scenario 4 Projects		**9,380**	**23,000**	**-1,400**

Notes: All Units are in acre-feet

[1] The Waterford/Hickman Surface Water Pump Station and Storage Tank and City of Modesto additional conservation Projects include beneficiaries in both the Turlock and Modesto Subbasin. The volumes in this table represent an estimated fraction of the effective contribution to the Turlock Subbasin

[2] This includes 2,200 AFY of increased pumping by the cities to provide off-set water supply to TID for agricultural water use, per the SRWA agreement. Additionally, it includes 1,400 AFY of increased private agricultural pumping due to reduction in surface water supply by TID to the growers. A negative number in this field indicates an increase in GW pumping.

Scenario 4 projects are expected to reduce net groundwater pumping in the subbasin by 30,980 AFY. The net benefit to groundwater storage is to reduce the projected average annual groundwater storage deficit from 5,500 AFY under the Baseline conditions to 400 AFY with these projects, resulting in a net savings of 5,100 AFY of groundwater in storage. Details are shown in **Table 8-25**.

Scenario 5: Sustainable Conditions

Scenario 5 is designed to combine the supply side and demand side PMAs together to address the estimated gap in net demand reduction remaining after implementation of the Group 1 and Group 2 projects and ensure that the sustainability goals of the Subbasin are met based on the sustainability indicators discussed in **Chapter 6**. Scenario 4, which represents the implementation of supply side projects with a high planning certainty, improves Subbasin conditions but does not meet the sustainability goals as defined by the Minimum Thresholds (MTs) outlined in **Chapter 6**, Sustainable Management Criteria. To meet the MTs, modeling results indicate that additional projects and actions will be needed. The modeling approach used for Scenario 5 is the same as the methodology used in determining sustainable yield, which is described in detail in **Chapter 5**, **Section 3**.

Analysis of demand reduction was performed through systematic reductions in groundwater pumping in each GSA independently and at Subbasin scale and comparing the projected groundwater levels to MTs established at Representative Monitoring Sites. The analysis further indicated that a 25% reduction in groundwater demand would be sufficient to meet the Subbasin scale sustainability goals. This level of demand reduction is equivalent to 61,300 acre-feet per year of pumping across ETSGSA, reducing the subbasins total projected pumping from 417,200 AFY as presented in the Projected Conditions Baseline, to 334,300 AFY. It is understood that the 25% groundwater demand reduction is subject to uncertainties inherent in the assumptions and data used in developing the model for a 50-year projection required by the GSP regulations, and the ability of the model to accurately calculate groundwater levels at specific locations. Uncertainties in forecast assumptions include hydrologic and climatologic conditions, land use and cropping patterns, irrigation practices, water supply and river/reservoir operations, population growth and urban development trends. These uncertainties are therefore included in the modeling analysis and projections performed. Future monitoring, data and information collection, and enhancements to the model and the projections analysis will be needed to ascertain more accurate demand reduction estimates. In order to address the uncertainty in the analysis, as explained in **Section 8.4**, the demand reduction will be implemented using an adaptive management approach to ensure an adequately scaled response is implemented that appropriately limits economic impacts on the agricultural community, while meeting the sustainability goals of the Subbasin.

Aquifer conditions under Scenario 5 are anticipated to experience an average annual increase in storage of 13,100 AFY, an improvement of 18,600 AFY over the Projected Conditions Baseline. Over the 50-year simulation period this is anticipated to improve aquifer storage by over 655,000 AFY, or over 930,000 greater than the baseline as shown in **Figure 8-9.** This is the effect of a net decrease in groundwater production by 82,900 AFY (met by a combination of possible supply side projects with the remainder made up by demand side reduction actions) and an increase in direct recharge of 9,400 AFY by implementing Group 1 and 2 projects. Under Scenario 5, simulated deep percolation is reduced by 4,500 AFY since less water is applied to agricultural fields. Expected impacts to the groundwater system include a reduction to net-stream seepage of 55,200 AFY and 14,000 AFY less subsurface flow from adjacent subbasins. The complete groundwater budget projected conditions under Scenario 5 is shown below in **Figure 8-10** and a tabular summary for all projected scenarios is shown below in **Table 8-25**.

Figure 8-9: Scenario 1-5 Cumulative Change in Storage

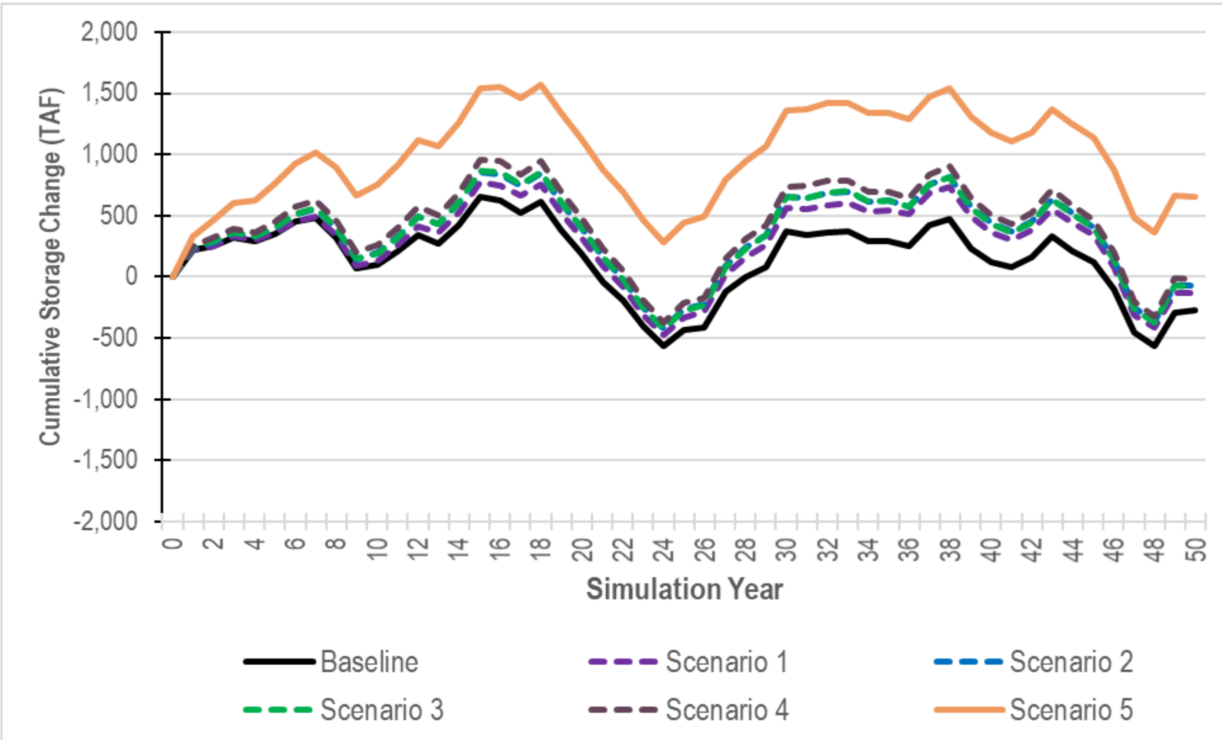


Figure 8-10: Scenario 5 Groundwater Budget

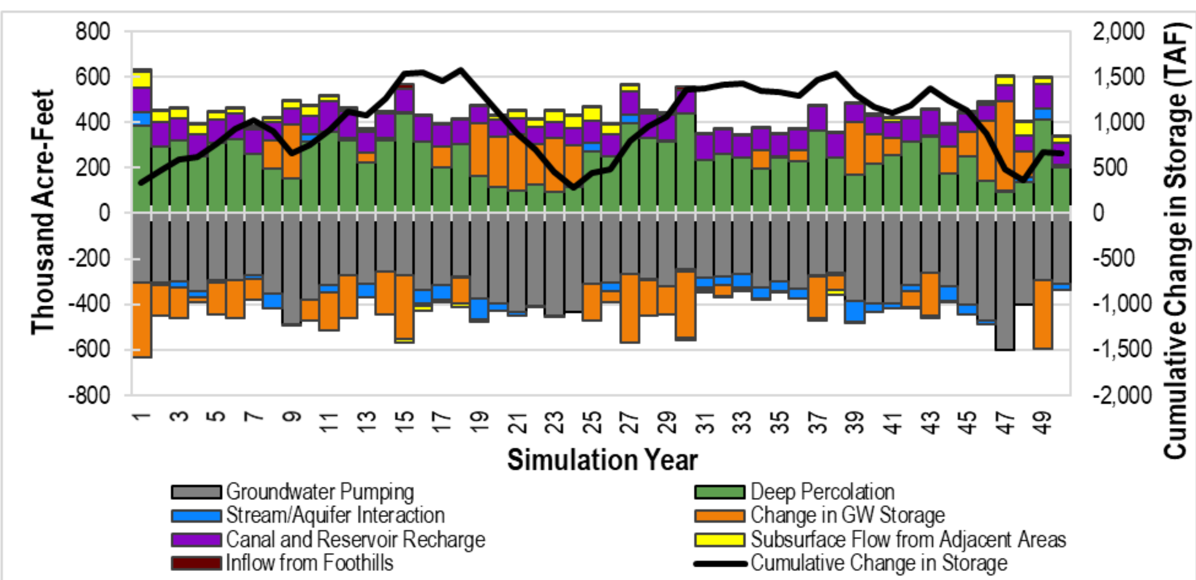


Table 8-25: Scenarios 1-5 Groundwater Budgets

	Baseline	Scenario 1 Urban & Municipal	Scenario 2 WTSGSA Agricultural	Scenario 3 ETSGSA Agricultural	Scenario 4 All Projects	Scenario 5 Projects & Dem. Red.
Deep Percolation	258,400	258,200	258,600	258,700	259,100	254,900
Canal, Res., & Direct Recharge	85,400	85,900	91,500	89,200	94,800	94,800
Net Stream Seepage	36,900	31,300	28,600	29,600	26,900	-18,300
Inflow from Foothills	2,100	2,100	2,100	2,100	2,100	2,100
Net Subsurface Inflow	28,900	21,400	16,700	17,000	12,300	14,900
Groundwater Pumping	417,200	401,600	399,000	398,200	395,600	334,300
Groundwater Storage Deficit[1]	5,500	2,700	1,500	1,600	400	-13,100

Notes: All Units are in acre-feet
[1] A negative value in "Groundwater Storage Deficit" indicates an annual increase in storage.

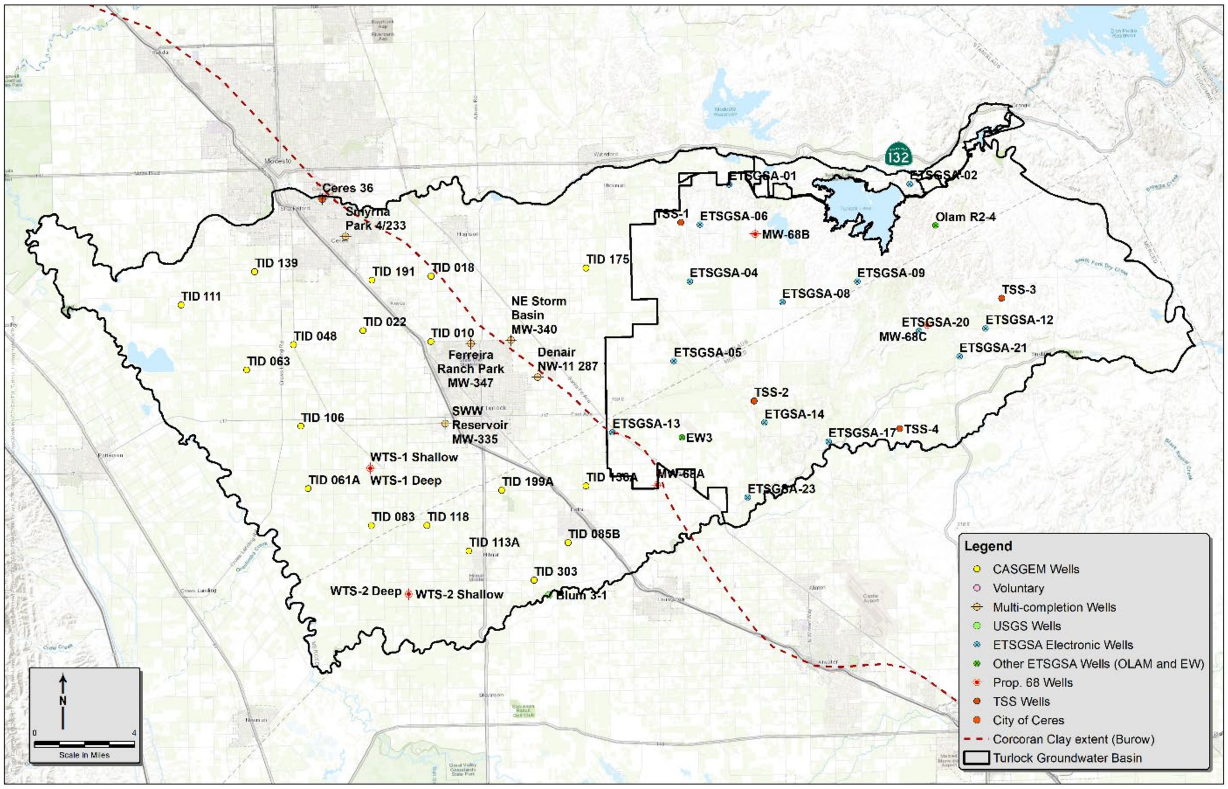
Term Definitions:

- Deep Percolation: inflow of water from the root/unsaturated zone to the aquifer
- Canal, Reservoir, & Direct Recharge: surface water contributions to the aquifer system from direct recharge projects and seepage from the Turlock and Merced Irrigation District conveyance systems, including the distribution lateral canals and Turlock Lake.
- Net Stream Seepage: net seepage inflow from the Tuolumne, Merced, and San Joaquin Rivers to the groundwater system
- Inflow from Foothills: subsurface inflow from the Sierra Nevada foothill watersheds
- Net Subsurface Inflow: combination of net subsurface inflows from the neighboring subbasins of Merced, Delta-Mendota, and Modesto Subbasins
- Groundwater Pumping: total groundwater pumped from the aquifer

8.5.2. Representative Hydrographs Scenarios 1-5

Figure 8-11 shows the location of the Monitoring Network wells that were used to evaluate the performance of the PMAs in each of the different scenarios.

Figure 8-11: Turlock Subbasin Monitoring Network



8.5.2.1. SMC1: Chronic Lowering of Groundwater Levels

Chapter 6: Sustainable Management Criteria ensure that groundwater levels throughout the subbasin do not exceed a given threshold set to protect the Subbasin from undesirable results resulting from the chronic lowering of groundwater levels (SMC1). **Chapter 5** defines undesirable results under SMC1 such that at no more than 33% of the representative monitoring wells shall exceed the 2015-low for a period longer than 3 years. Under Scenario 5, SGMA compliance was projected to be met throughout the simulation period. As shown in the figures below, simulated groundwater levels occasionally drop below the MT, but do not exceed the drought-time spatial or temporal limitations.

Note, the nine wells listed below (**Figures 8-13** through **8-21**) are not inclusive of all monitoring locations, rather this subset was included as they are considered representative of conditions throughout the Subbasin. Locations of these example representative hydrographs are shown in **Figure 8-12** below.

Figure 8-12: SMC1 Example Hydrographs

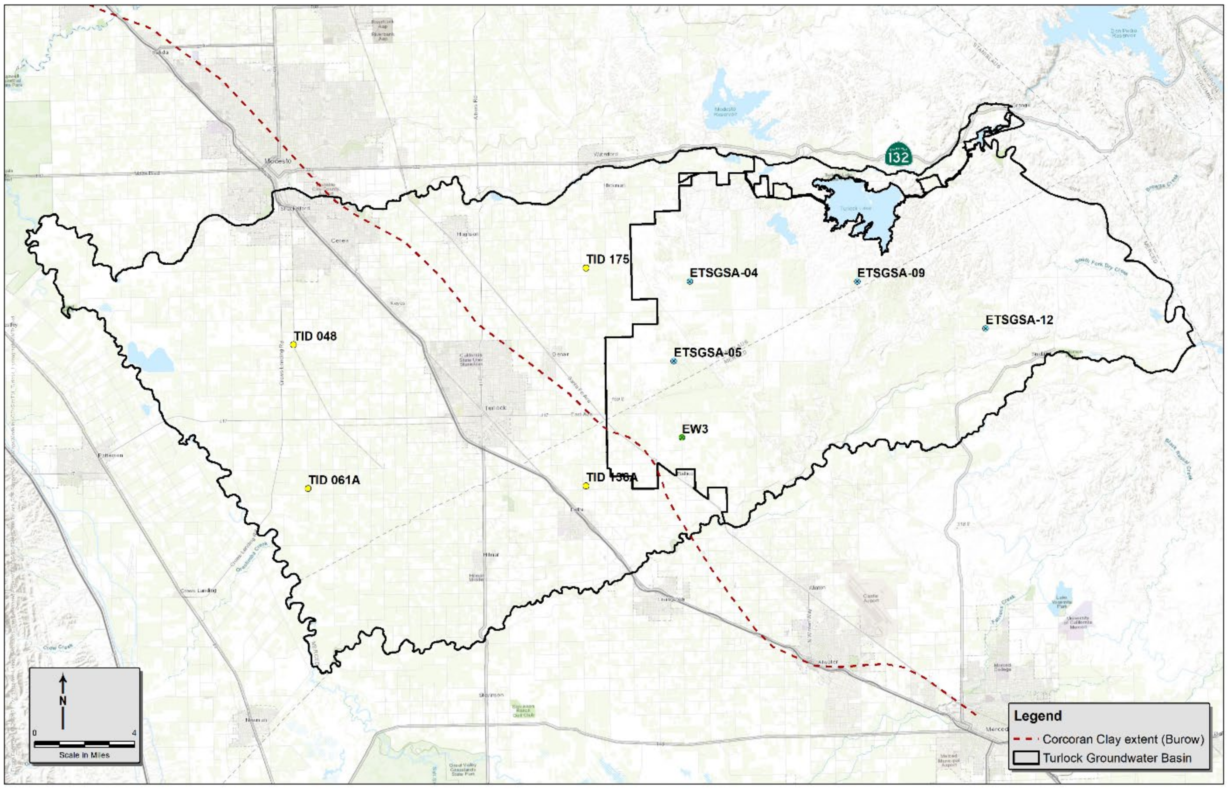


Figure 8-13: SMC1 Hydrograph ETSGSA-04

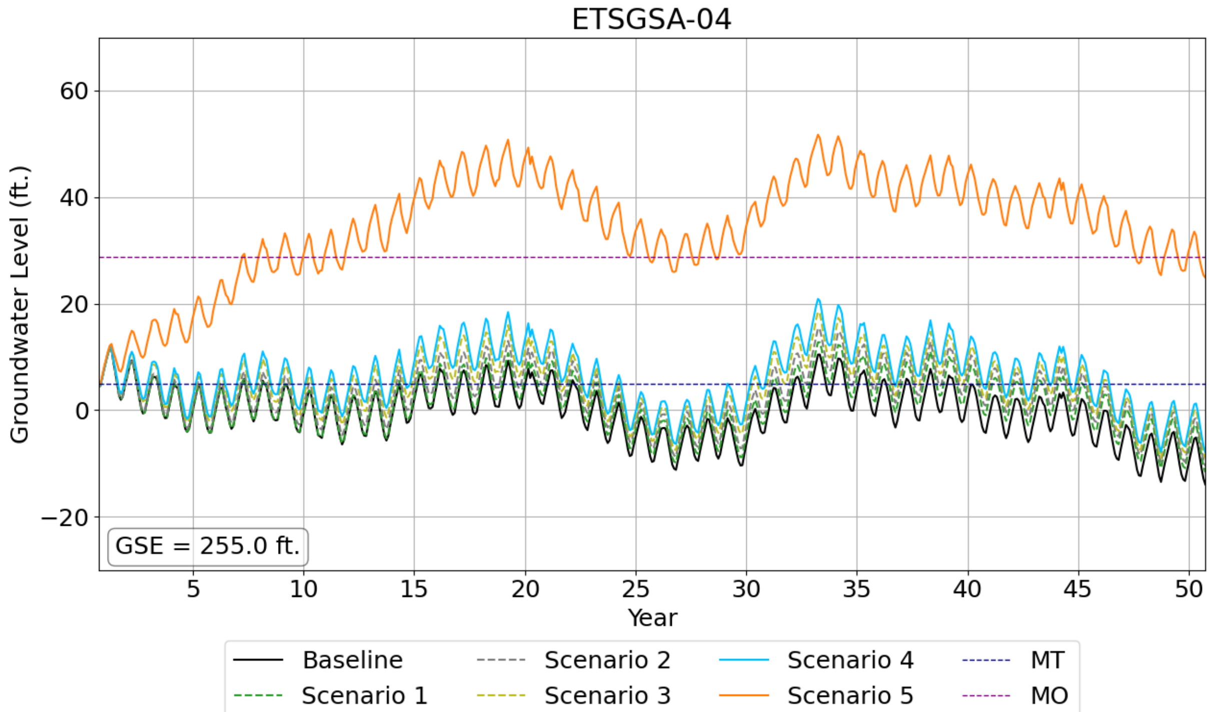


Figure 8-14: SMC1 Hydrograph ETSGSA-05

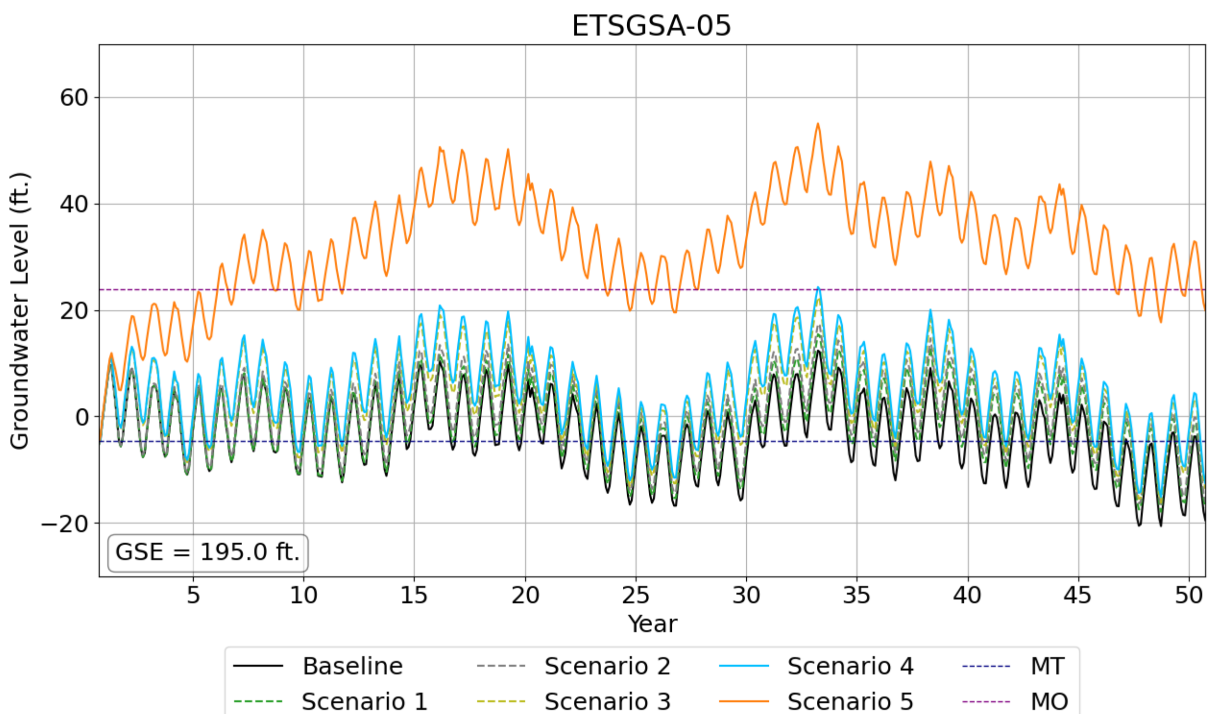


Figure 8-15: SMC1 Hydrograph ETSGSA-09

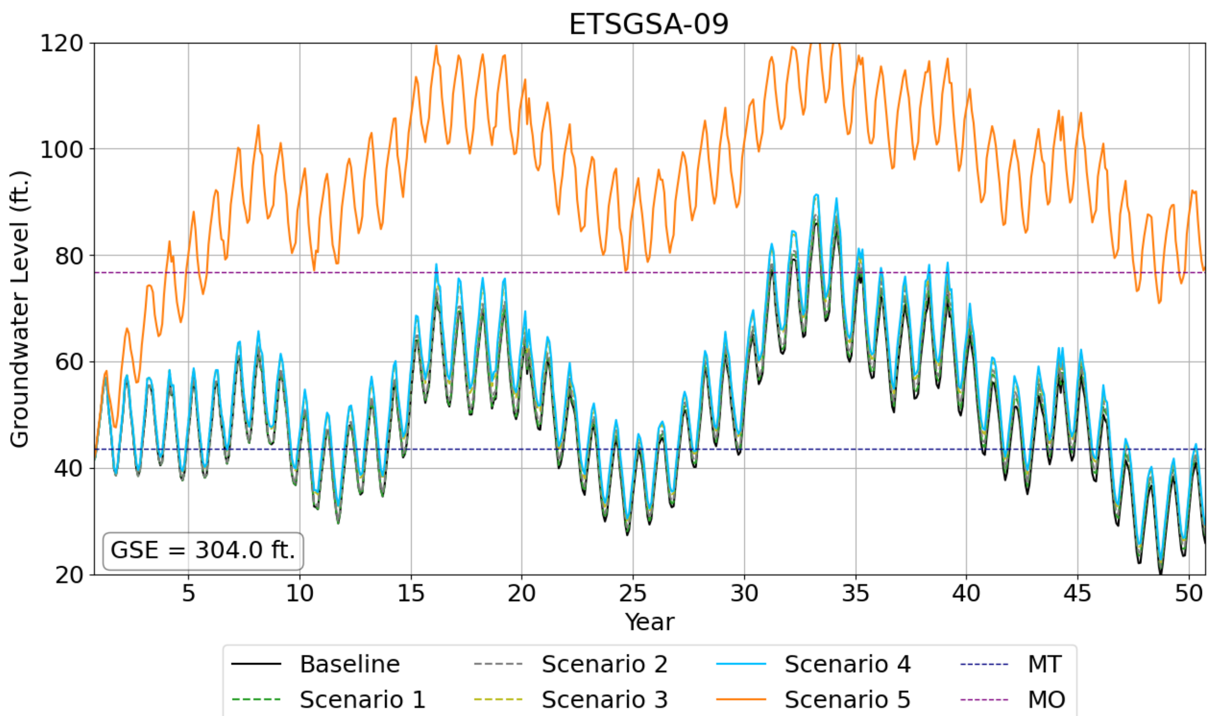


Figure 8-16: SMC1 Hydrograph ETSGSA-12

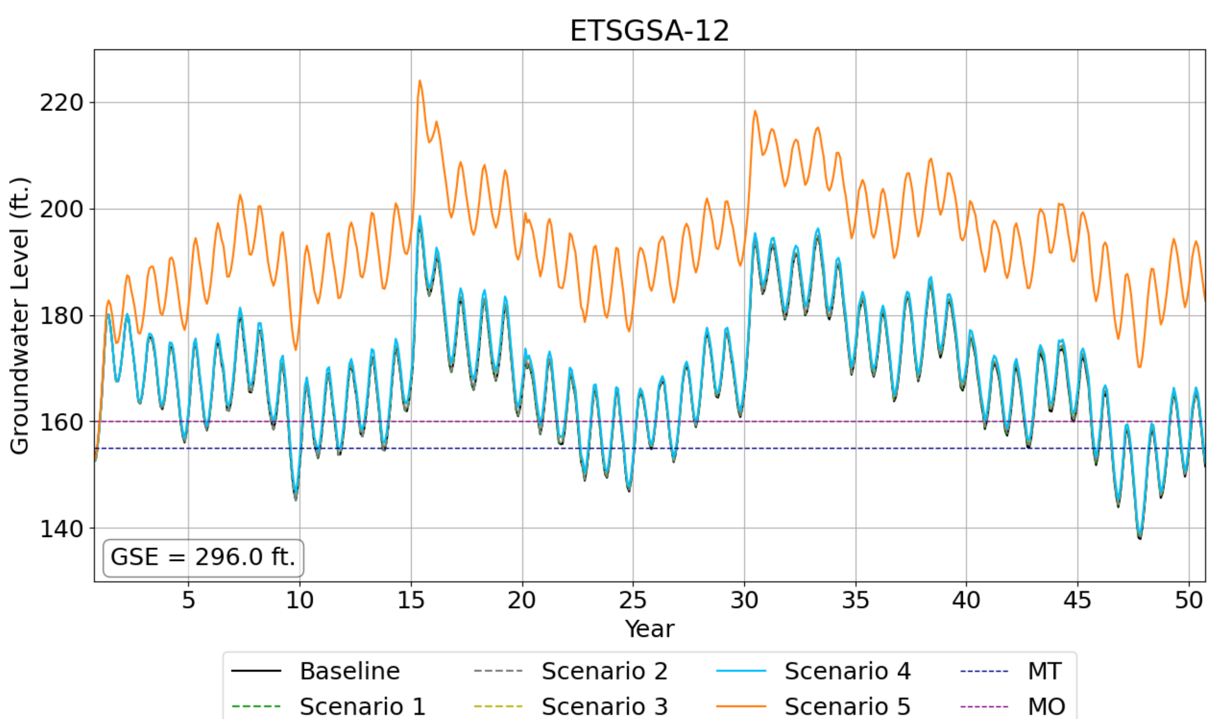


Figure 8-17: SMC1 Hydrograph EW3

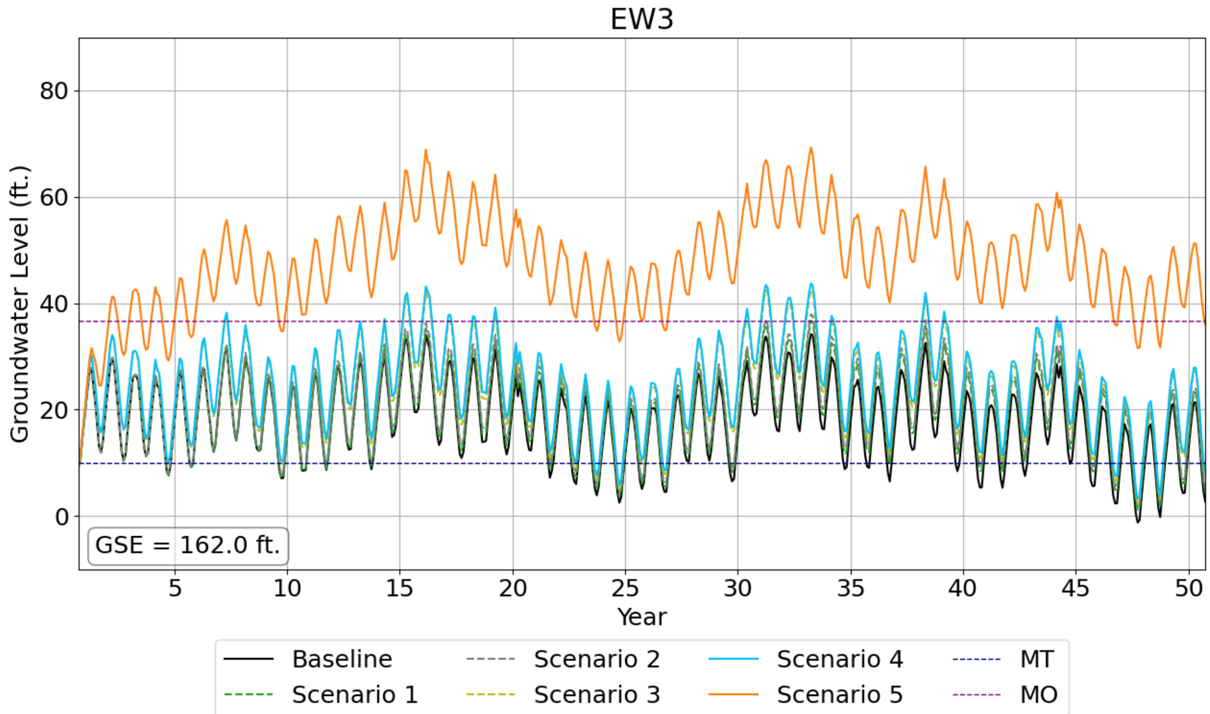


Figure 8-18: SMC1 Hydrograph TID-048

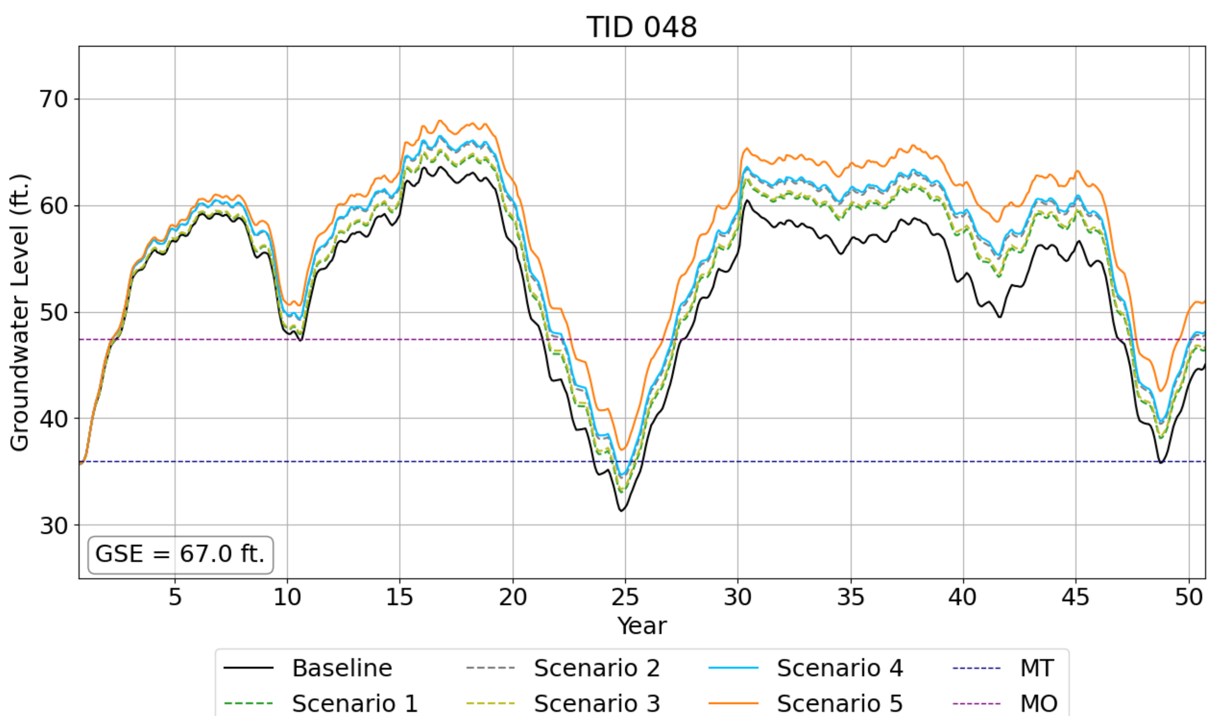


Figure 8-19: SMC1 Hydrograph TID-061A

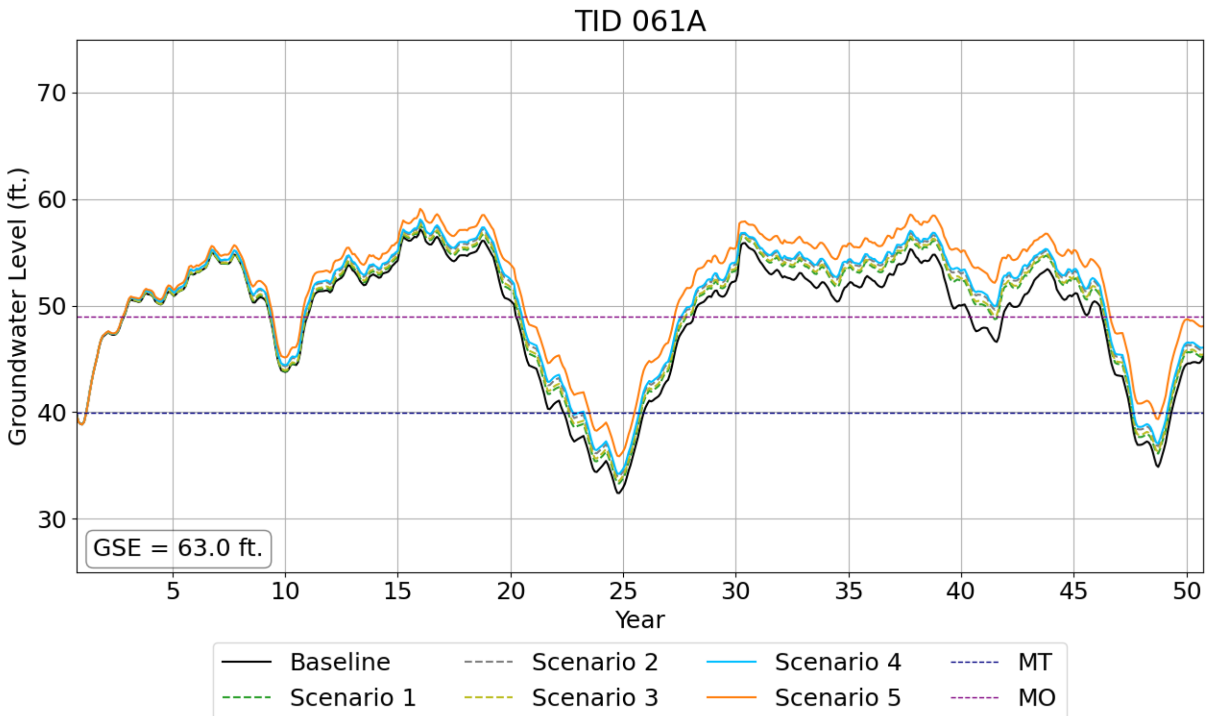


Figure 8-20: SMC1 Hydrograph TID-175

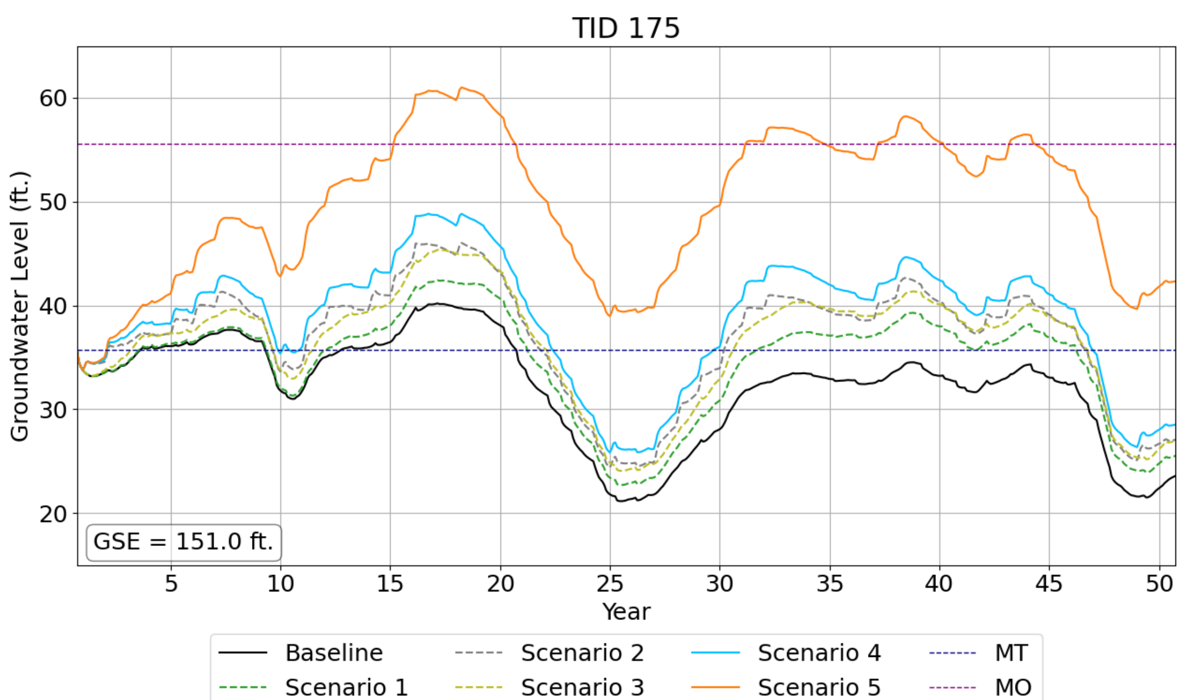
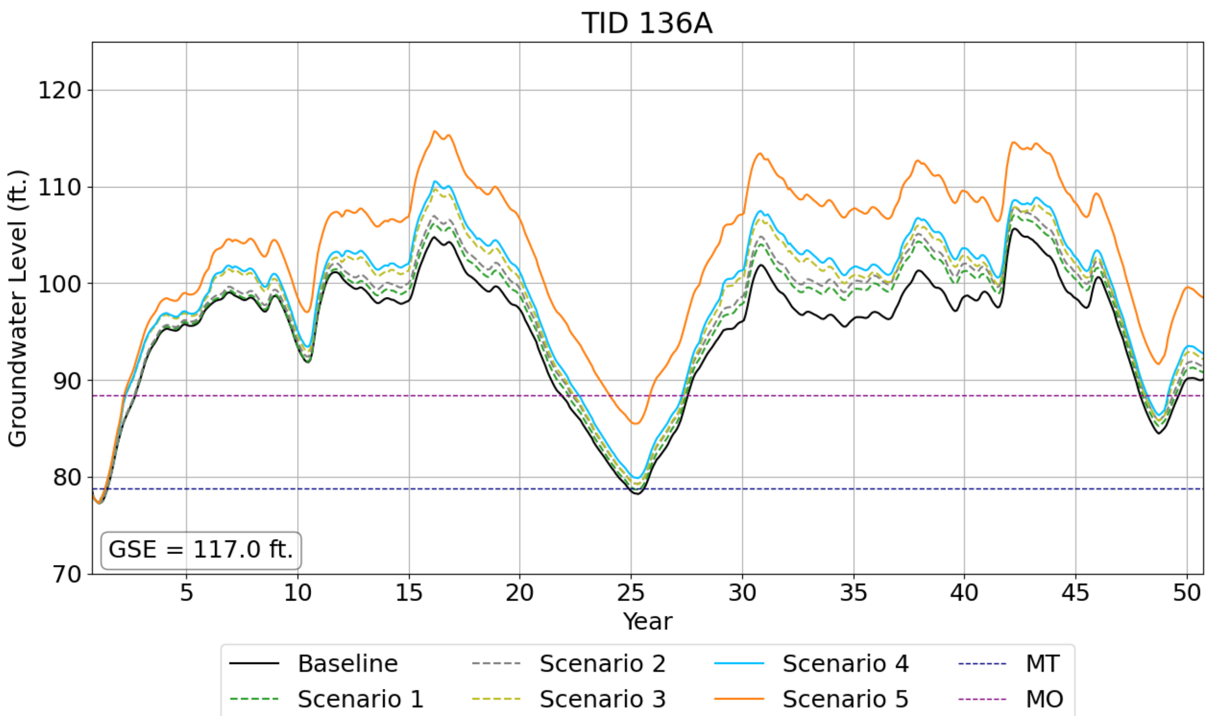


Figure 8-21: SMC1 Hydrograph TID-136A



8.5.2.2. SMC6: Interconnected Surface Water

Figure 8-22 shows the current monitoring wells along the rivers. MTs were set at wells along each of the major rivers within the Turlock Subbasin to protect interconnected surface water system from significant and unreasonable depletions (SMC6). **Chapter 6**: Sustainable Management Criteria define an undesirable result such that groundwater levels at no more than 50% of the representative monitoring wells along each river boundary shall be below a given threshold as measured by two consecutive annual monitoring events. These thresholds were defined as:

- Tuolumne River: Fall 2015 groundwater levels
- San Joaquin River: Fall 2015 groundwater levels
- Merced River: Spring 2014 groundwater levels[40]

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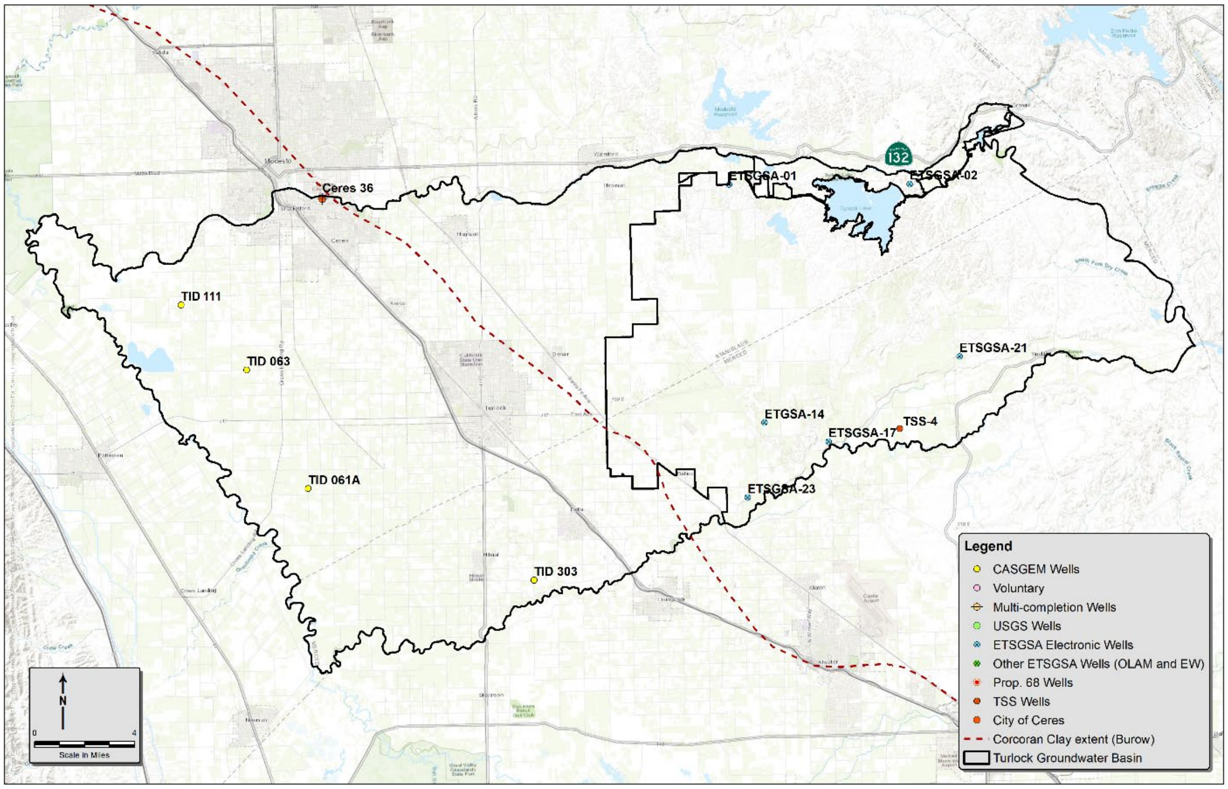
[40] Note that some of the MTs for wells near the Merced River are set for available wells with screen intervals up to over 100 feet below riverbed elevations without available vertical gradient data. These MTs may be subject to future adjustment as more data become available.

Under Scenario 5, SGMA compliance was met throughout the simulation period. As shown in the figures below, simulated groundwater levels occasionally drop below the MT, but do not exceed the drought-time spatial or temporal limitations.

Figure 8-22: SMC6 Monitoring Network



Interconnected Surface Water in the Tuolumne River

The monitoring wells ETSGSA-01 and ETSGSA-02 used to assess the groundwater levels near the Tuolumne River. **Figure 8-23** and **Figure 8-24** show the groundwater levels in these wells that result from Scenarios 1 through 5. Focusing on Scenario 5, groundwater levels are expected to increase up to 20 feet (ETSGSA-01) or 10 feet (ETSGSA-02) compared against the Baseline over the 50-year hydrologic period in the two wells. In both wells, the implementation of Scenario 5 conditions is expected to facilitate the compliance with the established MTs.

Figure 8-23: SMC6 Hydrograph ETSGSA-01

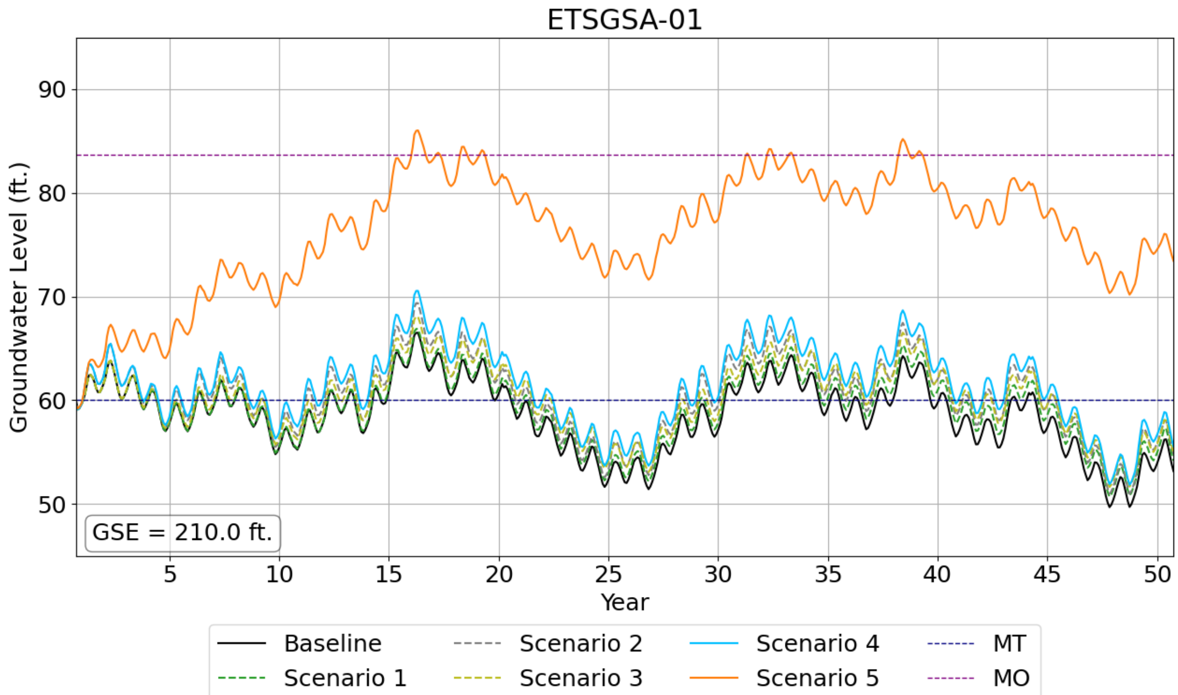
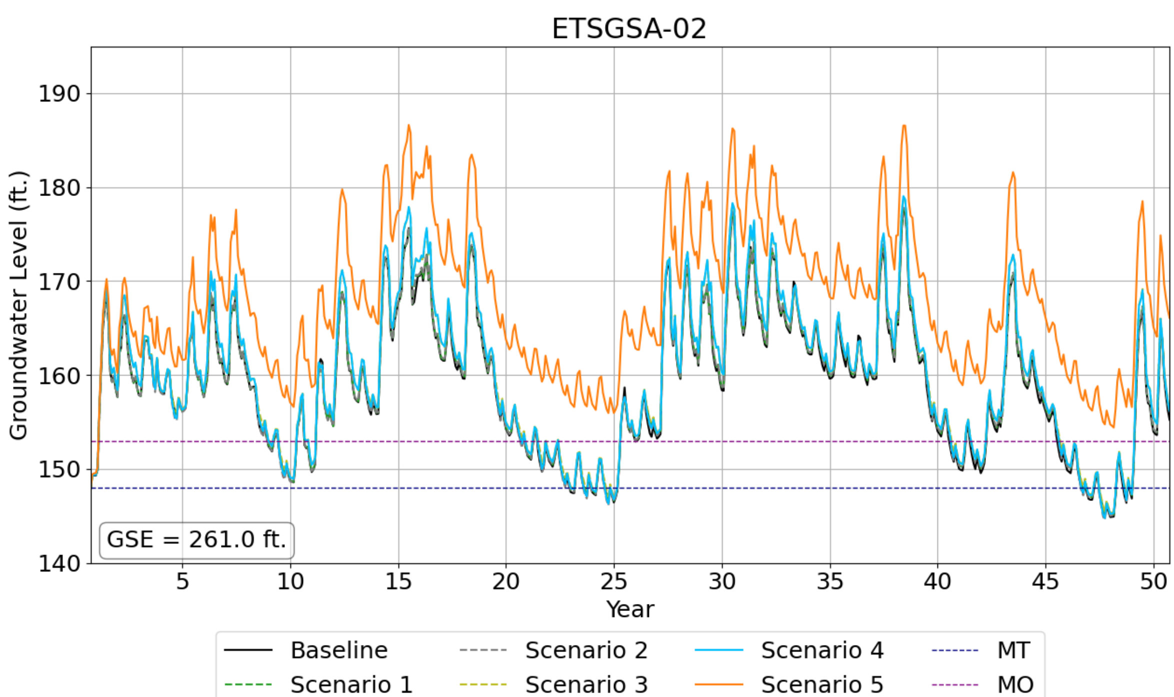


Figure 8-24: SMC6 Hydrograph ETSGSA-02



Interconnected Surface Water in San Joaquin River

The monitoring wells TID 061A, TID 063 and TID 111 are used to assess the groundwater levels near the San Joaquin River in the Turlock Subbasin. **Figure 8-25** through **Figure 8-27** show the groundwater levels in these wells expected to result from Scenarios 1 through 5. Focusing on Scenario 5, groundwater levels are predicted to increase up to 4-5 feet compared against the Baseline over the 50-year hydrologic period in the three wells. The implementation of conditions under Scenario 5 is expected to maintain groundwater levels such that MTs are met throughout the planning horizon.

Figure 8-25: SMC6 Hydrograph TID-061A

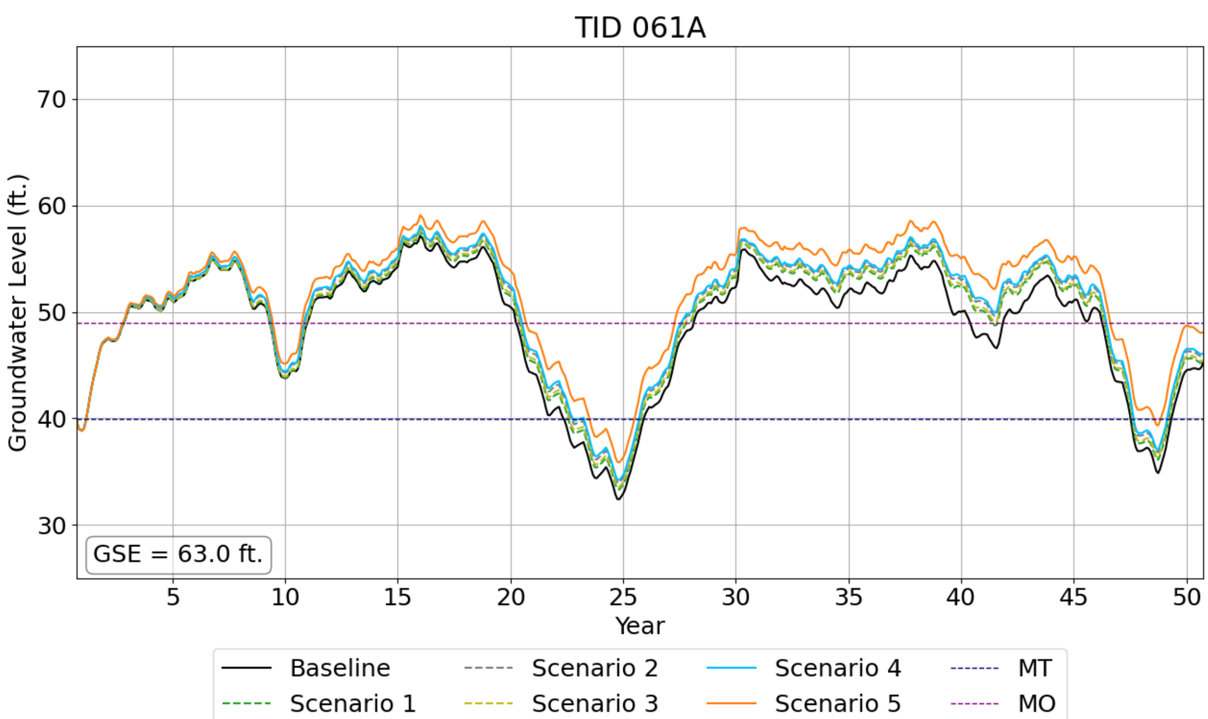


Figure 8-26: SMC6 Hydrograph TID_063

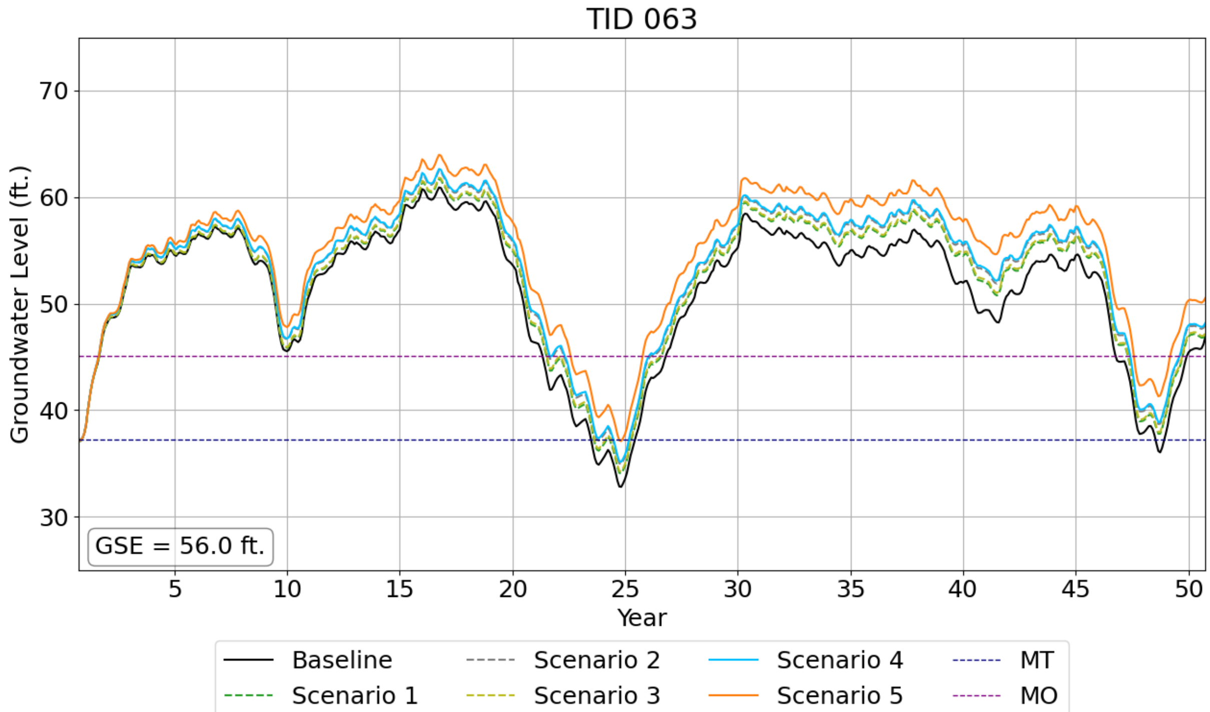
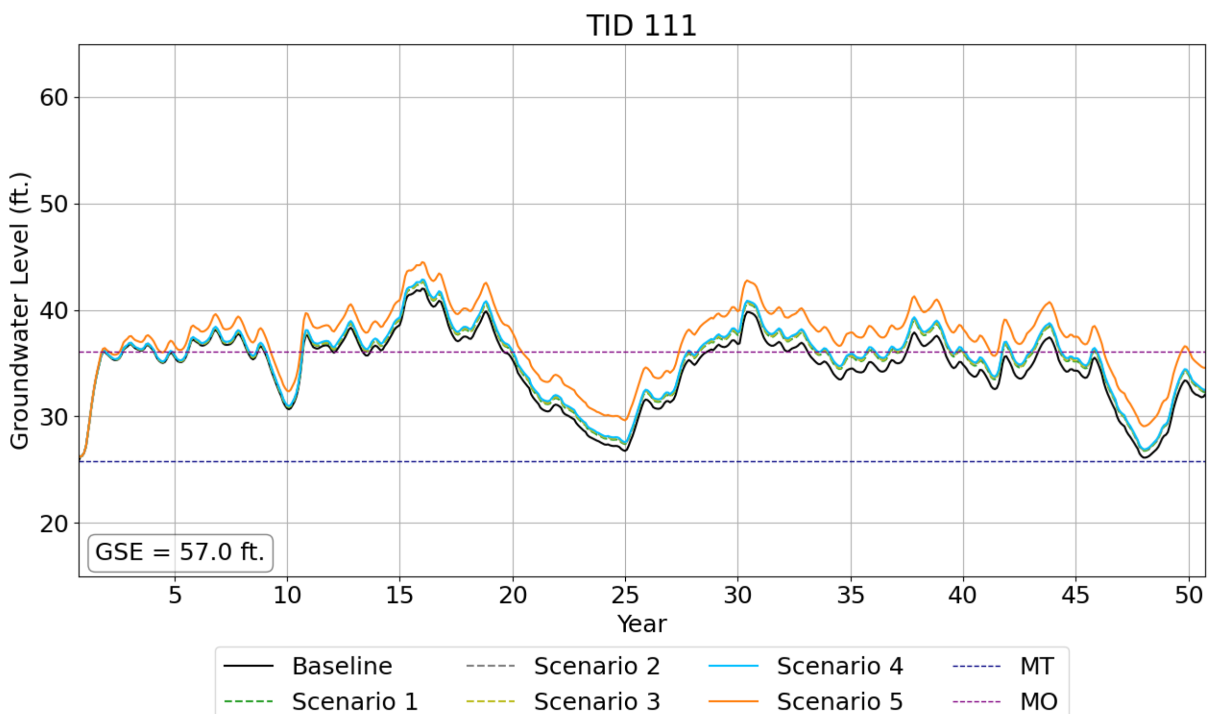


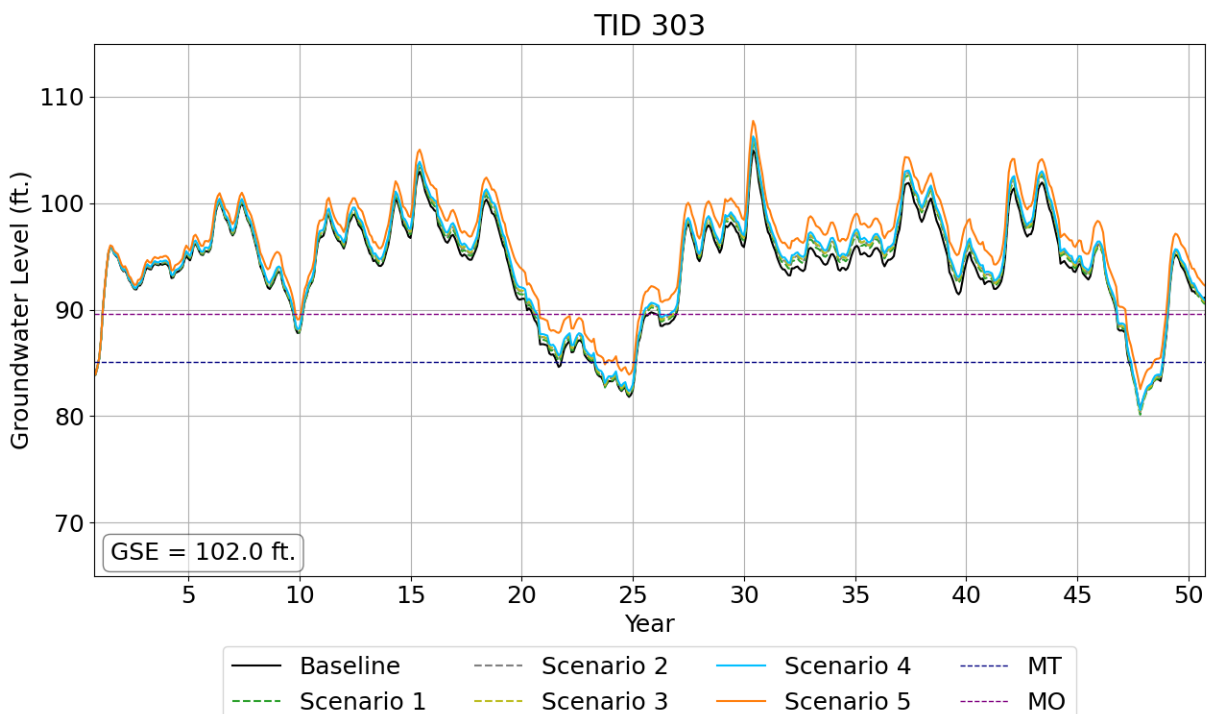
Figure 8-27: SMC6 Hydrograph TID-111



Interconnected Surface Water in Merced River

In contrast to MTs along the San Joaquin and Tuolumne River, MTs along the Merced River are set at Spring 2014 groundwater levels as described in **Chapter 6**.[41] The monitoring wells TID 303, ETSGSA-14, ETSGSA-17, ETSGSA-21, and ETSGSA-23 are used to assess the groundwater levels near the Merced River in the Turlock Subbasin. **Figure 8-28** though **Figure 8-32** show the groundwater levels in these wells projected result from Scenarios 1 through 5. Focusing on Scenario 5, groundwater levels are projected to increase from 2 ft (TID 303) up to 30 ft (ETSGSA-14 and ETSGSA-21) compared against the Baseline over the 50-year hydrologic period. Under Scenario 5 operations, conditions along the Merced River are projected to meet the MTs as outlined in **Chapter 6**: Sustainable Management Criteria.

Figure 8-28: SMC6 Hydrograph TID-303



[41] Note that some of the MTs for wells near the Merced River are set for available wells with screen intervals up to over 100 feet below riverbed elevations without available vertical gradient data. These MTs may be subject to future adjustment as more data become available.

Figure 8-29: SMC6 Hydrograph ETSGSA-14

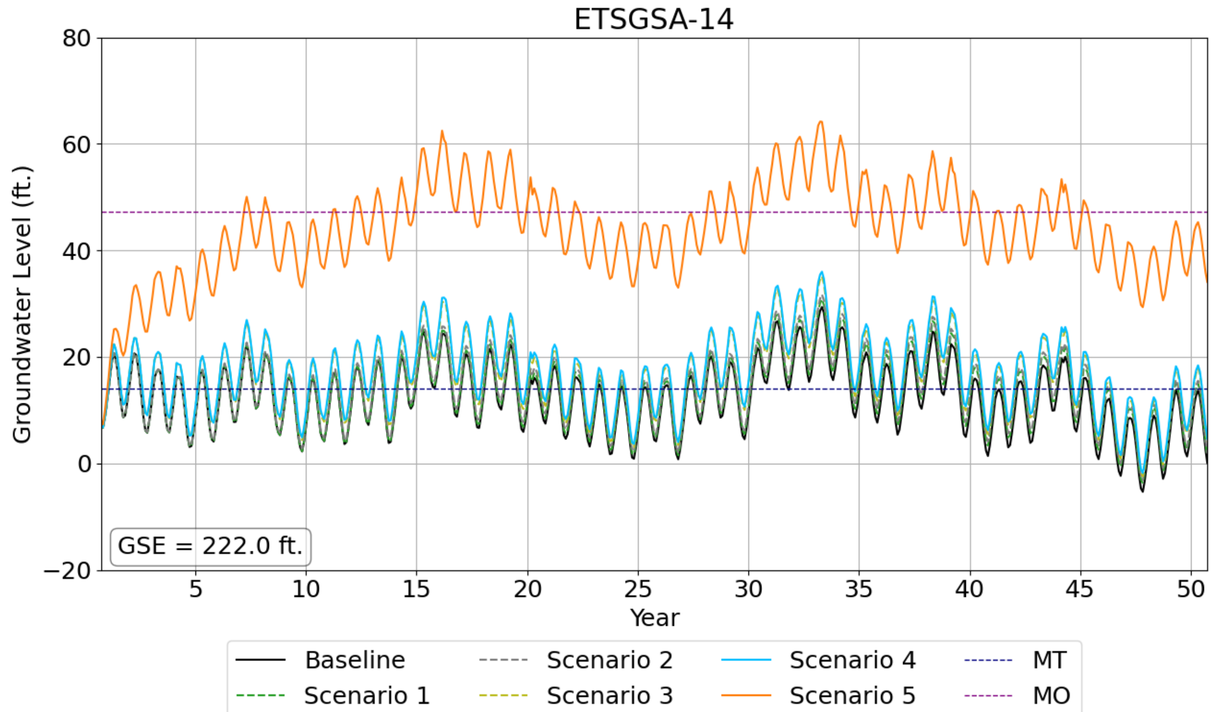


Figure 8-30: SMC6 Hydrograph ETSGSA-17

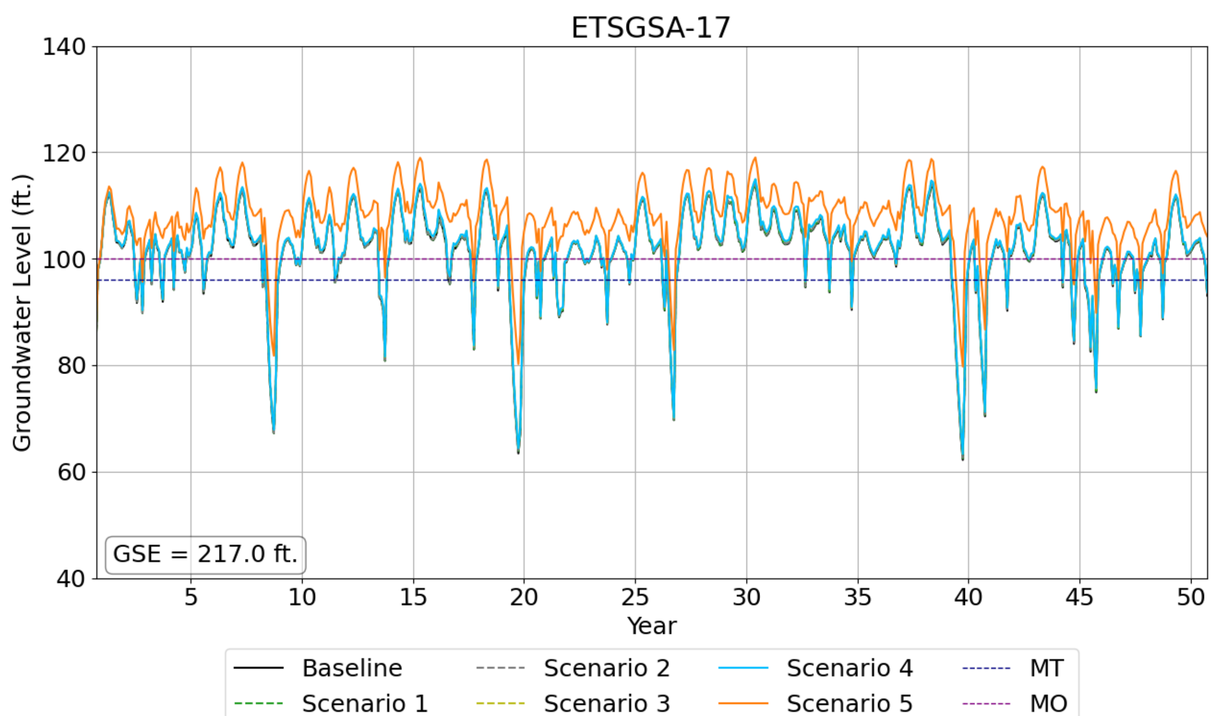


Figure 8-31: SMC6 Hydrograph ETSGSA-21

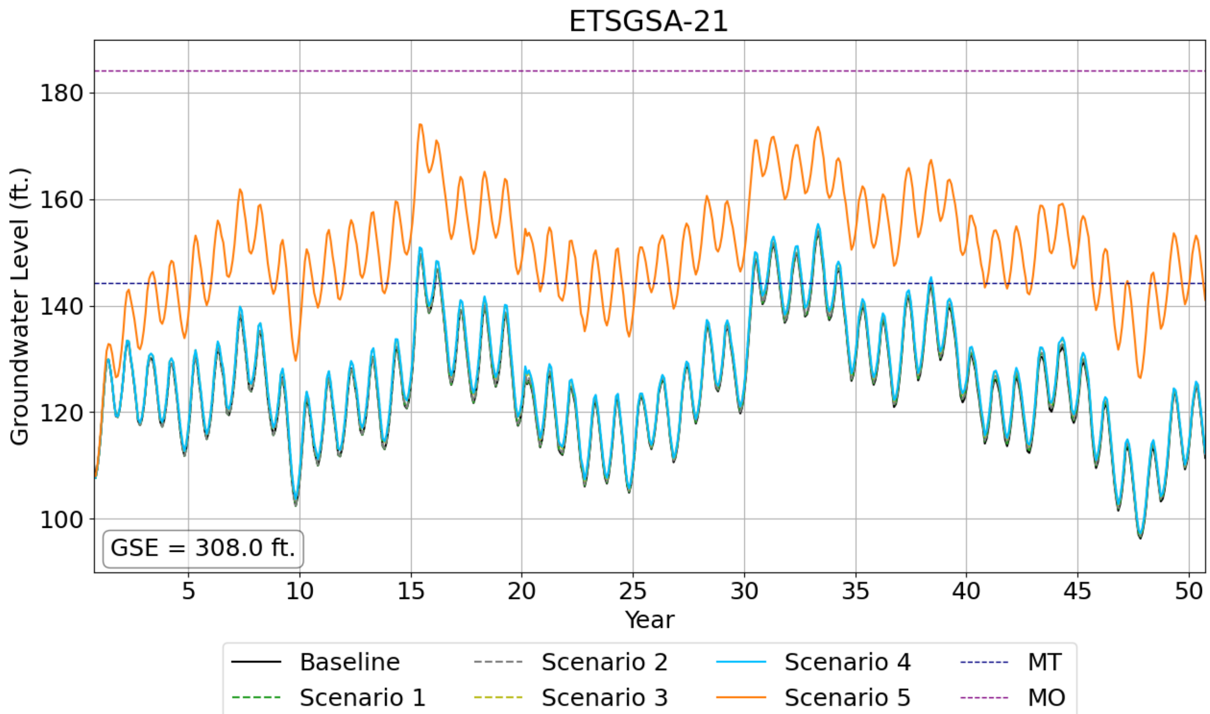
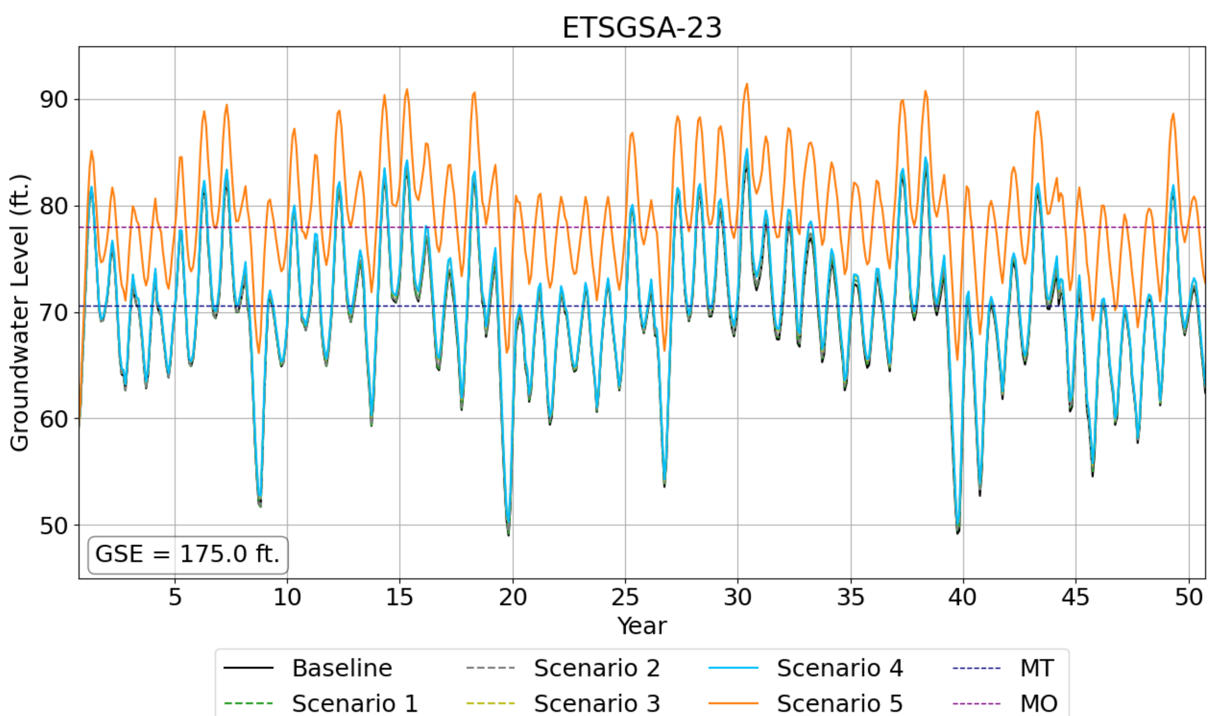


Figure 8-32: SMC6 Hydrograph ETSGSA-23



9. IMPLEMENTATION SUPPORT ACTIVITIES

This Chapter describes how the Turlock Subbasin GSP will be implemented. It provides a set of activities and actions in support of implementing the GSP between 2022 and 2042 but focuses on the most immediate activities in the first five years (between 2022 and 2027).

Implementing this GSP will require the following formative Implementation Support Activities (ISA), each of which is detailed in the subsequent subsections listed below. Estimates for ISA costs and schedule are summarized in **Sections 9.12 and 9.13**, respectively, at the end of the Chapter.

- Monitoring and reporting groundwater data (**Section 9.1**)
- Addressing identified data gaps including expanding and improving the existing monitoring networks (**Section 9.2**)
- Accounting mechanism for water supplies within the Subbasin (**Section 9.3**)
- Refining and implementing projects and management actions (adaptive management) (**Section 9.4**)
- Refine groundwater model incorporating new data and studies (**Section 9.5**)
- Develop action plan for exceedance of Minimum Thresholds (MTs) which may result in undesirable results (**Section 9.6**)
- Data Management System improvements (**Section 9.7**)
- Coordination and planning integration (**Section 9.8**)
- Well Registration and Management Program (**Section 9.9**)
- Developing financing strategies, including seeking grant funding to implement the GSP (**Section 9.10**)
- Updating Opti to include GSP Projects (**Section 9.11**)

The implementation plan in this Chapter is based on the current understanding of the Turlock Subbasin conditions and the current assessment of the projects and management actions (PMAs) described in **Chapter 8**. The understanding of the Subbasin's conditions and the details of the PMAs will evolve as the GSP is implemented, based on future data collection, model development, and input from stakeholders.

9.1. ISA 1: MONITORING, REPORTING, AND OUTREACH

During the first few years of implementation, the Turlock Subbasin GSAs will establish mechanisms and standard programs and practices to ensure the Subbasin is implementing the necessary monitoring, evaluating, and reporting of sustainability conditions. The Turlock Subbasin GSAs will hire consultants as necessary, negotiate agreements between agencies, and/or hire staff (or utilize GSA member agency staff) to implement the monitoring (**Section 9.1.1**), reporting (**Section 9.1.2**), and outreach (**Section 9.1.3**) functions described in more detail in the subsections below.

9.1.1. Monitoring

Monitoring of the five sustainability indicators which apply to the Subbasin will begin immediately upon adoption of the GSP. Most monitoring relies on existing monitoring programs, and therefore there is no need to initiate new programs. However, these programs will need to be coordinated to utilize the information to assess compliance with sustainable management criteria (SMC).

The Turlock Subbasin GSAs will coordinate the monitoring programs discussed in **Chapter 7** to track Subbasin conditions related to the sustainability indicators. Data compiled by the GSAs from the monitoring programs will be regularly evaluated to ensure progress is being made toward the sustainability goals or to identify if undesirable results are occurring or are expected to occur. Data will be maintained in the Data Management System (DMS). Data from the monitoring programs will be used by the Turlock Subbasin GSAs to guide decisions on PMAs and to prepare Annual Reports for stakeholders, member agencies, and DWR.

As described in **Chapter 7**, groundwater level monitoring networks were developed to monitor several sustainability indicators, including chronic lowering of groundwater levels, reduction of groundwater in storage, land subsidence, and depletions of interconnected surface water. The applicability and rationale for using groundwater elevations to monitor each of these four sustainability indicators is discussed in **Chapter 6**. The monitoring networks are composed of representative monitoring wells that will be used to monitor SMC for these sustainability indicators during the GSP implementation and planning horizon. There are 52 representative monitoring wells in the monitoring networks. Groundwater levels will be measured at the monitoring network wells twice a year, to capture the seasonal high and low groundwater elevations associated with the irrigation pumping cycle. In addition, the GSAs have identified an additional 52 wells, called SGMA monitoring wells, which will be monitored for groundwater levels but are not proposed to be used to monitor sustainability indicators. The protocols for data collection and monitoring are described in **Chapter 7**.

The monitoring network for degradation of water quality will be based on wells monitored by others and available at the State Water Resources Control Board (SWRCB) GeoTracker website (see **Section 9.1.1.3**).

9.1.1.1. Groundwater Elevation Monitoring

As described in **Chapter 7**, a monitoring network for the chronic lowering of groundwater levels sustainability indicator was developed for each principal aquifer. The monitoring network is composed of both existing and proposed wells. Existing wells include selected CASGEM wells, municipal multi-completion wells in the Cities of Ceres and Turlock and the town of Denair, a USGS well, and a series of active and inactive production wells and monitoring wells in the eastern Subbasin developed as part of the ETSGSA monitoring program. The monitoring network anticipates incorporation of new monitoring wells that will be constructed in Winter 2021/2022 with Proposition 68 grant funding from DWR and new monitoring wells within ETSGSA in 2022 and 2023 to be installed by well drilling services funded through the DWR Technical Support Services (TSS) program. The monitoring network for chronic lowering of groundwater levels includes 18 wells in the Western Upper Principal Aquifer, 8 wells in the Western Lower Principal Aquifer, and 21 wells in the Eastern Principal Aquifer. Static groundwater elevations will be measured twice a year in these monitoring wells to represent seasonal high and seasonal low groundwater conditions. The monitoring network and activities are described in **Chapter 7** and summarized on **Tables 7-1** and **7-3** and illustrated on **Figures 7-1, 7-2**, and **7-3.**

9.1.1.2. Groundwater Storage Monitoring

As described in **Chapters 6** and **7**, the SMC for chronic lowering of groundwater levels will be used as a proxy for the reduction of groundwater in storage sustainability indicator. Accordingly, the groundwater elevation monitoring will also be used for monitoring reduction of groundwater in storage. Static groundwater elevations will be measured twice a year in these monitoring network wells to represent seasonal high and seasonal low groundwater conditions.

9.1.1.3. Groundwater Quality Monitoring

As described in **Chapters 6** and **7**, the SWRCB and other agencies have the primary authority for water quality and the GSAs do not intend to duplicate this authority. Accordingly, the monitoring network for this sustainability indicator will incorporate existing monitoring data. **Figure 7-4** illustrates the monitoring data available from January 2020 through May 2021. Every year, water quality data will be downloaded from GeoTracker (https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/) for the six constituents of concern (COCs): arsenic, nitrate, total dissolved solids (TDS), uranium, 1,2,3-trichloropropane (1,2,3-TCP), and tetrachloroethene (PCE). These data will be compared to their MCLs, and any new MCL exceedances will be evaluated to determine whether the exceedances were caused, or exacerbated, by GSA management of water levels or GSA projects and management actions. This analysis will include an assessment of whether GSA management of water levels or GSA projects and management actions are impacting the human fight to water. This analysis will be included in the GSP Annual Reports.

9.1.1.4. Land Subsidence Monitoring

As described in **Chapters 6** and **7**, the SMC for chronic lowering of groundwater levels will be used as a proxy for the land subsidence sustainability indicator. Accordingly, the groundwater elevation monitoring will also be used for monitoring land subsidence. Static groundwater elevations will be measured twice a year in these monitoring network wells to represent seasonal high and seasonal low groundwater conditions.

In addition, land subsidence will be monitored in the Subbasin by updating and evaluating vertical displacement data collected using Interferometric Synthetic Aperture Radar (InSAR) by TRE Altamira Inc., under contract with DWR, and available on the SGMA Data Viewer (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub). This data will be downloaded and evaluated annually, and the analysis will be included in the GSP Annual Reports.

9.1.1.5. Interconnected Surface Water Monitoring

The monitoring network for depletions of interconnected surface water includes 12 well locations along the San Joaquin River, Tuolumne River, and Merced River. The wells are screened in the Western Upper Principal Aquifer and the Eastern Principal Aquifer and include wells from CASGEM, the ETSGSA monitoring program, City of Ceres (1 well), and a future TSS well cluster. Static groundwater elevations will be measured twice a year in these monitoring wells to represent seasonal high and seasonal low groundwater conditions. The monitoring network is summarized on **Table 7-2** and presented on **Figure 7-5**.

9.1.2. Reporting

SGMA regulations establish that reports must comply with DWR submittal requirements and that all transmittals must be signed by an authorized party. Data will be organized and made available to the public to document conditions within the Subbasin relative to the SMC established in **Chapter 6**. At a minimum, the following reports will be prepared:

- <u>Annual Reports</u>. SGMA Regulation §356.2 stipulates that Annual Reports will be submitted to DWR starting on April 1, 2022. Annual Reports provide key information to for both DWR and the GSAs to enable them to gage progress toward GSP implementation. The purpose of the report is to provide monitoring and total groundwater use data to DWR, compare monitoring data to the SMC, and adaptively manage actions and projects implemented to achieve sustainability. Annual Reports will also be available to stakeholders.
- <u>Five-Year GSP Assessment Reports</u>. Five-Year GSP Assessment Reports (also referred to as “Five-Year Updates” elsewhere in this GSP) will be prepared and provided to DWR starting in 2027. The Turlock Subbasin shall update and evaluate the GSP at least every 5 years to assess if it is achieving the sustainability goal of the Subbasin. The assessment will include a description of any significant new information that has become available since the GSP was adopted or amended, and whether the new information or understanding warrants changes to aspects of the GSP.
- <u>GSP Periodic Evaluations and Amendment</u>. While not required by SGMA or the regulations established to implement SGMA, the Turlock Subbasin GSAs may consider periodic evaluations or amendments to the GSP as necessary. Updates or amendments could include, but are not limited to, incorporating additional monitoring data, updating the SMC, and documenting any projects, management actions, or adaptive management activities. Updates to the model may result in updates to the water budgets (described in **Chapter 5**) that may warrant an amendment to the GSP. The DMS will also be routinely updated to include new information gathered from the monitoring networks and included in the Annual Reports and Five-Year GSP Assessment Reports.

9.1.3. Communication and Outreach

The Turlock Subbasin GSAs will utilize the monitoring data to routinely provide information to the public, including the disadvantaged and underrepresented communities within the Subbasin, about progress being made toward sustainability, challenges encountered, and the need to use groundwater efficiently. The Turlock Subbasin GSAs website will be maintained as a communication tool for posting data, reports, project information, meeting notices, and other pertinent information. Tools will be evaluated to make GSP monitoring data more accessible to stakeholders through the Subbasin website.

9.2. ISA 2: Addressing Identified Data Gaps Including Updating and Improving the Existing Monitoring Network

While the Turlock Subbasin has a comprehensive monitoring network, improvement of the monitoring network for this GSP will assist in identifying and maintaining sustainable groundwater management in the Subbasin. There are areas of the Subbasin that could be improved through additional monitoring, even though overall monitoring well density is sufficient. Gaps are present spatially, with depth, and related to groundwater levels, subsidence, and surface water depletions (refer to **Section 7.3** for more information about data gaps). Specific activities are described in the subsections below for three individual areas of the Subbasin:

1. Western Lower Principal Aquifer (**Section 9.2.1**)
2. Western Tuolumne River, Merced River, and San Joaquin River (**Section 9.2.2**)
3. Eastern Aquifer (**Section 9.2.3**).

Network-wide data gaps are described in the following **Section 9.2.4**.

Existing wells will be preferentially selected to serve as new groundwater monitoring locations, where available and appropriate for this use. The use of existing monitoring wells is more cost effective than installation of new monitoring well facilities. However, in some cases new monitoring wells may be required, either due to an inability to gain access to a suitable existing well or due to the need for more detailed, depth-specific information that cannot be obtained from existing production wells.

9.2.1. Fill Data Gaps in Western Lower Principal Aquifer (Chronic Lowering of Water Levels, Reduction of Groundwater in Storage, Land Subsidence)

Additional monitoring sites may be added within the Western Lower Principal Aquifer to address needs related to chronic lowering of groundwater levels, reduction of groundwater in storage, and land subsidence. The Western Lower Principal Aquifer is located in the portion of the Turlock Subbasin underlain by the Corcoran Clay. Additional monitoring needs in this area are driven by the higher potential for subsidence due to the nature of subsurface materials and due to a relatively lower density of monitoring locations.

The first additional monitoring wells are in early planning stages, with funding planned in the WTSGSA budget over two fiscal cycles (2021-22 and 2022-23). The WTSGSA may seek grant funding for well installation, or if unavailable, will use GSA funds. Two multi-completion wells are planned. Specific locations for these monitoring wells have not been chosen, but it is anticipated that one set will be southwest of Ceres, and one will be near Delhi. Both will benefit the Western Lower Principal Aquifer. Once these initial wells are installed and initial data gathered over the first few years, the total number of wells needed would be analyzed and reassessed, with additional plans identified at that time. Additionally, installation of one or more extensometers may be considered, in coordination with neighboring Subbasins and with other partners, such as the USGS, DWR, and the California High Speed Rail Commission.

9.2.2. Fill Data Gaps Along Western Tuolumne River, Merced River, and San Joaquin River – Locations and Shallow Well Depths (Interconnected Surface Water)

Additional monitoring sites may be added within the vicinity of the Tuolumne River, Merced River, and San Joaquin River to address needs related to depletions of interconnected surface water. Existing monitoring wells near these rivers are generally screened at depths typical of domestic, agricultural, or urban groundwater pumping. These monitoring wells are useful for understanding the impacts of groundwater pumping on the aquifer system as a whole, but shallower monitoring wells are needed to better understand shallow groundwater flow near the river boundaries.

Wells would be placed to better understand shallow groundwater conditions, their relationship with stream stage, and their relationship with deeper groundwater conditions. Given the unique nature of these wells, all wells would likely be newly constructed. Exceptions exist where existing wells may be considered for inclusion, such as the City of Ceres which has shallow wells associated with groundwater contamination.

The first additional monitoring wells to be added to the monitoring network to address interconnected surface water are in early planning stages, with funding in the GSA budgets over two fiscal cycles (2021-22 and 2022-23) to design the wells. The GSAs may seek grant funding to install the wells, or if unavailable, will use GSA funds. A total of 8 shallow monitoring wells are planned. Locations will be coordinated with neighboring subbasins. The GSAs tentatively plan to install three wells along the Tuolumne River, three wells along the Merced River, and two wells along the San Joaquin River. However, the locations may change as sites are identified. Once these initial wells are installed and data gathered over the first few years, the total number of wells needed would be analyzed and assessed, with additional plans identified at that time.

9.2.3. Fill Data Gaps in Eastern Principal Aquifer – Additional Wells Near Failed Domestic Wells

Additional monitoring sites may be added within the vicinity of failed domestic wells (e.g., in the surrounding areas of Hughson, Hickman, and eastern Denair). These monitoring wells would be selected for depths of typical domestic wells to improve the ability to manage groundwater conditions and avoid impacts to these users. They would be given highest priority for consideration of telemetry and public access, so domestic well users can assess their risk of well issues. Note that telemetry requires appropriate site locations and may not be possible at all locations.

The first additional monitoring well to be added to address this data gap is in early planning stages, with funding in the WTSGSA budget over two fiscal cycles (2021-22 and 2022-23). The WTSGSA may seek grant funding for well installation, or if unavailable, will use GSA funds. The WTSGSA tentatively plans to install one monitoring well in the Eastern Principal Aquifer area within the WTSGSA between Denair, Hughson, and Hickman. The exact location remains to be determined. Once this initial well is installed and initial data gathered, the total number of wells needed would be analyzed and assessed, with additional plans identified at that time.

9.2.4. Obtain Missing Information for Monitoring Network Sites

The ISAs described below cover other general improvements to monitoring well access as well as improving understanding of shallow groundwater conditions.

9.2.4.1. Obtain Long-Term Access Agreements for GSP Network Wells, As Needed.

Groundwater monitoring of private wells in the Subbasin has in many instances been performed on a "handshake" arrangement, where verbal or written agreements allow the monitoring, but no formal signed agreement exists. This ISA would involve coordination and outreach to obtain formal access agreements with property owners, including drafting access agreements, contacting property owners, and working to obtain signed agreements for existing monitoring wells (as needed) and any new monitoring wells identified.

9.2.4.2. Obtain Access to Available USGS Wells Drilled in The Subbasin

Similar to other access agreements described above, the GSAs do not have approvals from the USGS to access their wells or with the property owner to access the property on which USGS wells are located. Work under this ISA would include developing agreements or other approvals necessary with both the USGS and the property owners to enable the USGS wells to be used for long-term monitoring.

9.2.4.3. Improve Understanding of Shallow Groundwater Conditions and Operations to Control Shallow Groundwater Through Operation of Drainage Wells

In many areas of the WTSGSA, shallow groundwater can adversely impact crop production with drainage (through tile drains and drainage wells) used to counteract these impacts. Drainage water is pumped back into the canal system and is used for irrigation purposes downstream. However, under the GSP, areas with shallow groundwater conditions may have MTs within only a few feet of MOs, meaning the margin of operational flexibility is very narrow and both of these values are relatively close to the ground surface. This ISA proposes further evaluation of conditions in these shallow groundwater areas to develop an approach that enables water levels to be managed low enough so as not to adversely impact crops while avoiding undesirable results and putting the water to use for irrigation. In addition to developing guidance on the management of shallow groundwater in this area, this may result in suggested modifications of the MTs and MOs in the western side of the Subbasin to be taken into consideration in future GSP updates.

9.3. ISA 3: Accounting Mechanism for Water Supplies within the Subbasin

The GSAs acknowledge that implementation of the GSP will require that an accounting of groundwater, surface water stored in basin aquifers and/or the sustainable yield of the basin ("Groundwater Accounting Structure") be allocated to each GSA. Each of the GSAs has performed a preliminary analysis of accounting for water in the Subbasin, however, they have not been able to agree to a final Groundwater Accounting Structure within the time available to include such a final framework in the GSP. The GSAs have entered into a Memorandum of Agreement (MOA) that commits them to resolve that issue immediately after the GSP is submitted to the DWR for review. The MOA and the First Amendment to the MOA are included in **Appendix I** of the GSP. As part of that MOA, the GSAs agreed to include accounting documents related to the concept of the Groundwater Accounting Structure, which are attached to the MOA in **Appendix I** as **EXHIBIT A-1** and **EXHIBIT A-2** for the WTS GSA and **EXHIBIT B-1** and **EXHIBIT B-2** for the ETS GSA.

The target timeline for resolving the different positions of the GSAs as set forth in the accounting Exhibits shall be the following:

- 6 months after submission of the GSP to DWR: GSAs pass a resolution or other action that documents the agreed upon the binding rules and allocations that shall apply to the Groundwater Accounting Structure in the Turlock Subbasin;
- Within one year after submission of the GSP to DWR: GSAs identify and obtain all outstanding information or data required, if any, to support the development of an agreed upon Groundwater Accounting Structure;
- Within 18 months after submission of the GSP to DWR: Each GSA provides its GSA counterpart a detailed accounting of all groundwater in the Subbasin, the groundwater budget, and any supporting data, models, calculations and evaluations, consistent with the agreed upon rules. The GSAs agree to a series of meetings to resolve any inconsistencies or differences between the GSA-level Groundwater Accounting Structures;
- 24 months after the submission of the GSP to DWR: GSAs pass a resolution or other action that documents an agreed upon and final Groundwater Accounting Structure.

Each GSA is committed to the development of a Groundwater Accounting Structure within the timelines above. If unforeseen circumstances arise that prevent the above actions to be achieved, either GSA may choose to extend the targeted deadline through a written agreement signed by both GSAs, follow the remedies identified in the MOA, initiate litigation, or adopt a separate GSP. To the extent the above process takes additional time or steps, not contemplated in the process set forth above, the GSAs agree that no such additional time or process shall be used to support any claim to own or otherwise control water that would not otherwise be owned or controlled.

9.4. ISA 4: Implement Project and Management Actions including an Adaptive Management Approach

The PMAs identified in **Chapter 8** are key activities, projects, and management actions needed to ensure the Subbasin meets the sustainability goals and is able to achieve sustainability by 2042. The list of PMAs is currently considered sufficient for attaining sustainability within the Turlock Subbasin. Over the course of the 20-year implementation horizon, new or modified PMAs may be identified as technology evolves, better information and new data becomes available, and conditions change. As a result, as the GSAs refine the PMAs utilizing an adaptive management approach as described in **Chapter 8**, it must retain sufficient PMAs to account for the level of uncertainty in the Hydrologic Conceptual Model. The PMAs will be implemented in a coordinated fashion. Therefore, this ISA proposes ongoing implementation of an adaptive management strategy for managing the Subbasin which enables the Subbasin's approach to evolve as additional information becomes known, and as conditions change, to enable the PMAs to also evolve to ensure the Subbasin will continue meet its sustainability goals. Each GSA will develop its own management framework for progressing potential new projects from the conceptual and planning stages through implementation. New PMAs will be reported in Annual Reports and included in Five-Year GSP Assessment Reports.

To facilitate the efficient environmental review of projects under the California Environmental Quality Act (CEQA), a Programmatic Environmental Impact Report (PEIR) is being prepared. The PEIR will comprehensively analyze the basin-wide environmental effects of a broad range of GSP activities and projects. Once complete, it will allow the Turlock Subbasin GSAs a programmatic approach to assist their respective member entities to efficiently complete environmental documentation for their sponsored projects.

A Draft PEIR is already underway (October 2020 through September 2022) and is being funded by Proposition 68 (Round 3) grant funding. The Final PEIR will be developed to respond to comments and revisions after October 2022.

9.5. ISA 5: Develop Action Plan for Exceedance of Minimum Thresholds Which May Result in Undesirable Results

While a single exceedance of a MT at a well will not result in an undesirable result under the current SMC, this ISA proposes to develop an action plan that would review exceedances of MTs, as well as actions to understand the conditions and address issues as necessary to ensure it does not result in an undesirable result. Considerations when developing an action plan could include, but are not limited to:

- Identify the monitoring well(s) where an exceedance occurred, and investigate the area
- Communicate with other GSA
- Determine if undesirable results are actually occurring or have the potential to occur in the future
- Select appropriate management strategy for mitigation as necessary
- Consider institutional changes for future mitigation
- Consider if there is a need to improve monitoring. Is the monitoring well providing appropriate data to evaluate the respective SMC or should an alternative monitoring well be considered?
- Determine if an adjustment to the threshold is appropriate
- Recommend changes in the Five-Year GSP Assessment Report

9.6. ISA 6: Refine Groundwater Model Incorporating New Data and Studies

This ISA proposes updating the groundwater model periodically, as deemed to be appropriate by the GSAs, to reflect additional data and information as it becomes available to continue to improve the understanding of the Subbasin water resources and hydrogeology, transboundary flows, interconnected surface water, shallow and deep aquifer pumping, intra-basin flows, and other effects. Where appropriate, model refinement will be coordinated with adjoining subbasins. The model is expected to be used to help manage the Subbasin, providing valuable data on water budgets, sustainable yield, water movement, and achievement of SMCs. While the model meets the current needs, the model documentation section (**Appendix D**) identifies model uncertainties and limitation and includes recommendations for model improvements which the GSAs may consider in future years. Model updates are expected to occur along with corresponding Annual Report updates. The most current model is expected to be used to generate information to be included in the respective Annual Report.

Having an updated model will help the GSAs to address management questions and issues as they arise. Models may be used to evaluate management strategies and compliance with SGMA. Modeling can help to better understand movement of water between aquifers, movement between the aquifers and the rivers, as well as transboundary flows between the GSAs or neighboring subbasins. Modeling can also be used to evaluate the effectiveness of PMAs in achieving SMC by 2042.

9.7. ISA 7: Further Develop Data Management System (DMS)

The current repository of the data for the DMS is in the form of Excel and Access database, which has many limitations, including lack of integration, accessibility, and limitations on data update. A full and integrated DMS may assist the GSP to organize the hydrologic and water supply data to meet the long-term needs of the GSP. This ISA proposes evaluating development of a DMS in a unified location for storage and access of data which would provide better data management and more transparent public understanding of groundwater in the Subbasin. Such a DMS can utilize the existing data that has been collected and verified. The DMS can also integrate with the C2VSimTM model to include baseline and scenario information from the model and provide a seamless environment for both observed and model data sets. The process to evaluate and develop an integrated DMS may include:

- Identification of objectives, DMS needs, and the appropriate platform
- Development of rules for upload, editing, and access
- Development of the integrated DMS
- Uploading data in the DMS
- Providing training on the use of the DMS
- Hosting and maintenance of the DMS

Features that may be considered for the improved DMS could include:

- Web-based platform with an interface suitable for use by the public and by the GSAs
- Variable permissions depending on the user, allowing entities to maintain control over their data while still allowing view access to a broader set of users
- Integration with the C2VSimTM model
- Development of a sustainability dashboard to allow users to quickly understand the status of the Subbasin as it relates to the SMC
- Ability to access the key underlying data used to develop conclusions in the GSP for transparency in the planning process

9.8. ISA 8: Improve Coordination and Planning Integration

Coordination, communication, outreach, and planning are all critical components of a successful GSP. Coordinating GSP implementation and updates with other local and regional planning efforts would ensure consistent use of data and information throughout the subbasin and region. Coordination may also identify projects with multiple benefits and potential funding opportunities. Various planning processes are described in the paragraphs below, though this is not an exhaustive list.

Integrated Regional Water Management Planning

The groundwater components of Integrated Regional Water Management Plans (IRWMPs) are closely related to the information and activities presented in this GSP. Coordination is necessary with the East Stanislaus IRWMP and Merced IRWMP to align the plans to meet common goals of sustainable water management. This activity proposes coordination with both IRWMP groups to:

- Coordinate on projects and keep the associated projects lists consistent and up to date (see more information on the East Stanislaus IRWM Region Opti Database in **Section 9.11**)
- Discuss opportunities to improve water and groundwater management
- Seek opportunities to reduce duplication between the GSP and IRWMP efforts, which may include joint meetings, paired meetings, or other efforts to reduce cost and increase efficiency

Flood Management

Floods present a risk to life and property as well as an opportunity to capture water for groundwater recharge, resulting in potential benefits groundwater dependent ecosystems, and long-term water supplies. Coordination could include flood management entities at the federal, state, and local level to identify areas of common interest with the GSP.

Ecosystem Identification and Planning Processes

Coordination with ecosystem identification and planning processes (e.g., habitat conservation plans) to improve the understanding of ecosystems within the Subbasin would help to ensure the GSP is consistent with other ecosystem programs and processes. This additional information could assist in identification of groundwater dependent ecosystems and can help prioritize management of ecosystems to protect high-value areas based on the presence of special status species or other unique characteristics.

Urban Water Management Planning

Urban water management planning processes should be coordinated with GSP development and implementation to ensure water supply needs and projections, conservation practices and other data and information are consistent between both planning processes. Other opportunities to coordinate include, but are not limited to, existing and future projects, as well as climate change analyses and potential impacts on water supply availability. Utilizing consistent data and information can reduce cost and ensure water needs for the Subbasin are accurately and consistently reflected in all planning processes.

Agricultural Water Management Planning

Agricultural water management planning processes should be coordinated with GSP development and implementation to ensure water supply needs and projections, conservation practices, and other data and information are consistent between both planning processes. Other opportunities to coordinate include, but are not limited to, existing and future projects, as well as climate change analyses and potential impacts on water supply availability. Utilizing consistent data and information can reduce cost and ensure water needs for the Subbasin are accurately and consistently reflected in all planning processes.

Land Use Planning

There is no comprehensive map of areas favorable to recharge in the Subbasin. This component of ISA 8 would develop such a map, identifying individual components (e.g., soil, location relative to the Corcoran Clay, and water quality concerns) and showing overall favorability. The intent of the map would be to allow coordination with land use agencies. This coordination may result in reserving lands for recharge purposes, setting guidelines for development to avoid recharge impacts (e.g., stormwater capture, pervious surfaces, etc.), or other policy decisions. Further, the map could facilitate locating recharge projects and monitoring wells for water levels and water quality.

The effort may take a variety of forms, including a GIS overlay analysis or use of an existing platform such as GRAT (Groundwater Recharge Assessment Tool) being developed under the Proposition 68 grant for the Subbasin.

9.9. ISA 9: Well Registration and Management

The GSAs may develop a well registration and management program which may include a variety of components to enable the GSAs to better understand where wells are located, and how they are constructed, and operated. Such a program could include data housed within the DMS and would facilitate outreach efforts should there be a need to develop targeted outreach to specific types of stakeholders or in specific areas of the subbasin. Data and information gathered would help to improve the understanding of the subbasin and improve the groundwater model. Potential components of the program are described in the subsections below.

9.9.1. Well Registration Program

Details on individual wells are often poorly understood in the Subbasin and in much of the State of California. This ISA would develop a well registration program where well owners would provide information on their wells. This information would be cataloged by the GSAs and may be combined with metering programs and other efforts to manage the subbasin. The Domestic Well Mitigation Program, described within the PMAs Chapter (Management Action 7, see **Section 8.4.3**) of this document could be a component of this larger program.

Well registration programs are, by their nature, challenging to implement without adequate incentives for well owners to participate. The program could take a variety of forms as determined by each GSA, depending on the need and ultimate use for information to be collected through the program. These forms could include different well types for inclusion (e.g., domestic and/or agricultural), different data collected (e.g., location, construction, well setting, pump capacity, water levels), development of a master GIS map of wells, and others. The program could start with new wells and expand to include existing wells.

9.9.2. Well Permitting Program

This program proposes coordinating with the Counties regarding new well permits to ensure new wells are consistent with the GSP. The program could include review guidelines, well standards, and BMPs to avoid undesirable results. Well registration and meters may be considered on new wells to assist in improving the understanding of water use within the Subbasin and implementing programs and practices to avoid undesirable results.

9.10. ISA 10: Develop Financing Strategies, Including Seeking Grant Funding

Ongoing implementation of the GSP, Annual Reporting, monitoring, and other efforts described earlier in this Chapter will be funded through the GSAs. Each GSA was formed by a Joint Powers Agreement (JPA), which provides funding through member agency dues. In addition, SGMA allows GSAs to generate funds through a variety of other means. The Memorandum of Agreement (MOA) between the ETSGSA and the WTSGSA lays out a cost share agreement between the GSAs for sharing administrative costs for development and implementation of the GSP. The MOA also allows for project specific agreements to be implemented as needed to fund specific projects.

It is also important to note that the GSP projects identified in **Chapter 8** include project proponents that will be responsible for implementing their respective projects. The GSAs are envisioned to support efforts to implement the projects, which may include pursuing grant funding as appropriate, but the GSA is not the responsible agency unless identified as such. Any changes as the projects identified in Group 3 are further refined will be updated in Annual Reports and Five-Year GSP Assessment Reports as appropriate.

The WTSGSA JPA member agencies includes an irrigation district, cities, counties, county water districts, and community services districts. Each agency has the means to fund activities of those agencies. Pursuant to the WTSGSA JPA, administrative costs are funded through membership dues and fees to member agencies to fund the annual budget. In addition, the many of the member agencies are project proponents for the projects identified in **Chapter 8.** Each project description in **Chapter 8** includes information regarding how it is anticipated to be funded. Past WTSGSA funding discussions focused on developing the GSP using existing funding mechanisms. Once the GSP is adopted, the WTSGSA could consider other funding mechanisms within its authority, as needed to achieve the sustainability goals and objectives.

The ETSGSA JPA member agencies includes water districts and counties. Each agency has a means to fund activities of those agencies. ETSGSA administrative costs are funded primarily through fees on certain lands within the ETSGSA's service area pursuant to a Proposition 218 election. In addition, pursuant to the ETSGSA JPA, contributions are also collected from its member agencies to fund the annual budget. Some of the member agencies are also project proponents for the projects identified in **Chapter 8.** Each project description in **Chapter 8** includes information regarding how it is anticipated to be funded. Past ETSGSA funding discussions focused on developing the GSP using existing funding mechanisms. Once the GSP is adopted, the ETSGSA could consider other funding mechanisms within its authority, as needed to achieve the sustainability goals and objectives.

To keep costs low while achieving objectives, under this ISA the GSAs would continuously monitor federal, state, and other grant opportunities and apply for grants as appropriate to fund GSP Projects and ISAs. Focusing on multi-benefit projects as well as projects that benefit DACs would be advantageous in identifying additional funding sources as well as widen the benefits provided by such projects.

While broadly implementing projects that improve water supplies and water quality will benefit the Subbasin and those that rely upon it, consideration will also be given to more targeted support for sustainable groundwater supplies for underrepresented communities and DACs as appropriate. Items related to this are included under the Domestic Well Mitigation Program Management Action (see **Section 8.4.3**).

9.11. ISA 11: Updating Opti to Include GSP Projects

The East Stanislaus IRWM Region covers both the Turlock and Modesto Subbasins and uses an Opti database to store a living list of projects for the IRWM as well as the Stanislaus Multi-Agency Regional Storm Water Resource Plan. This ISA proposes to expand the East Stanislaus IRWM Region Opti Database to include PMAs listed in this GSP. The database would represent an extension of the DMS specifically as it relates to containing a list of the GSP's PMAs. The database would be maintained and updated as a living list of PMAs, reflecting the current status of each project and continually adjusting as needed to meet changing basin conditions.

To facilitate this change, a new query would be added to the project entry form to identify if the project is connected to the groundwater system and the GSP. If yes, additional questions would be required, such as identifying the applicable sustainability indicators or other GSP-specific information.

Once the East Stanislaus IRWM Region Opti Database is expanded to include GSP PMAs, the Turlock GSAs will view the database as a "living" document. The list of PMAs maintained in the database will be revised periodically and reflect, at any time in the future, the list of PMAs associated with this GSP. When revised, the PMA list will be approved by the Turlock Subbasin GSAs or other body, as appropriate, following updating. As such, the list of PMAs maintained in the database is considered to be the official Turlock GSP PMA list; no formal GSP adoption or re-adoption will be required for PMA list updating.

9.12. Implementation Support Activities Costs

The ISAs described above will incur costs which will require funding. The primary activities that will incur costs are listed and summarized in **Table 9-1**.

Table 9-1: Implementation Support Activities Costs

Implementation Support Activity	Estimated Cost (One-Time Cost)	Range of Estimated Annual Costs (Low)	Range of Estimated Annual Costs (High)	Assumptions
ISA 1: Monitoring, Reporting, and Outreach	N/A	$50,000	$75,000	**Monitoring:** - Monitoring: Assumes costs for monitoring GW levels. Does not include costs for new well installation. First year cost is at the higher end due to initial set up needs. - Costs will be borne by each GSA separately.
	N/A	$50,000	$100,000	**Annual Report Preparation:** - Includes data compiling and reporting on 1) General Information, 2) Basin Conditions, and 3) Plan Implementation Progress. - First year cost include setting up baseline measurements for WQ data, as well as set up of templates, coordination and outreach. - Costs for year 2 may need to be at the higher end as well to complete WQ baseline refinement, and additional coordination. - Year 3 and beyond tend to be at the lower range, assuming no major requests to change template, format, data/analysis needs after DWR review is completed. This cost does NOT include the cost of model update to support the Annual Report. Model update cost is included in ISA 6.
	$300,000 to $600,000	N/A	N/A	**5-year GSP Assessment Report:** - Assume a total cost of approx. $300,000 to $600,000 - Based on the conditions of the first 5 years and trends achieving sustainability, subsequent costs may vary. - Includes data compiling and reporting on progress for each relevant sustainability indicator, plan implementation progress and updates, monitoring network updates and progress in addressing data gaps, description of new information, amendments, and coordination.
	N/A	$50,000	$80,000	**Ongoing Outreach Needs:** - Assumes costs for creating communication materials, website updates (incl. maintenance and hosting), -conducting 2 public workshops per year, and focused outreach as needed to implement management actions. - Costs will be incurred by each GSA individually.
ISA 2: Addressing Identified Data Gaps Including Updating and Improving the Existing Monitoring Network	$771,260 budgeted between two GSAs for the 2021-2022 and 2022-2023 fiscal cycles to design wells (GSAs may seek grant funding to install wells or if unavailable, will fund themselves)	$80,000	$100,000	Once initial wells are installed over the first few years, the total number of wells needed will be analyzed and assessed, with additional plans identified and budgets developed at that time. Cost estimate assumes data gaps for GW levels, GW quality, and streamflow. Additional cost needs to be considered for other data types, such as land subsidence, surveys for geometry of streams and/or channels to support ISW evaluation, and further characterization of GDEs. This could include studies as well to address gaps in our understanding of the subbasin. One time costs (referenced currently) include currently budgeted well installations. Additional one time costs for well installations or other monitoring network needs will be determined once the initial set of wells are installed.
ISA 3: Accounting Mechanism for Water Supplies within the Subbasin	Initial estimate is $50,000 - $75,000 to develop accounting mechanisms.	$5,000	$10,000	This includes negotiation, technical work, and development of a framework and agreements for the groundwater accounting of the Subbasin. Additionally, set up of tools (perhaps in coordination with the DMS) to support the water accounting. Groundwater accounting mechanism will be incorporated into the water budget and annual reporting processes.
ISA 4: Implement Project and Management Actions including an Adaptive Management Approach	Initial estimate of $150,000 to $300,000 to establish Extraction Reporting Program, Pumping Management Program, Extraction Fee Program and Pumping Credit/Carry-Over tracking system in ETSGSA.	$15,000	$30,000	Includes estimated costs to develop Management Action programs and coordinate PMAs at a high level (across all PMAs) outside of administration of each individual PMA, including analysis of phasing of projects based on adaptive management approach and incremental analysis of the benefits on a phased basis. Administrative costs for ongoing implementation of Management Actions will depend on the scope and structure adopted by each GSA and will be determined as these programs are developed. The costs provided to not include establishment of a Groundwater Credit Market/Trading Program. The need and costs of such a program would be evaluated during implementation. Details on individual PMAs are provided in Chapter 8
ISA 5: Develop Action Plan for Exceedance of Minimum Thresholds Which May Result in Undesirable Results	$50,000.00	$10,000.00	$25,000.00	This includes development of an action to be implemented in the event of exceedance of a minimum threshold, including coordination and outreach with the GSAs, growers and private well owners, and neighboring subbasins, confirmation and investigation of causes, and implementation of mitigating actions based on threshold triggers. Cost for ongoing implementation of this item can vary widely, and are presented for planning purposes. Initial cost is to develop the plan. Annual costs include ongoing implementation of the plan.
ISA 6: Refine Groundwater Model Incorporating New Data and Studies	N/A	$30,000	$80,000	**Annual Report Support:** This includes use and updating of the model for supporting the annual report, which is the lower cost range for years 2 and beyond. The upper cost range is for the first year, which includes setting up the data collection templates and coordination.
	TBD (However, a cost of $100,000 to $300,000, depending on the scope is a reasonable range for planning)	N/A	N/A	**Model Refinement Activities:** This can be a one time cost of model update, refinements, upgrade, and re-calibration to support the 5-year GSP assessment and update. The details of level of effort for these refinements and upgrades will need to be developed depending on the scope of work and information and data available. Could include development of tools separate from the model to address specific data needs.
ISA 7: Further Develop Data Management System	Development cost is based on the scope and features. However, a budget of $55,000 to $70,000 is reasonable for planning purposes.	N/A	N/A	**DMS Development Cost:** Consider opportunities for DMS build on existing work in and outside the basin and ensure interbasin coordination. Cost assumes the following features which were in the original scope of the GSP: 1- Identify goals and objectives of DMS 2- Select DMS software package 3- Migrate GSP data to the software package 4- Develop custom reporting for GSP 5- Enhance select custom functionalities 6- Prepare user manual
	N/A	$15,000	$25,000	**DMS Annual Maintenance Cost:** Annual maintenance cost for a typical DMS, including data screening and update, hosting, routine feature updates
ISA 8: Improve Coordination and Planning Integration	N/A	$15,000	$30,000	Coordination among the GSAs, interbasin coordination with Modesto, Merced, and Delta-Mendota Subbasins, and coordination with water management groups and County Planning.
ISA 9: Well Registration and Management	TBD	TBD	TBD	This cost will depend on the number of wells, activities needed to outreach and encourage registration, tools to be developed to facilitate the registration. There will be a one-time cost to set up the system, and an annual maintenance cost to facilitate and monitor, as well as integrate with the DMS
ISA 10: Develop Financing Strategies, Including Seeking Grant Funding	$20,000 to $50,000 for planning purposes	$10,000	$30,000	This is a cost on "As-Needed" basis. Depending on the scope of projects to be included in the grant funding applications and the grant requirements.
ISA 11: OPTI Project List	$2,000	TBD	TBD	One time cost to develop place to include list in system. Ongoing costs for uploading/updating list, and GSA approval process.
TOTAL ESTIMATED COSTS	**$1.5 - $2.2 million**	**$330,000**	**$585,000**	**One time cost of $1.5 to $2.2 million is estimated for key implementation support activities including establishment of several programs associated with Management Actions described in Chapter 8. A range of annual costs for GSP implementation is estimated to range from $330,000 to $585,000.**

NOTES:
Additional annual costs will be incurred for GSA Administration, legal issues, etc. and are not included here.
Costs could be born by each GSA as they deem the need in some cases.

9.13. IMPLEMENTATION SCHEDULE

The ISAs described above will be implemented according to the schedule summarized in **Table 9-2**.

Table 9-2: Implementation Support Activities Schedule

<table>
<tr><th rowspan="2">Implementation Support Activity</th><th colspan="5">Schedule</th></tr>
<tr><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th><th>Year 5</th></tr>
<tr><td rowspan="3">ISA 1: Monitoring, Reporting, and Outreach</td><td colspan="5">Annual Monitoring</td></tr>
<tr><td colspan="5">Annual Reporting</td></tr>
<tr><td colspan="5">Communication and Outreach</td></tr>
<tr><td rowspan="2">ISA 2: Addressing Identified Data Gaps Including Updating and Improving the Existing Monitoring Network</td><td colspan="3">Install Monitoring Wells</td><td>--</td><td>--</td></tr>
<tr><td colspan="5">Additional Investigations (as needed)</td></tr>
<tr><td>ISA 3: Accounting Mechanism for Water Supplies within the Subbasin</td><td colspan="2">Develop Groundwater Accounting Framework</td><td colspan="3">Implement Annual Groundwater Accounting</td></tr>
<tr><td rowspan="2">ISA 4: Implement Project and Management Actions including an Adaptive Management Approach</td><td colspan="3">Develop Demand Reduction and Management Programs</td><td colspan="2">Implement Programs</td></tr>
<tr><td colspan="2">Develop Domestic Well Mitigation Program</td><td colspan="3">Implement Domestic Well Mitigation Program</td></tr>
<tr><td>ISA 5: Develop Action Plan for Exceedance of Minimum Thresholds Which May Result in Undesirable Results</td><td>Develop Plan</td><td colspan="4">Implement Plan (if needed)</td></tr>
<tr><td rowspan="2">ISA 6: Refine Groundwater Model Incorporating New Data and Studies</td><td>--</td><td>--</td><td colspan="2">Model Refinements</td><td>Update Forecasts</td></tr>
<tr><td colspan="5">Annual Updates and Reporting Support</td></tr>
<tr><td rowspan="2">ISA 7: Further Develop Data Management System</td><td colspan="2">Develop DMS</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td colspan="5">Ongoing Data Management</td></tr>
<tr><td>ISA 8: Improve Coordination and Planning Integration</td><td colspan="5">Ongoing Coordination</td></tr>
<tr><td>ISA 9: Well Registration and Management</td><td>Outreach and Planning</td><td>Voluntary Program</td><td>Expanded Program</td><td colspan="2">Ongoing Implementation</td></tr>
<tr><td>ISA 10: Develop Financing Strategies, Including Seeking Grant Funding</td><td colspan="5">Ongoing Planning and Strategy Implementation</td></tr>
<tr><td>ISA 11: Updating Opti to Include GSP Projects</td><td>Implement</td><td colspan="4">Update as needed</td></tr>
</table>

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Appendix B
Notice of Preparation and Notice of Preparation Comments

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State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Central Region
1234 East Shaw Avenue
Fresno, California 93710
(559) 243-4005
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

February 7, 2022

Michael Cooke
WTS GSA TAC Chair
West Turlock Subbasin Groundwater Sustainability Agency
c/o Turlock Irrigation District
PO Box 949
Turlock, California 95381-0949
micooke@TID.org

Subject: Turlock Subbasin Groundwater Sustainability Plan
Notice of Preparation of a Draft Program Environmental Impact Report
State Clearinghouse No. 2022010100

Dear Mr. Cooke:

The California Department of Fish and Wildlife (CDFW) received the NOP of a Program Environmental Impact Report (EIR) regarding the Turlock Subbasin Groundwater Sustainability Plan (Project) from the West Turlock Groundwater Sustainability Agency (WTGSA) for the above-referenced Project pursuant to the California Environmental Quality Act (CEQA) and CEQA Guidelines.[1]

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, CDFW appreciates the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW Role

CDFW is California's **Trustee Agency** for fish and wildlife resources and holds those resources in trust by statute for all the people of the State (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a)). CDFW, in the trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (*Id.*, § 1802). Similarly, for purposes of CEQA,

[1] CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

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CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

CDFW is also submitting comments as a **Responsible Agency** under CEQA (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381). CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code. As proposed, for example, the Project may be subject to CDFW's lake and streambed alteration regulatory authority (Fish & G. Code, § 1600 et seq.). Likewise, to the extent implementation of the Project as proposed may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), related authorization as provided by the Fish and Game Code will be required.

Bird Protection: CDFW has jurisdiction over actions that may result in the disturbance or destruction of active nest sites or the unauthorized take of birds. Fish and Game Code sections that protect birds, their eggs, and nests include section 3503 (regarding unlawful take, possession, or needless destruction of the nest or eggs of any bird), section 3503.5 (regarding the take, possession, or destruction of any birds-of-prey or their nests or eggs), and section 3513 (regarding unlawful take of any migratory nongame bird).

Water Rights: The capture of unallocated stream flows to artificially recharge groundwater aquifers is subject to appropriation and approval by the State Water Resources Control Board (SWRCB) pursuant to Water Code section 1200 et seq. CDFW, as Trustee Agency, is consulted by SWRCB during the water rights process to provide terms and conditions designed to protect fish and wildlife prior to appropriation of the State's water resources. Certain fish and wildlife are reliant upon aquatic and riparian ecosystems, which in turn are reliant upon adequate flows of water. CDFW therefore has a material interest in assuring that adequate water flows within streams for the protection, maintenance, and proper stewardship of those resources. CDFW provides, as available, biological expertise to review and comment on environmental documents and impacts arising from Project activities.

PROJECT DESCRIPTION SUMMARY

West Turlock Subbasin Groundwater Sustainability Agency (WTGSA)

Description: The Turlock Subbasin Groundwater Sustainability Plan (GSP) was developed to achieve the sustainability goals of the Turlock Subbasin by 2042 and to avoid undesirable results over the remainder of the 50-year planning horizon. The GSP presents a variety of projects that utilize water from various sources, including but not limited to surface water, stormwater, and reclaimed water, for direct and in-lieu groundwater recharge. Projects can be generally categorized as either urban and municipal or agricultural projects, and incorporate the use of new (e.g., treatment

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facilities, pipelines) or existing (e.g., canals, pipelines, reservoirs) infrastructure to enhance water supply. The GSP also identifies management actions to be implemented in conjunction with projects, including demand reduction strategies such as voluntary conservation and/or farmland fallowing; pumping management such as a groundwater extraction reporting program and a groundwater allocation and pumping management program; and a domestic well mitigation program. The EIR would analyze resources that may be affected by implementation of the projects and management actions in the GSP.

Location: The Turlock Subbasin boundary covers 348,160 acres (about 544 square miles), in Stanislaus and Merced Counties. The Turlock Subbasin is bounded on the north by the Tuolumne River, on the south by the Merced River, and on the west by the San Joaquin River.

COMMENTS AND RECOMMENDATIONS

Biological Resources

CDFW offers the comments and recommendations below to assist the WTGSA in adequately identifying and/or mitigating the Project’s significant, or potentially significant, direct and indirect impacts on fish and wildlife, i.e., biological resources. Editorial comments or other suggestions may also be included to improve the document. Based on a review of the Project description, a review of California Natural Diversity Database (CNDDB) records, a review of aerial photographs of the Project boundary and surrounding habitat, several special-status species could potentially be impacted by Project activities. Project-related construction activities within the Project boundary, including but not limited to construction and operation of water banking facilities and introduction of surface water flows for storage, could impact the special-status plant and wildlife species and habitats known to occur in the area.

In particular, CDFW is concerned regarding potential impacts for special status species and habitats known to occupy the Project area, including the State and federal endangered least Bell’s vireo (*Vireo bellii pusillus*); the State threatened Swainson’s hawk (*Buteo swainsoni*) and tricolored blackbird (*Agelaius tricolor*); the State and federal threatened California tiger salamander – central California Distinct Population Segment (DPS)(*Ambystoma californiense* pop. 1); the federal endangered vernal pool tadpole shrimp (*Lepidurus packardi*); the federal threatened vernal pool fairy shrimp (*Branchinecta lynchi*); the State and federal endangered, and Californian Rare Plant Rank (CRPR) 1B.1 hairy Orcutt grass (*Orcuttia pilosa*) and Hartweg’s golden sunburst (*Pseudobahia bahifolia*); the State endangered, federal threatened, and CRPR 1B.1 Colusa grass (*Neostapfia colusana*); the federal endangered and CRPR 1B.1 Delta button-celery (*Eryngium racemosum*); the State endangered, federal threatened, and CRPR 1B.2 succulent owl’s-clover (*Castilleja campestris* var. *succulenta*); the federal threatened and CRPR 1B.2 Hoover’s spurge (*Euphorbia hooveri*); the CRPR 1A Hoover’s cryptantha (*Cryptantha hooveri*); the CRPR 1B.2 spiny-sepaled button-celery

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(*Eryngium spinosepalum*); the CRPR 1B.3 Hoover's calycadenia (*Hoover's calycadenia*); the CRPR 2B.2 dwarf downingia (*Downingia pusilla*) and eel-grass pondweed (*Potamogeton zosteriformis*); and the State species of special concern burrowing owl (*Athene cunicularia*), American badger (*Taxidea taxus*), Merced kangaroo rat (*Dipodomys heermanni dixoni*), Townsend's big-eared bat (*Corynorhinus townsendii*), pallid bat (*Antrozous pallidus*), western mastiff bat (*Eumops perotis californicus*), western red bat (*Lasiurus blossevillii*), mountain plover (*Charadrius montanus*), western pond turtle (*Emys marmorata*), and western spadefoot (*Spea hammondii*). Suitable habitat for the rare and endemic crotch bumble bee (*Bombus crotchii*), obscure bumble bee (*Bombus caliginosus*), and Morrison bumble bee (*Bombus morrisoni*) also occurs in the Project vicinity. Other species of birds, amphibians, reptiles, mammals, fish, and plants also compose the local ecosystem within the Project boundary.

The Tuolumne, Merced, and San Joaquin Rivers support the federal threatened Central Valley steelhead DPS (*Oncorhynchus mykiss irideus* pop.11) and the State species of special concern fall-run Central Valley Chinook salmon (*Oncorhynchus tshawyscha*). The San Joaquin River supports the nonessential experimental population of spring run Central Valley Chinook salmon, for which the San Joaquin River Restoration Program goal is to restore a self-sustaining fishery. CDFW documented the presence of the experimental spring-run Chinook salmon in the Tuolumne and Merced Rivers during the 2021 escapement surveys, establishing the San Joaquin River as a migratory corridor for spring/fall Chinook and steelhead and likely providing rearing habitat. Other special status fish species known to occur within one or more of the three river systems include the State species of special concern hardhead (*Mylopharodon conocephalus*), Kern brook lamprey (*Lampetra hubbsi*), white sturgeon (*Acipenser transmontanus*), and Pacific lamprey (*Entosphenus tridentatus*). Surface and ground water dependent ecosystems, including northern hardpan vernal pool, swale, riparian, wetland, and oak woodland habitats, are present within the three watersheds and other areas within the Project boundary.

Please note that the CNDDB is populated by and records voluntary submissions of species detections. As a result, species may be present in locations not depicted in the CNDDB but where there is suitable habitat and features capable of supporting species. A lack of an occurrence record in the CNDDB does not mean a species is not present. In order to adequately assess any potential Project-related impacts to biological resources, surveys conducted by a qualified wildlife biologist/botanist during the appropriate survey period(s) and using the appropriate protocol survey methodology are warranted in order to determine whether or not any special status species are present at or near the Project area.

I. Mitigation Measure or Alternative and Related Impact Shortcoming

Would the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or

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special-status species in local or regional plans, policies, or regulations, or by CDFW or United States Fish and Wildlife Service (USFWS)?

COMMENT 1: Least Bell's Vireo (LBV)

Issues and Impacts: LBV occurrences have been documented within the Project area, including the vicinity of the San Joaquin, Merced, and Tuolumne Rivers, and suitable riparian habitat for nesting occurs in the Project vicinity (CDFW 2022). Suitable LBV habitat includes rivers and streams with dense riparian vegetation. Review of aerial imagery indicates that suitable habitat for LBV occurs within the Project area.

LBV were abundant and widespread in the United States until the 1950s (Grinnell and Miller 1944). By the 1960s, they were considered scarce (Monson 1960), and by 1980, there were fewer than 50 pairs remaining (Edwards 1980), although this number had increased to 2,500 by 2004 (Kus and Whitfield 2005). Breeding habitat loss resulting from urban development, water diversion, and spread of agricultural is the primary threat to LBV. The primary cause of decline for this species has been the loss and alteration of riparian woodland habitats (USFWS 2006). Fragmentation of their preferred habitat has also increased their exposure to brown-headed cowbird (*Molothrus ater*) parasitism (Kus and Whitefield 2005). Current threats to their preferred habitat include colonization by non-native plants and altered hydrology (diversion, channelization, etc.) (USFWS 2006). Suitable nesting habitat is present within or adjacent to the Project site. Without appropriate avoidance and minimization measures, potential significant impacts associated with subsequent activities may include nest abandonment, reduced reproductive success, and reduced health and vigor of eggs and/or young.

Recommended Mitigation Measure 1: LBV Habitat Assessment
CDFW recommends that a qualified biologist conduct a habitat assessment in advance of Project implementation, to determine if the Project site or its immediate vicinity contains suitable habitat for LBV. Although LBV inhabit riparian woodlands, the species has also been found to benefit from non-riparian systems including brushy fields, second-growth forest or woodland, scrub oak, coastal chaparral, and mesquite brushlands (Kus and Miner 1989, Poulin et al. 2011).

Recommended Mitigation Measure 2: Focused LBV Surveys
To reduce potential Project-related impacts to LBV, CDFW recommends that a qualified wildlife biologist conduct surveys following the survey methodology developed by USFWS (2001) prior to Project initiation, within the Project area and a 500-foot buffer around the Project area. In addition, if Project activities will take place during the typical breeding season (February 1 through September 15), CDFW recommends that additional preconstruction surveys for active nests be conducted by a qualified biologist no more than 10 days prior to the start of Project activities such as construction or habitat removal.

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Recommended Mitigation Measure 3: LBV Buffers
If an LBV nest is found during protocol or preconstruction surveys, CDFW recommends implementing a maintaining a minimum 500-foot no-disturbance buffer until the breeding season has ended or until a qualified biologist has determined that the birds have fledged and are no longer reliant upon the nest site or parental care.

Recommended Mitigation Measure 4: LBV Nest Avoidance and Habitat Mitigation
In addition to avoiding nests, CDFW recommends that impacts to known nest trees be avoided at all times of year. Regardless of nesting status, if potential or known LBV nesting habitat is removed, CDFW recommends that it be replaced with appropriate native tree species, planted at a ratio of 3:1 (replaced to removed), in an area that will be protected in perpetuity, to offset impacts of the loss of potential nesting habitat.

Recommended Mitigation Measure 5: LBV Take Authorization
If a 500-foot no-disturbance nest buffer is not feasible, consultation with CDFW is warranted and acquisition of an Incidental Take Permit (ITP) for LBV may be necessary prior to project implementation, to avoid unauthorized take, pursuant to Fish and Game Code section 2081, subdivision (b).

COMMENT 2: Swainson's Hawk (SWHA)

Issues and Impacts: The Project area is within the historic range of SWHA, and SWHA have been documented in areas of suitable habitat within the Project vicinity (CDFW 2022). Undeveloped and agricultural land in the surrounding area provide suitable foraging habitat for SWHA. Any trees in or near the Project area may also provide suitable nesting habitat.

SWHA exhibit high nest-site fidelity year after year and lack of suitable nesting habitat limits their local distribution and abundance (CDFW 2016). Approval of the Project may lead to subsequent ground-disturbing activities that involve noise, groundwork, construction of structures, and movement of workers that could affect nests and has the potential to result in nest abandonment and loss of foraging habitat, significantly impacting local nesting SWHA. In addition, conversion of undeveloped and agricultural land can directly influence distribution and abundance of SWHA, due to the reduction in foraging habitat. Groundwater pumping, surface water diversion, and habitat conversion may result in loss of riparian habitat and subsequent loss of nesting habitat. Without appropriate avoidance and minimization measures for SWHA, potential significant impacts that may result from Project activities include nest abandonment, loss of nest trees, loss of foraging habitat that would reduce nesting success (loss or reduced health or vigor of eggs or young), and direct mortality. All trees, including non-native or ornamental varieties, near the Project site may provide nesting sites.

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Recommended Mitigation Measure 6: Focused SWHA Surveys
CDFW recommends that a qualified wildlife biologist conduct surveys for nesting SWHA following the entire survey methodology developed by the SWHA Technical Advisory Committee (SWHA TAC 2000) prior to Project implementation.

Recommended Mitigation Measure 7: SWHA Avoidance
CDFW recommends that if Project-specific activities will take place during the SWHA nesting season (i.e., March 1 through September 15), and active SWHA nests are present, a minimum ½-mile no-disturbance buffer be delineated and maintained around each nest, regardless of when or how it was detected, until the breeding season has ended or until a qualified biologist has determined that the birds have fledged and are no longer reliant upon the nest or parental care for survival.

Recommended Mitigation Measure 8: SWHA Take Authorization
CDFW recommends that in the event an active SWHA nest is detected, and a ½-mile no-disturbance buffer is not feasible, consultation with CDFW is warranted to discuss how to implement the Project and avoid take. If take cannot be avoided, take authorization through the acquisition of an ITP, pursuant to Fish and Game Code section 2081, subdivision (b) is necessary to comply with CESA.

Recommended Mitigation Measure 9: Loss of SWHA Foraging Habitat
CDFW recommends compensation for the loss of SWHA foraging habitat as described in CDFW's "Staff Report Regarding Mitigation for Impacts to Swainson's Hawks" (CDFG 1994) to reduce impacts to foraging habitat to less than significant. The Staff Report recommends that mitigation for habitat loss occur within a minimum distance of 10 miles from known nest sites. CDFW has the following recommendations based on the Staff Report: for projects within one mile of an active nest tree, a minimum of one acre of habitat management (HM) land for each acre of development is advised; for projects within five miles of an active nest but greater than one mile, a minimum of ¾ acre of HM land for each acre of development is advised; and for projects within 10 miles of an active nest tree but greater than five miles form an active nest tree, a minimum of ½ acre of HM land for each acre of development is advised.

Recommended Mitigation Measure 10: SWHA Tree Removal
CDFW recommends that the removal of known SWHA nest trees, even outside of the nesting season, be replaced with an appropriate native tree species planting at a ratio of 3:1 at or near the Project area or in another area that will be protected in perpetuity, to offset the local and temporal impacts of nesting habitat loss.

COMMENT 3: Tricolored Blackbird (TRBL)

Issues and Impacts: TRBL are known to occur in the Project area (CDFW 2022, UC Davis 2021). Review of aerial imagery indicates that the Project area includes

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suitable habitat types including wetlands, ponds, and flood-irrigated agricultural land, which is an increasingly important nesting habitat type for TRBL (Meese et al. 2017).

Potential nesting habitat for TRBL is present within the Project vicinity. TRBL aggregate and nest colonially, forming colonies of up to 100,000 nests (Meese et al. 2014), and approximately 86% of the global population is found in the San Joaquin Valley (Kelsey 2008, Weintraub et al. 2016). In addition, TRBL have been forming larger colonies that contain progressively larger proportions of the species' total population (Kelsey 2008). In 2008, 55% of the species' global population nested in only two colonies in silage fields (Kelsey 2008). Nesting can occur synchronously, with all eggs laid within one week (Orians 1961). For these reasons, disturbance to nesting colonies can cause entire nest colony site abandonment and loss of all unfledged nests, significantly impacting TRBL populations (Meese et al. 2014). Without appropriate avoidance and minimization measures for TRBL, potential significant impacts associated with subsequent development include nesting habitat loss, nest and/or colony abandonment, reduced reproductive success, and reduced health and vigor of eggs and/or young.

Recommended Mitigation Measure 11: TRBL Surveys
CDFW recommends that the Project activities be timed to avoid the typical bird-breeding season of February 1 through September 15. If Project activity that could disrupt nesting must take place during that time, CDFW recommends that a qualified biologist conduct surveys for nesting TRBL no more than 10 days prior to the start of implementation to evaluate presence or absence of TRBL nesting colonies in proximity to Project activities and to evaluate potential Project-related impacts.

Recommended Mitigation Measure 12: TRBL Colony Avoidance
If an active TRBL nesting colony is found during surveys, CDFW recommends implementation of a minimum 300-foot no-disturbance buffer, in accordance with CDFW's (2015a) "Staff Guidance Regarding Avoidance of Impacts to Tricolored Blackbird Breeding Colonies on Agricultural Fields in 2015", until the breeding season has ended or until a qualified biologist has determined that nesting has ceased and the young have fledged and are no longer reliant upon the colony or parental care for survival. TRBL colonies can expand over time and for this reason, CDFW recommends that an active colony be reassessed to determine its extent within 10 days prior to Project initiation.

Recommended Mitigation Measure 13: TRBL Take Authorization
In the event that a TRBL nesting colony is detected during surveys, consultation with CDFW is warranted to discuss whether the Project can avoid take and, if take avoidance is not feasible, to acquire an ITP pursuant to Fish and Game Code section 2081, subdivision (b), prior to any Project activities.

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COMMENT 4: California Tiger Salamander (CTS)

Issues and Impacts: CTS are known to occur in the Project area and its vicinity (CDFW 2022). Review of aerial imagery indicates the presence of several wetland features in the Project's vicinity that have the potential to support breeding CTS. In addition, the Project area or its immediate surroundings may support small mammal burrows, a requisite upland habitat feature for CTS.

Up to 75% of historic CTS habitat has been lost to development (Shaffer et al. 2013). Loss, degradation, and fragmentation of habitat are among the primary threats to CTS (CDFW 2015b, USFWS 2017). The Project area is within the range of CTS and is both composed of and bordered by suitable upland habitat that could be occupied or colonized by CTS. Without appropriate avoidance and minimization measures for CTS, potential significant impacts associated with any construction or ground disturbing activity include burrow collapse; inadvertent entrapment; reduced reproductive success; reduction in health and vigor of eggs, larvae and/or young; and direct mortality of individuals. In addition, depending on the design of any activity, the Project has the potential to result in creation of barriers to dispersal.

Recommended Mitigation Measure 14: CTS Habitat Assessment
CDFW recommends that a qualified biologist conduct a habitat assessment well in advance of Project implementation, to determine if the Project area or its vicinity contains suitable habitat (upland or breeding) for CTS.

Recommended Mitigation Measure 15: Focused CTS Surveys
If the Project area does contain suitable habitat for CTS, CDFW recommends that a qualified biologist evaluate potential Project-related impacts to CTS prior to ground-disturbing activities using the USFWS (2003) "Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander". CDFW advises that the survey include a 100-foot buffer around the Project area in all areas of wetland and upland habitat that could support CTS.

Recommended Mitigation Measure 16: CTS Avoidance
CDFW advises that avoidance for CTS include a minimum 50-foot no disturbance buffer delineated around all small mammal burrows and a minimum 250-foot no disturbance buffer around potential breeding pools within and/or adjacent to the Project area. CDFW also recommends avoiding any impacts that could alter the hydrology or result in sedimentation of breeding pools. If avoidance is not feasible, consultation with CDFW is warranted to determine if the Project can avoid take.

Recommended Mitigation Measure 17: CTS Take Authorization
If through surveys it is determined that CTS occupy the Project area and if take cannot be avoided, take authorization may be warranted prior to initiating Project activities by acquiring an ITP pursuant to Fish and Game Code section 2081,

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subdivision (b), before Project ground or vegetation disturbing activities occur. Alternatively, in the absence of protocol surveys, the applicant can assume presence of CTS within the Project area and obtain an ITP.

COMMENT 5: Special-Status Plants

Issues and Impacts: State- and federal listed, and other special-status plant species meeting the definition of rare or endangered under CEQA section 15380, are known to occur throughout the Project boundary and surrounding area, including the species listed above, and potentially other special-status plant species.

Many of the special-status plant species listed above are threatened by grazing and agricultural, urban, and energy development. Many historical occurrences of these species are presumed extirpated (CNPS 2021). Though new populations have recently been discovered, impacts to existing populations have the potential to significantly impact populations of plant species. Without appropriate avoidance and minimization measures for special-status plants, potential significant impacts associated with subsequent Project-specific activities include loss of habitat, loss or reduction of productivity, and direct mortality.

Recommended Mitigation Measure 18: Special-Status Plant Surveys
CDFW recommends that individual Project sites be surveyed for special-status plants by a qualified botanist following the “Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities” (CDFG 2018). This protocol, which is intended to maximize detectability, includes the identification of reference populations to facilitate the likelihood of field investigations occurring during the appropriate floristic period.

Recommended Mitigation Measure 19: Special-Status Plant Avoidance
CDFW recommends that special-status plant species be avoided whenever possible by delineating and observing a no-disturbance buffer of at least 50 feet from the outer edge of the plant population(s) or specific habitat type(s) required by special-status plant species. If buffers cannot be maintained, then consultation with CDFW may be warranted to determine appropriate minimization and mitigation measures for impacts to special-status plant species.

Recommended Mitigation Measure 20: Listed Plant Species Take Authorization
If a State-listed plant species is identified during botanical surveys, consultation with CDFW is warranted to determine if the Project can avoid take. If take cannot be avoided, take authorization is warranted. Take authorization would occur through issuance of an ITP, pursuant to Fish and Game Code section 2081, subdivision (b).

COMMENT 6: Burrowing Owl (BUOW)

Issues and Impacts: BUOW inhabit open grassland containing small mammal burrows, a requisite habitat feature used for nesting and cover. BUOW may also occur in some agricultural areas, ruderal grassy fields, vacant lots, and pastures if the vegetation structure is suitable and there are useable burrows and foraging habitat in the area (Gervais et al. 2008). BUOW occurrences have been documented in the Project vicinity, and habitat both within and bordering the Project site supports suitable habitat for BUOW (CDFW 2022).

BUOW rely on burrow habitat year-round for their survival and reproduction. The Project and surrounding area contain remnant undeveloped land but is otherwise intensively managed for agriculture; therefore, subsequent ground-disturbing activities associated with subsequent constructions have the potential to significantly impact local BUOW populations. In addition, and as described in CDFW's "Staff Report on Burrowing Owl Mitigation" (CDFG 2012), excluding and/or evicting BUOW from their burrows is considered a potentially significant impact under CEQA. Potentially significant impacts to nesting and non-nesting BUOW can also occur as a result of ground-impacting activity, such as grading and flooding within active and fallow agricultural areas, and as a result of noise, vibration, and other disturbance caused by equipment and crews. Potential impacts associated with Project activities and land conversion include habitat loss, burrow collapse, inadvertent entrapment, nest abandonment, reduced reproductive success, reduction in health and vigor of eggs and/or young, and direct mortality of individuals.

Recommended Mitigation Measure 21: BUOW Habitat Assessment
CDFW recommends that a qualified biologist conduct a habitat assessment in advance of implementation of Project activities, to determine if the Project area or its vicinity contains suitable habitat for BUOW.

Recommended Mitigation Measure 22: BUOW Surveys
Where suitable habitat is present on or in the vicinity of the Project area, CDFW recommends assessing presence or absence of BUOW by having a qualified biologist conduct surveys following the California Burrowing Owl Consortium (1993) "Burrowing Owl Survey Protocol and Mitigation Guidelines" and the CDFG (2012) "Staff Report on Burrowing Owl Mitigation". Specifically, these documents suggest three or more surveillance surveys conducted during daylight, with each visit occurring at least three weeks apart during the peak breeding season of April 15 to July 15, when BUOW are most detectable. In addition, CDFW advises that surveys include a minimum 500-foot survey radius around the Project area.

Recommended Mitigation Measure 23: BUOW Avoidance
CDFW recommends that no-disturbance buffers, as outlined by CDFG (2012), be implemented prior to and during any ground-disturbing activities, and specifically that impacts to occupied burrows be avoided in accordance with the following table

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unless a qualified biologist approved by CDFW verifies through non-invasive methods that either: 1) the birds have not begun egg laying and incubation; or 2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

Location	Time of Year	Level of Disturbance		
		Low	Med	High
Nesting sites	April 1-Aug 15	200 m*	500 m	500 m
Nesting sites	Aug 16-Oct 15	200 m	200 m	500 m
Nesting sites	Oct 16-Mar 31	50 m	100 m	500 m

* meters (m)

Recommended Mitigation Measure 24: BUOW Eviction and Mitigation
If BUOW are found within these recommended buffers and avoidance is not possible, it is important to note that according to CDFG (2012), evicting birds from burrows is not a take avoidance, minimization, or mitigation method and is instead considered a potentially significant impact under CEQA. If it is necessary for Project implementation, CDFW recommends that burrow exclusion be conducted by qualified biologists and only during the non-breeding season, before breeding behavior is exhibited and after the burrow is confirmed empty through non-invasive methods, such as surveillance. CDFW then recommends mitigation in the form of replacement of occupied burrows with artificial burrows at a minimum ratio of one burrow collapsed to one artificial burrow constructed (1:1) to mitigate for evicting BUOW and the loss of burrows. BUOW may attempt to colonize or re-colonize an area that will be impacted; thus, CDFW recommends ongoing surveillance at a rate that is sufficient to detect BUOW if they return.

COMMENT 7: Special-Status Bat Species

Issues and Impacts: Townsend's big-eared bat have been documented to occur in the vicinity of the Project area (CDFW 2022). In addition, habitat features are present that have the potential to support pallid bat, western mastiff bat, and western red bat.

Western mastiff bat, pallid bat, and Townsend's big-eared bat are known to roost in buildings, caves, tunnels, cliffs, crevices, and trees. (Lewis 1994 and Gruver 2006). Western red bat is highly associated with riparian habitat (Peirson et al. 2006). Project activities have the potential to affect habitat upon which special-status bat species depend for successful breeding and have the potential to impact individuals and local populations. Without appropriate avoidance and minimization measures for special-status bat species, potential significant impacts resulting from ground- and vegetation-disturbing activities associated with Project activities include habitat loss, inadvertent entrapment, roost abandonment, reduced reproductive success, reduction in health and vigor of young, and direct mortality of individuals.

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Recommended Mitigation Measure 25: Bat Roost Habitat Assessment
CDFW recommends that a qualified biologist conduct a habitat assessment well in advance of Project implementation to determine if the Project area or its immediate vicinity contains suitable roosting habitat for special-status bat species.

Recommended Mitigation Measure 26: Bat Surveys
If suitable habitat is present, CDFW recommends assessing presence/absence of special-status bat roosts by conducting surveys during the appropriate seasonal period of bat activity. CDFW recommends methods such as through evening emergence surveys or bat detectors to determine whether bats are present.

Recommended Mitigation Measure 27: Bat Roost Disturbance Minimization and Avoidance
If bats are present, CDFW recommends that a 100-foot no-disturbance buffer be placed around the roost and that a qualified biologist who is experienced with bats monitor the roost for signs of disturbance to bats from Project activity. If a bat roost is identified and work is planned to occur during the breeding season, CDFW recommends that no disturbance to maternity roosts occurs and that CDFW be consulted to determine measures to prevent breeding disruption or failure.

COMMENT 8: Western Pond Turtle (WPT)

Issues and Impacts: WPT are documented in the Project area (CDFW 2022), and a review of aerial imagery shows requisite habitat features that WPT utilize for nesting, overwintering, dispersal, and basking occur in the Project area. These features include aquatic and terrestrial habitats such as rivers, lakes, reservoirs, ponded areas, irrigation canals, riparian and upland habitat. WPT are known to nest in the spring or early summer within 100 meters of a water body, although nest sites as far away as 500 meters have also been reported (Thomson et al. 2016). Noise, vegetation removal, movement of workers, construction and ground disturbance as a result of Project activities have the potential to significantly impact WPT populations. Without appropriate avoidance and minimization measures for WPT, potentially significant impacts associated with Project activities could include nest reduction, inadvertent entrapment, reduced reproductive success, reduction in health or vigor of eggs and/or young, and direct mortality.

Recommended Mitigation Measure 28: WPT Surveys
CDFW recommends that a qualified biologist conduct focused surveys for WPT within 10 days prior to Project implementation. In addition, CDFW recommends that focused surveys for nests occur during the egg-laying season of March through August.

Recommended Mitigation Measure 29: WPT Avoidance and Minimization
CDFW recommends that any WPT nests that are discovered remain undisturbed with a no-disturbance buffer maintained around the nest until the eggs have hatched

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and neonates are no longer in the nest or Project areas. If WPT individuals are discovered at the site during surveys or Project activities, CDFW recommends that they be allowed to move out of the area of their own volition without disturbance.

COMMENT 9: Crotch Bumble Bee (CBB), Morrison Bumble Bee (MBB), and Obscure Bumble Bee (OBB)

Issues and Impacts: CBB, MBB, and OBB, rare and endemic bumble bee species, have been documented within the Project area (CDFW 2022). Suitable habitat includes areas of grasslands and upland scrub that contain requisite habitat elements, such as small mammal burrows. These species of bumble bee primarily nest in late February through late October underground in abandoned small mammal burrows but may also nest under perennial bunch grasses or thatched annual grasses, underneath brush piles, in old bird nests, and in dead trees or hollow logs, and in structures (Williams et al. 2014, Hatfield et al. 2015). Overwintering sites utilized by mated queens include soft, disturbed soil (Goulson 2010), or under leaf litter or other debris (Williams et al. 2014).

CBB was once common throughout most of the central and southern California; however, it now appears to be absent from most of it, especially in the central portion of its historic range within California’s Central Valley (Hatfield et al. 2014). OBB historically occurs along the Pacific Coast with scattered records from the east side of the Central Valley. MBB historic range includes the California Central Valley (Hatfield et al. 2014). Analyses by the Xerces Society et al. (2018) suggest that there have been sharp declines in relative abundance of CBB by 98% and persistence by 80% over the last ten years. Analysis suggests a high population decline range-wide for OBB, including declines in range size by 40%, persistence by 67%, and relative abundance declines by 85%, but the level of population decline is difficult to ascertain, and more surveys are needed within the species’ historic range (Hatfield et al. 2014). Analysis of MBB yielded an average decline in species abundance of 58% (Hatfield et al. 2014). Without appropriate avoidance and minimization measures, potentially significant impacts associated with ground- and vegetation-disturbing activities associated with construction of the Project include loss of foraging plants, changes in foraging behavior, burrow collapse, nest abandonment, reduced nest success, reduced health and vigor of eggs, young and/or queens, in addition to direct mortality.

Recommended Mitigation Measure 30: CBB, MBB, and OBB Surveys and Avoidance

CDFW recommends that all small mammal burrows and thatched/bunch grasses be surveyed for the species during the optimal flight period of April 1through July 31 during the peak blooming period of preferred plant species prior to Project implementation. Avoidance of detected queens or workers is encouraged to allow CBB, MBB, and OBB to leave the Project site of their own volition. Avoidance and

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protection of detected nests prior to or during Project implementation is encouraged with delineation and observance of a 50-foot no-disturbance buffer.

COMMENT 10: Other State Species of Special Concern

Issues and Impacts: American badger, Merced kangaroo rat, and western spadefoot are known to inhabit grassland and upland shrub areas with friable soils (Williams 1986, Thomson et al. 2016). These species have been documented to occur in the vicinity of the Project, which supports requisite habitat elements for these species (CDFW 2022).

Habitat loss threatens all of the species mentioned above (Williams 1986, Thomson et al. 2016). Habitat within and adjacent to the Project represents some of the only remaining undeveloped land in the vicinity, which is otherwise intensively managed for agriculture. Without appropriate avoidance and minimization measures for these species, potentially significant impacts associated with ground disturbance include habitat loss, nest/den/burrow abandonment, which may result in reduced health or vigor of eggs and/or young, and direct mortality.

Recommended Mitigation Measure 31: Habitat Assessment
CDFW recommends that a qualified biologist conduct a habitat assessment in advance of project implementation, to determine if Project areas or their immediate vicinity contain suitable habitat for the species mentioned above.

Recommended Mitigation Measure 32: Surveys
If suitable habitat is present, CDFW recommends that a qualified biologist conduct focused surveys for applicable species and their requisite habitat features to evaluate potential impacts resulting from ground and vegetation disturbance.

Recommended Mitigation Measure 33: Avoidance
Avoidance whenever possible is encouraged via delineation and observance of a 50-foot no-disturbance buffer around dens of mammals like the American badger as well as the entrances of burrows that can provide refuge for small mammals, reptiles, and amphibians.

Would the Project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS?

COMMENT 11: Wetland, and Riparian Habitats

Issues and Impacts: The Project area contains numerous waterways and wetland features including vernal pools and swales within an agricultural landscape mosaic that also maintains undeveloped habitats. Project activities such as water recharge and any associated ground disturbances have the potential to involve temporary and

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permanent impacts to these habitat features. Project activities have the potential to result in temporary and permanent impacts to these features through groundwater pumping, habitat conversion, grading, fill, and related development. Riparian and associated floodplain and wetland areas are valuable for their ecosystem processes such as protecting water quality by filtering pollutants and transforming nutrients; stabilizing stream banks to prevent erosion and sedimentation/siltation; and dissipating flow energy during flood conditions, thereby spreading the volume of surface water, reducing peak flows downstream, and increasing the duration of low flows by slowly releasing stored water into the channel through subsurface flow. Vernal pools provide unique wetland habitat for many special status and endemic plant and aquatic wildlife species. The Fish and Game Commission policy regarding wetland resources discourages development or conversion of wetlands that results in any net loss of wetland acreage or habitat value. Habitat conversion, construction, grading, and fill activities within these features also has the potential to impact downstream waters as a result of Project site impacts leading to erosion, scour, and changes in stream morphology.

Recommended Mitigation Measure 34: Stream and Wetland Mapping
CDFW recommends that formal stream mapping and wetland delineation be conducted by a qualified biologist or hydrologist, as warranted, to determine the baseline location, extent, and condition of streams (including any floodplain) and wetlands within and adjacent to the Project area. Please note that while there is overlap, State and federal definitions of wetlands differ, and complete stream mapping commonly differs from delineations used by the United States (U.S.) Army Corps of Engineers specifically to identify the extent of Waters of the U.S. Therefore, it is advised that the wetland delineation identify both State and federal wetlands in the Project area as well as the extent of all streams including floodplains, if present, within the Project area. CDFW advises that site map(s) depicting the extent of any activities that may affect wetlands, lakes, or streams be included with any Project site evaluations, to clearly identify areas where stream/riparian and wetland habitats could be impacted from Project activities.

Recommended Mitigation Measure 35: Stream and Wetland Habitat Mitigation
CDFW recommends that the potential direct and indirect impacts to stream/riparian and wetland/vernal pool habitat be analyzed according to each Project activity. Based on those potential impacts, CDFW recommends that the EIR include measures to avoid, minimize, and/or mitigate those impacts. CDFW recommends that impacts to riparian habitat, including biotic and abiotic feature, take into account the effects to stream function and hydrology from riparian habitat loss or damage, as well as potential effects from the loss of riparian habitat to special-status species already identified herein. CDFW recommends that losses to vernal pools, swales, and other wetland or riparian habitats be offset with corresponding habitat restoration incorporating native vegetation to replace the value to fish and wildlife provided by the habitats lost from Project implementation. If on-site restoration to replace habitats is not feasible, CDFW recommends offsite mitigation by restoring or

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enhancing in-kind riparian or wetland habitat and providing for the long-term management and protection of the mitigation area, to ensure its persistence.

COMMENT 12: Sustainable Groundwater Management Act (SGMA) and Groundwater Dependent Ecosystems

Issues and Impacts: Many sensitive ecosystems and public trust resources such as streams, springs, riparian areas, and wetlands are dependent on groundwater and interconnected surface waters. The Project boundary overlaps the boundary for the Turlock Subbasin located in the northern San Joaquin Valley Groundwater Basin (Groundwater Basin Number 5-22.03). A draft Groundwater Sustainability Plan was prepared for the Turlock Subbasin jointly by the West Turlock Subbasin GSA and the East Turlock Subbasin GSA and was adopted in January 2022. The Turlock Subbasin is listed as a high priority Subbasin by the Department of Water Resources. SGMA defines sustainable groundwater management as “management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results (Water Code, § 10721 (v)).” Significant and undesirable results that may result from Project related activities and have adverse impacts to groundwater dependent ecosystems include chronic lowering of groundwater levels, reduction of groundwater storage, degraded water quality, land subsidence, and depletions of interconnected surface water that have an adverse impact on beneficial uses of surface water.

Project-related activities may result in significant and adverse impacts to groundwater dependent ecosystems including wetland and riparian habitats and the species dependent upon these habitats.

Analysis Recommendations:

- CDFW recommends that the EIR include an analysis of Project-related activities in relation to the Turlock Subbasin Groundwater Sustainability Plan, including analysis of potential undesirable results and adverse impacts to groundwater dependent ecosystems including the biological resources listed above.

- CDFW recommends that the EIR analyze how the Project may affect surface and subsurface water levels, including drawdown from confined aquifers.

- CDFW recommends a hydrologic study or other information that identifies and analyzes the impacts to the aquatic ecosystems and fisheries of the Merced, Tuolumne, and San Joaquin Rivers that may result from Project implementation.

- CDFW recommends that the EIR include specific triggers for evaluating changes to surface and ground water levels and monitoring wetland and riparian habitats that would be affected by these changes.

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Recommended Mitigation Measure 36: Groundwater Dependent Ecosystem Monitoring and Mitigation:
CDFW recommends that the EIR include requirements to identify, evaluate, and monitor all groundwater dependent ecosystems that would be affected by Project activities, and develop a plan to offset losses of groundwater dependent ecosystems caused by changes in hydrology associated with the Project. The plan should address mitigation for impacted habitat value and function, to achieve a minimum no net loss of these habitats, consistent with California Fish and Game Commission policy on Wetlands Resources.

COMMENT 13: Water Rights and Impacts from Surface Water Diversion

Issues and Impacts: As stated previously, the capture of unallocated stream flows to artificially recharge groundwater aquifers is subject to appropriation and approval by the SWRCB pursuant to Water Code section 1200 et seq. CDFW recommends that the EIR include a detailed description of the water rights and water entitlements that would pertain to the Project and address any applications or change petitions that may be filed. CDFW, as Trustee Agency, is consulted by the SWRCB during the water rights process to provide terms and conditions designed to protect fish and wildlife prior to appropriation of the State's water resources. Given the potential for impacts to sensitive species and their habitats, it is advised that required consultation with CDFW occur well in advance of the SWRCB water right application process.

Analysis Recommendations:

- CDFW recommends that the EIR analyze how the Project may affect surface and subsurface water levels.

- CDFW recommends a hydrologic study, water availability analysis, or other information that identifies and analyzes the impacts to aquatic ecosystems and fish and wildlife resources of the Merced, Tuolumne, and San Joaquin Rivers that may result from Project-related surface water diversion, including diversion for groundwater storage.

- CDFW recommends that the EIR include specific triggers for evaluating changes to surface flow and subsurface water levels, and monitoring wetland and riparian habitats that would be affected by these changes.

Recommended Mitigation Measure 37: Aquatic Ecosystem Monitoring and Mitigation:
CDFW recommends that the EIR include requirements to identify, evaluate, and monitor all aquatic ecosystems and fish and wildlife resources therein that would be affected by Project activities related to surface water diversion, and develop a plan to offset losses caused by changes in hydrology associated with the Project. The

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plan should address mitigation for impacted habitat value and function, to achieve a minimum no net loss of these habitats, consistent with California Fish and Game Commission policy on Wetlands Resources.

Editorial Comments and/or Suggestions

Lake and Streambed Alteration: Project activities that have the potential to substantially change the bed, bank, and channel of streams and associated wetlands may be subject to CDFW's regulatory authority pursuant to Fish and Game Code section 1600 et seq. Fish and Game Code section 1602 requires an entity to notify CDFW prior to commencing any activity that may (a) substantially divert or obstruct the natural flow of any river, stream, or lake; (b) substantially change or use any material from the bed, bank, or channel of any river, stream, or lake (including the removal of riparian vegetation): (c) deposit debris, waste or other materials that could pass into any river, stream, or lake. "Any river, stream, or lake" includes those that are ephemeral or intermittent as well as those that are perennial. CDFW is required to comply with CEQA in the issuance of a Lake or Streambed Alteration (LSA) Agreement; therefore, if the CEQA document approved for the Project does not adequately describe the Project and its impacts, a subsequent CEQA analysis may be necessary for LSA Agreement issuance. Additional information on notification requirements is available through the Central Region LSA Program at (559) 243-4593 or R4LSA@wildlife.ca.gov and the CDFW website: https://wildlife.ca.gov/Conservation/LSA.

Nesting birds: CDFW has jurisdiction over actions with potential to result in the disturbance or destruction of active nest sites or the unauthorized take of birds. Fish and Game Code sections that protect birds, their eggs and nests include sections 3503 (regarding unlawful take, possession or needless destruction of the nest or eggs of any bird), 3503.5 (regarding the take, possession or destruction of any birds-of-prey or their nests or eggs), and 3513 (regarding unlawful take of any migratory nongame bird).

CDFW encourages that Project implementation occur during the bird non-nesting season; however, if Project activities must occur during the breeding season (i.e., February through mid-September), the Project applicant is responsible for ensuring that implementation of the Project does not result in violation of the Migratory Bird Treaty Act or relevant Fish and Game Code sections as referenced above.

To evaluate Project-related impacts to nesting birds, CDFW recommends that a qualified biologist conduct preconstruction surveys for active nests no more than 10 days prior to the start of ground disturbance to maximize the probability that nests that could potentially be impacted by the Project are detected. CDFW also recommends that surveys cover a sufficient area around the work site to identify nests and determine their status. A sufficient area means any area potentially affected by the Project. In addition to direct impacts (i.e., nest destruction), noise, vibration, and movement of workers or equipment could also affect nests. Prior to initiation of construction activities, CDFW recommends that a qualified biologist conduct a survey to establish a behavioral baseline of all identified nests. Once construction begins, CDFW recommends that a qualified biologist continuously monitor nests to detect behavioral changes resulting from the Project. If behavioral changes occur, CDFW recommends that the work causing that change cease and that CDFW be consulted for additional avoidance and minimization measures.

If continuous monitoring of identified nests by a qualified biologist is not feasible, CDFW recommends a minimum no-disturbance buffer of 250 feet around active nests of non-listed bird species and a 500-foot no-disturbance buffer around active nests of non-listed raptors. These buffers are advised to remain in place until the breeding season has ended or until a qualified biologist has determined that the birds have fledged and are no longer reliant upon the nest or parental care for survival. Variance from these no-disturbance buffers is possible when there is compelling biological or ecological reason to do so, such as when the construction area would be concealed from a nest site by topography. CDFW recommends that a qualified biologist advise and support any variance from these buffers.

Endangered Species Act Consultation: CDFW recommends consultation with the USFWS prior to Project ground disturbance, due to potential impacts to Federal listed species. Take under the ESA is more stringently defined than under CESA; take under ESA may also include significant habitat modification or degradation that could result in death or injury to a listed species, by interfering with essential behavioral patterns such as breeding, foraging, or nesting. Similarly, for potential effects to steelhead and its critical habitat, CDFW recommends consultation with the National Marine Fisheries Service (NMFS). Consultation with the USFWS and NMFS in order to comply with ESA is advised well in advance of Project implementation.

ENVIRONMENTAL DATA

CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database that may be used to make subsequent or supplemental environmental determinations (Pub. Resources Code, § 21003, subd. (e)). Accordingly, please report any special status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNDDB field survey form can be obtained at the following link: https://www.wildlife.ca.gov/Data/CNDDB/Submitting-Data . The completed form can be mailed electronically to CNDDB at the following email address: CNDDB@wildlife.ca.gov. The types of information reported to CNDDB can be found at the following link: https://www.wildlife.ca.gov/Data/CNDDB/Plants-and-Animals

FILING FEES

The Project, as proposed, would have an impact on fish and/or wildlife, and assessment of filing fees is necessary. Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by

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CDFW. Payment of the fee is required in order for the underlying project approval to be operative, vested, and final (Cal. Code Regs, tit. 14, § 753.5; Fish & G. Code, § 711.4; Pub. Resources Code, § 21089).

CONCLUSION

CDFW appreciates the opportunity to comment on the NOP to assist WTGSA in identifying and mitigating Project impacts on biological resources. If you have questions regarding this letter, please contact Annette Tenneboe, Senior Environmental Scientist (Specialist), at (559) 580-3202 or by email at Annette.Tenneboe@wildlife.ca.gov.

Sincerely,

DocuSigned by:
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Attachment 1

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
RECOMMENDED MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)

PROJECT: Turlock Subbasin Groundwater Sustainability Plan

STATE CLEARINGHOUSE No.: 2022010100

RECOMMENDED MITIGATION MEASURES	STATUS/DATE/INITIALS
Before Project Activity	
Recommended Mitigation Measure 1: LBV Habitat Assessment	
Recommended Mitigation Measure 2: Focused LBV Surveys	
Recommended Mitigation Measure 3: LVB Buffers	
Recommended Mitigation Measure 4: LBV Nest Avoidance and Habitat Mitigation	
Recommended Mitigation Measure 5: LVB Take Authorization	
Recommended Mitigation Measure 6: Focused SWHA Surveys	
Recommended Mitigation Measure 7: SWHA Avoidance	
Recommended Mitigation Measure 8: SWHA Take Authorization	
Recommended Mitigation Measure 9: Loss of SWHA Foraging Habitat	
Recommended Mitigation Measure 10: SWHA Tree Removal	
Recommended Mitigation Measure 11: TRBL Surveys	
Recommended Mitigation Measure 12: TRBL Colony Avoidance	
Recommended Mitigation Measure 13: TRBL Take Authorization	
Recommended Mitigation Measure 14: CTS Habitat Assessment	
Recommended Mitigation Measure 15: Focused CTS Surveys	
Recommended Mitigation Measure16: CTS Avoidance	

RECOMMENDED MITIGATION MEASURES	STATUS/DATE/INITIALS
Recommended Mitigation Measure 17: CTS Take Authorization	
Recommended Mitigation Measure 18: Special-Status Plant Surveys	
Recommended Mitigation Measure 19: Special-Status Plant Avoidance	
Recommended Mitigation Measure 20: Listed Plant Species Take Authorization	
Recommended Mitigation Measure 21: BUOW Habitat Assessment	
Recommended Mitigation Measure 22: BUOW Surveys	
Recommended Mitigation Measure 23: BUOW Avoidance	
Recommended Mitigation Measure 24: BUOW Eviction and Mitigation	
Recommended Mitigation Measure 25: Bat Roost Habitat Assessment	
Recommended Mitigation Measure 26: Bat Surveys	
Recommended Mitigation Measure 27: Bat Roost disturbance Minimization and Avoidance	
Recommended Mitigation Measure 28: WPT Surveys	
Recommended Mitigation Measure 29: WPT Avoidance and Minimization	
Recommended Mitigation Measure 30: CBB, MBB, and OBB Surveys and Avoidance	
Recommended Mitigation Measure 31: Habitat Assessment – – American badger, Merced kangaroo rat, and western spadefoot.	
Recommended Mitigation Measure 32: Surveys – American badger, Merced kangaroo rat, and western spadefoot.	
Recommended Mitigation Measure 33: Avoidance – American badger, Merced kangaroo rat, and western spadefoot.	
Recommended Mitigation Measure 34: Stream and Wetland Mapping	
Recommended Mitigation Measure 35: Stream and Wetland Habitat Mitigation	

RECOMMENDED MITIGATION MEASURES	**STATUS/DATE/INITIALS**
Recommended Mitigation Measure 36: Groundwater Dependent Ecosystem Monitoring and Mitigation	
Recommended Mitigation Measure 37: Aquatic Ecosystem Monitoring and Mitigation	
During Project Activity	
Recommended Mitigation Measure 3: LVB Buffers	
Recommended Mitigation Measure 4: LBV Nest Avoidance and Habitat Mitigation	
Recommended Mitigation Measure 7: SWHA Avoidance	
Recommended Mitigation Measure 12: TRBL Colony Avoidance	
Recommended Mitigation Measure 16: CTS Avoidance	
Recommended Mitigation Measure 19: Special-Status Plant Avoidance	
Recommended Mitigation Measure 23: BUOW Avoidance	
Recommended Mitigation Measure 27: Bat Roost disturbance Minimization and Avoidance	
Recommended Mitigation Measure 29: WPT Avoidance and Minimization	
Recommended Mitigation Measure 30: CBB, MBB, and OBB Surveys and Avoidance	
Recommended Mitigation Measure 33: Avoidance – American badger, Merced kangaroo rat, and western spadefoot.	