Murrieta Creek Bridge at Overland Drive

Final Initial Study – Mitigated Negative Declaration

Federal Aid Project No. BR-NBIL (543)
City Project No. PW 16-05

prepared by

City of Temecula
Planning Division, Department of Community Development
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Acronyms and Abbreviations

AASHTO	Association of State Highway and Transportation Officials
AB	Assembly Bill
APE	Area of Potential Effect
AQMP	Air Quality Management Plan
BMP	Best Management Practice
CAAQS	California Ambient Air Quality Standards
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
dB	decibels
DBESP	Determination of Biologically Equivalent or Superior Preservation
dBA	A-weighted sound pressure level
DNL	Day-Night Average Level
DPM	diesel particulate matter
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTIP	Federal Transportation Improvement Program
GHG	greenhouse gas
GWP	global warming potential
I-15	Interstate 15
IPPC	Intergovernmental Panel on Climate Change
L_{ea}	equivalent noise level
LST	Localized Significance Thresholds
MSHCP	Multiple Species Habitat Conservation Plan
NAAQS	National Ambient Air Quality Standards
NAC	noise abatement criteria
NAHC	Native American Heritage Commission

NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
PBA	peak bedrock acceleration
$PM_{2.5}$	particulate matter with a diameter equal to or less than 2.5 microns
PM_{10}	particulate matter with a diameter equal to or less than 10 microns
PPV	peak particle velocity
RCA	Regional Conservation Authority
RMs	root mean squared
ROG	reactive organic gases
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategy
SIP	State Implementation Plan
SR	State Road
SWPPP	Stormwater Pollution Prevention Plan
SWP	State Water Project
TAC	toxic air contaminant
TNM	Traffic Noise Model
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VMT	vehicle miles traveled
VOC	volatile organic compound

Initial Study

1. Project Title

Murrieta Creek Bridge at Overland Drive (Project)

2. Lead Agency Name and Address

City of Temecula
Community Development Department
Planning Division
41000 Main Street
Temecula, California 92590

3. Contact Person and Phone Number

Contact: Nino Abad, Senior Civil Engineer, Project Manager
(951) 308-6385

4. Project Location

The proposed project is located in the City of Temecula, County of Riverside, California, west of Interstate 15 (I-15), north of Rancho California Road, west of Commerce Center Drive, south of Winchester Road, and east of Diaz Road (see Figure 1). The approximate longitude and latitude coordinates of the proposed bridge sites are 117.1658° W and 35.5239° N. The project is located 0.3 mile west of Interstate 15 and will extend Overland Drive across Murrieta Creek to connect to Avenida Alvarado at the Diaz Road intersection (see Figure 2).

5. General Plan Designation

Light Industrial, Service Commercial, and Open space

6. Zoning

The project is located in the Specific Plan 14 (SP-14) zone. Light Industrial (LI) is located adjacent to the west.

Figure 1 Regional Location

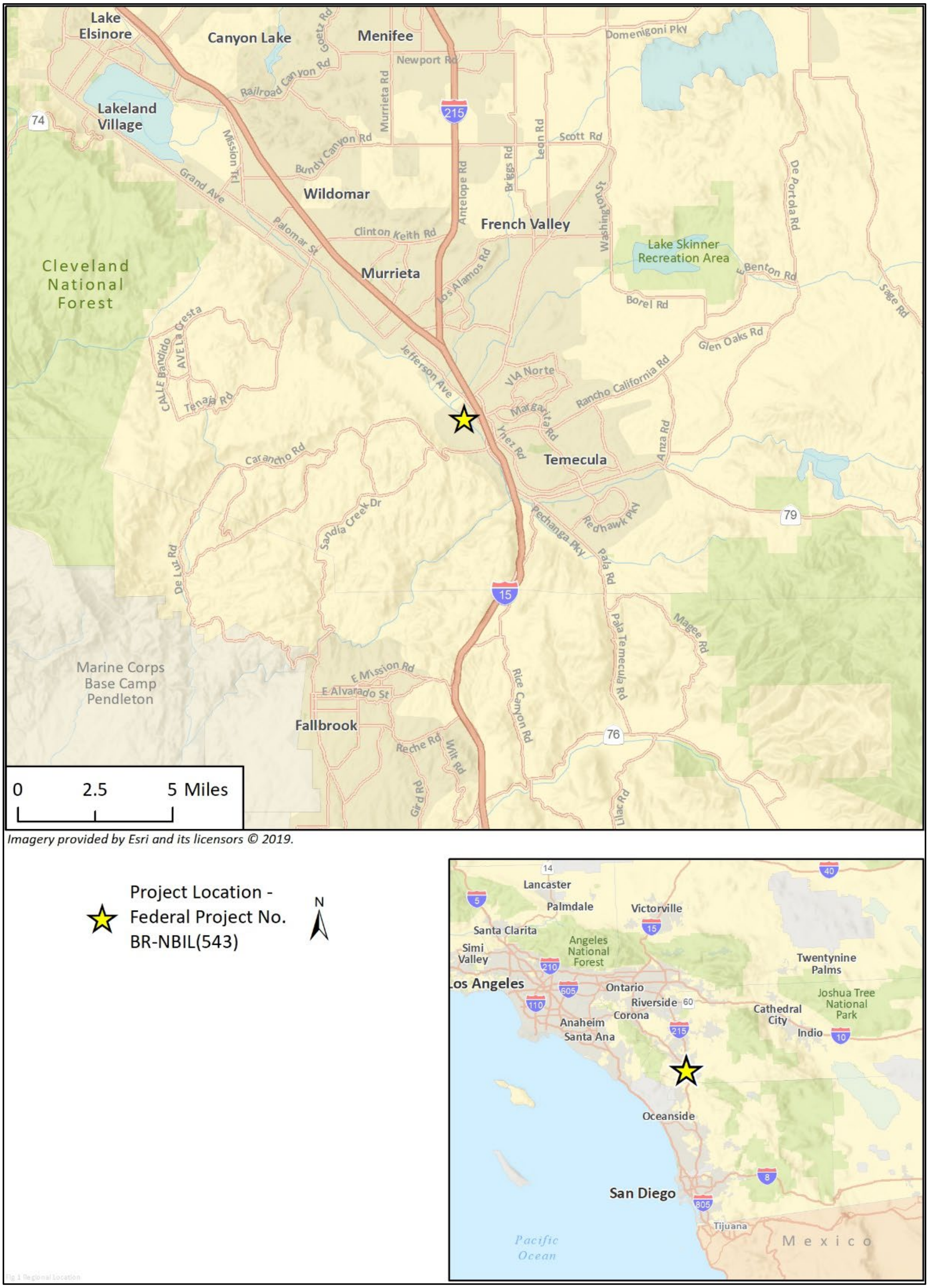

Figure 2 Project Location

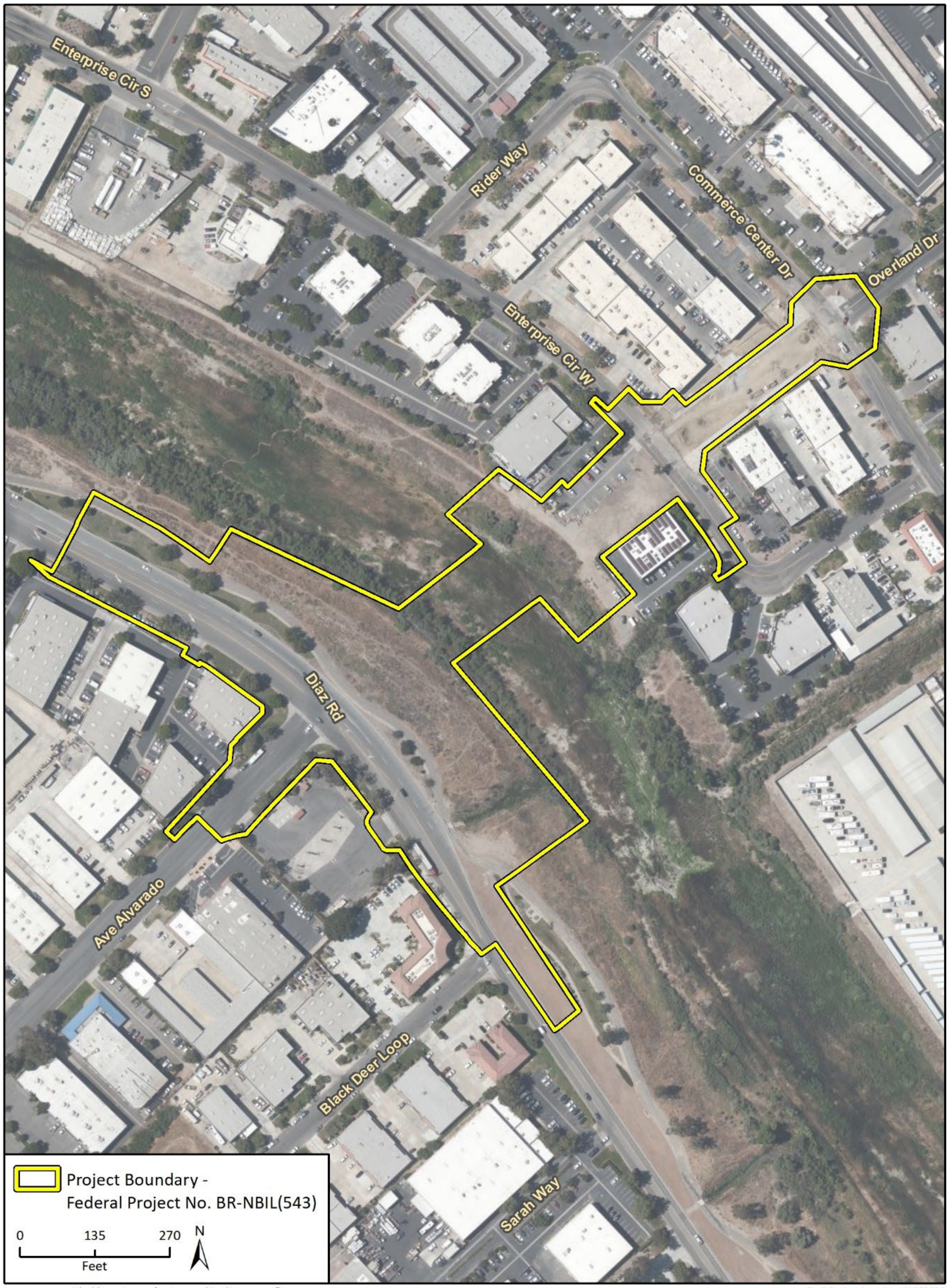

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Fig 2 Project Location_20200318

7. Description of Project

The project proposes to construct a bridge over Murrieta Creek to connect Avenida Alvarado with Overland Drive in the City of Temecula, Riverside County. The Murrieta Creek Bridge at Overland Drive is anticipated to be a concrete girder structure spanning approximately 348 linear feet over Murrieta Creek. The bridge would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 5-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

Upon completion of the Murrieta Creek Bridge Project, the proposed street configuration would be consistent with the four-lane roadway segment on Overland Drive to the east. In addition to the construction of the bridge, various roadway and utility improvements would occur at the western and eastern bridge approaches. In order to match the roadway section on Avenida Alvarado on the west side of the bridge, the project would transition the lane configuration in the eastern portion of Avenida Alvarado to be consistent with the four-lane configuration of the bridge. Intersection improvements to Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado would include the installation of traffic signals and associated signing, striping, streetlights, and utilities. Traffic signals and streetlights will be installed at the Overland Drive/Commerce Center Drive intersection as well. Reconstruction and roadway improvements along Diaz Road and Avenida Alvarado would include undergrounding electrical utilities, construction of curbs, gutters, and sidewalks, relocating sewer and water facilities, and adding traffic signage and striping. As a part of the bridge construction, one abutment would be constructed on each end of the bridge, along with two piers within Murrieta Creek. Earth embankments with concrete slope protection and cutoff walls buried underground for scour protection would also be installed on the east and west side of the Creek. The foundation of the bridge piers involving large-diameter cast-in-drilled-hole concrete piles will be installed below the channel bottom, which is deep enough for protection from scour. The channel bottom will remain earthen without any concrete or rip rap lining. The bridge girder would provide cell openings to accommodate future utilities and electrical conduits for streetlights and traffic signal communication.

The project will also include railing architectural treatment and landscaping modifications or improvements in the right-of-way along the bridge approach, at the Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado intersections, and on Diaz Road and Overland Drive.

During construction, best management practices (BMPs) are anticipated to include construction scheduling, streambank stabilization, wind erosion controls, gravel bag berms, gravel bag check dams, sediment sweeping and vacuuming, and material and waste handling and storage. Site Design BMPs would include preservation of existing vegetation and channel and slope protection (permanent soil stabilization including concrete slope protection under the bridge abutments and erosion control hydroseed mix on graded areas within the creek). In addition, all proposed slopes with slope gradient of 2:1 or flatter would be planted with deep rooted, drought tolerant erosion protection vegetation native to the area. Slopes steeper than 2:1 gradient would be lined with concrete for erosion protection and slope stability. Proposed Treatment Control BMPs, which are structural BMPs designed to treat and reduce pollutants in stormwater runoff prior to releasing it to receiving waters, include curb inlet media filters in the proposed catch basins. The proposed BMPs would target and reduce pollutants of concern from stormwater runoff from the project site.

8. Surrounding Land Uses and Setting

The surrounding urban land uses are predominately built out and consist of industrial and commercial uses. The project site is surrounded by industrial park uses to the west and service commercial uses to the east. The project will cross over the Murrieta Creek, which is designated as open space.

9. Other Public Agencies Whose Approval is Required

The City of Temecula is the lead agency with responsibility for approving the project. The project would require regulatory permits from the U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and San Diego Regional Water Quality Control Board (RWQCB) due to impacts to jurisdictional Waters of the State or Waters of the United States. An encroachment permit from the Riverside County Flood Control District and Water Conservation District (RCFCD&WCD) would be required due to the proposed construction activities within the Murrieta Creek Channel. Approval from the Western Riverside County Regional Conservation Authority (RCA), CDFW, and the United States Fish and Wildlife Service (USFWS) would be required for compliance with the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) and the Determination of Biologically Equivalent or Superior Preservation (DBESP).

10. Have California Native American Tribes Traditionally and Culturally Affiliated with the Project Area Requested Consultation Pursuant to Public Resources Code Section 21080.3.1?

On March 12, 2020, the City of Temecula distributed AB 52 consultation letters, including project information, map, and contact information, to each of the five (5) Native American tribes previously requesting to consult on City of Temecula projects. The tribal governments that were provided an AB 52 consultation letter include the following:

- Pechanga Band of Mission Indians
- Rincon Band of Luiseño Indians
- Soboba Band of Luiseño Indians
- Agua Caliente Band of Cahuilla Indians
- Torres-Martinez Desert Cahuilla Indians

Despite a July 8, 2020, follow up email from the City, the Torres-Martinez Desert Cahuilla Indians did not respond to the City's invitation to consult on the project. Each of the other four Tribes responded to the City's consultation letter. Responses are detailed in Section 18, *Tribal Cultural Resources*.

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Environmental Factors Potentially Affected

This project would potentially affect the environmental factors checked below, involving at least one impact that is "Potentially Significant" or "Less than Significant with Mitigation Incorporated" as indicated by the checklist on the following pages.

☐	Aesthetics	☐	Agriculture and Forestry Resources	☐	Air Quality
■	Biological Resources	■	Cultural Resources	☐	Energy
■	Geology and Soils	☐	Greenhouse Gas Emissions	☐	Hazards and Hazardous Materials
☐	Hydrology and Water Quality	☐	Land Use and Planning	☐	Mineral Resources
☐■	Noise	☐	Population and Housing	☐	Public Services
☐	Recreation	☐	Transportation	■	Tribal Cultural Resources
☐	Utilities and Service Systems	☐	Wildfire	■	Mandatory Findings of Significance

Determination

Based on this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

■ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "less than significant with mitigation incorporated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potential significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date
Nino Abad	
Printed Name	Title

Environmental Checklist

1 Aesthetics

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Except as provided in Public Resources Code Section 21099, would the project:				
a. Have a substantial adverse effect on a scenic vista?	☐	☐	■	☐
b. Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	■	☐
c. 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). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	■	☐
d. Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?	☐	☐	■	☐

a. Would the project have a substantial adverse effect on a scenic vista?

A scenic vista is usually a view of a valued resource, such as waterways, the ocean, hills, valleys, or mountains. The City has generally identified the conservation of the hills and Santa Ana Mountains to the west and southern ridgelines, the Santa Margarita River, the slopes in the Sphere of Influence located west and east of the City limits and other important landforms and historic landscape features as scenic vistas.

Interstate 15 (I-15) from Corona south to the San Diego County line has been designated as an Eligible State Scenic Highway. While this portion of the I-15 is eligible to be designated as a state scenic highway, it has not yet been recognized as such (Caltrans 2016).

From the project site, unobstructed views to the ridgelines and hills to the west are present. In addition, the southern hillsides are also visible but partially obstructed by development and trees. Murrieta Creek is visible from the surrounding area and travels through the project site. While there are no designated scenic resources, there are a number of resources within and visible from the project which are considered aesthetically important to the City of Temecula. The proposed project is located below the western escarpment, which is considered a scenic vista pursuant to the City's General Plan; however, there will not be a significant adverse impact on the scenic vista of the escarpment, as the proposed bridge will be constructed generally at existing grade and will not block scenic vistas within the area. Therefore, views of the project area would not be substantially altered by this project and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

The project is not located within a designated scenic highway corridor. The nearest designated State Scenic Highways in Riverside County are along State Road (SR) 74 and SR-243. The portions of these highways that are designated are located about 26 miles northeast of the project area and are not visible from within the project area or surrounding areas. The project is located adjacent to the I-15, which is designated by Caltrans as an Eligible State Scenic Highway; however, it is not officially designated as a State Scenic Highway by Caltrans. Public views of the distant mountains (Cleveland National Forest) from I-15 would not be obscured by development of the project. The project is not located on a scenic highway and would not substantially damage scenic resources, including rock outcroppings or historic buildings.

The Open Space and Conservation Element of the City's General Plan states waterways provide for scenic enjoyment in the area. In addition, natural drainage courses provide a scenic setting for the community. The proposed project would add a bridge structure across Murrieta Creek, but would not substantially degrade the existing visual character or quality of the site and its surroundings. Therefore, views of the project area for passengers along I-15 would not be substantially altered by the project and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. Would the project 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). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

The viewers in the area consist of workers at their place of business, motorists and pedestrians traveling through the area, and recreational users of the Class I shared use path along Murrieta Creek. A majority of the viewers in the area would not be considered sensitive as they are at work or traveling through the area. However, people utilizing the shared use path would be considered sensitive viewers as they are utilizing and recreational amenity in the area.

The project site is currently undeveloped and is covered with riparian/riverine communities. The visual character of the project site would be altered; however, the proposed character would be consistent with existing bridges located 1,000 feet northwest and 2,300 feet southeast of the project site. The project would not substantially damage the surrounding natural scenic resources and visual character and would be similar to surrounding uses. In addition, the project would implement the following Avoidance and Mitigation Measures to ensure the project would not degrade the existing visual character or quality of public views:

- Existing landscaping impaired by the proposed project will be replaced with similar landscaping in the right-of-way along the bridge approach, Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado intersections, and along Diaz Road and Overland Drive.
- Street trees and landscaping of business parks impacted by the project shall be replaced with similar landscaping.
- Trees removed along the Class I shared-use trail shall be replaced at a 3:1 ratio.
- Bridge design would incorporate colored decorative metal railings for bicycle and pedestrian safety, and Caltrans standard fractured rib texture treatments on concrete railings to control graffiti.
- Murrieta Creek vegetation disturbed by construction will be treated for erosion control and re-seeding with native species seed mix.

Therefore, the project would result in a less than significant impact on the visual character of the area and no further analysis of this issue is necessary.

LESS THAN SIGNIFICANT IMPACT

d. Would the project create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?

Light pollution is regulated by Chapter 17.22 Section 17.22.176 of the City of Temecula Municipal Code. Ordinance 655 requires lighting to be shielded, directed down to avoid glare onto adjacent properties, and emit low levels of glare into the sky. Existing sources of light or glare in the project area include vehicles on the surrounding roadways, lights on local streets and parking lots, and windows from the light industrial and office commercial buildings. The bridge would not result in additional vehicles on local roadways. New streetlights would be placed along the bridge for vehicle and pedestrian safety; however, lights would comply with City of Temecula outdoor light standards and would be similar to streetlights on the surrounding roadways. Therefore, the project would not create new sources of light or glare which would adversely impact the daytime or nighttime visual setting of the area. Compliance with the Municipal Code would result in compliance with the County of Riverside's Mount Palomar Light Pollution Ordinance, the project would result in a less than significant impact.

LESS THAN SIGNIFICANT IMPACT

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2 Agriculture and Forestry Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	□	□	□	■
b. Conflict with existing zoning for agricultural use or a Williamson Act contract?	□	□	□	■
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)); timberland (as defined by Public Resources Code Section 4526); or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	□	□	□	■
d. Result in the loss of forest land or conversion of forest land to non-forest use?	□	□	□	■
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	□	□	□	■

a. Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

The project site is located within an urbanized area of the City. The surrounding area is developed for commercial and industrial uses, while the project site itself, which crosses Murrieta Creek, consists of riparian/riverine communities. The project site does not contain agricultural uses or related operations. According to Figure OS-3, of the City of Temecula General Plan, the project site is not located on Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. No impact would occur.

NO IMPACT

b. Would the project conflict with existing zoning for agricultural use or a Williamson Act contract?

The project site is currently zoned Specific Plan 14 (SP-14). No portion of the project site or surrounding land uses are zoned for agriculture and no nearby lands are enrolled under the Williamson Act. As such, future development of the project would not conflict with existing zoning for agricultural use or a Williamson Act contract, and no impact would occur in this regard. In addition, the project will not involve changes in the existing environment, which would result in the conversion of farmland to non-agricultural uses. No impact would occur.

NO IMPACT

c. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)); timberland (as defined by Public Resources Code Section 4526); or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?

As discussed above under Response 2.b, the project site is currently zoned SP-14. No forest land or timberland zoning is present on the project site or in the surrounding area. As such, future development of the project would not conflict with existing zoning for forest land or timberland and would not result in the loss of or conversion of forestland. No impact would occur.

NO IMPACT

d. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

No forest land exists on the project site or in the surrounding area. As such, future development of the project would not result in the loss of forest land or conversion of forest land to non-forest use. No impact would occur.

NO IMPACT

e. Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

Since there are no agricultural or forest uses or related operations on or near the project site, future development of the project would not involve the conversion of farmland or forest land to other uses, either directly or indirectly. No impacts to agricultural land or use would occur. Further analysis of this issue is not necessary.

NO IMPACT

3 Air Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
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 project 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?	☐	☐	■	☐

Overview of Air Pollution

The federal and State Clean Air Acts mandate the control and reduction of certain air pollutants. Under these laws, the U.S. Environmental Protection Agency (USEPA) and the California Air Resources Board (CARB) have established the National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (CAAQS) for "criteria pollutants" and other pollutants. Some pollutants are emitted directly from a source (e.g., vehicle tailpipe, an exhaust stack of a factory, etc.) into the atmosphere, including carbon monoxide, volatile organic compounds (VOC)/reactive organic gases (ROG),[1] nitrogen oxides (NO_X), particulate matter with diameters of ten microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), sulfur dioxide, and lead. Other pollutants are created indirectly through chemical reactions in the atmosphere, such as ozone, which is created by atmospheric chemical and photochemical reactions primarily between VOC and NO_X. Secondary pollutants include oxidants, ozone, and sulfate and nitrate particulates (smog).

Air pollutant emissions are generated primarily by stationary and mobile sources. Stationary sources can be divided into two major subcategories:

- Point sources occur at a specific location and are often identified by an exhaust vent or stack. Examples include boilers or combustion equipment that produce electricity or generate heat.
- Area sources are widely distributed and include such sources as residential and commercial water heaters, painting operations, lawn mowers, agricultural fields, landfills, and some consumer products.

[1] CARB defines VOC and ROG similarly as, "any compound of carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate," with the exception that VOC are compounds that participate in atmospheric photochemical reactions. For the purposes of this analysis, ROG and VOC are considered comparable in terms of mass emissions, and the term VOCi s used in this IS-MND.

Mobile sources refer to emissions from motor vehicles, including tailpipe and evaporative emissions, and can also be divided into two major subcategories:

- On-road sources that may be legally operated on roadways and highways.
- Off-road sources include aircraft, ships, trains, and self-propelled construction equipment.

Air pollutants can also be generated by the natural environment, such as when high winds suspend fine dust particles.

Air Quality Standards and Attainment

The project site is located in the South Coast Air Basin (SCAB), which is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). As the local air quality management agency, the SCAQMD is required to monitor air pollutant levels to ensure that the NAAQS and CAAQS are met and, if they are not met, to develop strategies to meet the standards. Depending on whether the standards are met or exceeded, the SCAB is classified as being in "attainment" or "nonattainment." In areas designated as non-attainment for one or more air pollutants, a cumulative air quality impact exists for those air pollutants, and the human health impacts associated with these criteria pollutants, presented in Table 1, are already occurring in that area as part of the environmental baseline condition. Under state law, air districts are required to prepare a plan for air quality improvement for pollutants for which the district is in non-compliance. The portion of Riverside in the SCAB is designated nonattainment extreme for the 8-hour ozone NAAQS, nonattainment serious for the 24-hour $PM_{2.5}$ and annual $PM_{2.5}$ NAAQS; nonattainment for the 8-hour ozone CAAQS; nonattainment for the 24-hour and annual PM_{10} CAAQS; and nonattainment for the annual $PM_{2.5}$ CAAQS (SCAQMD 2016). This nonattainment status is a result of several factors, the topography and climate of Southern California, the large population growth, and anthropogenic sources, such as exhaust from vehicles driving on roadways (SCAQMD 2017a).

Table 1 Health Effects Associated with Non-Attainment Criteria Pollutants

Pollutant	Adverse Effects
Ozone	(1) Short-term exposures: (a) pulmonary function decrements and localized lung edema in humans and animals and (b) risk to public health implied by alterations in pulmonary morphology and host defense in animals; (2) long-term exposures: risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (3) vegetation damage; and (4) property damage.
Suspended particulate matter (PM_{10})	(1) Excess deaths from short-term and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease (including asthma).[1]
Suspended particulate matter ($PM_{2.5}$)	(1) Excess deaths from short- and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes, including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children, such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease, including asthma.

Source: United States Environmental Protection Agency 2022

Air Quality Management

States are required to adopt enforceable plans, known as a State Implementation Plan (SIP), to achieve and maintain air quality meeting the NAAQS.

Since the SCAB currently exceeds ozone and $PM_{2.5}$ NAAQS standard, the SCAQMD is required to implement strategies to reduce pollutant levels to achieve attainment of the NAAQS. The SCAQMD 2022 Air Quality Management Plan (2022 AQMP) is a regional blueprint designed to meet the NAAQS and demonstrate how attainment will be reached. The 2022 AQMP represents a thorough analysis of existing and potential regulatory control options, includes available, proven, and cost-effective strategies, and seeks to achieve multiple goals in partnership with other entities promoting reductions in greenhouse gases and toxic risk, as well as efficiencies in energy use, transportation, and goods movement. The prior AQMP, published in 2016, determined that, with implementation of the proposed control strategy, the SCAB could expect to reach attainment of the 1997 8-hour ozone standard by July 15, 2024, and the 2012 annual $PM_{2.5}$ by 2025. The 2006 24-hour $PM_{2.5}$ did not meet the attainment date of December 31, 2019, which required SCAQMD to revise the plan to meet standard as early as possible. SCAQMD's 2022 AQMP, an update to the 2016 AQMP, was developed to identify and implement strategies and control measures to meet the 2015 8-hour ozone NAAQS as expeditiously as practicable, but no later than the statutory attainment deadline of August 3, 2038 for the SCAB (SCAQMD 2022).

Air Pollutant Emission Thresholds

The SCAQMD has adopted guidelines for quantifying and determining the significance of air quality emissions (SCAQMD 2019).

The SCAQMD recommends quantitative regional significance thresholds for temporary construction activities and long-term project operation in the SCAB, shown in Table 2, are used to evaluate a project's potential air quality impacts (SCAQMD 2019).

Table 2 SCAQMD Regional Air Quality Significance Thresholds

Pollutant	Construction (Pounds per Day)	Operation (Pounds per Day)
NO_x	100	55
VOC	75	55
PM_{10}	150	150
$PM_{2.5}$	55	55
SO_x	150	150
CO	550	550

NO_x = Nitrogen Oxides; VOC = Volatile Organic Compounds; PM_{10} = Particulate Matter with a diameter no more than 10 microns; $PM_{2.5}$ = Particulate Matter with a diameter no more than 2.5 microns; SO_x = Sulfur Oxide; CO = Carbon Monoxide

Source: SCAQMD 2019

Localized Significance Thresholds

In addition to the above regional thresholds, the SCAQMD has developed Localized Significance Thresholds (LSTs) in response to the Governing Board's Environmental Justice Enhancement Initiative (1-4), which was prepared to update the California Environmental Quality Act (*CEQA)* Air Quality Handbook (1993). LSTs were devised in response to concern regarding exposure of individuals to criteria pollutants in local communities and have been developed for NO_X, CO, PM_{10}, and $PM_{2.5}$. LSTs represent the maximum emissions from a project that will not cause or contribute to an air quality exceedance of the most stringent applicable federal or State ambient air quality standard at the nearest sensitive receptor, taking into consideration ambient concentrations in each SRA, distance to the sensitive receptor, and project size. LSTs have been developed for emissions within construction areas up to five acres in size. However, LSTs only apply to on-site emissions sources and are not applicable to off-site mobile sources, such as cars on a roadway (SCAQMD 2008a, 2009). For residential and retail projects the majority of operational emissions are associated with project-generated vehicle trips not stationary sources. Therefore, for these land use types, LSTs are typically applied only to construction emissions.

In order to minimize efforts, the SCAQMD developed mass rate lookup tables as a simple screening procedure. If a project's on-site emissions do not exceed the screening levels for any pollutant, it can be concluded that the project would not cause or contribute to an adverse localized air quality impact. Screening levels are provided for various distances between the project boundary and the nearest sensitive receptor and various project site acreages. Screening levels increase, as the project distance between the boundary and the nearest receiver increases. This is because air pollutant dispersion increases with distance. Screening levels increase, as the acreage increases. This is because the distance between construction sources and sensitive receptors increases with project acreage.

The LST mass rate lookup tables account for ambient pollutant concentrations based on the project's source receptor area. LSTs are provided for receptors at a distance of 82 feet (25 meters), 164 feet (50 meters), 328 feet (100 meters), 656 feet (200 meters), 1,640 feet (500 meters) from the project disturbance boundary to the sensitive receptors.

The site is located in SRA-26 (Temecula Valley). The project area totals approximately five acres. The nearest sensitive receptors are students attending Temecula Montessori Academy, and the receptors are approximately 480 feet from the nearest project site boundary. To be conservative, the LSTs at the distance of 328 feet (100 meters) are used for a two-acre site (LSTs become more stringent with smaller project area acreages). The analysis uses the following LST values as shown in Table 3.

Table 3 SCAQMD LSTs for Construction

Pollutant	Allowable Emissions for a 2-Acre Site at 328 feet in SRA 26
Gradual conversion of NO_X to NO_2	363
CO	2,781
PM_{10}	38
$PM_{2.5}$	10

SRA = source receptor area; lbs/day = pounds per day; NO_x/NO_2 = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter 10 micrometers in diameter or less; $PM_{2.5}$ = fine particulate matter 2.5 micrometers in diameter or less
Source: SCAQMD 2009

Toxic Air Contaminants Thresholds

SCAQMD has developed significance thresholds for the emissions of toxic air contaminants (TAC) based on health risks associated with elevated exposure to such compounds. For carcinogenic compounds, cancer risk is assessed in terms of incremental excess cancer risk. A project would result in a potentially significant impact if it would generate an incremental excess cancer risk of 10 in 1 million (1×10^{-6}) or a cancer burden of 0.5 excess cancer cases in areas exceeding 1 in 1 million risks. Additionally, non-carcinogenic health risks are assessed in terms of a hazard index. A project would result in a potentially significant impact if it would result in a chronic and acute hazard index greater than 1.0 (SCAQMD 2019).

Sensitive Receptors

CARB and the Office of Environmental Health Hazard Assessment have identified the following groups of individuals as the most likely to be affected by air pollution: the elderly over 65, children under 14, infants (including in utero in the third trimester of pregnancy), and persons with cardiovascular and chronic respiratory diseases such as asthma, emphysema, and bronchitis (CARB 2005; Office of Environmental Health Hazard Assessment 2015). Some land uses considered more sensitive to air pollution than others due to the types of population groups or activities involved are referred to as sensitive receptors. Examples of these sensitive receptors are residences, schools, hospitals, religious facilities, and daycare centers. SCAQMD Risk Assessment Procedures define receptors as any location outside the boundaries of a facility at which a person could experience repeated, continuous exposure. The procedures further note that sensitive receptors include any residence (e.g., private homes, condominiums, apartments, and living quarters), schools (including preschools and daycare centers), health facilities (e.g., hospitals, retirement and nursing homes, long-term care hospitals, hospices), as well as prisons, dormitories, or similar live-in housing where children, chronically ill individuals, or other sensitive persons could be exposed to TACs (SCAQMD 2017).

The nearest sensitive receptors would be students attending the Temecula Montessori Academy, which provides programs for infants and preschool to third grade students.

Methodology

The following discussion is based on the Air Quality Report prepared for the project by Rincon Consultants dated August 2023 and is included as Appendix A. The report used project-specific information for construction and the VMT Analysis Technical Memorandum prepared by STC Traffic, Inc. in February 2021, which is included as Appendix B. The construction emissions were calculated using the Road Construction Emissions Model, Version 9.0.0. Refer to Appendix C for more details regarding the methodology.

a. Would the project conflict with or obstruct implementation of the applicable air quality plan?

A project may be inconsistent with the AQMP if it would generate population, housing, or employment growth exceeding forecasts used in the development of the AQMP.

The 2022 AQMP, the most recent AQMP adopted by the SCAQMD, incorporates local city general plans and the Southern California Association of Governments (SCAG)'s 2020 RTP/SCS socioeconomic forecast projections of regional population, housing, and employment growth (SCAQMD 2022, SCAG 2020a). The project involves the construction of a bridge over and across Murrieta Creek to connect Avenida Alvarado at the intersection of Diaz Road with Overland Drive at the intersection of Enterprise Circle West in the City. The construction of this project would not generate new population, housing, or employment. Therefore, the project would not generate air pollution emission that would impede or conflict with the 2022 AQMP.

Additionally, the federal clean air act requires a demonstration that federal actions conform to the State Implementation Plan (SIP) and similar approved plans in areas that are designated as non-attainment or have maintenance plans for criteria pollutants. Transportation measures, such as the project, are analyzed for conformity with the SIP as part of the RTP and the Federal Transportation Improvement Program (FTIP). If the design concept and scope of a proposed transportation project are consistent with the project description in the applicable RTP and FTIP, and the assumptions in the regional emissions analysis for the RTP and FTIP, then the project would conform to the SIP, and no adverse regional air quality impact would occur as a result of the project.

SCAG, as the area's metropolitan planning organization, and the FHWA must make a determination that the applicable RTP and FTIP conform to the applicable SIP. Conformity to the SIP means that transportation activities will not create new air quality violations, worsen existing violations, or delay the attainment of the NAAQS. Federal regulations also require SCAG to conduct an air quality conformity analysis of all regionally significant projects that increase the transportation system capacity. All regionally significant capacity-increasing transportation projects, regardless of funding sources, must be included in the RTIP.

The currently applicable RTP and FTIP for the project area are the *Connect SoCal* 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy and the 2023 FTIP (SCAG 2020a, 2023). Both plans were prepared by SCAG. The project is included in *Connect SoCal* and the 2023 FTIP under FTIP ID 991203A. The FHWA made a finding of conformity on the 2020-2045 RTP/SCS through Amendment #3 on June 9, 2023 (FHWA 2022). In addition, the FHWA approved the 2023 FTIP Consistency Amendment #23-03 and concurred that the associated conformity determination conformed to the applicable SIP in accordance with the provisions of 40 CFR Parts 51 and 93 on June 9, 2023 (FHWA 2023).

Therefore, the project is assumed to conform with the 2022 AQMP and the SIP. Furthermore, implementation of the project would ensure that the City would be consistent with the *Connect SoCal* RTP/SCS and the 2023 FTIP. No adverse regional or local air quality impact would occur as a result of the project.

NO IMPACT

b. *Would the project 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?*

Construction Emissions

The project would allow for the construction of a bridge that would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 5-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

Construction would involve grubbing/land clearing, grading/excavation, drainage/utilities/sub-grade, and paving. Exhaust emissions would be associated with use of heavy-duty construction equipment and truck trips hauling debris, soils, and construction materials; fugitive dust (PM_{10} and $PM_{2.5}$) emissions would primarily result from earthwork activities (e.g., grubbing/land clearing and grading) activities. The paving operations would release VOCs. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation and, for dust, the prevailing weather conditions. According to the City of Temecula General Plan, the City shall require individual development projects to comply with the following measures to minimize short term, construction-related PM_{10} and NOx emissions, and to minimize off-site impacts:

- Water all active construction areas at least twice daily;
- Cover all haul trucks or maintain at least two feet of freeboard;
- Pave or apply water four times daily to all unpaved parking or staging areas;
- Sweep or wash any site access points within 30 minutes of any visible dirt deposition on any public roadway;
- Cover or water twice daily any on-site stockpiles of debris, dirt or other dusty material;
- Suspend all operations on any unpaved surface if winds exceed 25 mph;
- Hydroseed or otherwise stabilize any cleared area which is to remain in active for more than 96 hours after clearing is completed;
- Ensure that all cut and fill slopes are permanently protected from erosion;
- Require the construction contractor to ensure that all construction equipment is maintained in peak working order;
- Limit allowable idling to 10 minutes for trucks and heavy equipment;
- Encourage carpooling for construction workers;
- Limit lane closures to off-peak travel periods;
- Park construction vehicles off traveled roadways;
- Wet down or cover dirt hauled off site;
- Wash or sweep away access points daily;
- Encourage receipt of materials during non-peak traffic hours; and,
- Sandbag construction sites for erosion control.

In addition, demolition and grading for the project shall be performed in compliance with SCAQMD Rule 4032, Fugitive Dust. Contractor compliance with Rule 403 requirements would be mandated in the contractor's specifications and shall include the following measures:

- Land disturbance shall be minimized to the extent feasible. Grading activities shall be limited to the disturbance of no more than five acres in the course of one day.
- Haul trucks shall be covered when loaded with fill.
- Paved streets shall be swept at least once per day where there is evidence of dirt that has been carried onto the roadway.
- Watering trucks shall be used to minimize dust. Watering should be sufficient to confine dust plumes to the project work areas. Active, disturbed areas shall have water applied to them three times daily.
- For disturbed surfaces that will not be revegetated and that will be left inactive for four or more days, a chemical stabilizer shall be applied pursuant to the manufacturer's instruction.
- For unpaved roads, chemical stabilizers shall be applied or the roads shall be watered once per hour during active operation.
- Vehicle speed on unpaved roads shall be limited to 15 miles per hour. For open storage piles that will remain on site for two or more days, water shall be applied once per hour, or coverings shall be installed.
- For paved road trackout, all haul vehicles shall be covered or shall comply with the vehicle freeboard requirements of Section 23114 of the *California*

Vehicle Code for both public and private roads. During high wind conditions (i.e., wind speeds in excess of 25 miles per hour), all earth-moving activities shall cease or water shall be applied to soil not more than 15 minutes prior to disturbing such soil.

Table 4 summarizes the estimated maximum daily emissions of VOC, NO_x, CO, SO_2, PM_{10}, and $PM_{2.5}$ emissions per phase of construction. All construction-related criteria pollutant emissions would be below the SCAQMD regional thresholds. Therefore, project construction would not 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. Impacts would be less than significant.

Table 4 Project Construction Emissions

	VOC (lbs/day)	PM_{10} (lbs/day)	$PM_{2.5}$ (lbs/day)	CO (lbs/day)	SO_X (lbs/day)	NO_x (lbs/day)
Grubbing/Land Clearing	1.30	15.19	3.27	30.60	0.05	3.92
Grading/Excavation	2.28	15.35	3.37	44.14	0.08	5.15
Drainage/Utilities/Sub-Grade	4.74	15.68	3.68	106.23	0.17	12.31
Paving	3.46	0.44	0.36	71.72	0.12	8.82
Maximum Daily	**4.74**	**15.68**	**3.68**	**106.23**	**0.17**	**12.31**
SCAQMD Significance Threshold	75	150	55	550	150	100
Exceed Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

See Appendix C

Operational Emissions

As described in the Air Quality Report prepared for the project, the project would result in a reduction of operational emissions. While the VMT Analysis Technical Memorandum (STC Traffic, Inc. 2021, Appendix B) shows VMT increasing in the future (2,618 VMT per day in 2025 and 2,922 VMT per day in 2045), the analysis does not capture the fact that traffic would be redistributed on the local roadway network with the construction of the bridge. VMT within the study area would grow with or without the project due to population growth. The proposed project would improve traffic flow in the City and would not increase capacity. In actuality, the project would reduce VMT for current trips on the network as the new roadway segment lowers VMT for journeys from Overland Drive to Diaz Road and Avenida Alvarado. The distance from the Overland Drive/Enterprise Circle intersection to the Diaz Road/ Avenida Alvarado intersection is currently 0.7 mile. The distance between the two intersections across the creek is approximately 825 feet. This is an approximate reduction of 2,870 feet traveled per vehicle trip. With a reduction in overall trip distance for the area, the project would result in emissions reductions compared to the existing conditions. Therefore, project operation would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment, and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. *Would the project expose sensitive receptors to substantial pollutant concentrations?*

Carbon Monoxide Hotspots

A carbon monoxide hotspot is a localized concentration of carbon monoxide that is above a carbon monoxide ambient air quality standard. Localized carbon monoxide hotspots can occur at intersections with heavy peak hour traffic. Specifically, hotspots can be created at intersections where traffic levels are sufficiently high such that the local carbon monoxide concentration exceeds the federal one-hour standard of 35.0 ppm or the federal and state eight-hour standard of 9.0 ppm (SCAQMD 2016).

As described under criterion (b), the project would not generate new trips in the project area but provide another access point to improve connectivity for existing traffic traveling in between Overland Drive to Avenida Alvarado. The project would relieve congestion at other nearby intersections since the development of the bridge would create a new east to west roadway connection. Therefore, the project would not result in or substantially contribute to concentrations that exceed the one-hour or eight-hour CO standard. Therefore, impacts would be less than significant.

Localized Significance Thresholds

Table 5 summarizes maximum daily on-site emissions associated with construction of the project. The on-site construction emissions of NO_X, CO, PM_{10}, and $PM_{2.5}$ emissions would not exceed SCAQMD LST screening levels during any phase of construction. Therefore, the project would not expose sensitive receptors to substantial criteria pollutant concentrations and impacts would be less than significant.

Table 5 On-site Construction Emissions

	Maximum On-site Emissions (lbs/day)[1]			
Year	NO_X	CO	PM_{10}	$PM_{2.5}$
Grubbing/Land Clearing	3.92	30.60	15.19	3.27
Grading/Excavation	5.15	44.14	15.35	3.37
Drainage/Utilities/Sub-Grade	12.31	106.23	15.68	3.68
Paving	8.82	71.72	0.44	0.36
Maximum Daily	**12.31**	**106.23**	**15.68**	**3.68**
Applicable LST; 2 acres at 100 meters	**363**	**2,781**	**38**	**10**

SRA = source receptor area; lbs/day = pounds per day; NO_x/NO_2 = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter 10 micrometers in diameter or less; $PM_{2.5}$ = fine particulate matter 2.5 micrometers in diameter or less

[1]Emissions only account for on-site construction emissions.

Source: Appendix C

Toxic Air Contaminants

Construction TAC

Construction-related activities would result in temporary project-generated emissions of diesel particulate matter (DPM) exhaust emissions from off-road, heavy-duty diesel equipment for site preparation, grading, building construction, and other construction activities. DPM was identified as a TAC by CARB in 1998 (CARB 2022). The potential cancer risk from the inhalation of DPM (discussed in the following paragraphs) outweighs the potential non-cancer health impacts and is therefore the focus of this analysis.

Generation of DPM from construction projects typically occurs in a single area for a short period. Construction of the proposed project would occur over approximately 17 months. The dose to which the receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the extent of exposure that person has with the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for the Maximally Exposed Individual. The risks estimated for a Maximally Exposed Individual are higher if a fixed exposure occurs over a longer period of time. According to the California Office of Environmental Health Hazard Assessment, health risk assessments, which determine the exposure of sensitive receptors to toxic emissions, should be based on a 70-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project. Thus, the duration of proposed construction activities (i.e., 23 months) is approximately six percent of the total exposure period used for 30-year health risk calculations. Current models and methodologies for conducting health-risk assessments are associated with longer-term exposure periods of 9, 30, and 70 years, which do not correlate well with the temporary and highly variable nature of construction activities, resulting in difficulties in producing accurate estimates of health risk (Bay Area Air Quality Management District 2017).

The maximum exhaust PM_{10} and $PM_{2.5}$ emissions, which are used as surrogates for DPM, would occur during the drainage/utilities/sub-grade activities. These activities would last for approximately 11 months. PM emissions would decrease for the remaining construction period because construction activities, such as paving, would require less intensive construction equipment. While the maximum DPM emissions associated with demolition, site preparation, and grading activities would only occur for a portion of the overall construction period, these activities represent the worst-case condition for the total construction period. This would represent three percent of the total 30-year exposure period for health risk calculation. Given the aforementioned discussion, DPM generated by project construction would not create conditions where the probability is greater than one in ten million of contracting cancer for the Maximally Exposed Individual or to generate ground-level concentrations of non-carcinogenic TACs that exceed a Hazard Index greater than one for the Maximally Exposed Individual. Therefore, project construction would not expose sensitive receptors to substantial TAC concentrations, and impacts would be less than significant.

Operational TAC

The development of the project would not site new mobile sources of TAC in the general vicinity. As a bridge development, the project would be a new access point for existing vehicles traveling near or on Overland Drive and Avenida Alvarado. Existing vehicles and motorists would use the bridge for easier east to west access. Therefore, the project would not include substantial mobile TAC sources, nor would it result in the exposure of off-site sensitive receptors to significant amounts of carcinogenic or toxic air contaminants. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

For construction activities, odors would be short-term in nature and are subject to SCAQMD Rule 402 Nuisance (SCAQMD 1976). Construction activities would be temporary and transitory and associated odors would cease upon construction completion. Accordingly, the project would not create objectionable odors affecting a substantial number of people during construction, and short-term impacts would be less than significant.

Common sources of operational odor complaints include sewage treatment plants, landfills, recycling facilities, and agricultural uses. The proposed plan would not include any of these uses. The project would construct a bridge to connect vehicles traveling to and from Overland Drive and Avenida Avenue. The project would not generate new vehicle trips but add an additional access point access for existing vehicles, motorists, pedestrians, and bicyclists. This development is not considered a typical nuisance for odor. Therefore, operational odor impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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4 Biological Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Have 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 or U.S. Fish and Wildlife Service?	□	■	□	□
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	□	■	□	□
c. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	□	■	□	□
d. 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?	□	■	□	□
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	□	■	□	□
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	□	■	□	□

This section is based on the City of Temecula's prior Final Initial Study, dated May 28, 2013, the Jurisdictional Delineation Report, dated January 2013, and the Habitat Assessment for Murrieta Creek Bridge and Overland Drive Extension and related surveys for the project, prepared by BonTerra Consulting (September 2012), the Least Bell's Vireo Protocol Survey Report, dated September 2019, the Jurisdictional Waters Delineation, dated April 1, 2020, the MSHCP Consistency Analysis, dated July 2021, and the MSHCP ~~Determination of Biologically Equivalent or Superior Preservation (~~DBESP~~)~~, as amended March 2022, for the Murrieta Creek Bridge at Overland Drive (Avenida Alvarado Over Murrieta Creek) Federal Aid Project No. BR-NBIL (543), City Project No. PW 16-05, City of Temecula, Riverside County, California, prepared by Rincon Consultants, Inc. (Rincon). The DBESP was provided to the Western Riverside County ~~Regional Conservation Authority~~ RCA, the ~~California Department of Fish and Wildlife (~~CDFW~~)~~, and the ~~United States Fish and Wildlife Service (~~USFWS~~)~~ (collectively referred to as the "Wildlife Agencies") for comment, and the 60-day response period concluded on September 05, 2022. As such, the project is in compliance with the Western Riverside MSHCP and the DBESP is considered to be approved."

a. *Would the project have 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 or U.S. Fish and Wildlife Service?*

The project site is located within Subunit 1 (Murrieta Creek) of the Western Riverside ~~Multiple Species Habitat Conservation Plan's (~~MSHCP's~~)~~ Southwest Area Plan. The project site is located in Criteria Area Cells 6783 and 6890, which contributes to Proposed Constrained Linkage 13 (Murrieta Creek). The land along Murrieta Creek is owned by the Riverside County Flood Control and Water Conservation District (District). The project site is not located in a Criteria Area Plant Species Survey Area or within the Narrow Endemic Plant Survey Area; therefore, focused plant surveys for these species are not required.

The project site is within a Burrowing Owl (*Athene cunicularia*) Survey Area. A Step I Habitat Assessment and Step II Part A Focused Burrow Survey were completed in the Study Area (all areas of potential project-related effects and a 500-foot buffer) on May 10, 2019 and May 20, 2019, respectively, in accordance with methods outlined in the *Burrowing Owl Survey Instructions for the Western Riverside Multiple Species Habitat Conservation Plan Area* (County of Riverside 2006). This search identified marginally suitable habitat present in the Study Area along the banks of Murrieta Creek. This habitat is isolated and highly disturbed but contains a complex of several burrows of suitable size for burrowing owl. No burrowing owls or owl sign (e.g., prey remains, cast pellets, white-wash, or feathers) were observed in the Study Area during the Step I Habitat Assessment or Step II A focused Burrow Survey.

The project would impact Riparian/Riverine resources that are occupied by least Bell's vireo (*Vireo bellii pusillus*), smooth tarplant (*Centromadia pungens* ssp. *laevis*), and yellow-breasted chat (*Icteria virens*), and potentially occupied by yellow warbler (*Setophaga petechia*), western pond turtle (*Emys marmorata*), and arroyo chub (*Gila orcuttii*). Specifically, the southern willow scrub and riparian scrub habitats in the Study Area provide habitat that is occupied by the least Bell's vireo. Updated focused surveys for this species were conducted between May 10 and July 19, 2019. The surveys were conducted in accordance with the USFWS *Least Bell's Vireo Survey Guidelines*, issued January 19, 2001. Eight (8) surveys were conducted during this time frame. The surveys occurred between dawn and 11:00 am each day within all portions of the Study Area containing potentially suitable riparian habitat. The proposed project would directly impact habitat for this species. Least Bell's vireo territories were observed within the arroyo willow thickets habitat along the banks of

Murrieta Creek in the Study Area. A Natural Environment Study was performed within the Biological Study Area and concluded that impacts to least Bell's vireo are expected to occur as a result of the project. As a result, a ~~Biologically Equivalent or Superior Preservation (~~DBESP~~)~~ report was prepared that described proposed mitigation for this impact (Appendix D). The project will adhere to the MSHCP Guidelines for Covered Projects found in Sections 6.1.4, 7.5.1, and 7.5.3, and of the Western Riverside County Final MSHCP. The project will also implement all feasible BMPs from the Western Riverside County Final MSHCP during construction. A qualified biologist shall be onsite during construction activities to ensure that these guidelines are followed.

The removal of vegetation may also result in temporary impacts to nesting birds due to the temporarily reduced available nesting habitat. To reduce impacts to sensitive and special status species, mitigation measures BIO-1 through BIO-5 from ~~in~~ the DBESP report will be incorporated into the project and will result in less than significant impacts.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. *Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?*

Riparian habitats are those habitats located along banks or rivers or streams. Sensitive natural communities are natural communities that are considered rare in the region by the USFWS, CDFW, or local regulatory agencies; that are known to provide habitat for sensitive animal or plant species; or are known to be significant wildlife corridors. The Study Area contains freshwater marsh, riparian scrub, southern willow thickets, non-native grassland, and developed/ornamental areas. Freshwater marsh, riparian scrub, southern willow thickets meet the definition of a Riparian/Riverine community. Project implementation would result in unavoidable permanent impacts to 0.09 acre and temporary impacts to 0.78 acre of freshwater marsh, permanent impacts to 0.06 acre and temporary impacts to 0.08 acre of riparian scrub, and permanent impacts to 0.01 acre and temporary impacts to 0.36 acre of southern willow scrub. Project implementation would result in unavoidable permanent impacts to 0.16 acre of Riparian/Riverine area and temporary impacts to 1.22 acres of Riparian/Riverine area. The MSHCP recommends avoidance of Riparian/Riverine areas, if feasible. Since avoidance is not feasible based on the nature of the proposed project, a DBESP describing the mitigation strategy to provide Riparian/Riverine resources of equivalent or superior habitat value to those being impacted was prepared. The mitigation measures identified in the DBESP report will be incorporated into the project and will result in less than significant impacts.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

c. *Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?*

Wetlands are defined under the federal Clean Water Act as land that is flooded or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that normally does support, a prevalence of vegetation adapted to life in saturated soils. Wetlands include areas such as swamps, marshes, bogs, mudflats, and vernal pools. Murrieta Creek is under the jurisdiction of the ~~U.S. Army Corps of Engineers (~~USACE~~)~~, the CDFW, and ~~Regional Water Quality Control Board (~~RWQCB~~)~~ Region 9, San Diego Region. Project implementation would result in impacts to 0.96 acres (0.08 acre permanent, 0.88 acres temporary) of wetland waters of the U.S., and 2.48 acres (0.33 acre permanent, 2.15 acres temporary) of wetland waters of the State. The DBESP describes the mitigation strategy to provide Riparian/Riverine resources, which include jurisdictional wetland waters, of equivalent or superior habitat value to those being impacted. The mitigation measures identified in the DBESP report will be incorporated in the project and will result in less than significant impacts.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

d. Would the project 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?

A variety of biological resources are known to exist within the vicinity of the project site. Implementation of future development of the project may have the potential to directly or indirectly impact sensitive species and habitats. The project is located within the Murrieta Creek Proposed Constrained Linkage 13, which connects core habitat at the Santa Rosa Plateau and Proposed Linkage 10 to conserved habitats in San Diego County. Murrieta Creek is constrained on all sides by existing urban development; therefore, wildlife is constrained to moving along the creek, which is used as a wildlife corridor. The proposed bridge across Murrieta Creek would be similar to the Winchester Bridge, approximately 1,000 feet northwest of the project site. It is assumed that wildlife species that currently move along the creek under the Winchester Road Bridge would continue along the creek as they currently do. However; night lighting and headlights on the proposed bridge could increase light levels within the creek, which could discourage nocturnal wildlife movement. Additionally, if vehicle noise and or the noise driving over the bridge substantially increases above ambient conditions in the creek, this could also discourage wildlife movement. As an MSHCP-covered roadway, the project is also subject to the guidelines provided in MSHCP Sections 7.5.1 and 7.5.3. Urban/Wildlands Interface guidelines presented in Section 6.1.4 of the MSHCP are intended to address indirect effects associated with locating commercial, mixed uses and residential developments in proximity to a Conservation Area. Final project design will ensure BMPs are incorporated into the proposed project including the guidelines included in Section 6.1.4 of the MSHCP as well as maintenance and conveyance of seasonal clean water flows through the project site. In addition, BMPs would be implemented during construction in accordance with the Western Riverside County Final MSHCP, as described below (Dudek 2003).

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e. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

The City's General Plan includes a number of policies related to the protection of sensitive natural resources, including biological resources. The project will not conflict with any local ordinances or policies as they relate to the protection of biological resources. The City of Temecula has a Heritage Tree Ordinance designed to protect certain species of trees within the City. However, no trees designated in the ordinance are located within the project area. The City of Temecula General Plan outlines a number of policies which emphasize the interrelationship between the built and natural environment. The General Plan recognizes the importance of conserving important biological habitat and protecting plant and animal specifies of concern. As a result, the General Plan requires that development proposals identify significant biological resources. The MSHCP Consistency Analysis and DBESP report identified mitigation measures to reduce impacts to biological resources to less than significant. These mitigation measures will be incorporated into the project and will be consistent with the resources agencies' comments.

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f. Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

The City of Temecula and project site are located within the Western Riverside County MSHCP, a comprehensive, multi-jurisdictional Habitat Conservation Plan focusing on the conservation of 146 species and their associated habitats in Western Riverside County. The Plan's overall goal is to maintain biological and ecological diversity within the rapidly urbanizing area. The Plan Area encompasses approximately 1.26 million acres and includes the City of Temecula within its boundaries. The City is a participant in the MSHCP. As such, impacts on special status species covered by the MSHCP are considered fully mitigated by the City's participation in the MSHCP. The project's consistency with the provisions in the MSHCP are described in the MSHCP Consistency Analysis, dated July 2021, prepared by Rincon. The proposed project will not conflict with the provisions of the MSHCP with implementation of the below mitigation measures.

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Mitigation Measures

~~*Regulatory Agency Permits*~~

~~Prior to construction, the City of Temecula shall obtain the required regulatory permits from the USACE, CDFW and San Diego RWQCB for project-related impacts that will occur in areas under the jurisdiction of these regulatory agencies.~~

BIO-1 Riparian/Riverine Resources

The project has been designed to minimize impacts on Riparian/Riverine Resources. Riparian/Riverine resources mapped in the survey area generally overlap with resources under the jurisdiction of the USACE, the CDFW, and the RWQCB. Therefore, the following mitigation would satisfy the MSHCP's requirements for the loss of Riparian/Riverine resources, and jurisdictional resources.

Prior to the initiation of any construction-related activities that result in any ground disturbances and subsequent direct and/or indirect impacts on areas within these agencies' jurisdictions, the City of Temecula shall obtain all required permits/agreements/certifications from the USACE, the CDFW, the RWQCB, and the RCFC&WCD.

The City shall obtain all appropriate permits for impacts on USACE, CDFW, and RWQCB jurisdictional areas. Mitigation for the loss of jurisdictional areas and Riparian/Riverine resources may include (1) preservation of existing riparian habitat (preferably within or adjacent to an area identified as a Criteria Area, Core, or Linkage by the MSHCP) or (2) restoration of riparian habitat (preferably within or adjacent to an area identified as a Criteria Area, Core, or Linkage by the MSHCP). If the City chooses to mitigate Riparian/Riverine habitat through purchase or restoration, acreage shall be of equivalent or superior quality habitat at no less than a 1:1 ratio. Currently, the proposed mitigation strategy would: (1) restore areas temporarily impacted by the project onsite at a 1:1 ratio; and (2) provide offsite restoration for areas permanently impacted by the project. The resource agencies, including the WRC RCA and the USFWS, will review the proposed acquisition during the permitting process to ensure that the lands to be acquired by the City of Temecula are of equivalent or superior quality to the resources impacted by the project. During site meetings, the resource agencies gave preliminary approval to restoring Riparian/Riverine habitat along Temecula Creek as mitigation for the project (Appendix D).

If the project would mitigate for impacts on Riparian/Riverine resources through restoration of riparian habitat (as currently planned), a detailed restoration program shall be prepared for approval by the USACE and the CDFW prior to construction and shall contain the following items:

- **Responsibilities and Qualifications.** Responsibilities and qualifications of the personnel to implement and supervise the plan. The responsibilities of the City, specialists, and maintenance personnel that will supervise and implement the plan shall be specified.
- **Site Selection.** Site selection for restoration and enhancement mitigation shall be determined in coordination with the City and the resource agencies. The mitigation site(s) shall be located in a dedicated open space area. The restoration site selected is located along Temecula Creek.
- **Site Preparation and Planting Implementation.** Site preparation shall include (1) protection of existing native species; (2) trash and weed removal; (3) native species salvage and reuse (i.e., duff); (4) soil treatments (i.e., imprinting, decompacting); (5) temporary irrigation installation; (6) erosion-control measures (i.e., rice or willow wattles); (7) seed mix application; and (8) container species, if appropriate.
- **Schedule.** A schedule shall be developed which includes planting to occur in late fall and early winter, between October 1 and January 30.
- **Maintenance Plan/Guidelines.** The maintenance plan shall include (1) weed control; (2) herbivory control; (3) trash removal; (4) irrigation system maintenance; (5) maintenance training; (6) replacement planting; and (7) biological monitoring during maintenance activities that occur during the breeding season.
- **Monitoring Plan.** The monitoring plan shall include (1) qualitative monitoring (i.e., photographs and general observations); (2) quantitative monitoring (i.e., randomly placed transects); (3) performance criteria as approved by the resource agencies; (4) monthly reports for the first year, and every other month for following years; and (5) annual reports for three to five years, which will be submitted to the resource agencies. The site shall be monitored and maintained for five years to ensure successful establishment of riparian habitat within the restored and created areas; however, if there is successful coverage prior to five years, the City may be released from monitoring requirements with the approval of the resource agencies.
- **Long-term Preservation.** Long-term preservation of the site shall also be outlined in the conceptual mitigation plan to ensure the mitigation site is not impacted by future projects.

PERMANENT AND TEMPORARY PROJECT IMPACTS

To mitigate permanent impacts to 0.16 acre of Riparian/Riverine areas and temporary impacts to 1.22 acre of Riparian/Riverine areas (coterminous with CDFW jurisdiction), the City of Temecula shall perform habitat rehabilitation of a 1.23-acre area in the Temecula Creek Mitigation Parcel. The City of Temecula shall mitigate temporary impacts at a 1:1 ratio and permanent impacts at a 3:1 ratio for rehabilitation at the Temecula Creek mitigation site. Rehabilitation activities for permanent impacts would consist of 1) control of non-native weeds, and 2) replanting with appropriate native, riparian plant species that currently occur within the mitigation parcel. For temporary impacts, habitat shall be re-vegetated with a native seed mix suitable for use at each location after construction. This seed mix will be in addition to replanting cuttings, regular weeding and monitoring of the arroyo willow thicket that is currently on site.

All restoration activities shall be overseen by a qualified Restoration Specialist familiar with riparian habitat restoration implementation, monitoring, and reporting. The work will be performed by a Restoration Contractor. The Restoration Contractor is a qualified native landscape contractor with experience in riparian restoration, who is responsible for site preparation, installation, and maintenance of the mitigation area.

Table 6 Proposed Mitigation Site Acreage

Habitat Type	Permanent Impacts (acres)	Mitigation: Impact Ratio	Temporary Impacts (acres)	Mitigation: Impact Ratio	Acres Mitigated
Freshwater Marsh	0.09	3:1	0.78	1:1	1.05
Riparian Scrub	0.06	3:1	0.08	1:1	0.26
Southern Willow Scrub	0.01	3:1	0.36	1:1	0.39
Total	**0.16**	**–**	**1.22**	**–**	**1.7**

The Restoration Specialist shall identify the spatial distribution of native plantings for optimal habitat development based on various environmental factors, including, but not limited to, elevation and hydrology. Final quantities per species shall be determined based on site conditions after construction and as directed by the Restoration Specialist. Cuttings to be installed in the temporary impact areas shall be spaced irregularly and in clusters to emulate natural conditions. Actual species installed shall be dependent on those species that are available at the time of implementation. A vegetative cover consisting of desirable riparian plant species is expected to develop from the installed material with proper management. Plant spacing is designed to achieve dense native cover within three years or less. It is expected that native understory species will naturally colonize and establish.

BIO-2 Least Bell's Vireo

The limits of project construction shall be clearly delineated with the use of fencing (lathe and rope, orange snow fencing, or stakes and flagging) prior to the initiation of construction. All removal of riparian vegetation shall be conducted during the non-breeding season for this species (i.e., September 16 to March 14). Vegetation removal within the creek shall be monitored by a qualified Biological Monitor.

To the extent practicable, construction of the project shall be conducted during the non-breeding season for the least Bell's vireo (i.e., September 16 to March 14) in order to avoid indirect noise impacts on this species. If project construction begins during the vireo nesting season, a qualified Biologist shall survey all riparian habitat within 500 feet of the construction limits for the presence of least Bell's vireo nests/territories prior to the start of construction. Three surveys shall be conducted within one week prior to the initiation of construction within or adjacent to riparian habitat. Any active nests/territories shall be mapped on an aerial photograph by the Biologist, and the location information shall be given to the USFWS and CDFW. The locatio33n of any least Bell's vireo nests/territories shall be marked on applicable construction plans. If no active nests/territories are found, construction may proceed. Surveys shall be updated once per week as long as construction is within 500 feet of riparian habitat. Surveys may be discontinued after if no vireos have been detected after eight weekly visits; if a vireo territory is observed, monitoring surveys shall be continued until vireo leave for the wintering grounds (August/September). A pre-construction least Bell's vireo survey report (including mapping of any active territories) shall be prepared by a qualified Biologist and shall be submitted to the USFWS and CDFW.

Any active territories shall be protected as Environmentally Sensitive Areas (ESAs) until no longer occupied to ensure compliance with the Federal and State Endangered Species Acts and Migratory Bird Treaty Act. To protect any active territory sites, the following restrictions on construction are required between March 15 and September 15 (or until territories are no longer active, as determined by a qualified Biologist): (1) no clearing of habitat shall be allowed within Murrieta Creek and (2) access and surveying shall not be allowed within approximately 100 feet of nests/territories (or as otherwise determined by a qualified Biologist). Any construction activities that would occur within Murrieta Creek during the breeding season shall be monitored by a qualified Biologist.

If construction would result in noise readings greater than 60 A-weighted decibels (dBA) at the edge of least Bell's vireo habitat (Murrieta Creek), construction shall not be allowed during the breeding season (March 15 to September 15) unless appropriate noise measures are implemented, as approved by the USFWS and the CDFW. Noise measures may include, but would not be limited to, soundwalls to reduce noise between the construction site and the vireo territory; use of construction equipment with noise-reducing alterations; or delay of noise-intensive construction (e.g., pile driving, demolition) until after the breeding season. Soundwalls shall be installed, as-needed, to maintain a noise level of less than 60 dBA at the edge of riparian habitat. Installation of the noise barriers shall be monitored by a qualified Biologist to ensure that riparian habitat is not inadvertently affected.

A noise monitoring methodology shall be used during the breeding season for construction within 500 feet of occupied habitat along Murrieta Creek. Noise monitoring stations shall be monitored weekly between March 15 and September 15 to ensure that noise levels remain less than 60 dBA. If noise monitoring determines that the noise level exceeds 60 dBA, noise barriers shall be modified, as recommended by a qualified Acoustical Technician, to reduce noise levels below 60 dBA.

BIO-3 Burrowing Owl

A pre-construction survey for burrowing owl will be conducted 30 days prior to construction in accordance with Section 6.3.2 of the MSHCP. If burrowing owl is present in the impact area during the breeding season (March 1 to August 31), the burrow will be protected until nesting activity has ended. To protect the active burrow, a 500-foot buffer will be established around the active burrow. Any encroachment into the buffer area around the active burrow will only be allowed if the Biologist determines that the proposed activity will not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest. If burrowing owl is present in the impact area during the non-breeding season (September 1 to February 28), the burrowing owl will be flushed from the burrow and the burrow will be closed using CDFW-approved burrow-closing procedures. If no burrowing owls are observed, construction may proceed.

BIO-4 Night Lighting

Permanent night lighting used to light the bridge shall use best engineering practices to direct lighting to the roadway and shall minimize spillage of light into adjacent habitat areas to the extent practicable. Additionally, approved wildlife-friendly night lighting will be used. Lighting designs shall be submitted to the City of Temecula Planning Department for review and approval prior to the issuance of a grading permit for the project.

BIO-5 Noise

The bridge concrete deck shall receive grinding and grooving treatment per Caltrans bridge design standards to reduce vehicular tire noise.

~~BIO-6 MSHCP Guidelines for Covered Projects~~

~~As a Covered Roadway, the project is subject to guidelines outlined in Section 7.5.1 of the MSHCP. These guidelines include:~~

1. ~~Planned roads shall be located in the least environmentally sensitive location feasible, including disturbed and developed areas or areas that have been previously altered. Alignments shall follow existing roads, easements, rights-of-way, and disturbed areas, as appropriate to minimize habitat fragmentation.~~
2. ~~Planned roads shall avoid, to the greatest extent feasible, impacts to Covered Species and wetlands. If wetlands avoidance is not possible, then any impacts to wetlands shall require issuance of and mitigation in accordance with a federal 404 and /or state 1600 permit.~~
3. ~~Design of planned roads shall consider wildlife movement requirements, as further outlined below under Guidelines for Construction of Wildlife Corridors.~~
4. ~~Narrow Endemic Plant Species shall be avoided; if avoidance is not feasible, then mitigation as described in the Narrow Endemics Plant Policy shall be implemented.~~
5. ~~Any construction, maintenance and operation activities that involve clearing of natural vegetation will be conducted outside the active bird breeding season (March 1 through June 30).~~
6. ~~Prior to design and construction of transportation facilities, biological surveys shall be conducted within the study area for the facility including vegetation mapping and species surveys and/or wetland delineations. The appropriate biological surveys to be conducted will be based on field conditions and recommendations of the project manager in consultation with a qualified biologist. The results of the biological resources investigations will be mapped and documented. The documentation will include preliminary conclusions and recommendations regarding potential effects of facility construction on MSHCP Conservation Area resources and methods to avoid and minimize impacts to MSHCP Conservation Area resources in conjunction with project siting, design, construction and operation. The project biologist will work with facility designers during the design and construction phase to ensure implementation of feasible recommendations.~~

~~As a covered roadway, the project is also subject to the guidelines provided in MSHCP Section 7.5.3. and shall be required to implement the following guidelines:~~

1. ~~Plans for water pollution and erosion control shall be prepared. The plans shall describe sediment and hazardous materials control, dewatering or diversion structures, fueling and equipment management practices, and use of plant material for erosion control. Plans shall be reviewed and approved by the County of Riverside and participating jurisdictions prior to construction.~~
2. ~~Habitat clearing shall be avoided during the active bird breeding season defined as March 1 to June 30.~~
3. ~~Sediment and erosion control measures shall be implemented until such time soils are determined to be successfully stabilized.~~

4. ~~Short-term stream diversions shall be accomplished by use of sand bags or other methods that will result in minimal instream impacts. Short-term diversions shall consider effects on wildlife.~~
5. ~~Silt fencing or other sediment trapping materials shall be installed at the downstream end of construction activities to minimize the transport of sediments off-site.~~
6. ~~Settling ponds where sediment is collected shall be cleaned in a manner that prevents sediment from re-entering the stream or damaging/disturbing adjacent areas. Sediment from settling ponds shall be removed to a location where sediment cannot re-enter the stream or surrounding drainage area. Care shall be exercised during removal of silt fencing to minimize release of debris or sediment into streams.~~
7. ~~No erodible materials shall be deposited into water courses. Brush, loose soils, or other debris material shall not be stockpiled within stream channels or on adjacent banks.~~
8. ~~The footprint of disturbance shall be minimized to the maximum extent feasible. Access to sites shall occur on pre-existing access routes to the greatest extent possible.~~
9. ~~Equipment storage, fueling and staging areas shall be sited on non-sensitive upland habitat types with minimal risk of direct discharge into riparian areas or other sensitive habitat types.~~
10. ~~The limits of disturbance, including the upstream, downstream and lateral extents, shall be clearly defined and marked in the field. Monitoring personnel will review the limits of disturbance prior to initiation of construction activities.~~
11. ~~During construction, the placement of equipment within the stream or on adjacent banks or adjacent upland habitats occupied by Covered Species that are outside of the project footprint shall be avoided.~~
12. ~~Exotic species removed during construction shall be properly handled to prevent sprouting or regrowth.~~
13. ~~Training of construction personnel shall be provided.~~
14. ~~Ongoing monitoring and reporting will occur for the duration of the construction activity to ensure implementation of best management practices.~~
15. ~~When work is conducted during the fire season (as identified by the Riverside County Fire Department) adjacent to coastal sage scrub or chaparral vegetation, appropriate fire-fighting equipment (e.g., extinguishers, shovels, water tankers) shall be available on the site during all phases of project construction to help minimize the chance of human-caused wildfires. Shields, protective mats, and/or other fire preventative methods shall be used during grinding, welding, and other spark-inducing activities. Personnel trained in fire hazards, preventative actions, and responses to fires shall advise contractors regarding fire risk from all construction-related activities.~~
16. ~~Active construction areas shall be watered regularly to control dust and minimize impacts to adjacent vegetation.~~
17. ~~All equipment maintenance, staging, and dispensing of fuel, oil, coolant, or any other toxic substances shall occur only in designated areas within the proposed grading limits of the project site. These designated areas shall be clearly marked and located in such a manner as to contain run-off.~~
18. ~~Waste, dirt, rubble, or trash shall not be deposited in the Conservation Area or on native habitat.~~

~~Urban/Wildlands Interface Guidelines~~

~~Urban/Wildlands Interface guidelines are presented in Section 6.1.4 of the MSHCP. Project design features that shall be implemented, pursuant to Section 6.1.4 of the Western Riverside County MSHCP, include:~~

1. ~~Wildlife-friendly light emitting diode (LED) lighting will be installed and directed downward toward the bridge and away from adjacent habitat;~~
2. ~~Quiet bridge decking technology will be use; and~~
3. ~~A bird friendly barrier will be installed on the sidewalls of the bridge to prevent bird-vehicle collisions.~~

~~Best Management Practices~~

~~BMPs from the Western Riverside County Final MSHCP shall be implemented during construction (Dudek 2003). A qualified biologist shall be onsite during construction activities to ensure that these guidelines are followed.~~

1. ~~A qualified biologist shall conduct a training session for project personnel prior to grading. The training shall include a description of the species of concern and its habitats, the general provisions of the Endangered Species Act (Act) and the MSHCP, the need to adhere to the provisions of the Act and the MSHCP, the penalties associated with violating the provisions of the Act, the general measures that are being implemented to conserve the species of concern as they relate to the project, and the access routes to and project site boundaries within which the project activities must be accomplished.~~
2. ~~Water pollution and erosion control plans shall be developed and implemented in accordance with San Diego RWQCB requirements.~~
3. ~~The footprint of disturbance shall be minimized to the maximum extent feasible. Access to sites shall be via preexisting access routes to the greatest extent possible.~~
4. ~~The upstream and downstream limits of projects disturbance plus lateral limits of disturbance on either side of the stream shall be clearly defined and marked in the field and reviewed by the biologist prior to initiation of work.~~
5. ~~Projects should be designed to avoid the placement of equipment and personnel within the stream channel or on sand and gravel bars, banks, and adjacent upland habitats used by target species of concern.~~
6. ~~Projects that cannot be conducted without placing equipment or personnel in sensitive habitats should be timed to avoid the breeding season of riparian bird species identified in MSHCP Global Species Objective No. 7 (Dudek 2003).~~
7. ~~When stream flows must be diverted, the diversions shall be conducted using sandbags or other methods requiring minimal in stream impacts. Silt fencing or other sediment trapping materials shall be installed at the downstream end of construction activity to minimize the transport of sediments off site. Settling ponds where sediment is collected shall be cleaned out in a manner that prevents the sediment from reentering the stream. Care shall be exercised when removing silt fences, as feasible, to prevent debris or sediment from returning to the stream.~~
8. ~~Equipment storage, fueling, and staging areas shall be located on upland sites with minimal risks of direct drainage into riparian areas or other sensitive habitats. These designated areas shall be located in such a manner as to prevent any runoff from entering sensitive habitat. Necessary precautions shall be taken to prevent the release of cement or other toxic substances into~~

~~surface waters. Project related spills of hazardous materials shall be reported to appropriate entities including but not limited to the City of Temecula, USFWS, CDFW, and RWQCB and shall be cleaned up immediately and contaminated soils removed to approved disposal areas.~~

9. ~~Erodible fill material shall not be deposited into water courses. Brush, loose soils, or other similar debris material shall not be stockpiled within the stream channel or on its banks.~~
10. ~~The removal of native vegetation shall be avoided and minimized to the maximum extent practicable. Temporary impacts shall be returned to preexisting contours and revegetated with appropriate native species.~~
11. ~~Exotic species that prey upon or displace target species of concern should be permanently removed from the site to the extent feasible.~~
12. ~~To avoid attracting predators of the species of concern, the project site shall be kept as clean of debris as possible. All food-related trash items shall be enclosed in sealed containers and regularly removed from the site(s).~~
13. ~~Construction employees shall strictly limit their activities, vehicles, equipment, and construction materials to the proposed project footprint and designated staging areas and routes of travel. The construction area(s) shall be the minimal area necessary to complete the project and shall be specified in the construction plans. Construction limits shall be fenced with orange snow screen. Exclusion fencing should be maintained until the completion of all construction activities. Employees shall be instructed that their activities are restricted to the construction areas.~~

5 Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	□	■	□	□
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	□	■	□	□
c. Disturb any human remains, including those interred outside of dedicated cemeteries?	□	■	□	□

CEQA requires a lead agency determine whether a project may have a significant effect on historical resources (Public Resources Code [PRC], Section 21084.1) and tribal cultural resources (PRC Section 21074 [a][1][A]-[B]). A historical resource is a resource listed in, or determined to be eligible for listing, in the California Register of Historical Resources, a resource included in a local register of historical resources, or any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant (State CEQA Guidelines, Section 15064.5[a][1-3]).

A resource shall be considered historically significant if it:

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2. Is associated with the lives of persons important in our past;
3. 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
4. Has yielded, or may be likely to yield, information important in prehistory or history.

In addition, if it can be demonstrated that a project would cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that resources cannot be left undisturbed, mitigation measures are required (PRC, Section 21083.2[a], [b]).

PRC, Section 21083.2(g) defines a unique archaeological resource as 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:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;

2. Has a special and particular quality such as being the oldest of its type or the best available example of its type; or
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

a. Would the project cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?

b. Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

An archaeological resource survey revealed that the project site consists of the undeveloped channel that is bordered by developed areas containing buildings and roadways. At the time of the survey, vegetation growth within the channel was dense, with poor ground visibility throughout (0-5 percent). No evidence of archaeological resources was identified during the survey.

On July 25, 2019, Rincon conducted a records search of the California Historical Resources Information System at the Eastern Information Center, located at University of California, Riverside. The records search and literature review identified no known archaeological resources within or immediately adjacent to the project site. However, eight archaeological sites, including six prehistoric archaeological sites were identified within a 1-mile buffer. These sites are located on elevated landforms at least 20 feet above the active channel and annual floodplain. In addition, no evidence of archaeological remains was found during the pedestrian survey of the project site. Although the presence of buildings and roadways precluded the inspection of the ground surface in portions of the project site, geoarchaeological data indicate that the area has a low potential to contain buried prehistoric and historic period cultural deposits and those that may be present are likely in a secondary context. Based on the results of the records search and literature review, survey, and geoarchaeological data, there is a low likelihood of encountering any archaeological resources within the project site. Though the potential is low that historic period or archaeological resources exist on site, there is a chance unanticipated discoveries of cultural resources would occur, resulting in a significant impact. Mitigation measures are included to reduce project impacts to a less than significant level.

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c. Would the project disturb any human remains, including those interred outside of dedicated cemeteries?

Evidence has been found that suggests human remains are present within ½ mile of the project site. In addition, Native American populations were known to bury remains along water courses such as Murrieta Creek. Therefore, it is possible that remains may be unearthed during construction activities. If human remains are discovered during construction activities, the mitigation measures below would reduce project impacts to a less than significant level.

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Mitigation Measures

CR-1 Retain a Qualified Archaeological Monitor

Prior to the issuance of a grading permit, the City shall retain a Riverside County qualified archaeological monitor to monitor all ground-disturbing activities in archaeological sensitive sediments in an effort to identify any unknown archaeological resources. The Project Archaeologist shall have the authority to temporarily redirect earthmoving activities in the event that suspected archaeological resources are unearthed during project construction. The Project Archeologist shall attend the pre-grading meeting with the City, Pechanga Tribe, the construction manager and any contractors and shall conduct a mandatory Cultural Resources Worker Sensitivity Training to those in attendance. The training shall include a brief review of the cultural sensitivity of the project site and surrounding area; what resources could potentially be identified during earthmoving activities; the requirements of the monitoring program; the protocols that apply in the event inadvertent discoveries of cultural resources are identified, including who to contact and appropriate avoidance measures until the find(s) can be properly evaluated; and any other appropriate protocols. All new construction personnel that will conduct earthwork or grading activities that begin work on the project following the initial Training shall take the Cultural Sensitivity Training prior to beginning work and the project archaeologist shall make themselves available to provide the training on an as-needed basis.

CR-2 Cultural Resources Treatment and Monitoring Agreement

At least 30 days prior to beginning project construction the City shall contact the Pechanga Tribe to notify the Tribe of grading, excavation and the monitoring program, and to coordinate with the City of Temecula and the Tribe to develop a Cultural Resources Treatment and Monitoring Agreement. The Agreement shall address the treatment of known cultural resources, the designation, responsibilities, and participation of professional Native American Tribal monitors during grading, excavation and ground disturbing activities; project grading and development scheduling; terms of compensation for the monitors; and treatment and final disposition of any cultural resources, sacred sites, and human remains discovered on the site. Tribal monitors shall have the authority to temporarily halt and redirect earth moving activities in the affected area in the event that suspected archaeological resources are unearthed. The Pechanga Tribe shall attend the pre-grading meeting with the City, Project Archaeologist, the construction manager and any contractors and shall conduct a mandatory Cultural Resources Worker Sensitivity Training to those in attendance. The training shall include a brief review of the cultural sensitivity of the project and the surrounding area; what resources could potentially be identified during earthmoving activities; the requirements of the monitoring program; the protocols that apply in the event inadvertent discoveries of cultural resources are identified, including who to contact and appropriate avoidance measures until the find(s) can be properly evaluated; and any other appropriate protocols.

CR-3 Pre-grade Report

Prior to beginning project construction, the Project Archaeologist shall file a Cultural Resource Monitoring Plan (CRMP) with the City to document the proposed methodology for grading activity observation which will be determined in consultation with the Pechanga Tribe. Methodology shall include:

- Project description and location;
- Project grading and development scheduling;

- Roles and responsibilities of individuals on the project;
- The pre-grading meeting and Cultural Resources Worker Sensitivity Training details;
- The protocols and stipulations that the contractor, City, Consulting Tribe(s) and Project Archaeologist shall follow in the event of inadvertent cultural resources discoveries, including any newly discovered cultural resource deposits that shall be subject to a cultural resource's evaluation;
- The type of recordation needed for inadvertent finds and the stipulations of recordation of sacred items; and,
- Contact information of relevant individuals for the project.

CR-4 Inadvertent Discovery of Human Remains

If human remains are encountered, California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the Riverside County Coroner has made the necessary findings as to origin. Further, pursuant to California Public Resources Code Section 5097.98(b) remains shall be left in place and free from disturbance until a final decision as to their treatment and disposition has been made. If the Riverside County Coroner determines the remains to be Native American, the Native American Heritage Commission must be contacted within 24 hours. The Native American Heritage Commission must then immediately identify the "most likely descendant(s)" of receiving notification of the discovery. The most likely descendant(s) shall then make recommendations within 48 hours of being granted access to the site, and engage in consultations concerning the treatment of the remains as provided in Public Resources Code 5097.98 and the Treatment Agreement described in TCR-2.

CR-5 Ownership of Cultural Resources

The landowner shall relinquish ownership of all cultural resources, including sacred items, burial goods and all archaeological artifacts that are found on the project area to the appropriate Tribe for proper treatment and disposition.

CR-6 Avoidance of Sacred Sites

It is understood by all parties that, unless otherwise required by law, the site of any reburial of Native American human remains or associated grave goods shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies, shall be asked to withhold public disclosure information related to such reburial, pursuant to the specific exemption set forth in California Government Code 6254(r).

CR-7 Inadvertent Discovery of Cultural Resources

If inadvertent discoveries of subsurface archaeological/cultural resources are discovered during grading, the Developer, the project archaeologist, and the Tribe shall assess the significance of such resources and shall meet and confer regarding the mitigation for such resources. Pursuant to California Public Resources Code § 21083.2(b) avoidance is the preferred method of preservation for archaeological resources. If the Developer, the project archaeologist and the Tribe cannot agree on the significance or the mitigation for such resources, these issues will be presented to the City's Planning Director for a decision. The Planning Director shall make the determination based on the provisions of the California Environmental Quality Act with respect to archaeological resources and shall take into account the religious beliefs, customs, and practices of the Tribe. Treatment of tribal cultural resources inadvertently discovered during the project's ground-disturbing activities shall be subject to the consultation process required by state law and AB 52:

- All ground disturbance activities within 100 feet of the discovered cultural resources shall be halted until a meeting is convened between the Project Applicant, the Project Archaeologist, the Tribal Representative(s), and the Community Development Director to discuss the significance of the find.
- At the meeting, the significance of the discoveries shall be discussed and after consultation with the Tribal Representative(s) and the Project Archaeologist, a decision shall be made, with the concurrence of the Community Development Director, as to the appropriate mitigation (documentation, recovery, avoidance, etc.) for the cultural resources.
- Further ground disturbance, including but not limited to grading, trenching etc., shall not resume within the area of the discovery until an agreement has been reached by all parties as to the appropriate mitigation. Work shall be allowed to continue outside of the buffer area and will be monitored by additional Tribal Monitors, if needed.
- Treatment and avoidance of the newly discovered resources shall be consistent with the Cultural Resources Management Plan and Monitoring Agreements entered into with the appropriate tribes. This may include avoidance of the cultural resources through project design, in-place preservation of cultural resources located in native soils and/or re-burial on the project property so they are not subject to further disturbance in perpetuity as identified in Non-Disclosure of Reburial Condition/Mitigation Measures.
- If the find is determined to be significant and avoidance of the site has not been achieved, a Phase III data recovery plan shall be prepared by the Project Archeologist, in consultation with the Tribe, and shall be submitted to the City for their review and approval prior to implementation of the said plan.
- Pursuant to Calif. Pub. Res. Code § 21083.2(b), avoidance is the preferred method of preservation for archaeological resources and cultural resources. If the Project Applicant and the Tribe(s) cannot agree on the significance or the mitigation for the archaeological or cultural resources, these issues will be presented to the City Community Development Director for decision. The City Community Development Director shall make the determination based on the provisions of the California Environmental Quality Act with respect to archaeological resources, recommendations of the project archeologist and shall consider the cultural and religious principles and practices of the Tribe. Notwithstanding any other rights available under the law, the decision of the City Community Development Director shall be appealable to the City Planning Commission and/or City Council." Evidence of compliance with this mitigation measure, if a significant archaeological resource is found, shall be provided to City of Temecula upon the completion of a treatment plan and final report detailing the significance and treatment finding.

CR-8 Final Disposition of Inadvertent Discovery

In the event that Native American cultural resources are discovered during the course of grading (inadvertent discoveries), the following procedures shall be carried out for final disposition of the discoveries. One or more of the following treatments, in order of preference, shall be employed with the tribes. Evidence of such shall be provided to the City of Temecula Community Development Department:

- Preservation-In-Place of the cultural resources, if feasible. Preservation in place means avoiding the resources, leaving them in the place where they were found with no development affecting the integrity of the resources.
- Reburial of the resources on the project property. The measures for reburial shall include, at least, measures and provisions to protect the future reburial area from any future impacts in perpetuity. Reburial shall not occur until all legally required cataloging and basic recordation have been completed, with an exception that sacred items, burial goods, and Native American human remains are excluded. Any reburial process shall be culturally appropriate. Listing of contents and location of the reburial shall be included in the confidential Phase IV report. The Phase IV Report shall be filed with the City under a confidential cover and not subject to Public Records Request.
- If preservation in place or reburial is not feasible then the resources shall be curated in a culturally appropriate manner at a Riverside County curation facility that meets State Resources Department Office of Historic Preservation Guidelines for the Curation of Archaeological Resources ensuring access and use pursuant to the Guidelines. The collection and associated records shall be transferred, including title, and are to be accompanied by payment of the fees necessary for permanent curation. Evidence of curation in the form of a letter from the curation facility stating that subject archaeological materials have been received and that all fees have been paid, shall be provided by the landowner to the City. There shall be no destructive or invasive testing on sacred items, burial goods, and Native American human remains. Results concerning finds of any inadvertent discoveries shall be included in the Phase IV monitoring report. Evidence of compliance with this mitigation measure, if a significant archaeological resource is found, shall be provided to City of Temecula upon the completion of a treatment plan and final report detailing the significance and treatment finding.

CR-9 Final Inspection

Prior to final inspection, the Project Archeologist is to submit two (2) copies of the Phase IV Cultural Resources Monitoring Report that complies with the Planning Department's requirements for such reports. The Phase IV report shall include evidence of the required cultural/historical sensitivity training for the construction staff held during the pre-grade meeting. The Planning Department shall review the reports to determine adequate mitigation compliance. Provided the reports are adequate, the Planning Department shall clear this condition. Once the report(s) are determined to be adequate, two (2) copies shall be submitted to the Eastern Information Center (EIC) at the University of California Riverside (UCR) and one (1) copy shall be submitted to the Pechanga Cultural Resources Department.

6 Energy

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	□	□	■	□
b. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	□	□	□	■

a. Would the project result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

The proposed project would use nonrenewable resources for construction of the project. The anticipated use of these resources is detailed in the following subsections. The Road Construction Emissions Model outputs for the air pollutant and GHG emissions modeling (Appendix C), were used to estimate energy consumption associated with the proposed project.

Construction Energy Demand

The project would require grubbing/land clearing, grading/excavation, drainage/utilities/sub-grade, and paving. During project construction, energy would be consumed in the form of petroleum-based fuels used to power off-road construction vehicles and equipment on the project site, construction worker travel to and from the project site, and vehicles used to deliver materials to the site. As shown in Table 7, project construction would require approximately 9,768 gallons of gasoline and approximately 266,783 gallons of diesel fuel. These construction energy estimates are conservative because they assume that the construction equipment used in each phase of construction is operating every day of construction.

Table 7 Estimated Fuel Consumption during Construction

	Fuel Consumption (gallons)	
Source	Gasoline	Diesel
Construction Equipment & Hauling Trips	Not Applicable	266,783
Construction Worker Vehicle Trips	9,768	Not Applicable

See Appendix E for energy calculation sheets.

Energy use during construction would be temporary in nature, and construction equipment used would be typical of similar-sized construction projects in the region. In addition, construction contractors would be required to comply with the provisions of California Code of Regulations Title 13 Sections 2449 and 2485, which prohibit diesel-fueled commercial motor vehicles and off-road diesel vehicles from idling for more than five minutes and would minimize unnecessary fuel consumption. Construction equipment would be subject to the USEPA Construction Equipment Fuel Efficiency Standard, which would also minimize inefficient, wasteful, or unnecessary fuel consumption. Furthermore, per applicable regulatory requirements, such as the latest California Green Building Standard Codes standards, the project would comply with construction waste management practices to divert a minimum of 65 percent of construction debris. These practices would result in efficient use of energy necessary to construct the project. In the interest of cost-efficiency, construction contractors also would not utilize fuel in a manner that is wasteful or unnecessary. Therefore, the project would not involve the inefficient, wasteful, and unnecessary use of energy during construction, and construction impacts related to energy consumption would be less than significant.

Operational Energy Demand

Operation of the project would lead to a slight reduction in gasoline and diesel fuel consumption associated with vehicle trips. As described in Section 3, *Air Quality*, the construction of the bridge would reduce distance traveled by 2,870 feet per vehicle trip. Existing vehicles would be able to cut through the industrial park area using Overland Drive and Avenida Alvarado instead of using Winchester Road or Via Montezuma. Also, the proposed project would not add capacity. It would not result in an increase in traffic volumes or resulting energy use in the form of electricity, natural gas or petroleum following completion of construction. Therefore, project operation would not result in potentially significant environmental effects due to the wasteful, inefficient, or unnecessary consumption of energy, and no impacts would occur.

LESS THAN SIGNIFICANT IMPACT

b. Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

The SCAG *Connect SoCal* RTP/SCS contains transportation strategies to achieve the following: preserve and optimize the current and future system and implement capital improvement by mode to complete the system (2020b). These overarching transportations goals combined with the sustainable communities strategies for land use developments will help the SCAG achieve and exceed emissions reduction targets. The *Connect SoCal* RTP/SCS is intended to help to minimize energy consumption by improving the overall efficiency of the transportation system and land use patterns.

The proposed project would lead to the construction of a bridge that would provide safe all-weather access across Murrieta Creek; provide a reliable route for emergency vehicles, motorists, pedestrians, and bicyclists; and provide an additional access point to the City’s industrial park. This would improve traffic operations at the project site by diverting traffic from other nearby intersections to this new access point, which would reduce congestion and improve vehicular traffic flow. This type of project supports the efforts of the *Connect SoCal* RTP/SCS. Therefore, implementation of the proposed project would not conflict with or obstruct a state or local plan for renewable energy or energy efficiency. No impact would occur.

NO IMPACT

7 Geology and Soils

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i. 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?	☐	☐	■	☐
ii. Strong seismic ground shaking?	☐	☐	■	☐
iii. Seismic-related ground failure, including liquefaction?	☐	☐	■	☐
iv. Landslides?	☐	☐	■	☐
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	■	☐
c. 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?	☐	☐	■	☐
d. Be located on expansive soil, as defined in Table 1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	■	☐
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	■
f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	■	☐	☐

a.i. Would the project 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?

The seismically active region of Southern California is crossed by numerous faults. A fault is a fracture in the crust of the earth along which rocks on one side have moved relative to those on the other side. Most faults are the result of repeated displacements over a long period of time. A fault trace is the line on the earth's surfacing defining the fault. Fault rupture is the displacement that occurs along the surface of a fault during an earthquake. The California Geological Survey has established earthquake fault zones known as Alquist-Priolo Earthquake Fault Zones around the surface traces of active faults to assist cities and counties in planning, zoning, and building regulation functions. These zones identify areas where potential surface rupture along an active fault could prove hazardous and identify where special studies are required to characterize hazards to habitable structures.

According to the report of Geotechnical Design Report, (Leighton Consulting, Inc., 2023) the proposed bridge structure does not fall within an Alquist-Priolo fault Zone; however, the easterly improvement consisting of street improvements outside the proposed bridge may fall within the Alquist-Priolo fault Zone. The nearest mapped trace of the Temecula/Wildomar trace of the Elsinore fault is located approximately 500 feet east of the proposed bridge. The Murrieta Creek fault associated with the Elsinore Fault zone is located approximately 2,000 feet west of the proposed bridge. The project does not include any occupiable structures, which would expose people to fault related hazards; however, Caltrans Guidelines for Structures Foundations Reports (Version 2.0, dated March 2006) requires active faults that have the potential to affect the project site be identified in accordance with Caltrans Seismic Hazard Map and Report 1996, or latest revision. The calculated Peak Ground Acceleration (PGA) was approximately 0.54g for this site using Caltrans ARS online tool V3.0.2. The project will incorporate all recommendations contained in the Geotechnical Design Report prepared for the project. Compliance with the applicable site preparation and design standards will ensure potential impacts related to strong seismic ground shaking would be less than significant.

LESS THAN SIGNIFICANT IMPACT

a.ii. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

According to the City of Temecula General Plan and various published earthquake hazard maps, the Elsinore fault, which is located to the east and west of the project site, traverses the City. Other faults surrounding the City include the San Andreas, San Jacinto, San Gabriel, Newport-Inglewood, Sierra Madre-Santa Susana-Cucamonga, Rose Canyon, Coronado Banks, San Diego Trough, and San Clemente Island faults. Several nearby faults, including the Elsinore and San Jacinto fault zones, are capable of generating strong ground motions at this location. The San Andreas Fault is located further away to the northeast but is capable of generating larger magnitude earthquakes. The project site is located in a seismically active area, as is the majority of Southern California. The project would be constructed to the standards of the most recent seismic Uniform Building and Safety Code and Caltrans Seismic Design Criteria, and will incorporate all recommendations contained in the Geotechnical Design Report prepared for the project (Leighton Consulting, Inc., 2023). Compliance with the applicable site preparation and design standards will ensure potential impacts related to strong seismic ground shaking would be less than significant.

LESS THAN SIGNIFICANT IMPACT

a.iii. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when the shock waves from an earthquake of sufficient magnitude and duration compact and decrease the volume of the soil; if drainage cannot occur, this reduction in soil volume will increase the pressure exerted on the water contained in the soil, forcing it upward to the ground surface. This process can transform stable soil material into a fluid-like state. This fluid-like state can result in horizontal and vertical movements of soils and building foundations from lateral spreading of liquefied materials and post-earthquake settlement of liquefied materials. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion.

According to the Geotechnical Design Report (2023), the project area is in a liquefaction zone. Geotechnical exploratory borings were obtained for evaluation of potential dry seismic settlement and liquefaction induced settlement. The estimated total seismically induced settlement is expected to be less than two (2) inches along the bridge alignment. The differential settlement is expected to be less than one (1) inch over a horizontal distance of 100 feet or between adjacent bridge piers/abutments. Compliance with the applicable design standards will ensure potential impacts related to liquefaction would be less than significant.

LESS THAN SIGNIFICANT IMPACT

a.iv. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?

Landslide hazard areas are generally considered to exist when substantial slopes are located on or immediately adjacent to a subject property. There are no substantial slopes located within or near the project site that could potentially create a hazard associated with landslides. The channel slope stability was analyzed as part of the Geotechnical Design Report and the results of the technical analyses indicate adequate factor of safety against slope instability (Leighton Consulting, Inc., 2023). Consequently, the potential for landslides to occur at the site is considered less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project result in substantial soil erosion or the loss of topsoil?

Soil erosion refers to the process by which soil or earth material is loosened or dissolved and removed from its original location. Erosion can occur by varying processes and may occur in the project site where bare soil is exposed to wind or moving water (both rainfall and surface runoff). The processes of erosion are generally a function of material type, terrain steepness, rainfall or irrigation levels, surface drainage conditions, and general land uses.

The site may be susceptible to soil erosion during the short-term construction activities. As discussed in further detail in Section 10, *Hydrology and Water Quality*, short-term erosion effects during the construction phase of the project would be prevented through implementation of a

Storm Water Pollution Prevention Plan (SWPPP), which is required in accordance with the Countywide National Pollutant Discharge Elimination System (NPDES) Stormwater Permit. The SWPPP specifies the Erosion Control and Sediment Control Best Management Practices (BMPs) that would be implemented during construction to control on-site and off-site erosion. Therefore, with implementation of an approved SWPPP, impacts resulting from erosion during construction would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. *Would the project 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?*

As previously discussed under Responses 7.a.iii and 7.a.iv above, the project site is in a liquefaction zone, but the potential for surface manifestation of liquefaction is considered to be low. Subsidence occurs when a void is located or created underneath a surface, causing the surface to collapse. Common causes of subsidence include withdrawal of groundwater or oil resources or wells beneath a surface. Subsidence is not known to have occurred in the project area and is unlikely to occur at the project site. Compliance with recommendations from the Report of Geotechnical Investigation will reduce risk of geologic hazards at the site to a less than significant level.

LESS THAN SIGNIFICANT IMPACT

d. *Would the project be located on expansive soil, as defined in Table 1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?*

Expansive soils are typically associated with fine-grained clayey soils that have the potential to shrink and swell with repeated cycles of wetting and drying. expansive soils, if encountered within the project site, would be removed and/or replaced as part of standard construction practices pursuant to the City and/or 2016 California Building Code building requirements.

The Report of Geotechnical Investigation noted that two types of soils were encountered onsite including artificial alluvial consisting of silty sand and older alluvium consisting of loose to very dense silty sand, poorly graded sand and sand with silt. The Report did not specifically discuss the expansive potential of these soils, but it is assumed to be low given the lack of clays within subsurface soils. The Report of Geotechnical Investigation recommends soil materials below the subgrade be over excavated and replaced as compacted fill in accordance with Caltrans standard Specifications to reduce risk due to differential settlement. Compliance with recommendations for ground preparation from the Report of Geotechnical Investigation will reduce risk of any geologic hazards to a less than significant level.

LESS THAN SIGNIFICANT IMPACT

e. *Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?*

The project will not require the use of septic tanks or other wastewater disposal systems.

NO IMPACT

f. Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Paleontological resources, or fossils, are the evidence of once-living organisms preserved in the rock record. They include both the fossilized remains of ancient plants and animals and the traces thereof (e.g., trackways, imprints, burrows, etc.). Paleontological resources are not found in "soil" but are contained within the geologic deposits or bedrock that underlies the soil layer. Typically, fossils are greater than 5,000 years old (i.e., older than middle Holocene in age) and are typically preserved in sedimentary rocks. Although rare, fossils can also be preserved in volcanic rocks and low-grade metamorphic rocks under certain conditions (Society of Vertebrate Paleontology [SVP] 2010). Fossils occur in a non-continuous and often unpredictable distribution within some sedimentary units, and the potential for fossils to occur within sedimentary units depends on several factors. It is possible to evaluate the potential for geologic units to contain scientifically important paleontological resources, and therefore evaluate the potential for impacts to those resources and provide mitigation for paleontological resources if they are discovered during construction of a development project.

Rincon evaluated the paleontological sensitivity of the geologic units that underlie the project site to assess the project's potential for significant impacts to scientifically important paleontological resources. The analysis was based on the results of a paleontological locality search and a review of existing information in the scientific literature regarding known fossils within geologic units mapped at the project site. According to the SVP (2010) classification system, geologic units can be assigned a high, low, undetermined, or no potential for containing scientifically significant nonrenewable paleontological resources. Following the literature review, a paleontological sensitivity classification was assigned to each geologic unit mapped within the project site. This criterion is based on rock units within which vertebrate or significant invertebrate fossils have been determined by previous studies to be present or likely to be present. The potential for impacts to significant paleontological resources is based on the potential for ground disturbance to directly impact paleontologically sensitive geologic units.

The project is located in the *Murrietta, California* United States Geological Survey 7.5-minute topographic quadrangle(s). The geology of the region surrounding the project site was mapped by Morton and Miller (2006) who mapped two geologic units, Quaternary young axial channel deposits and Quaternary young alluvial-valley deposits, at the surface within the project site.

Quaternary young axial channel deposits are found within Murrietta Creek and consist of slightly to moderately consolidated silt, sand, and gravel (Morton & Miller 2006). Quaternary young alluvial-valley deposits underlie the banks and roadways on either side of Murrietta Creek and consist of unconsolidated clay, silt, and sand. Both of these geologic units are Holocene in age and generally considered too young (i.e., less than 5,000 years old) to contain paleontological resources. Therefore, Quaternary young axial channel deposits and Quaternary young alluvial-valley deposits have low paleontological sensitivity. However, the project's geotechnical investigation encountered older (i.e., Pleistocene-aged) alluvium and the Pauba Formation during test borings conducted within the project site (Leighton Consulting, Inc. 2023). Older alluvium was encountered at approximately 1,000 feet above sea level in areas mapped as Quaternary young axial channel deposits (i.e., approximately 10 feet below the surface) and Quaternary young alluvial-valley deposits (i.e., approximately 25 feet below the surface). Sediments corresponding to older alluvium or the Pauba Formation were encountered 20 feet below the surface in areas mapped as Quaternary young axial channel deposits and 45 feet below the surface in areas mapped as Quaternary young alluvial-valley deposits. Pleistocene-aged alluvium and the Pauba Formation are known to produce significant paleontological resources within Riverside County (Jefferson 2010; Paleobiology Database 2023). Therefore, Pleistocene-aged alluvium and the Pauba Formation have high paleontological sensitivity.

Rincon requested a paleontological locality search from the Western Science Center on November 7, 2023. The records search recovered no known fossil localities within the project site (McDonald 2023). However, one known fossil locality from Quaternary-aged sediments occurs within one mile of the project site, and several others are known elsewhere in the Temecula Valley in areas mapped as Quaternary young axial channel deposits (Morton & Miller 2006).

Ground-disturbing activities within previously undisturbed sediments with high paleontological sensitivity could result in significant impacts to paleontological resources. Impacts would be significant if construction activities result in the destruction, damage, or loss of scientifically important paleontological resources and associated stratigraphic and paleontological data. Ground-disturbing activities for this project will include drilling for the bridge piers and abutments; excavations for the new and rerouted underground utilities within Avenida Alvarado, Diaz Road, and Overland Drive; and grading/excavations for channel improvement and stabilization. Drilling for the bridge abutments (within areas mapped as Quaternary young alluvial-valley deposits) and piers (in areas mapped as Quaternary axial channel deposits) are expected to reach approximately 60 feet and 135 feet below the surface, respectively. At these depths, these activities will impact high-sensitivity sediments (i.e., older alluvium and/or Pauba Formation) and, therefore, could significantly impact paleontological resources. Excavations for the new and rerouted underground utilities will reach up to 20 feet below the surface in areas mapped as Quaternary young alluvial-valley deposits, meaning that these excavations will not impact high-sensitivity sediments and are not expected to significantly impact paleontological resources. Ground disturbance for channel improvement is expected to only impact the uppermost layers of sediments and is not expected to significantly impact paleontological resources.

Mitigation Measure GEO-1 would reduce potential impacts to paleontological resources resulting from the drilling of the bridge piers and abutments to less than significant level and would effectively mitigate the project's impacts to these resources through paleontological monitoring to aid the recovery, identification, and curation of previously unrecovered fossils.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

Mitigation Measures

GEO-1 Paleontological Resource Monitoring

- **Qualified Professional Paleontologist.** Prior to excavation, the project applicant shall retain a Qualified Professional Paleontologist, as defined by the Society of Vertebrate paleontology (SVP; 2010). The Qualified Professional Paleontologist shall draft a Paleontological Resources Mitigation and Monitoring Plan, which shall direct all mitigation measures related to paleontological resources.
- **Paleontological Worker Environmental Awareness Program.** Prior to the start of construction, the Qualified Professional Paleontologist or their designee shall conduct a paleontological Worker Environmental Awareness Program (WEAP) training for construction personnel regarding the appearance of fossils and the procedures for notifying paleontological staff should fossils be discovered by construction personnel.

- **Paleontological Monitoring.** Full-time paleontological monitoring shall be conducted during drilling for the bridge piers that reaches more than 10 feet below the surface or for the bridge abutments that reaches more than 25 feet below the surface. Paleontological monitoring shall be conducted by a paleontological monitor with experience with collection and salvage of paleontological resources and who meets the minimum standards of the SVP (2010) for a Paleontological Resources Monitor. The Qualified Professional Paleontologist may recommend that monitoring be reduced in frequency or ceased entirely based on geologic observations. Such decisions shall be subject to review and approval by the City of Temecula. In the event of a fossil discovery by the paleontological monitor or construction personnel, all construction activity within 50 feet of the find shall cease, and the Qualified Professional Paleontologist shall evaluate the find. If the fossil(s) is (are) not scientifically significant, then construction activity may resume. If it is determined that the fossil(s) is (are) scientifically significant, the following shall be completed:
  - **Fossil Salvage.** The paleontological monitor shall salvage (i.e., excavate and recover) the fossil to protect it from damage/destruction. Typically, fossils can be safely salvaged quickly by a single paleontological monitor with minimal disruption to construction activity. In some cases, larger fossils (such as complete skeletons or large mammal fossils) require more extensive excavation and longer salvage periods. Bulk matrix sampling may be necessary to recover small invertebrates or microvertebrates from within paleontologically sensitive deposits. After the fossil(s) is (are) salvaged, construction activity may resume.
  - **Fossil Preparation and Curation**. Fossils shall be identified to the lowest (i.e., most-specific) possible taxonomic level, prepared to a curation-ready condition, and curated in a scientific institution with a permanent paleontological collection along with all pertinent field notes, photos, data, and maps. Fossils of undetermined significance at the time of collection may also warrant curation at the discretion of the Qualified Professional Paleontologist.

- **Final Paleontological Mitigation Report.** Upon completion of ground-disturbing activities (or laboratory preparation and curation of fossils, if necessary), the Qualified Professional Paleontologist shall prepare a final report describing the results of the paleontological monitoring efforts. The report shall include a summary of the field and laboratory methods employed; an overview of project geology; and, if fossils were discovered, an analysis of the fossils, including physical description, taxonomic identification, and scientific significance. The report shall be submitted to the City of Temecula and, if fossil curation occurred, the designated scientific institution.

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8 Greenhouse Gas Emissions

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	□	□	■	□
b. Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	□	□	□	■

Overview of Climate Change and Greenhouse Gases

Climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans along with other substantial changes in climate (such as wind patterns, precipitation, and storms) over an extended period of time. Climate change is the result of numerous, cumulative sources of greenhouse gas (GHG) emissions contributing to the "greenhouse effect," a natural occurrence which takes place in Earth's atmosphere and helps regulate the temperature of the planet. The majority of radiation from the sun hits Earth's surface and warms it. The surface, in turn, radiates heat back towards the atmosphere in the form of infrared radiation. Gases and clouds in the atmosphere trap and prevent some of this heat from escaping into space and re-radiate it in all directions.

GHG emissions occur both naturally and as a result of human activities, such as fossil fuel burning, decomposition of landfill wastes, raising livestock, deforestation, and some agricultural practices. GHGs produced by human activities include carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Different types of GHGs have varying global warming potentials (GWP). The GWP of a GHG is the potential of a gas or aerosol to trap heat in the atmosphere over a specified timescale (generally, 100 years). Because GHGs absorb different amounts of heat, a common reference gas (CO_2) is used to relate the amount of heat absorbed to the amount of the gas emitted, referred to as "carbon dioxide equivalent" (CO_2e), which is the amount of GHG emitted multiplied by its GWP. Carbon dioxide has a 100-year GWP of one. By contrast, methane has a GWP of 30, meaning its global warming effect is 30 times greater than CO_2 on a molecule per molecule basis (Intergovernmental Panel on Climate Change [IPCC] 2021).[2]

[2] The Intergovernmental Panel on Climate Change's (2021) *Sixth Assessment Report* determined that methane has a GWP of 30. However, the 2017 Climate Change Scoping Plan published by the California Air Resources Board uses a GWP of 25 for methane, consistent with the Intergovernmental Panel on Climate Change's (2007) *Fourth Assessment Report*. Therefore, this analysis utilizes a GWP of 25.

The United Nations IPCC expressed that the rise and continued growth of atmospheric CO_2 concentrations is unequivocally due to human activities in the IPCC's Sixth Assessment Report (2021). Human influence has warmed the atmosphere, ocean, and land, which has led the climate to warm at an unprecedented rate in the last 2,000 years. It is estimated that between the period of 1850 through 2019, that a total of 2,390 gigatonnes of anthropogenic CO_2 was emitted. It is likely that anthropogenic activities have increased the global surface temperature by approximately 1.07 degrees Celsius between the years 2010 through 2019 (IPCC 2021). Furthermore, since the late 1700s, estimated concentrations of CO_2, methane, and nitrous oxide in the atmosphere have increased by over 43 percent, 156 percent, and 17 percent, respectively, primarily due to human activity (USEPA 2021). Emissions resulting from human activities are thereby contributing to an average increase in Earth's temperature. Potential climate change impacts in California may include loss of snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (State of California 2018).

Regulatory Framework

In response to climate change, California implemented Assembly Bill (AB) 32, the "California Global Warming Solutions Act of 2006." AB 32 required the reduction of statewide GHG emissions to 1990 emissions levels (essentially a 15 percent reduction below 2005 emission levels) by 2020 and the adoption of rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emissions reductions. On September 8, 2016, the Governor signed Senate Bill (SB) 32 into law, extending AB 32 by requiring the State to further reduce GHG emissions to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged). On December 14, 2017, CARB adopted the 2017 Scoping Plan, which provides a framework for achieving the 2030 target. The 2017 Scoping Plan relies on the continuation and expansion of existing policies and regulations, such as the Cap-and-Trade Program and the Low Carbon Fuel Standard, and implementation of recently adopted policies and legislation, such as SB 1383 (aimed at reducing short-lived climate pollutants including methane, hydrofluorocarbon gases, and anthropogenic black carbon) and SB 100 (discussed further below). The 2017 Scoping Plan also puts an increased emphasis on innovation, adoption of existing technology, and strategic investment to support its strategies. As with the 2013 Scoping Plan Update, the 2017 Scoping Plan does not provide project-level thresholds for land use development. Instead, it recommends local governments adopt policies and locally-appropriate quantitative thresholds consistent with a statewide per capita goal of six metric tons (MT) of CO_2e by 2030 and two MT of CO_2e by 2050 (CARB 2017).

Other relevant state laws and regulations include:

- **SB 375.** The Sustainable Communities and Climate Protection Act of 2008 (SB 375), signed in August 2008, enhances the state's ability to reach AB 32 goals by directing the CARB to develop regional GHG emission reduction targets to be achieved from passenger vehicles by 2020 and 2035. Metropolitan Planning Organizations are required to adopt a Sustainable Communities Strategy (SCS), which allocates land uses in the Metropolitan Planning Organization's Regional Transportation Plan (RTP). On March 22, 2018, CARB adopted updated regional targets for reducing GHG emissions from 2005 levels by 2020 and 2035. SCAG was assigned targets of an 8 percent reduction in per capita GHG emissions from passenger vehicles by 2020 and a 19 percent reduction in per capita GHG emissions from passenger vehicles by 2035 (CARB 2018). In the SCAG region, SB 375 also provides the option for the coordinated development of subregional plans by the subregional councils of governments and the county transportation commissions to meet SB 375 requirements.

Significance Thresholds

Individual projects do not generate sufficient GHG emissions to influence climate change directly. However, physical changes caused by a project can contribute incrementally to significant cumulative effects, even if individual changes resulting from a project are limited. The issue of climate change typically involves an analysis of whether a project's contribution towards an impact would be cumulatively considerable. "Cumulatively considerable" means the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines Section 15064[h][1]).

According to CEQA Guidelines Section 15183.5(b), projects can tier from a qualified GHG reduction plan, which allows for project-level evaluation of GHG emissions through the comparison of the project's consistency with the GHG reduction policies included in a qualified GHG reduction plan. This approach is considered by the Association of Environmental Professionals (2016) in its white paper, *Beyond Newhall and 2020*, to be the most defensible approach presently available under CEQA to determine the significance of a project's GHG emissions.

This analysis utilizes two thresholds to evaluate the significance of the project's GHG emissions: the SCAQMD-recommended bright-line threshold and consistency with applicable plans, policies, and regulations for the reduction of GHG emissions.

Considering that no specific GHG threshold or qualified GHG reduction plan has been recommended or adopted by the City of Temecula, it is appropriate to refer to guidance from other agencies when discussing GHG emissions. In guidance provided by the SCAQMD's GHG CEQA Significance Threshold Working Group in September 2010, SCAQMD considered a tiered approach to determine the significance of residential and commercial projects. The draft tiered approach is outlined in meeting minutes dated September 29, 2010 (SCAQMD 2010):

- **Tier 1.** If the project is exempt from further environmental analysis under existing statutory or categorical exemptions, there is a presumption of less than significant impacts with respect to climate change. If not, then the Tier 2 threshold should be considered.
- **Tier 2.** Consists of determining whether the project is consistent with a GHG reduction plan that may be part of a local general plan, for example. The concept embodied in this tier is equivalent to the existing concept of consistency in CEQA Guidelines Section 15064(h)(3), 15125(d) or 15152(a). Under this Tier, if the project is consistent with the qualifying local GHG reduction plan, it is not significant for GHG emissions. If there is not an adopted plan, then a Tier 3 approach would be appropriate.
- **Tier 3.** Establishes a screening significance threshold level to determine significance. The Working Group has provided a recommendation of 10,000 MT of CO_2e per year for industrial projects and 3,000 MT of CO_2e per year for non-industrial projects.
- **Tier 4.** Establishes a service population threshold to determine significance. The Working Group has provided a recommendation of 4.8 MT of CO_2e per year for land use projects.

The project would not be statutory or categorically exempt, and therefore Tier 1 does not apply. As previously stated, the City of Temecula does not have a local, qualified GHG reduction plan for the project to tier from, and Tier 2 would not apply. Service population is defined as employees plus residents. Since the project is related to the operation of a bridge for vehicular traffic, it would not generate any residents or require new employees; therefore, a service population threshold would not provide an accurate depiction of project GHG emission impacts. Thus, for the purposes of this analysis, the bright-line threshold developed by the SCAQMD of 3,000 MT of CO_2e per year for non-industrial projects is used in this analysis to determine the significance of GHG emissions in accordance with Tier 3.

According to the CEQA Guidelines Section 15064(h)(3), a project's incremental contribution to a cumulative impact can be found not cumulatively considerable if the project would comply with an approved plan or mitigation program that provides specific requirements that would avoid or substantially lessen the cumulative problem in the geographic area of the project. To qualify, such plans or programs must be specified in law or adopted by the public agency with jurisdiction over the affected resources through a public review process to implement, interpret, or make specific the law enforced or administered by the public agency. Examples of such programs include a "water quality control plan, air quality attainment or maintenance plan, integrated waste management plan, habitat conservation plan, natural community conservation plans [and] plans or regulations for the reduction of GHG emissions." Therefore, a lead agency can make a finding of less than significant for GHG emissions if a project complies with adopted programs, plans, policies and/or other regulatory strategies to reduce GHG emissions. The proposed project's consistency with applicable plans, policies, and regulations adopted for the purpose of reducing GHG emissions is evaluated qualitatively. A project is considered consistent with the provisions of these documents if it meets the general intent in reducing GHG emissions in order to facilitate the achievement of local and state-adopted goals and does not impede attainment of those goals.

Therefore, this analysis utilizes two thresholds to evaluate the significance of the project's GHG emissions: the SCAQMD-recommended bright-line threshold and consistency with applicable plans, policies, and regulations for the reduction of GHG emissions.

Methodology

GHG emissions associated with project construction and operation were estimated using the Road Construction Emissions Model outputs with the assumptions described under Section 3, *Air Quality*, in addition to the following:

- **Amortization of Construction Emissions.** In accordance with SCAQMD recommendation, GHG emissions from construction of the proposed project were amortized over a 30-year period and added to annual operational emissions to determine the project's total annual GHG emissions (SCAQMD 2008b).

a. Would the project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?

Construction of the proposed project would generate temporary GHG emissions primarily as a result of operation of construction equipment on-site as well as from vehicles transporting construction workers to and from the project site and heavy trucks to transport building materials and soil export. As shown in Table 8, construction of the proposed project would generate an estimated total of 2,413 MT of CO_2e. Amortized over a 30-year period pursuant to SCAQMD guidance, construction of the proposed project would generate an estimated 80 MT of CO_2e per year. Neither the total construction emissions nor the amortized emissions would exceed the 3,000 MT CO_2e threshold. Furthermore, construction activities would cease upon completion and would not be a continuous source of GHG emissions. During project operations, the total amount of vehicle miles traveled would be reduced by providing a more direct connection for travelers in the area. Accordingly, mobile source GHG emissions would be reduced during project operations as compared to existing conditions. Impacts would be less than significant.

Table 8 Estimated Construction GHG Emissions

Year	Project Emissions (MT/yr CO_2e)
Grubbing/Land Clearing	74
Grading/Excavation	90
Drainage/Utilities/Sub-Grade	1,838
Paving	411
Total	**2,413**
Total Amortized over 30 Years	**80**

See Appendix C

LESS THAN SIGNIFICANT IMPACT

b. *Would the project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?*

The SCAG *Connect SoCal* RTP/SCS was created to help California reach its GHG reduction goals by reducing GHG emissions from passenger cars by 8 percent below 2005 levels by 2020 and 19 percent by 2035 in accordance with SB 375, which is also part of the CARB 2017 Scoping Plan (2020b). The *Connect SoCal* RTP/SCS includes ten goals with corresponding implementation strategies for focusing growth near destinations and mobility options, promoting diverse housing choices, leveraging technology innovations, and supporting implementation of sustainability policies (2020b). As described in Section 3, *Air Quality,* under criterion (a), the project is included in *Connect SoCal* RTP/SCS under FTIP ID 991203A. The project would conform with the SCAG *Connect SoCal* RTP/SCS and support the efforts of SB 375 and subsequently the CARB 2017 Scoping Plan. Therefore, given the aforementioned, the project is consistent with state and local policies for reducing GHG emissions and no impacts would occur.

NO IMPACT

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9 Hazards and Hazardous Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	□	□	□	■
b. 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?	□	□	□	■
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?	□	□	□	■
d. Be located on a site that is included on a list of hazardous material 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?	□	□	□	■
e. For a project located in 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 project area?	□	□	□	■
f. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	□	□	■	□
g. Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?	□	□	□	■

a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Construction or operation of the proposed project would not involve the routine transport, use, or disposal of hazardous materials. Therefore, the project would not create a hazard to the public or environment through the use, transport or disposal of hazardous materials.

NO IMPACT

b. Would the project 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?

The proposed project will not create a significant hazard to the public or the environment through reasonably foreseeable conditions involving the release of hazardous materials into the environment. The proposed project does not involve the use of hazardous materials and thus will not emit hazardous materials into the environment or impact the public through day-to-day operations. In addition, the project will not require the handling of hazardous or acutely hazardous materials, substances and waste.

NO IMPACT

c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?

The proposed project will not create a significant hazard to the public or the environment through reasonably foreseeable conditions involving the release of hazardous materials into the environment. The proposed project does not involve the use of hazardous materials and thus will not emit hazardous materials into the environment or impact the public through day-to-day operations. In addition, the project will not require the handling of hazardous or acutely hazardous materials, substances and waste.

NO IMPACT

d. Would the project be located on a site that is included on a list of hazardous material 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?

The proposed project is not located on a site which is included on a list of hazardous materials sites pursuant to Government Code Section 65962.5 and, as a result, will not create a significant hazard to the public or the environment. A search of the California State Department of Toxic Substances Control EnviroStor database shows that the project is not located on or within a quarter mile of any hazardous materials sites. The project would not create a significant hazard to the public in this regard.

NO IMPACT

e. 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, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

The project is not located near any airports and therefore would not subject people to safety hazards associated with public or private airports.

NO IMPACT

f. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The project adds additional roadway connections from the west of Murrieta Creek to the east of Murrieta Creek and thus improved circulation and access across Murrieta Creek. The project does not interfere with emergency response and evacuation plans. Traffic Interference will be kept to a minimum during construction per standard City procedure to ensure consistency with emergency response and evacuation needs; therefore the proposed project would not result in a significant impact in this regard.

LESS THAN SIGNIFICANT IMPACT

g. Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?

The project does not involve any habitable structures and there are no wildland areas within the project vicinity which would create a significant fire hazard in the project area.

NO IMPACT

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10 Hydrology and Water Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	□	□	■	□
b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	□	□	■	□
c. 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:				
(i) Result in substantial erosion or siltation on- or off-site;	□	□	■	□
(ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;	□	□	■	□
(iii) 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	□	□	■	□
(iv) Impede or redirect flood flows?	□	□	■	□
d. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	□	□	■	□
e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	□	□	■	□

The analysis in this section is based on the Water Quality Assessment Report (Engineering Resources of Southern California, Inc. [ERSC] 2019) and the Hydrology and Hydraulics Report (ERSC 2020) prepared for the project, included in Appendices F and H, respectively.

a. Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Construction activities would disturb approximately 4.89 acres of soil. Soil disturbance would increase the potential for erosion and sedimentation. If construction activities occur during the rainy season, or in the event of heavy storms, soils from the site could be entrained, eroded, and transported off-site or to the downstream receiving waters. In addition, chemicals, liquid products, petroleum products (e.g., paints, solvents, and fuels), and concrete-related waste may be spilled or leaked and have the potential to be transported into Murrieta Creek via stormwater runoff.

Construction within Murrieta Creek would include channel grading, including slope excavation for the concrete slope protection and construction of the pier foundations. Construction within the creek would occur within the dry seasons. However, low flow may be present within the channel bottom that would require diversion to provide a dry area for construction activities. Water is anticipated to be diverted using barriers such as sandbags, k-rails, or plastic sheathing. For construction of the pier foundation piling, the contractor may use slurry to maintain the stability of the drilled holes.

Construction projects that disturb one or more acres of soil are subject to the requirements of the State Water Resource Control Board's (SWRCB's) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2022-0057-DWQ, National Pollutant Discharge Elimination System (NPDES) No. CAS000002 (Construction Stormwater General Permit), which requires preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) to control the discharge of pollutants, including sediment, into surface water drainages. The City would be required to obtain coverage under the Construction Stormwater General Permit and prepare and implement a SWPPP that specifies the stormwater monitoring and construction BMPs required to reduce pollutants in stormwater runoff. Construction BMPs would include, but would not be limited to, Erosion Control and Sediment Control BMPs designed to minimize erosion and retain sediment on site, and Good Housekeeping BMPs to prevent spills, leaks, and off-site discharge of construction debris and waste. As discussed in the Water Quality Assessment Report prepared for the project, construction BMPs are anticipated to include construction scheduling, streambank stabilization, wind erosion controls, gravel bag berms, gravel bag check dams, sediment sweeping and vacuuming, and material and waste handling and storage. Additionally, construction activities such as staging or stockpiling of construction materials or waste in areas where pollutants can be discharged into storm drains would be prohibited in compliance with the City municipal code. Compliance with the Construction General Permit and City municipal code and implementation of BMPs to control pollutant discharge into Murrieta Creek would ensure that project construction would not violate water quality standards or substantially degrade surface water. Impacts would be less than significant. No mitigation is required.

According to the Geotechnical Design Report (Leighton Consulting, Inc., 2023), groundwater was encountered during geotechnical borings at approximately 2 to 11.5 feet below ground surface [bgs] in the bottom of Murrieta Creek and approximately 19 to 26 feet bgs along the top of the berms/slope. Due to the seasonal fluctuations of groundwater levels, groundwater could occur at depths as shallow as approximately 6 inches bgs. Therefore, groundwater dewatering is anticipated to be required during construction of the bridge abutments and piers. During excavation below the groundwater table, groundwater levels would be lowered to the bottom of the excavation using a system of collection ditches and sump pumps to provide a workable condition. Slurry may be used for stabilization of the work area. Water or slurry from the drilled holes would be pumped into a tank on the creek bank. Dewatered groundwater is anticipated to be discharged into Murrieta Creek. Therefore, coverage under San Diego Regional Water Quality Control Board's General Waste Discharge Requirements for Groundwater Extraction Discharges to Surface Waters within the San Diego Region, Order No. R9-2015-0013, NPDES No. CAG919003, (Groundwater Dewatering Permit) would be required. Groundwater may contain elevated levels of total dissolved solids, nitrates, or other constituents that could affect surface water quality. However, groundwater dewatering would be conducted in accordance with the requirements of the Groundwater Dewatering Permit, which requires testing and treatment, as necessary, of groundwater prior to its release into surface waters to ensure that effluent limitations are not exceeded. The projects plans and specification would require that the contractor not discharge slurry into Murrieta Creek. As a result, groundwater dewatering during excavation activities would not violate water quality standards or waste discharge requirements. Impacts would be less than significant. No mitigation is required.

Operation

The project would result in an increase in impervious surface, which could potentially increase stormwater runoff, erosion, and pollutant discharge to Murrietta Creek. Generally, pollutants of concern associated with roadway/bridge projects include oil and grease, sediment, nutrients, nitrate discharges, litter, and metals.

Project design and operation would be required to comply with the requirements of the San Diego RWQCB's National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region, Order No. R9-2013-0001, as amended by R9-2015-0001 and R9- 2015-0100, NPDES No. CAS0109266 (San Diego MS4 Permit). The San Diego MS4 Permit] requires that a Water Quality Management Plan be prepared for projects that details the operational BMPs that would be implemented to capture, treat, and reduce pollutants of concern in stormwater runoff.

As discussed in the Water Quality Assessment Report (Appendix F) prepared for the project, Source Control, and Treatment BMPs proposed for the project. Source Control BMPs are preventative measures that are implemented to prevent the introduction of pollutants into stormwater. Proposed Source Control BMPs would include education for property owners, drainage facility inspection and maintenance, street sweeping, and storm drain stenciling and slope protection. Site Design BMPs are stormwater management strategies that emphasize conservation and use of existing site features to reduce the amount of runoff and pollutant loading generated from a project site. Proposed Site Design BMPs would include preservation of existing vegetation and channel and slope protection (permanent soil stabilization including concrete slope protection under the bridge abutments and erosion control hydroseed mix on graded areas within the creek). In addition, all proposed slopes with slope gradient of 2:1 or flatter would be planted with deep rooted, drought tolerant erosion protection vegetation native to the area. Slopes steeper than 2:1 gradient would be lined with concrete for erosion protection and slope stability. Treatment Control BMPs are structural BMPs designed to treat and reduce pollutants in stormwater runoff prior to releasing it to receiving waters. Proposed Treatment Control BMPs include curb inlet media filters in the proposed catch basins. The proposed BMPs would target and reduce pollutants of concern from stormwater runoff from the project site in compliance with the San Diego MS4 Permit requirements. The curb inlet media filters are specifically designed to capture and reduce fine to course sediments/pollutants, including trash and debris, total suspended solids, nutrients, metals, and hydrocarbons. In addition, street maintenance and vehicle washing and maintenance would be prohibited within the project area in areas that discharge to Murrieta Creek. The project includes concrete slope protection on the earthen embankments and the cutoff walls and bridge pier foundations would be buried underground to provide scour protection and reduce the potential for soil erosion. Compliance with NPDES requirements and City municipal code requirements, including incorporation of operational BMPs into the project design to target pollutants of concern, would ensure that potential impacts related to violation of water quality standards or waste discharge requirements or degradation of water quality during project operation would be less than significant. No mitigation is required.

LESS THAN SIGNIFICANT IMPACT

b. Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

Rancho California Water District's current service area represents 99,000 acres, and the District has 878 miles of water mains, 35 storage reservoirs, one surface reservoir (Lake Vail), 53 groundwater wells, and 36,759 service connections. Approximately 109,000 people are served by Rancho California Water District, which relies on imported water from Metropolitan Water District of Southern California to meet much of its water demands. Metropolitan Water District of Southern California obtains its water from the Colorado River and Northern California, via the State Water Project (SWP). Both sources are over-allocated and water supplies can be significantly limited during dry weather years and droughts. Additionally, water quality and Endangered Species Act requirements in the Sacramento-San Joaquin Bay Delta could further reduce Metropolitan Water District of Southern California's SWP allocations. Water delivered to homes and businesses is a blend of groundwater (35%) and import water (65%).

As discussed under Impact HWQ-1 above, groundwater dewatering is anticipated to be required during construction of the bridge abutments and piers. Dewatered groundwater would be discharged to Murrieta Creek. However, groundwater dewatering would be temporary during construction of the bridge abutments and pier foundations. In addition, dewatered groundwater would be discharged to Murrieta Creek, which is an earthen bottom. where some infiltration back to groundwater could occur. Due to the temporary nature of groundwater dewatering activities, impacts to groundwater supplies and recharge would be less than significant.

The project does not propose uses that would substantially deplete groundwater supplies. Water use during operation would be minimal and limited to irrigation for the proposed landscaping. In addition, according to the *Water Quality Assessment Report* (Appendix F) prepared for the project, the increase in impervious surface area would be minimal compared to the size of the overall watershed and would therefore not substantially interfere with groundwater recharge efforts during operation.

LESS THAN SIGNIFICANT IMPACT

c.(i) Would the project 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?

As discussed further in checklist question c(iv), below, the construction of the bridge abutments and piers would provide adequate conveyance and would allow flood waters in Murrieta Creek to flow unimpeded. Therefore, the project would not substantially alter the course of a stream or river. The project will also allow the bridge and roadway flows to discharge to the Creek. It is anticipated that there will be no significant increase to the flow, volume, rate, depth or seasonal changes of 100-year storm flows due to the small amount of additional impervious surface compared to the overall size of the watershed. As discussed in checklist question a, above, BMPs would be implemented during project construction and operation to reduce the potential for erosion and siltation to occur. In addition, the project includes concrete slope protection on the earthen embankments and the bridge foundations would be designed to minimize scour. Potential for erosion and accretion due to the construction of the project is less than significant.

LESS THAN SIGNIFICANT IMPACT

c.(ii) Would the project 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 substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

The project would introduce minimal impervious surfaces associated with construction of a new bridge over Murrieta Creek. In addition, as discussed in more detail in checklist question c(iv) below, the proposed bridge would provide adequate conveyance capacity for the 100-year flow in the Murrieta Creek. The project will include minimal drainage changes within the creek. Activities will include minor re-grading of the creek near the bridge, construction of bridge piers, and construction of concrete slope protection and cutoff wall to protect the bridge abutments from scour. The project would not substantially increase the water surface elevation within Murrieta Creek, and would therefore not substantially increase flooding during 100-year storm events. The project would not introduce impervious surfaces that would substantially increase the amount of surface runoff in a manner that would result in flooding on- or off- site. Impacts related to flooding would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c.(iii) Would the project 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 that would 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?

As discussed in more detail in checklist question c(iv), the proposed bridge would not substantially alter the capacity of Murrieta Creek to convey flood flows during a 100-year storm event. The project includes storm drainage systems to convey stormwater from the bridge and new impervious areas to Murrieta Creek, which has sufficient capacity to accommodate increased stormwater discharge. Therefore, the project would not exceed the capacity of a downstream storm drain system. As discussed in checklist question a, above, BMPs would be implemented during project construction and operation which would reduce pollutants in stormwater runoff. Therefore, the project would not provide substantial additional sources of polluted runoff. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c.(iv) Would the project 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 impede or redirect flood flows?

According to the City of Temecula General Plan and the Federal Emergency Management Agency Flood Insurance Rate Map (No 06065C2720G), the project site is located within the 100-year Flood Zone and Dam Inundation Area. Murrieta Creek has the potential to become flooded when major rainstorms cause stream overflows. Lake Skinner is a 42,800-acre feet reservoir located northeast of Temecula. Diamond Valley Lake is an 800,000 acre-feet reservoir located north of Temecula. The failure of Lake Skinner or Diamond Valley Lake could result in flooding along parts of Murrieta Creek. The bridge would be constructed to provide adequate conveyance of the 100-year flows. According to the Hydrology and Hydraulics Report (Appendix H) prepared for the project, the bridge itself would be constructed above the 100-year water surface elevation with enough freeboard[3] to allow flood water to pass beneath the bridge during a 100-year storm event. While the project would include construction of bridge piers within Murrieta Creek, the project would result in a minimal (up to 0.03 foot) increase in the water surface elevation during a 100-year storm event. In addition, backwater[4] caused by the project would not affect Winchester Road bridge, which is located approximately 1,200 feet upstream. Because the bridge would be designed to allow for conveyance of 100-year flood flows, impacts related to redirection of flood flows impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. In flood hazard, tsunami, or seiche zones, would the project risk release of pollutants due to project inundation?

According to the City of Temecula General Plan, the site is approximately 25 miles inland from the Pacific Ocean and at an elevation of greater than 1,060 feet above sea level and thus not subject to the effects of tsunamis. The site is not located near any large water bodies that would potentially be affected by a seiche. Therefore, the project site would not be inundated by either of these natural phenomena.

As discussed in checklist question c(iv) above, the project site has a potential to be inundated during a 100-year storm event or as a result of failure of Lake Skinner or Diamond Valley Lake dams. However, the bridge itself would be constructed above the 100-year water surface elevation and would therefore not be inundated during a 100-year storm event. In addition, the project does not involve use or storage of large quantities of hazardous materials or other pollutants that could be released as a result of inundation. The project includes concrete slope protection on the earthen embankments and the cutoff walls and bridge pier foundations would be buried underground to provide scour protection and reduce the potential for soil erosion and release of erosion-related

[3] Freeboard is the distance between the top of the water surface and the bottom of the bridge deck.
[4] Backwater is the increase in water surface elevation upstream of a bridge.

pollutants in the event inundation occurs below the bridge within Murrieta Creek. Impacts related to release of pollutants from inundation would be less than significant.

LESS THAN SIGNIFICANT IMPACT

e. Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

The project site overlies the Temecula Valley Groundwater Basin, which is designated as a very-low priority basin by the Department of Water Resources (DWR) pursuant Sustainable Groundwater Management Act (SGMA), and development of a Groundwater Sustainability Plan (GSP) was not required. Therefore, there is no GSP that is applicable to the project. The project would therefore not conflict with a sustainable groundwater management plan.

The Water Quality Control Plan (Basin Plan), adopted by the San Diego RWQCB, is the water quality control plan applicable to the project site. The Basin Plan defines beneficial uses, establishes water quality objectives, and establishes programs to ensure the quality of surface water and groundwater is managed to achieve water quality objectives to protect beneficial uses. As discussed in checklist question a, above, the preparation of a SWPPP and WQMP would ensure the project would not result in excessive runoff or pollutant discharge during project construction BMPs would be implemented during construction and operation, which would reduce potential construction and operation impacts to water quality. Project adherence to the BMPs required by the SWPPP and WQMP would reduce potential water quality impacts to a less than significant level.

LESS THAN SIGNIFICANT IMPACT

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11 Land Use and Planning

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Physically divide an established community?	☐	☐	☐	■
b. 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?	☐	☐	☐	■

a. Would the project physically divide an established community?

The proposed project involves the extension of an existing roadway and the construction of a bridge across Murrieta Creek. The project adds additional connections from east and west across Murrieta Creek, and thus does not divide an established community.

NO IMPACT

b. Would the project 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?

The project is part of a designated roadway on the General Plan. The project will not conflict with any land use policies. The project helps circulation as envisioned by the City's General Plan Circulation Element.

NO IMPACT

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12 Mineral Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. 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?	□	□	□	■
b. 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?	□	□	□	■

a. Would the project 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?

According to the General Plan, the State Division of Mines and Geology has prepared a mineral resources report entitled Mineral Land Classification of the Temescal Valley Area, Riverside County, California, Special Report 165, which evaluated mineral deposits within the Temecula Planning Area. According to the Report, the Temecula Planning Area was classified as a Mineral Resources Zone-3a (MRZ-3a), which determined that the area contains sedimentary deposits, which have the potential to supply sand and gravel for concrete and crushed stones for aggregate; however, these areas are not considered to contain mineral resources of significant economic value. No impact is anticipated.

NO IMPACT

b. Would the project 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?

According to the General Plan, the State Division of Mines and Geology has prepared a mineral resources report entitled Mineral Land Classification of the Temescal Valley Area, Riverside County, California, Special Report 165, which evaluated mineral deposits within the Temecula Planning Area. According to the Report, the Temecula Planning Area was classified as a Mineral Resources Zone-3a (MRZ-3a), which determined that the area contains sedimentary deposits, which have the potential to supply sand and gravel for concrete and crushed stones for aggregate; however, these areas are not considered to contain mineral resources of significant economic value. In addition, the project would not restrict access to these resources. No impact is anticipated.

NO IMPACT

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13 Noise

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in:				
a. Generation of 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?	☐	☐	■	☐
b. Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	■	☐
c. 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 two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	■

The following analysis is based upon the project's Noise Study Report (Caltrans 2020; Appendix G).

Overview of Noise and Vibration

Noise

Sound is a vibratory disturbance created by a moving or vibrating source, which is capable of being detected by the hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment (Caltrans 2013).

HUMAN PERCEPTION OF SOUND

Noise levels are commonly measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels so that they are consistent with the human hearing response. Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used to measure earthquake magnitudes. A doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; dividing the energy in half would result in a 3 dB decrease (Caltrans 2013).

Human perception of noise has no simple correlation with sound energy: the perception of sound is not linear in terms of dBA or in terms of sound energy. Two sources do not “sound twice as loud” as one source. It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA, increase or decrease (i.e., twice the sound energy); that a change of 5 dBA is readily perceptible (8 times the sound energy); and that an increase (or decrease) of 10 dBA sounds twice (half) as loud (10.5 times the sound energy) (Caltrans 2013).

SOUND PROPAGATION AND SHIELDING

Sound changes in both level and frequency spectrum as it travels from the source to the receiver. The most obvious change is the decrease in the noise level as the distance from the source increases. The manner by which noise reduces with distance depends on factors such as the type of sources (e.g., point or line), the path the sound will travel, site conditions, and obstructions.

Sound levels are described as either a “sound power level” or a “sound pressure level,” which are two distinct characteristics of sound. Both share the same unit of measurement, the dB. However, sound power (expressed as L_{pw}) is the energy converted into sound by the source. As sound energy travels through the air, it creates a sound wave that exerts pressure on receivers, such as an eardrum or microphone, which is the sound pressure level. Sound measurement instruments only measure sound pressure, and noise level limits are typically expressed as sound pressure levels.

Noise levels from a point source (e.g., construction, industrial machinery, air conditioning units) typically attenuate, or drop off, at a rate of 6 dBA per doubling of distance. Noise from a line source (e.g., roadway, pipeline, railroad) typically attenuates at about 3 dBA per doubling of distance (Caltrans 2013). Noise levels may also be reduced by intervening structures; the amount of attenuation provided by this “shielding” depends on the size of the object and the frequencies of the noise levels. Natural terrain features, such as hills and dense woods, and man-made features, such as buildings and walls, can significantly alter noise levels. Generally, any large structure blocking the line of sight will provide at least a 5-dBA reduction in source noise levels at the receiver (Federal Highway Administration [FHWA] 2011). Structures can substantially reduce exposure to noise as well. The FHWA’s guidance indicates that modern building construction generally provides an exterior-to-interior noise level reduction of 10 dBA with open windows and an exterior-to-interior noise level reduction of 20 to 35 dBA with closed windows (FHWA 2011).

DESCRIPTORS

The impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important factors of project noise impact. Most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors have been developed.

L_{eq} is one of the most frequently used noise metrics; it considers both duration and sound power level. The L_{eq} is defined as the single steady-state A-weighted sound level equal to the average sound energy over a time period. When no time period is specified, a 1-hour period is assumed. The L_{max} is the highest noise level within the sampling period, and the L_{min} is the lowest noise level within the measuring period. Normal conversational levels are in the 60 to 65-dBA L_{eq} range; ambient noise levels greater than 65 dBA L_{eq} can interrupt conversations (Federal Transit Administration [FTA] 2018).

Noise that occurs at night tends to be more disturbing than that occurring during the day. Community noise is usually measured using Day-Night Average Level (DNL or L_{DN}), which is the

24-hour average noise level with a +10 dBA penalty for noise occurring during nighttime hours (10:00 p.m. to 7:00 a.m.). Community noise can also be measured using Community Noise Equivalent Level (CNEL or L_{DEN}), which is the 24-hour average noise level with a +5 dBA penalty for noise occurring from 7:00 p.m. to 10:00 p.m. and a +10 dBA penalty for noise occurring from 10:00 p.m. to 7:00 a.m. (Caltrans 2013).[5] The relationship between the peak-hour L_{eq} value and the L_{DN}/CNEL depends on the distribution of noise during the day, evening, and night; however noise levels described by L_{DN} and CNEL usually differ by 1 dBA or less. Quiet suburban areas typically have CNEL noise levels in the range of 40 to 50 CNEL, while areas near arterial streets are in the 50 to 60+ CNEL range (FTA 2018).

Groundborne Vibration

Groundborne vibration of concern in environmental analysis consists of the oscillatory waves that move from a source through the ground to adjacent buildings or structures and vibration energy may propagate through the buildings or structures. Vibration may be felt, may manifest as an audible low-frequency rumbling noise (referred to as groundborne noise), and may cause windows, items on shelves, and pictures on walls to rattle. Although groundborne vibration is sometimes noticeable in outdoor environments, it is almost never annoying to people who are outdoors. The primary concern from vibration is that it can be intrusive and annoying to building occupants at vibration-sensitive land uses and may cause structural damage.

Typically, ground-borne vibration generated by manmade activities attenuates rapidly as distance from the source of the vibration increases. Vibration amplitudes are usually expressed in peak particle velocity (PPV) or root mean squared (RMS) vibration velocity. The PPV and RMS velocity are normally described in inches per second (in/sec). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is often used as it corresponds to the stresses that are experienced by buildings (Caltrans 2020).

High levels of groundborne vibration may cause damage to nearby building or structures; at lower levels, groundborne vibration may cause minor cosmetic (i.e., non-structural damage) such as cracks. These vibration levels are nearly exclusively associated with high impact activities such as blasting, pile-driving, vibratory compaction, demolition, drilling, or excavation. The American Association of State Highway and Transportation Officials (AASHTO) has determined vibration levels with potential to damage nearby buildings and structures; these levels are identified in Table 9.

Table 9 AASHTO Maximum Vibration Levels for Preventing Damage

Type of Situation	Limiting Velocity (in/sec)
Historic sites or other critical locations	0.1
Residential buildings, plastered walls	0.2–0.3
Residential buildings in good repair with gypsum board walls	0.4–0.5
Engineered structures, without plaster	1.0–1.5
Source: Caltrans 2020	

[5] Because DNL and CNEL are typically used to assess human exposure to noise, the use of A-weighted sound pressure level (dBA) is implicit. Therefore, when expressing noise levels in terms of DNL or CNEL, the dBA unit is not included.

Numerous studies have been conducted to characterize the human response to vibration. The vibration annoyance potential criteria recommended for use by Caltrans, which are based on the general human response to different levels of groundborne vibration velocity levels, are described in Table 10.

Table 10 Vibration Annoyance Potential Criteria

	Vibration Level (in/sec PPV)	
Human Response	Transient Sources	Continuous/Frequent Intermittent Sources[1]
Severe	2.0	0.4
Strongly perceptible	0.9	0.10
Distinctly perceptible	0.25	0.04
Barely perceptible	0.04	0.01

in/sec = inches per second; PPV = peak particle velocity

[1] Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: Caltrans 2020

Regulatory Framework

City of Temecula Municipal Code

Section 9.20.060 of the Temecula Municipal states that no person shall engage in or conduct construction activity, when the construction site is within one-quarter mile of an occupied residence, between 6:30 p.m. and 7:00 a.m., Monday through Friday, and shall only engage in or conduct construction activity between the hours of 7:00 a.m. and 6:30 p.m. on Saturday. No construction activity shall be undertaken on Sunday and nationally recognized holidays. The City of Temecula does not have a quantitative standard for construction noise.

City of Temecula General Plan Noise Element

The Noise Element of the City of Temecula General Plan contains policies and programs that focus on protecting the quality of life for noise-sensitive uses from the persistent hazards of excessive noise. Relevant policies to the proposed project include:

- **Policy 1.2:** Limit the hours of construction activity next to residential areas to reduce noise intrusion in the early morning, late evening, weekends, and holidays.
- **Policy 4.4:** Coordinate with Caltrans to ensure the inclusion of noise mitigation measures in the design of new highways or improvement projects in the Planning Area.

Caltrans

Caltrans Standard Specifications Section 14-8.02 includes noise control requirements that state construction noise levels shall not exceed 86 dBA L_{max} at 50 feet from the job site activities between the hours of 9:00 p.m. to 6:00 a.m. (Caltrans 2018). Therefore, project construction noise impacts are analyzed against this standard.

For Caltrans projects, traffic noise impacts are considered to occur at receptor locations where predicted noise levels would be 12 dB or greater than existing ambient noise levels, or where predicted noise levels approach or exceed the noise abatement criteria (NAC) for the applicable activity category. Table 11 summarizes NAC corresponding to various land use activity categories.

Activity categories and related traffic noise impacts are determined based on the actual or permitted land use in a given area.

Table 11 Activity Categories and Noise Abatement Criteria (23 CFR 772)

Activity Category	Activity $L_{eq}[h]$[1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F			Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G			Undeveloped lands that are not permitted.

[1] The $L_{eq}(h)$ activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).

[2] Includes undeveloped lands permitted for this activity category.

Existing Noise Environment

The project site is surrounded by existing service commercial and light industrial development with a place of worship. A field noise study was conducted to measure the existing noise environment. Short-term monitoring was conducted at four locations on Wednesday, June 17, 2020, using an Extech 407780A Type 2 sound level meter (serial number 160507863). The calibration of the meter was checked before and after the measurement using an Extech 407744 professional acoustic calibrator (serial number H373147). Measurements were taken over a 20-minute period at each site. Short-term monitoring was conducted along the alignment. The short-term measurement locations are identified in Figure 3. A summary of noise measurements is provided in Table 12. The dominant noise source in the area was observed as vehicular traffic. Other noise sources associated with adjacent land uses include heating, ventilation, and air conditioning units, landscape maintenance machinery, pumps, and heavy equipment.

Figure 3 Noise Measurement Locations

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Table 12 Summary of Short-term Noise Level Measurements

Measurement Location	Measurement Location	Sample Times	Approximate Distance to Primary Noise Source	Leq (dBA)[1]	Lmin (dBA)	Lmax (dBA)
1	27525 Enterprise Circle West	10:00 – 10:20 a.m.	50 feet from Enterprise Circle West	58.2	54.4	76.3
2	27462 Enterprise Circle West	10:30 – 10:50 a.m.	50 feet from Enterprise Circle West	60.1	57.6	81.2
3	27495 Diaz Road	12:30 – 12:50 p.m.	50 feet from Diaz Road	70.1	56.9	83.4
4	41976 Avenida Alvarado	1:00 – 1:20 p.m.	60 feet from Diaz Road	69.8	57.1	85.6

a. Would the project result in generation of 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?

Construction

Construction noise would be associated with the use of heavy-duty construction equipment used for clearing and grading, trenching and installing underground utilities, spreading and compacting materials, and paving. In addition, drilled piles would be required in Murrieta Creek for the installation of piles.

Construction equipment with heavy-duty diesel engines typically generate maximum noise levels from 80 to 90 dBA at a distance of 50 feet (FHWA 2006). Table 13 summarizes typical construction equipment noise levels. Equipment goes through varying load cycles, and there are breaks for the operators and for non-equipment tasks, such as measurement. Thus, average hourly noise levels would be less than maximum noise levels. Typical noise levels from earthworks activities reach 82 dBA L_{eq} at 50 feet from the center of construction activity when assessing the loudest pieces of equipment working simultaneously.

Maximum noise levels would occur when the loudest construction equipment is nearest to a noise sensitive receiver. Due to the linear nature of roadway construction, noise levels would be intermittent and the intensity of construction activities in a given area varies substantially.

Based on previous experience, construction activities would progress at a rate of approximately 100 feet per day and would include an active work area of approximately 300 feet. Due to the length of the active work area, 300 feet, when the active work area is directly adjacent to a given receiver, construction activities throughout the day would be an average distance of 150 feet along an active portion of the alignment from the receiver. For example, the average distance from construction equipment to a receiver that is 50 feet from the centerline of alignment would be 158 feet. Although construction equipment may temporarily be located at the point on the alignment nearest to a receiver, over time equipment would move along the alignment. Therefore, the distance from a receiver to the centerline of the alignment is not the same as the average distance during a given day from the receiver to construction equipment. Thus, average noise levels correlate to the area of active construction.

Table 13 Typical Construction Equipment Noise Levels

Equipment	Noise Level at 50 Feet dBA L_{max}	Typical Duty Cycle
Auger Drill Rig	85	20%
Backhoe	80	40%
Blasting	94	1%
Chain Saw	85	20%
Clam Shovel	93	20%
Compactor (ground)	80	20%
Compressor (air)	80	40%
Concrete Mixer Truck	85	40%
Concrete Pump	82	20%
Concrete Saw	90	20%
Crane (mobile or stationary)	85	20%
Dozer	85	40%
Dump Truck	84	40%
Excavator	85	40%
Front End Loader	80	40%
Generator (25 kilovolt amps or less)	70	50%
Generator (more than 25 kilovolt amps)	82	50%
Grader	85	40%
Hydra Break Ram	90	10%
Impact Pile Driver (diesel or drop)	95	20%
In situ Soil Sampling Rig	84	20%
Jackhammer	85	20%
Mounted Impact Hammer (hoe ram)	90	20%
Paver	85	50%
Pneumatic Tools	85	50%
Pumps	77	50%
Rock Drill	85	20%
Roller	74	40%
Scraper	85	40%
Tractor	84	40%
Vacuum Excavator (vac-truck)	85	40%
Vibratory Concrete Mixer	80	20%
Vibratory Pile Driver	95	20%

dBA = A-weighted decibels; L_{max} = maximum sound level

Source: Federal Highway Administration 2006

Construction along the project site would be characterized by hard site attenuation rate of 6 dBA per doubling of distance. This analysis conservatively assumes no attenuation from barriers and topography. The nearest receivers are approximately 50 feet from the road (e.g., Overland Drive). Thus, when assessing the loudest pieces of equipment working simultaneously on the proposed alignment, noise levels would attenuate to approximately 72 dBA L_{eq} at the nearest receivers. Therefore, construction noise levels would not exceed the Caltrans Standard Specifications Section 14-8.02 noise control requirements from job site activities between the hours of 9:00 p.m. to 6:00 a.m., and impacts would be less than significant.

Operation

Traffic noise levels were predicted using the FHWA Traffic Noise Model (TNM) Version 2.5 (TNM 2.5). Key inputs to TNM 2.5 were the locations of roadways, traffic mix and speed, shielding features (e.g., topography and buildings), noise barriers, ground type, and receptors. Three-dimensional representations of these inputs were developed using computer-aided design drawings, aerials, and topographic contours. Full model inputs are described in the project's Noise Study Report (Appendix G).

The City of Temecula does not have standards for traffic noise increases from a proposed project. Therefore, the Caltrans standard of a 12 dB increase or greater than existing ambient noise levels, or where predicted noise levels approach or exceed the NAC for the applicable activity category is used for this analysis. Commercial and light industrial land uses (Caltrans Activity Category F) and places of worship (Caltrans Activity Category C and D) were identified in the project area (see Figure 5 for locations).Table 14 summarizes the traffic noise modeling results for existing conditions and design-year conditions with and without the project. Predicted design-year traffic noise levels with the project are compared to existing conditions and to design-year no-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts as defined under 23 CFR 772. The comparison to no-project conditions indicates the direct effect of the project. As shown in Table 14, traffic noise levels at modeled receivers range from 46 to 71 dBA L_{eq} for existing conditions and range from 48 to 72 dBA L_{eq} for design-year conditions.

Table 14 Summary of Noise Modeling

Receiver Number	Area	Land Use	Activity Category (NAC)	Units	Address	Loudest Hour Noise Level dBA L_{eq} Existing	Without Project	With Project	Increase Over Existing	Direct Project Increase	Potential Impact Type
1	A	SC	F	1	27479 Enterprise Circle W.	54	56	61	7	5	None
2	A	PoW	C	1	27452 Enterprise Circle W.	58	59	60	2	1	None
3	A	SC	F	1	27495 Commerce Center Dr.	58	59	63	5	4	None
4	A	SC	F	1	27496 Commerce Center Dr.	59	60	62	3	2	None
5	**B**	**SC**	**F**	**1**	**27531 Commerce Center Dr.**	**56**	**57**	**63**	**7**	**6**	**None**
6	**B**	**SC**	**F**	**1**	**27515 Commerce Center Dr.**	**58**	**58**	**60**	**2**	**2**	**None**
7	**B**	**SC**	**F**	**1**	**27511 Commerce Center Dr.**	**61**	**62**	**65**	**4**	**3**	**None**
8	**B**	**SC**	**F**	**1**	**27516 Commerce Center Dr.**	**54**	**55**	**57**	**3**	**2**	**None**
9	C	Ind	F	1	42030 Avenida Alvarado	46	47	48	2	1	None
10	C	Ind	F	1	41976 Avenida Alvarado	68	69	69	1	0	None
11	C	Ind	F	1	27461 Diaz Rd.	68	69	70	2	1	None
12	**D**	**Ind**	**F**	**1**	**42011 Avenida Alvarado**	**59**	**60**	**60**	**1**	**0**	**None**
13	**D**	**Ind**	**F**	**1**	**43015 Black Deer Loop**	**71**	**72**	**72**	**1**	**0**	**None**
14	**D**	**Ind**	**F**	**1**	**43020 Black Deer Loop**	**71**	**72**	**72**	**1**	**0**	**None**

NAC = noise abatement criteria

dB(A) = A-weighted decibels

Leq(1) = equivalent sound level at one hour

Ind = Industrial

SC = Service Commercial

PoW = Places of Worship

Figure 4 Project Overview Map

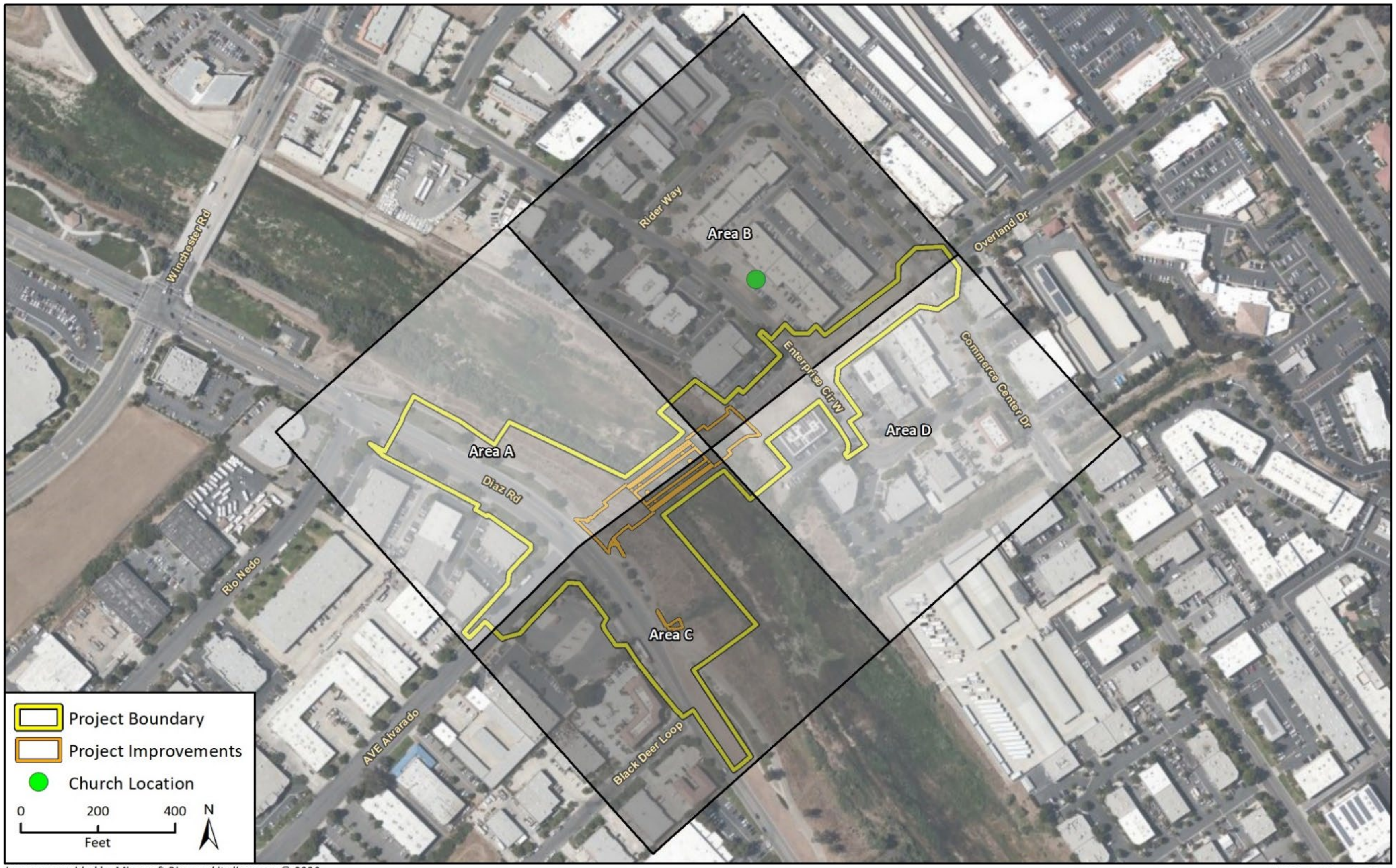

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Fig 5 Project Overview Map

Figure 5 Impact Area A Receivers

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Figure 6 Impact Area B Receivers

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Fig 6 Noise Receiver Locations - Area B

Figure 7 Impact Area C Receivers

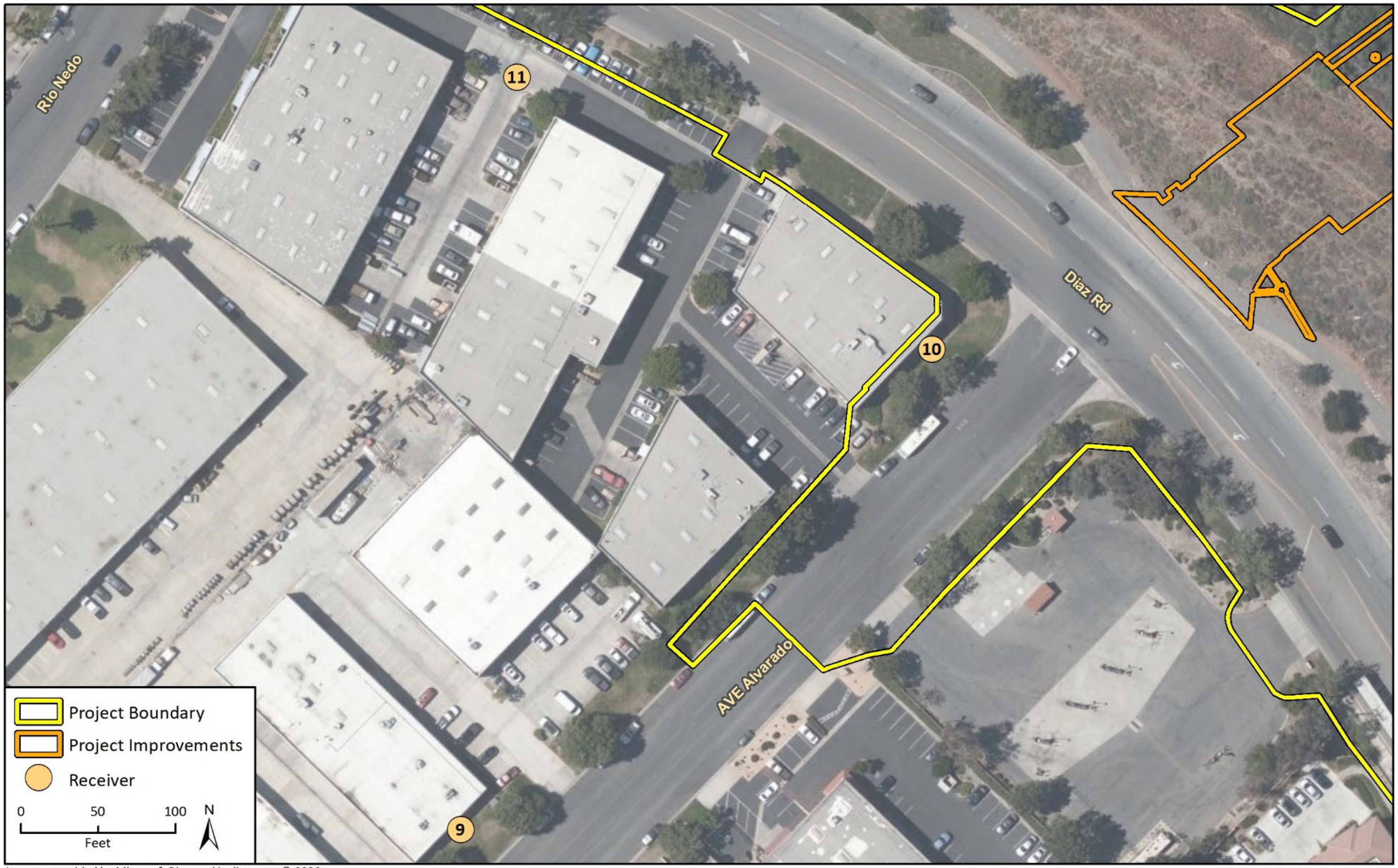

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Fig 7 Noise Receiver Locations - Area C

Figure 8 Impact Area D Receivers

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The traffic noise modeling results in Table 14 indicate that traffic noise levels at residences in Area A are predicted to be in the range of 60 to 63 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is predicted to be up to 7 dB. Because the predicted noise levels in the design-year are not predicted to approach or exceed the noise abatement criterion at the Calvary Church (Categories C and D) or result in a substantial increase in noise, no traffic noise impacts are predicted in Area A.

The traffic noise modeling results in Table 14 indicate traffic noise levels at residences in Area B are predicted to be in the range of 57 to 65 dBA L_{eq} in the design-year, and that the increase in noise will be up to 7 dB in the design-year. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in Area B.

The traffic noise modeling results in Table 14 indicate traffic noise levels at commercial uses in Area C will be 48 to 70 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is 2 dB. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in this area.

The traffic noise modeling results in Table 14 indicate traffic noise levels at commercial uses in Area C will be 60 to 72 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is 0 dB. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in this area.

Because the church has an interior noise abatement criterion in addition to the exterior criterion, interior noise must be considered at the church as well. From Table 6 in the FHWA Highway Traffic Noise Analysis and Abatement Guidance document, the building noise reduction factor for standard construction with ordinary windows closed is 20 dB. The interior noise level in the church in the design-year is therefore predicted to be 40 dBA L_{eq}. Because this predicted design-year noise level does not exceed the interior NAC of 52 dBA L_{eq}, no interior traffic noise impacts are predicted at the church. Therefore, impacts would be less than significant from operational noise.

LESS THAN SIGNIFICANT IMPACT

b. Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

Project construction would not involve activities typically associated with excessive groundborne vibration such as pile driving or blasting. The equipment utilized during project construction that would generate the highest levels of vibration would include rollers, loaded trucks, and bulldozers. The City of Temecula has not adopted standards to assess vibration impacts during construction and operation. However, Caltrans has developed limits for the assessment of vibrations from transportation and construction sources. The Caltrans vibration limits are reflective of standard practice for analyzing vibration impacts on structures from continuous and intermittent sources. The thresholds of significance used in this analysis to evaluate vibration impacts are based on these impact criteria, as summarized in Table 10.

Project construction may require operation of vibratory equipment such as vibratory rollers, loaded trucks, and bulldozers within 50 feet from the road (e.g., Overland Drive). As shown in Table 15, vibration levels from individual pieces of construction equipment would not exceed the threshold at which damage can occur to residential structures, 0.20 in/sec PPV, or the threshold at which transient vibration sources would be distinctly perceptible to 0.25 in/sec PPV. Construction vibration levels at all other buildings in the immediate vicinity would be less than the levels shown in Table 15 because vibration levels would further attenuate with distance. Therefore, vibration impacts would be less than significant.

Table 15 Vibration Levels at Sensitive Receivers

Equipment	Estimated in/sec PPV at Nearest Building (50 feet)
Vibratory Roller	0.098
Large Bulldozer	0.042
Loaded Truck	0.036
Threshold	**0.20**
Threshold Exceeded?	No

LESS THAN SIGNIFICANT IMPACT

c. *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 two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?*

The airport closest to the project site is the French Valley Airport, located approximately four miles northeast of the project site. The project site is not located within noise contours shown in Exhibit FV-5 of the River County Airport Land Use Compatibility Plan (County of Riverside 2011). In addition, the project site is not in close proximity to a private airstrip. Therefore, the project would not expose people residing or working in the project area to excessive noise levels from airport noise. No impact would occur.

NO IMPACT

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14 Population and Housing

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Induce substantial unplanned population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	□	□	■	□
b. Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	□	□	□	■

a. Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

The project would not induce substantial population growth in the area, as no homes are proposed. It is anticipated that the construction workers would be hired from nearby areas. The presence of construction workers would be temporary and would not lead to a demand for permanent housing, goods, or services in the area.

LESS THAN SIGNIFICANT IMPACT

b. Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

The project alignment is located in an open space area adjacent to a creek. Therefore, the project would have no impact on the City's existing housing stock.

NO IMPACT

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15 Public Services

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
1 Fire protection?	□	□	□	■
2 Police protection?	□	□	□	■
3 Schools?	□	□	□	■
4 Parks?	□	□	□	■
5 Other public facilities?	□	□	■	□

a.1. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered fire protection facilities, or the need for new or physically altered fire protection facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives?

Fire protection and emergency medical services are provided to the City and the project site by the Temecula Fire Department, who contracts with the Riverside County Fire Department. Implementation of the project would not require new fire protection services, and would provide a more direct travel connection which would improve emergency response; therefore, no impact would occur.

NO IMPACT

a.2. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered police protection facilities, or the need for new or physically altered police protection facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives?

Police services for the City and the project site are provided by the City of Temecula Police Department (PD), who contracts with the Riverside County Sheriff Department. Implementation of the project would not increase the need for police protection services and would provide a more direct travel connection that would improve emergency response; therefore, no impact would occur.

NO IMPACT

a.3. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered schools, or the need for new or physically altered schools, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios or other performance objectives?

The project site is located within the Temecula Valley Unified School District. There is no housing or commercial component related to the project which would have any impact on local schools. Therefore, there will be no impact on school services.

NO IMPACT

a.4. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered parks, public facilities, or the need for new or physically altered parks, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios or other performance objectives?

Operation of future development of the project would introduce temporary construction workers and residents on the project site. The project complements the City's trail system and would not have an impact on City parks.

NO IMPACT

a.5. Would the project result in substantial adverse physical impacts associated with the provision of other new or physically altered public facilities, or the need for new or physically altered public facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives?

The proposed project poses no uses which would result in an unusually heavy burden on maintenance on public facilities. Therefore, the project will not result in a significant impact on other public facilities.

LESS THAN SIGNIFICANT IMPACT

16 Recreation

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Would the project 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?	□	□	□	■
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	□	□	■	□

a. Would the project 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?

The proposed project would not have an impact to the existing parks; however, it will connect to an existing Class I trail that runs along the west bank of Murrieta Creek. The project will add an additional connection to the trail as a result of the project, improving access to recreational resources. No impacts are anticipated as a result of the project.

NO IMPACT

b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The proposed project does not involve the construction of or expansion of a recreational facility. The project will provide an additional connection to the existing Class I trail that runs along the west bank of Murrieta Creek, which will have short-term impacts to the use of the trail. It is anticipated that construction would not result in an adverse effect on the environment, since construction would be short-term in nature and would not be intensive. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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17 Transportation

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	□	□	■	□
b. Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	□	□	□	■
c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible use (e.g., farm equipment)?	□	□	□	■
d. Result in inadequate emergency access?	□	□	□	■

a. Would the project conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

The project will not result in any activities that increase vehicular traffic on area roadways. The extension of Overland Road and the construction of the new bridge across Murrieta Creek are identified in the Temecula Five Year Capital Improvement Program in the City's General Plan Circulation Element. The project spans Murrieta Creek adding another east/west connection between two north/south arterials resulting in improved circulation for all transportation modes.

LESS THAN SIGNIFICANT IMPACT

b. Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

CEQA Guidelines section 15064.3 describes specific considerations for evaluating a project's transportation impacts. Generally, VMT is identified as the most appropriate measure of transportation impacts. For the purposes of this CEQA section, "vehicle miles traveled" refers to the amount and distance of automobile travel attributable to a project. Lead agencies are required to approve a VMT significance threshold by July 1, 2020. As discussed previously, the project will not result in any additional vehicular trips, as the project does not generate vehicle trips. The project also would provide a more direct travel connection that would shorten the average length of vehicle trips in the project area and therefore incrementally reduce VMT. The project will be consistent with CEQA Guidelines section 15064.3, subdivision (b).

NO IMPACT

c. Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible use (e.g., farm equipment)?

The proposed project improvements would not include any sharp curves or hazardous roadway design elements. The project will be designed in accordance with Caltrans design standards, as a result, no impacts would occur.

NO IMPACT

d. Would the project result in inadequate emergency access?

Adequate emergency vehicular access will be provided during and after project construction via Commerce Center Drive and Diaz Road.

NO IMPACT

18 Tribal Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in a Public Resources Code Section 21074 as either a site, feature, place, or 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:				
a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k), or	☐	■	☐	☐
b. 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 Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	■	☐	☐

As of July 1, 2015, California AB 52 of 2014 was enacted and expands CEQA by defining a new resource category, “tribal cultural resources.” AB 52 establishes that “A project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment” (PRC Section 21084.2). It further states that the lead agency shall establish measures to avoid impacts that would alter the significant characteristics of a tribal cultural resource, when feasible (PRC Section 21084.3).

PRC Section 21074 (a)(1)(A) and (B) defines tribal cultural resources as “sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe” and is:

1. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or
2. 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 Public Resources Code Section 5024.1. In applying these criteria, the lead agency shall consider the significance of the resource to a California Native American tribe.

AB 52 also establishes a formal consultation process for California tribes regarding those resources. The consultation process must be completed before a CEQA document can be certified. Under AB 52, lead agencies are required to "begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project." Native American tribes to be included in the process are those that have requested notice of projects proposed within the jurisdiction of the lead Agency.

a. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code Section 21074 that is listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k)?*

b. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code Section 21074 that is 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 Public Resources Code Section 5024.1?*

The Native American Heritage Commission (NAHC) was contacted on January 21, 2020 for a search of its Sacred Lands File (SLF). The NAHC responded on January 30, 2020, stating that the search of the SLF was positive and recommended contacting the Pechanga Band of Luiseño Indians for more information.

On March 20, 2020, the following Native American Tribes were sent initial consultation letters:

- Pechanga Band of Luiseño Indians
- Rincon Band of Luiseño Indians
- Soboba Band of Luiseño Indians
- Agua Caliente Band of Cahuilla Indians
- Torres-Martinez Desert Cahuilla Indians

Four responses were received, each of which is summarized below:

1. Tuba Ebru Ozdil, Cultural Resources Analysist for the Pechanga Band of Luiseño Indians, replied on March 20, 2020, requesting formal consultation with the City and additional detailed information about the proposed project. Additionally, Ms. Ozdil requested that the Tribe be formally notified and involved during the entire environmental review process for the duration of the project because the project area lies within the Tribe's aboriginal territory.
2. Cheryl Madrigal, Tribal Historic Preservation Officer of the Rincon Band of Luiseño Indians, replied on July 10, 2020. Ms. Madrigal requested copies of any geotechnical reports, cultural survey reports (including archaeological results and shapefiles), archaeological search results, and grading plans. Ms. Madrigal indicated the Tribe would be participating fully in the environmental review process for the project because the project area lies within the Luiseño territory and is within their specific area of historic interest.
3. Joseph Ontiveros, Tribal Historic Preservation Officer of the Soboba Band of Luiseño Indians, replied on July 8, 2020, deferring consultation for this project to the Pechanga Band of Luiseño Indians.
4. Patricia Garcia-Plotkin, Director of Historic Preservation for the Agua Caliente Band of Cahuilla Indians, replied on July 9, 2020, deferring consultation for this project to the Pechanga Band of Luiseño Indians.

Based on the positive results of the Sacred Lands File search coupled with ethnographic settlement patterns, the area is considered sensitive for tribal cultural resources. This sensitivity was echoed during confidential government-to-government consultation meetings that occurred between City and Pechanga representatives on November 7, 2022, and April 18, 2023. Both archaeological and Native American monitoring were requested during consultation. Therefore, Mitigation Measures CR-1 through CR-9 are required to bring impact to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

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19 Utilities and Service Systems

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	□	□	■	□
b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple Dry years?	□	□	■	□
c. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	□	□	□	■
d. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	□	□	■	□
e. Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	□	□	□	■

a. Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

The project could require minor relocations of existing utility infrastructure associated with Rancho California Water District, Southern California Edison, Southern California Gas Company, Charter Communications, and Frontier Communications located near the Diaz Road and Avenida Alvarado intersection. Utility coordination will be initiated with each utility company in the final phase of design, prior to project implementation. Such coordination would ensure that any necessary utility relocations would not cause significant environmental effects. The project will not require the construction of major new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities beyond those evaluates as part of the proposed project. Therefore, this impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

Water would be supplied to the project site by Rancho California Water District. According to their analysis of water supply reliability in the 2021 Water Shortage Contingency Plan, the District will have sufficient water supply to meet the projected demands through the year 2045 under all scenarios considered, including normal year, single dry year, and multiple dry years (Rancho California Water District 2021).

Project construction will result in minor water usage during construction for dust suppression but would be adequately served by existing water supplies. Long-term operation of the project would not require any water use. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

The project will not result in the need for any new water or wastewater treatment facilities, nor would it add any demand to existing facilities.

NO IMPACT

d. Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

Solid waste generated during project construction would be disposed of at Lamb Canyon Sanitary Landfill, which has an expected closure year of 2040 and is located at 16411 Lamb Canyon Road in Beaumont, CA, approximately 33 miles north of the project site. Operation of the project would not result in substantial generation of solid waste that would exceed standards or infrastructure capacity. This impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

e. Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

All solid waste will be disposed of at an approved site in compliance with federal, state and county regulations.

NO IMPACT

20 Wildfire

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a. Substantially impair an adopted emergency response plan or emergency evacuation plan?	□	□	□	■
b. 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?	□	□	□	■
c. 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?	□	□	□	■
d. Expose people or structures to significant risks, including downslopes or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	□	□	□	■

a. Substantially impair an adopted emergency response plan or emergency evacuation plan?

b. 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?

c. 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?

d. Expose people or structures to significant risks, including downslopes or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

The project site is not located within or near an area designated as a state responsibility area (Cal Fire, 2007, 2011) nor is it classified as a very high fire hazard severity zone or located near a very high fire hazard severity zone (Cal Fire, 2007, 2011). The project site is mapped as Non-VHFHSZ per the California Department of Forestry and Fire Protection Fire Hazard Severity Zone Maps prepared under the Fire and Resource Assessment Program. The nearest State Responsibility Area very high fire hazard severity zone is located along the hillside approximately 1.02 miles west of the project site. The nearest Local Responsibility Area very high fire hazard severity zone is approximately 0.44 miles southwest of the project site. No further analysis of this issue is required in the EIR.

NO IMPACT

21 Mandatory Findings of Significance

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Does the project:				
a. Have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	□	■	□	□
b. Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	□	□	■	□
c. Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	□	□	■	□

a. Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

The project would impact Riparian/Riverine resources that are occupied by least Bell's vireo, smooth tarplant, Pacific (western) pond turtle, and arroyo chub. Special Status Plant Surveys and surveys for least Bell's vireo and burrowing owl were conducted. Least Bell's Vireo territories were observed within the southern willow scrub habitat along the banks of Murrieta Creek in the survey area. A Natural Environment Study was performed within the Biological Study Area and concluded that impacts to least Bell's vireo are expected to occur as a result of the project. The removal of vegetation may also result in temporary impacts to nesting birds due to the temporarily reduced available nesting habitat. To lessen impacts to sensitive and special status species, mitigation measures will be incorporated into the project and will result in less than significant impacts.

There is a high potential for cultural and paleontological resources in the area; however, identified mitigation measures to avoid or reduce impacts on these resources will be incorporated into the project such that important examples of the major periods of California history or prehistory would not be eliminated.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

As concluded in Sections 1 through 20, the project would have no impact, less than significant impact, or less than significant impact with mitigation incorporated, with respect to all environmental issues considered in this document. Cumulative impacts related to several resource areas have been addressed in the individual resource sections of this Initial Study, including air quality and GHG emissions (see CEQA Guidelines Section 15064(h)(3)). As discussed in Section 3, *Air Quality*, and in Section 8, *Greenhouse Gas Emissions*, the project would result in less than significant impacts associated with air quality and GHG emissions during project construction and operation. The impact analysis in these sections uses thresholds that already account for cumulative (regional impacts). Therefore, air quality and GHG emissions associated with operation and construction would be less than significant and would not be cumulatively considerable.

Cumulatively considerable impacts could occur if the construction of other projects occurs at the same time as the proposed project and in the same vicinity, such that the effects of similar impacts of multiple projects combine to expose a resource to greater levels of impact than would occur under the proposed project. For example, the proposed project and other cumulative projects could impact the same environmental resources, such as biological resources. The project may temporarily impact the habitat utilized by special status species, but the project would incorporate mitigation measures to reduce the project's contribution to cumulative impacts to a less-than-significant level.

This Initial Study determined that, for some of the other resource areas (e.g., agriculture and forestry resources, land use and planning, mineral resources, population and housing, recreation, etc.), the project would have no impact compared to existing conditions. Therefore, the project would not contribute to cumulative impacts related to these issues. Other issues (e.g., cultural resources, geology, hazards and hazardous materials, and tribal cultural resources) are by their nature project-specific and impacts at one location do not add to impacts at other locations or create additive impacts. As such, cumulative impacts would be less than significant (not cumulatively considerable).

LESS THAN SIGNIFICANT IMPACT

c. *Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?*

In general, impacts to human beings are associated with air quality, hazards and hazardous materials, and noise impacts. As detailed in Section 3, *Air Quality*, the project would not result, either directly or indirectly, in substantial adverse effects related to air quality through construction or operation. As discussed in Section 9, *Hazards and Hazardous Materials*, project operation would not involve the routine use of extremely hazardous materials. Compliance with applicable regulations during project construction would reduce potential impacts on human beings related to hazards and hazardous materials to a less than significant level. During project construction, noise impacts would be limited to the daytime hours, and construction activities would not generate noise above the FTA threshold for construction noise at a sensitive land use; therefore, construction noise impacts would be temporary and less than significant. Project operation would not result in a substantial increase in noise. Consequently, operational noise would not significantly impact nearby sensitive receivers. Therefore, the project would not have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly. These impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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Appendix A

Air Quality Report (Rincon Consultants Inc., August 2023)

AIR QUALITY REPORT

Murrieta Creek Bridge at Overland Drive
(Avenida Alvarado over Murrieta Creek)

City of Temecula, Riverside County, California

District 8, County of Riverside
Federal Aid Project No. BR-NBIL (543); City Project No. PW16-05

Prepared by

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Caltrans

August 2023

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AIR QUALITY REPORT

MURRIETA CREEK BRIDGE AT OVERLAND DRIVE
(AVENIDA ALVARADO OVER MURRIETA CREEK)
CITY OF TEMECULA, CALIFORNIA

CALIFORNIA DEPARTMENT OF TRANSPORTATION DISTRICT 8

Federal Aid Project No. BR-NBIL (543)
City Project No. PW16-05]

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Acronyms and Abbreviations

Term	**Definition**
°F	Degrees Fahrenheit
AADT	Average annual daily traffic
AB	Assembly Bill
ARB	California Air Resources Board
CAA	Federal Clean Air Act
CAAA	Clean Air Act Amendments
CAFÉ	Corporate Fuel Economy
Caltrans	California Department of Transportation
CCAA	California Clean Air Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
City	Temecula
EMFAC	Emissions Factors
EO	Executive Order
FCAA	Federal Clean Air Act
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTIP	Federal Transportation Improvement Program
GHG	Greenhouse gas
GWP	Global warming potential
H_2S	Hydrogen sulfide
I-5	Interstate 5

Term	Definition
IRIS	Integrated Risk Information System
LOS	Level of service
MMT	Million metric tons
MOVES	Motor Vehicle Emission Simulator
mph	Miles per hour
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxics
MT	Metric tons
N_2O	Nitrous oxide
NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessment
NEPA	National Environmental Policy Act
NHTSA	National Highway Traffic Safety Administration
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxide
O_3	Ozone
PM	Particulate matter
PM_{10}	Particulate matter less than 10 microns in diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
ppb	Parts per billion
ppm	Parts per million
Protocol	Transportation Project-Level Carbon Monoxide Protocol
RCEM	Roadway Construction Emissions Model
RCFC&WCD	Riverside County Flood Control and Water Conservation District
ROGs	Reactive organic gases
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SIP	State Implementation Plan

Term	Definition
SCAQMD	South Coast Air Quality Management District
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO_2	Sulfur dioxide
SO_X	Sulfur oxides
TCE	Temporary construction easements
TCWG	Transportation Conformity Working Group
USDOT	United States Department of Transportation
U.S. EPA	United States Environmental Protection Agency
VMT	Vehicle miles traveled
VRP	Visibility-reducing particles
VOCs	Volatile organic compounds
WRCC	Western Region Climatic Center
WRCOG	Western Riverside Council of Governments

1. Proposed Project Description

1.1 Introduction

The City of Temecula (City), in cooperation with the California Department of Transportation (Caltrans) District 8, proposes the construction of a bridge over and across Murrieta Creek to connect Avenida Alvarado at the intersection of Diaz Road with Overland Drive at the intersection of Enterprise Circle West in the City. The bridge will replace the existing 2-lane low-water crossing at Via Montezuma with a 4-lane bridge at Overland Drive and Avenida Alvarado over Murrieta Creek. The project's open-to-traffic year would be 2025.The City is lead agency under the California Environmental Quality Act (CEQA).

The project would extend from the terminus of Overland Drive near the Enterprise Circle West intersection, over Murrieta Creek, along Diaz Road, approximately 600 feet on either side of Avenida Alvarado, and about 500 feet along Avenida Alvarado.

The purpose of this air quality analysis is to describe the existing regional and local air quality of the project area, identify the potential air quality impacts of the project, and demonstrate air quality conformity of the project with the State Implementation Plan (SIP), as required by the federal Clean Air Act (CAA). This report also identifies measures to mitigate or minimize pollutant emissions that could occur during project construction.

1.2 Location and Background

The project is located in the northwest area in the City of Temecula, spanning and adjacent to Murrieta Creek. The project would extend from the terminus of Overland Drive near the Enterprise Circle West intersection, over Murrieta Creek, along Diaz Road, approximately 600 feet on either side of Avenida Alvarado, and about 500 feet along Avenida Alvarado. The project's regional location is shown in Figure 1 and the Project Location is shown on Figure 2.

Roadways at the location of the proposed bridge consist of the intersection of Diaz Road and Avenida Alvarado on the west side of the Creek. Diaz Road parallels the Creek, has a width of 76 feet and consists of two northbound and two southbound through lanes, and Avenida Alvarado has a width of 64 feet with one eastbound and one westbound travel lane. To the east of the Creek, Overland Drive terminates at Commerce Center Drive. Overland Drive was recently extended to Enterprise Circle West under a separate Overland Drive Extension Project (City Project PW 16-06). The project involved the demolition of two buildings, roadway improvements including construction of curbs and gutters, sidewalks, storm drains, utility facilities, traffic signage, and intersection improvements at Overland Drive/Commerce Center Drive and Overland Drive/Enterprise Circle West. Enterprise Circle West is 44 feet in width with one northbound and one southbound lane and

Overland Drive between Enterprise Circle West and Commerce Center Drive is 68 feet in width with two westbound and two eastbound lanes.

An existing pedestrian and bike trail parallels the west side of the Creek to the east of Diaz Road. Nearby Creek crossings include the Winchester Road Bridge, approximately 0.3 mile north, and the Via Montezuma low-water crossing, approximately 0.5 mile south.

The project is included in the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023; RTP ID 991203) and the conforming 2023 FTIP (Amendment 23-03, approved June 9, 2023; FTIP ID 991203A). The project is described in the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023) as "in western Riv Co in the City of Temecula: phase 1: extend overland drive (4 lanes) from commerce center drive to Avenida Alvarado/Diaz Rd intersection. See 991203a for phase 2 bridge project." The project is described in the 2023 FTIP (Amendment 23-03, approved June 9, 2023) as "in western Riv Co in the City of Temecula: Phase 2: replace 2-lane low water crossing with 4-lane bridge (BR#00L0087) over Murrieta Creek at Avenida Alvarado. See 991203 for Phase 1" (see Appendix A). In the approved 2023 FTIP (Amendment 23-03, approved June 9, 2023), there is $4,382 available for project funding in the following FY 22/23. There are no available funds for FY 23/24, FY 24/25, and FY 25/26 because the funding in FY 22/23 is sufficient to complete all preconstruction tasks (preliminary engineering and right-of-way work). Once the right-of-way work is certified by Caltrans, the $19,167 currently available for project funding in FY 26/27 will be moved forward to FY 24/25 or FY 25/26 through the Annual Survey process.

The project was discussed among stakeholders at a Transportation Conformity Working Group (TCWG) meeting on July 28, 2020, pursuant to the interagency consultation requirement of 40 CFR 93.105(c)(1)(i). The members of the TCWG confirmed that the project, RTP Project ID 991203, would not be considered a project of air quality concern. The TCWG determination is included as Appendix D. A follow-up letter from SCAG on September 26, 2022 confirmed to the City of Temecula that this July 28, 2020 TCWG finding also applied to FTIP Project ID 991203A (included in Appendix D).

While the project has not been part of any amendments, the FHWA made a finding of conformity on the 2020-2045 RTP/SCS through Amendment #3 on June 9, 2023, included as Appendix B. In addition, the FHWA approved the 2023 FTIP Consistency Amendment #23-03 and concurred that the associated conformity determination conformed to the applicable SIP in accordance with the provisions of 40 CFR Parts 51 and 93 on June 9, 2023, also included as Appendix B. In addition, the Transportation Air Quality Conformity Findings Checklist is included as Appendix C.

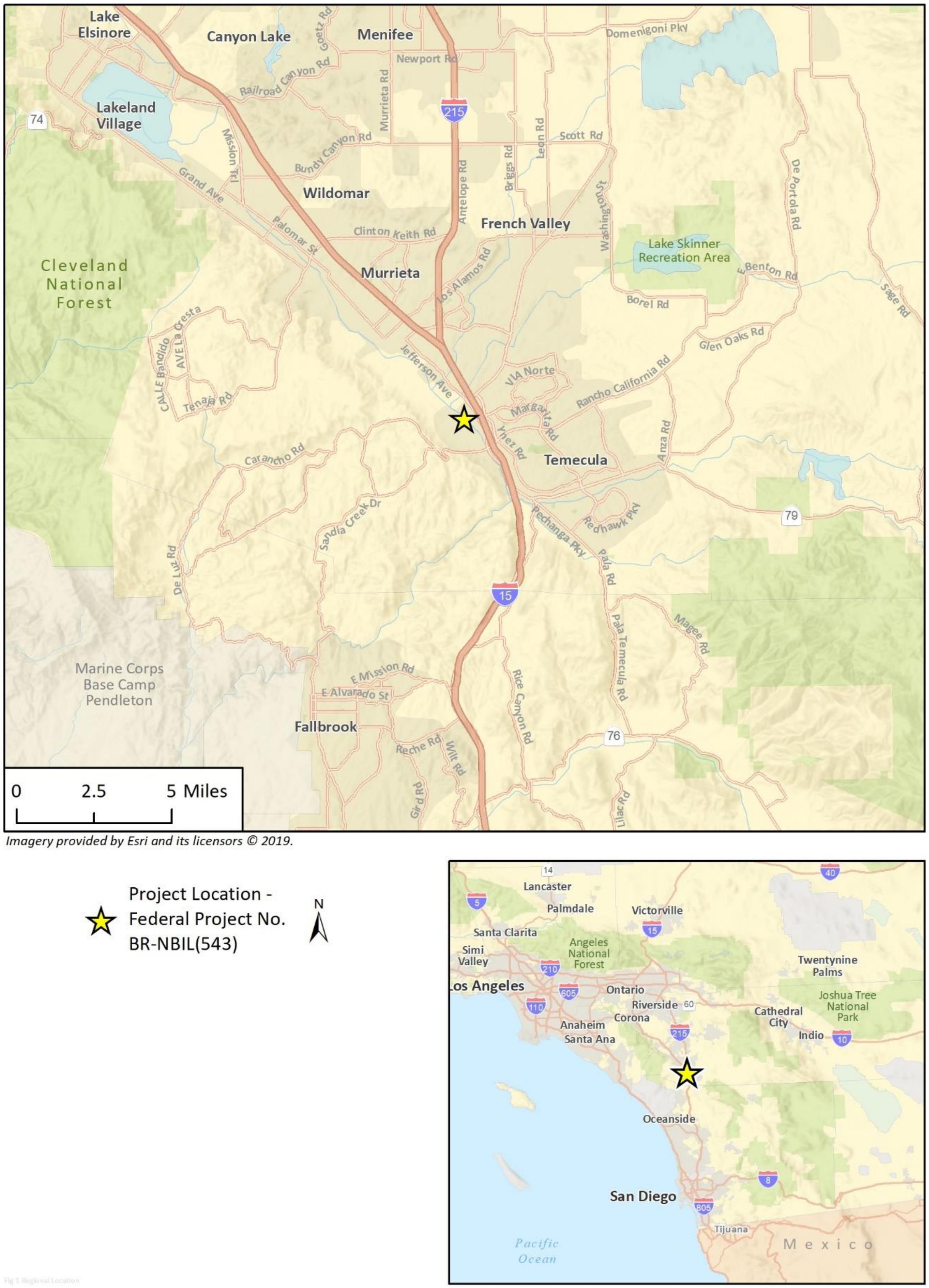

Figure 1. Map of the Project Location.

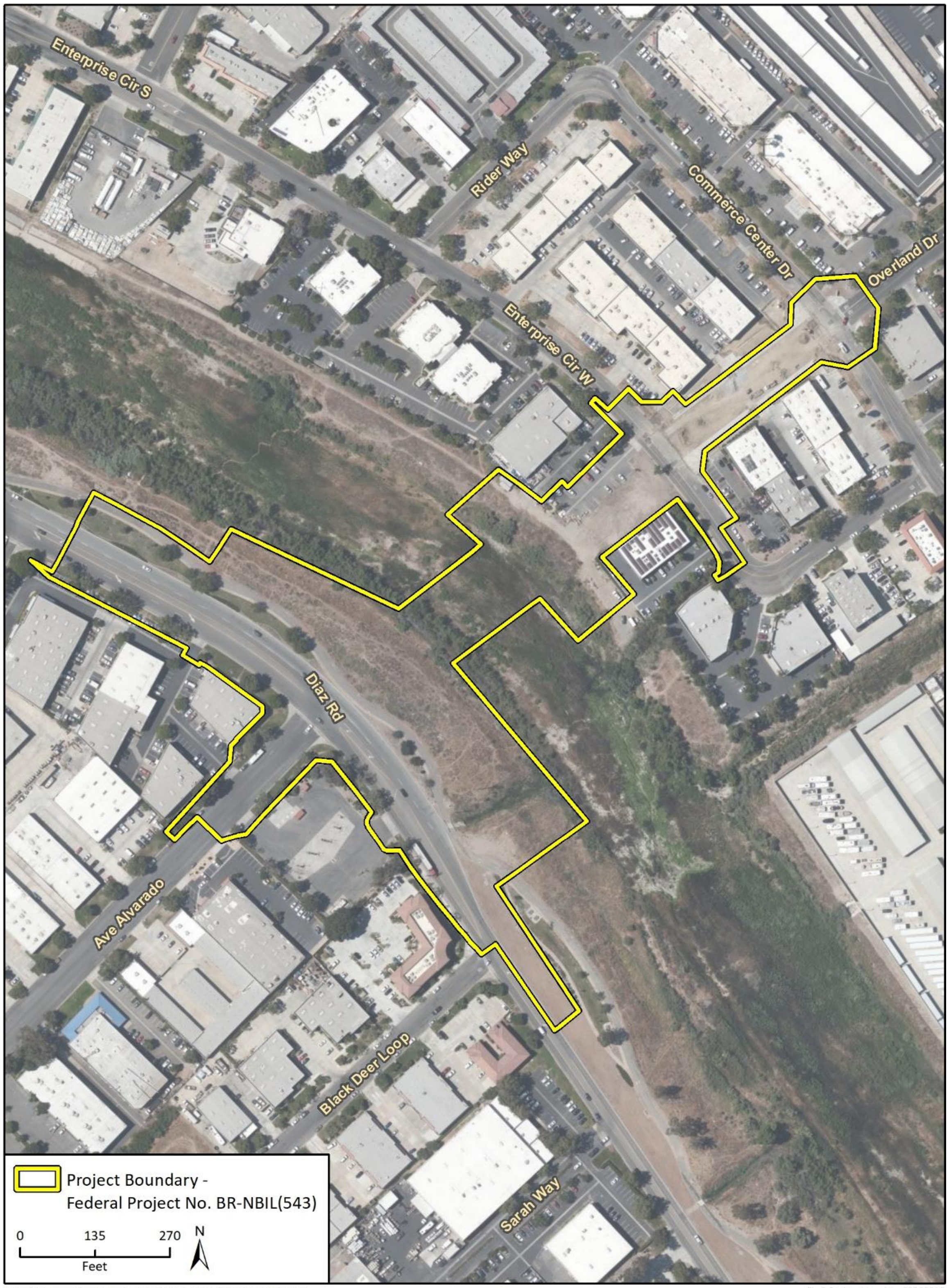

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Figure 2. Map of the Project Boundary.

1.3 Purpose and Need

The purpose of the project is to construct a bridge over and across Murrieta Creek to connect Avenida Alvarado at the intersection of Diaz Road with Overland Drive at the intersection of Enterprise Circle West in the City of Temecula.

The proposed improvements will accomplish the following in the project area:

1. Provide safe all-weather access across Murrieta Creek

2. Provide reliable route for emergency vehicles, motorists, pedestrians, and bicyclists

3. Provide an additional access point to the City's industrial park

Murrieta Creek bisects Temecula west of Interstate 15 (I-15) and separates industrial park and open space areas in the western City limits from the rest of the City. Murrieta Creek is an important riparian resource within the City, which protects water quality, conveys stormwater, and contains important biological resources and habitats. In addition, the Creek is an important archaeological area with known and unknown archaeological sites. Therefore, there are limited Creek crossings in the City.

A low-water crossing of Murrieta Creek currently exists at Via Montezuma, approximately 0.5 miles south of Overland Drive. The low-water crossing is frequently closed in wet seasons and is not a reliable route to cross the Creek during storm and flooding events. The crossing is scheduled to be removed in the future by a separate channel improvements project. Therefore, there is a need for an additional all-weather creek crossing location for employees and residents to access the industrial and open space areas to the west of Murrieta Creek.

1.4 Baseline and Forecasted Conditions for No-Build and Project Alternatives

The project proposes to construct a bridge over Murrieta Creek to connect Avenida Alvarado with Overland Drive in the City of Temecula, Riverside County. The Murrieta Creek Bridge at Overland Drive is anticipated to be a concrete girder structure spanning approximately 348 linear feet over Murrieta Creek. The bridge would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 6-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

Upon completion of the Murrieta Creek Bridge project, the proposed street configuration would be consistent with the four-lane roadway segment on Overland Drive to the east. In addition to the construction of the bridge, various roadway and utility improvements would occur at the western and eastern bridge approaches. In order to match the roadway section on Avenida Alvarado on the west side of the bridge, the project would transition the lane configuration in the eastern portion of Avenida Alvarado to be consistent with the four-lane configuration of the bridge. Intersections improvements to Overland Drive/Enterprise Circle West, Overland Drive/Commerce Center Drive and Diaz Road/Avenida Alvarado would include the installation of traffic signals and associated signing, striping, streetlights, and utilities. Reconstruction and roadway improvements along Diaz Road and Avenida Alvarado would include undergrounding electrical utilities, construction of curb, gutter, and sidewalks, relocating sewer and water facilities, and adding traffic signage and striping.

As a part of the bridge construction, one abutment would be constructed on each end of the bridge, along with two piers within the Murrieta Creek. Earth embankments with concrete slope protection and cutoff walls buried underground would also be installed on the east and west side of the Creek. The foundation of the bridge piers involving large-diameter cast-in-drilled-hole concrete piles will be installed below the channel bottom, which is deep enough for protection from scour. The channel bottom will remain earthen without any concrete or rip rap lining. The bridge girder would provide cell openings to accommodate future utilities and electrical conduits for streetlights and traffic signal communication.

The project will also include the following additional improvements:

- **Railing Architectural treatment:** The bridge design will incorporate concrete barriers, metal hand and bicycle railings, and standard architectural treatments.

- **Landscaping:** Landscaping modifications or improvements in the right-of-way along the bridge approach, Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado intersections, and along Diaz Road and Overland Drive.

- **Right-of-Way Requirements:** The right of way on the east side of the creek has been acquired by the City as part of the completed Overland Drive Extension Project (City Project PW 16-06); however, due to raise of the Diaz Road and Avenida Alvarado street grade, portions of four driveways and parkways in three private properties at the westerly approach will be reconstructed. Temporary construction easements (TCE's) will be acquired at these locations. There will be a street easement for the bridge and its approaches in the Creek, which is to be acquired from Riverside County Flood Control and Water Conservation District (RCFC&WCD). A temporary construction easement at the northeast corner of the Overland Drive/Enterprise Circle West intersection may be required to reconstruct an ADA-compliant curb ramp.

- **Construction Traffic Controls:** Diaz Road, Avenida Alvarado, and Overland Drive will include temporary striping to divert traffic away from work areas. The temporary striping will allow for staged construction of roadway and intersection improvements to maintaining vehicle and pedestrian and bicyclist access at all times. The TCE for grading in the channel is to be acquired through an encroachment permit from RCFC&WCD. Permanent and temporary construction easements in four private properties at the easterly side of the Creek may be required to construct storm drains, a retaining wall, and the bridge approach embankment.

1.4.1 Existing Roadways and Traffic Conditions

Roadways at the location of the proposed bridge consist of the intersection of Diaz Road and Avenida Alvarado on the west side of the Creek. Diaz Road parallels the Creek, has a width of 76 feet and consists of two northbound and two southbound through lanes, and Avenida Alvarado has a width of 64 feet with one eastbound and one westbound travel lane. To the east of the Creek, Overland Drive terminates at Commerce Center Drive. Overland Drive was recently extended to Enterprise Circle West under a separate Overland Drive Extension Project (City Project PW 16-06). The project involved the demolition of two buildings, roadway improvements including construction of curbs and gutters, sidewalks, storm drains, utility facilities, traffic signage, and intersection improvements at Overland Drive/Commerce Center Drive and Overland Drive/Enterprise Circle West. Enterprise Circle West is 44 feet in width with one northbound and one southbound lane and Overland Drive between Enterprise Circle West and Commerce Center Drive is 68 feet in width with two westbound and two eastbound lanes. Traffic volumes along the existing roadways affected by the project are shown in Table 1.

An existing pedestrian and bike trail parallels the west side of the Creek to the east of Diaz Road. Nearby Creek crossings include the Winchester Road Bridge, approximately 0.3 mile north, and the Via Montezuma low-water crossing, approximately 0.5 mile south.

Table 1. Summary of Existing Traffic Conditions.

Scenario/ Analysis Year	Location	AADT		% Truck[1]	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
Existing/Baseline Year 2019	Diaz Road from Winchester Road to Avenida Alvarado	14,335	1,003	7	3,340	NB, AM: 19 NB, PM: 14 SB, AM: 45 SB, PM: 45	NB: 18 SB: 45
	Diaz Road between Avenida Alvarado and Via Montezuma	12,655	886	7	4,493	NB, AM: 44 NB, PM: 45 SB, AM: 45 SB, PM: 43	NB: 45 SB: 43
	Avenida Alvarado west of Diaz Road	2,001	140	7	1,159	EB, AM: 21 EB, PM: 15 WB, AM: 35 WB, PM: 35	EB: 17 WB: 35

Scenario/ Analysis Year	Location	AADT		% Truck[1]	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
	Overland Drive between Diaz Road and Enterprise Circle	N/A	N/A	7	N/A	N/A[2]	N/A[2]
	Overland Drive between Enterprise Circle and Commerce Center Drive	2,977	208	7	211	EB, AM: 35 EB, PM: 35 WB, AM: 18 WB, PM: 18	EB: 35 WB: 18
	Overland Drive between Commerce Center Drive and Jefferson Avenue	6,959	487	7	1,246	EB, AM: 13 EB, PM: 5 WB, AM: 35 WB, PM: 35	EB: 7 WB: 35
	Overland Drive between Jefferson Avenue and Ynez Road	20,215	1,415	7	7,298	N/A[2]	N/A[2]
	Winchester Road between Diaz Road and Enterprise Circle	25,068	1,755	7	3,735	EB, AM: 19 EB, PM: 10 WB, AM: 16 WB, PM: 13	EB: 12 WB: 13

Source: STC Traffic, Inc. 2021

NB = Northbound; SB = Southbound

[1] According to the traffic engineer for the project, Avenida Alvarado would carry approximately 7 percent trucks (STC Traffic, Inc. 2020). This is the current truck volume for I-15 at SR 79, and is appropriate for evaluation of the project as it is a cross-street of I-15 and runs parallel to the future extension of Avenida Alvarado.

[2] The model used by the traffic engineer for the project does not go out farther than this location; therefore, it does not generate average speeds for this intersection, which relies upon intersections further out in the model to generate speeds through the intersection.

1.4.2 No-Build Alternatives

Under the No-Build Alternatives, no bridge would be constructed in the project area. Traffic volumes under the opening year (2025) and horizon year (2045) traffic scenarios are shown in Table 2.

Table 2. Summary of Future No-Build Traffic Conditions.

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
Opening Year/2025	Diaz Road from Winchester Road to Avenida Alvarado	16,055	1,124	7	3,741	NB, AM: 19 NB, PM: 12 SB, AM: 45 SB, PM: 45	NB: 13 SB: 45
	Diaz Road between Avenida Alvarado and Via Montezuma	14,174	992	7	5,032	NB, AM: 44 NB, PM: 45 SB, AM: 45 SB, PM: 45	NB: 45 SB: 45
	Avenida Alvarado west of Diaz Road	2,241	157	7	1,298	EB, AM: 21 EB, PM: 14 WB, AM: 35 WB, PM: 35	EB: 17 WB: 35
	Overland Drive between Diaz Road and Enterprise Circle**	N/A	N/A	7	N/A	N/A	N/A
	Overland Drive between Enterprise Circle and Commerce Center Drive	3,334	233	7	237	EB, AM: 35 EB, PM: 35 WB, AM: 18 WB, PM: 18	EB: 35 WB: 18

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
	Overland Drive between Commerce Center Drive and Jefferson Avenue	7,794	546	7	1,395	EB, AM: 13 EB, PM: 7 WB, AM: 35 WB, PM: 35	EB: 8 WB: 35
	Overland Drive between Jefferson Avenue and Ynez Road	22,641	1,585	7	8,173	N/A[2]	N/A[2]
	Winchester Road between Diaz Road and Enterprise Circle	28,076	1,965	7	4,183	EB, AM: 18 EB, PM: 7 WB, AM: 15 WB, PM: 13	EB: 9 WB: 13
Horizon Year/2045	Diaz Road from Winchester Road to Avenida Alvarado	18,062	1,264	7	4,208	NB, AM: 16 NB, PM: 13 SB, AM: 45 SB, PM: 45	NB: 14 SB: 45
	Diaz Road between Avenida Alvarado and Via Montezuma	15,945	1,116	7	5,660	NB, AM: 44 NB, PM: 45 SB, AM: 45 SB, PM: 45	NB: 45 SB: 45
	Avenida Alvarado west of Diaz Road	2,521	176	7	1,460	EB, AM: 12 EB, PM: 3 WB, AM: 35 WB, PM: 35	EB: 5 WB: 35
	Overland Drive between Diaz Road and Enterprise Circle**	N/A	N/A	7	N/A	N/A	N/A

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
	Overland Drive between Enterprise Circle and Commerce Center Drive	3,751	263	7	266	EB, AM: 35 EB, PM: 35 WB, AM: 18 WB, PM: 18	EB: 35 WB: 18
	Overland Drive between Commerce Center Drive and Jefferson Avenue	8,768	614	7	1,569	EB, AM: 12 EB, PM: 8 WB, AM: 35 WB, PM: 35	EB: 9 WB: 35
	Overland Drive between Jefferson Avenue and Ynez Road	25,471	1,783	7	9,195	N/A[2]	N/A[2]
	Winchester Road between Diaz Road and Enterprise Circle	31,586	2,211	7	4,706	EB, AM: 17 EB, PM: 8 WB, AM: 15 WB, PM: 10	EB: 11 WB: 10

Source: STC Traffic, Inc. 2021

NB = Northbound; SB = Southbound

[1] According to the traffic engineer for the project, Avenida Alvarado would carry approximately 7 percent trucks (STC Traffic, Inc. 2020). This is the current truck volume for I-15 at SR 79, and is appropriate for evaluation of the project as it is a cross-street of I-15 and runs parallel to the future extension of Avenida Alvarado.

[2] The model used by the traffic engineer for the project does not go out farther than this location; therefore, it does not generate average speeds for this intersection, which relies upon intersections further out in the model to generate speeds through the intersection.

1.4.3 Project Build Alternatives

The Project Build Alternative is described under Section 1.4.1. Traffic volumes under the opening year (2025) with project and horizon year (2045) with project traffic scenarios are shown in Table 3.

Table 3. Summary of Build Traffic Conditions.

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck[1]				
Opening Year + Project/2025	Diaz Road from Winchester Road to Avenida Alvarado	18,863	1,320	7	4,395	NB, AM: 18 NB, PM: 13 SB, AM: 24 SB, PM: 25	NB: 13 SB: 25
	Diaz Road between Avenida Alvarado and Via Montezuma	14,174	992	7	5,032	NB, AM: 34 NB, PM: 31 SB, AM: 45 SB, PM: 45	NB: 31 SB: 45
	Avenida Alvarado west of Diaz Road	2,241	157	7	1,298	EB, AM: 21 EB, PM: 19 WB, AM: 35 WB, PM: 35	EB: 20 WB: 35
	Overland Drive between Diaz Road and Enterprise Circle**	6,400	448	7	998	EB, AM: 20 EB, PM: 16 WB, AM: 11 WB, PM: 13	EB: 16 WB: 14
	Overland Drive between Enterprise Circle and Commerce Center Drive	8,868	621	7	630	EB, AM: 14 EB, PM: 9 WB, AM: 24 WB, PM: 16	EB: 9 WB: 16
	Overland Drive between Commerce Center Drive and Jefferson Avenue	13,328	933	7	2,386	EB, AM: 12 EB, PM: 7 WB, AM: 22 WB, PM: 18	EB: 8 WB: 19

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck[1]				
	Overland Drive between Jefferson Avenue and Ynez Road	22,641	1,585	7	8,173	N/A[2]	N/A[2]
	Winchester Road between Diaz Road and Enterprise Circle	25,269	1,769	7	3,765	EB, AM: 19 EB, PM: 7 WB, AM: 15 WB, PM: 13	EB: 10 WB: 13
Horizon Year +Project/2045	Diaz Road from Winchester Road to Avenida Alvarado	21,221	1,485	7	4,944	NB, AM: 17 NB, PM: 12 SB, AM: 22 SB, PM: 22	NB: 13 SB: 23
	Diaz Road between Avenida Alvarado and Via Montezuma	15,945	1,116	7	5,660	NB, AM: 32 NB, PM: 27 SB, AM: 45 SB, PM: 45	NB: 28 SB: 45
	Avenida Alvarado west of Diaz Road	2,521	176	7	1,460	EB, AM: 17 EB, PM: 16 WB, AM: 35 WB, PM: 35	EB: 16 WB: 35
	Overland Drive between Diaz Road and Enterprise Circle	7,600	532	7	1,186	EB, AM: 21 EB, PM: 18 WB, AM: 13 WB, PM: 12	EB: 19 WB: 12
	Overland Drive between Enterprise Circle and Commerce Center Drive	9,636	675	7	684	EB, AM: 13 EB, PM: 9 WB, AM: 15 WB, PM: 14	EB: 10 WB: 14

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck[1]				
	Overland Drive between Commerce Center Drive and Jefferson Avenue	14,653	1,026	7	2,623	EB, AM: 11 EB, PM: 7 WB, AM: 24 WB, PM: 20	EB: 8 WB: 20
	Overland Drive between Jefferson Avenue and Ynez Road	25,471	1,783	7	9,195	N/A[2]	N/A[2]
	Winchester Road between Diaz Road and Enterprise Circle	28,427	1,990	7	4,236	EB, AM: 18 EB, PM: 9 WB, AM: 15 WB, PM: 9	EB: 11 WB: 9

Source: STC Traffic, Inc. 2021

NB = Northbound; SB = Southbound

[1] According to the traffic engineer for the project, Avenida Alvarado would carry approximately 7 percent trucks (STC Traffic, Inc. 2020). This is the current truck volume for I-15 at SR 79, and is appropriate for evaluation of the project as it is a cross-street of I-15 and runs parallel to the future extension of Avenida Alvarado.

[2] The model used by the traffic engineer for the project does not go out farther than this location; therefore, it does not generate average speeds for this intersection, which relies upon intersections further out in the model to generate speeds through the intersection.

1.4.4 Comparison of Existing/Baseline and Build Alternatives

The project's VMT Analysis Technical Memorandum (STC Traffic, Inc., 2021) showed that project study area VMT will be 2,618 VMT per day under the Opening Year (2025) scenario and 2,922 VMT per day in the Horizon Year (2045). Project study area VMT is shown to be increasing because the project study area VMT analysis does not consider redistribution of traffic and potential VMT reductions on routes outside of the project study area (e.g., Rancho California). The project study area was determined by the City for traffic flow purposes and not for VMT purposes. In reality, the proposed project does not increase capacity, and would reduce VMT for current trips on the network as the new roadway segment lowers VMT for journeys from Overland Drive to Diaz Road and Avenida Alvarado. The distance from the Overland Drive/Enterprise Circle intersection to the Diaz Road/ Avenida Alvarado intersection is currently 0.7 miles. The distance between the two intersections across the creek is approximately 825 feet. This is an approximate reduction of 2,870 feet traveled per vehicle trip.

Table 4 summarizes design features and operational impacts on traffic conditions near the proposed project, including VMT, AADT, and average speed.

Table 4. Summary of Long-Term Operational Impacts on Traffic Conditions.

Scenario/ Analysis Year	Design Features and Operational Impacts on Traffic Conditions
Opening Year + Project/2025	The peak and off-peak speeds analysis shows that during the Opening Year + Project/2025 scenario, speeds will be lower on the Diaz Road and Overland Drive segments compared to the Existing/Baseline Year 2019, Opening Year/2025, and Horizon Year/2045 scenarios. The project's VMT Analysis Technical Memorandum (STC Traffic, Inc., 2021) showed that project study area VMT will be an additional 2,618 VMT per day during the Opening Year + Project/2025 scenario compared to without the project. The project study area was determined by the City for traffic flow purposes and not for VMT purposes. In reality, the proposed project does not increase capacity, and would reduce VMT for current trips on the network as the new roadway segment lowers VMT for journeys from Overland Drive to Diaz Road and Avenida Alvarado.
Horizon Year +Project/2045	The peak and off-peak speeds analysis shows that during the Horizon Year + Project/2045 scenario, speeds will be lower on the Diaz Road and Overland Drive segments compared to the Existing/Baseline Year 2019, Opening Year/2025, and Horizon Year/2045 scenarios. The project's VMT Analysis Technical Memorandum (STC Traffic, Inc., 2021) showed that project study area VMT will be an additional 2,922 VMT per day during the Horizon Year +Project/2045 scenario compared to without the project. The project study area was determined by the City for traffic flow purposes and not for VMT purposes. In reality, the proposed project does not increase capacity, and would reduce VMT for current trips on the network as the new roadway segment lowers VMT for journeys from Overland Drive to Diaz Road and Avenida Alvarado.

1.5 Construction Activities and Schedule

Diaz Road, Avenida Alvarado, and Overland Drive will include temporary striping to divert traffic away from work areas. The temporary striping will allow for staged construction of roadway and intersection improvements to maintaining vehicle and pedestrian and bicyclist access at all times.

Temporary and short-term access impact may occur during construction, and will require coordination with property owners, the public, and other stakeholders.

Although construction is planned to last approximately 2 years, no construction activities are anticipated to last more than five years at any individual site. Emissions from construction-related activities are thus considered temporary as defined in 40 CFR 93.123(c)(5); and are not required to be included in PM hot-spot analyses to meet conformity requirements. The milestone completion dates included in Table 5 are anticipated from project construction.

The length of the project construction period, including advertise and award and project closure, is approximately two years, and the following milestone completion dates are anticipated:

Table 5. Construction Activities and Schedule.

Construction Phase	Description/List of Activities	Begin Date	Completion Date	Working Days
Advertisement and Award				
Advertisement and Award	N/A	10/2/2023	1/31/2024	N/A
Site Preparation				
Traffic Control and Demolition	Shift traffic on Diaz Road and remove asphalt pavement	2/1/2024	2/22/2024	15
Clearing and Grubbing	Prepare the site to access the channel bottom from east and west approaches	2/23/2024	3/25/2024	20
Channel Grading				
Grading Channel Slopes	Grade channel slopes at bridge and tie in to upstream and downstream transition	3/26/2024	4/29/2024	25
Stage I Construction				
Bridge Construction - Foundation	Install pile foundations	5/1/2024	7/17/2024	55
Bridge Construction – Substructure	Construct pier columns, abutment walls, and slope linings	7/18/2024	10/17/2025	65
Bridge Construction – Superstructure	Construct girders and railings	10/18/2025	2/7/2025	80
Grading/Embankment Backfill/Pavement	Construct east and west approaches, and east side of Diaz Road	2/10/2025	4/11/2025	45
Stage II Construction				
Traffic Control and Demolition	Shift traffic on Diaz Road and remove pavement	4/14/2025	5/12/2025	20
Grading/Embankment Backfill/Pavement	Construct west side of Diaz Road and extend Avenida Alvarado	5/13/2025	7/29/2025	55

Construction Phase	Description/List of Activities	Begin Date	Completion Date	Working Days
Project Closure				
Demobilization/Project Closure	N/A	7/30/2025	9/30/2025	N/A
Source: STC Traffic, Inc. 2021				

The following project equipment in Table 6 would be used for the project.

Table 6. Construction Equipment Assumptions.

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers
Site Preparation				
Traffic Control and Demolition – 15 Days	Excavators	2	15 Days	8
	Loaders	2	15 Days	
	Rubber Tired Dozers	1	15 Days	
	Traffic Control Trucks	1	5 Days	
	Hauling Trucks - Asphalt Concrete and Concrete Recycling (Site 1)	N/A	32 Round Trips	
	Hauling Trucks - Construction Debris (Site 2)	N/A	10 Round Trips	
Clearing and Grubbing – 20 Days	Excavators	2	20 Days	10
	Dozers	2	20 Days	
	Loaders	2	20 Days	
	Hauling Trucks - Construction Debris (Site 2)	N/A	20 Round Trips	
Channel Grading				
Grading Channel Slopes – 25 Days	Scrapers	2	25 Days	12
	Excavators	3	25 Days	
	Dozers	2	25 Days	
	Backhoe Loader/Loader	2	25 Days	
	Hauling Trucks - Construction Debris (Site 2)	N/A	10 Round Trips	
Stage I Construction				
Bridge Construction – Foundation – 55 Days	Pile Drilling Rigs	1	55 Days	16
	Cranes	2	55 Days	
	Excavators	2	55 Days	
	Loaders	2	55 Days	

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers
	Ready Mix Concrete Trucks (Site 4)	N/A	120 Round Trips	
	Concrete/Slurry Pump Truck	2	15 Days	
	Generator Sets	1	55 Days	
Bridge Construction – Substructure – 65 Days	Cranes	2	65 Days	16
	Excavators	1	65 Days	
	Loaders	1	65 Days	
	Ready Mix Concrete Trucks	N/A	92 Round Trips	
	Concrete Pump Truck	1	10 Days	
	Generator Sets	1	65 days	
Bridge Construction – Superstructure – 80 Days	Cranes	1	80 Days	16
	Ready Mix Concrete Trucks	N/A	110 Round Trips	
	Concrete Pump Truck	1	10 Days	
	Bid Well	1	5 Days	
	Generator Sets	2	80 Days	
	Forklifts	2	80 Days	
Grading/Embankment Backfill/Pavement – 45 Days	Scrapers	1	40 Days	12
	Excavators	2	40 Days	
	Dozers	2	40 Days	
	Rollers	1	40 Days	
	Backhoe Loader/Loader	2	40 Days	
	Asphalt Paving Machine	1	5 Days	
	Asphalt Paver Finisher	1	5 Days	
	Generator Sets	2	45 Days	
	Hauling Truck – Borrow (Site 3)	N/A	64 Round Trips	
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	52 Round Trips	
Stage II Construction				
Traffic Control and Demolition – 20 Days	Excavators	2	20 Days	10
	Loaders	2	20 Days	
	Rubber Tired Dozers	1	20 Days	
	Traffic Control Trucks	1	5 Days	
	Hauling Trucks - Asphalt Concrete and Concrete Recycling (Site 1)	N/A	44 Round Trips	

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers
	Hauling Trucks - Construction Debris (Site 2)	N/A	10 Round Trips	
Grading/Embankment Backfill/Pavement – 55 Days	Scrapers	1	45 Days	14
	Excavators	2	45 Days	
	Dozers	2	45 Days	
	Rollers	1	45 Days	
	Backhoe Loader/Loader	2	45 Days	
	Asphalt Paving Machine	1	10 Days	
	Asphalt Paver Finisher	1	10 Days	
	Generator Sets	2	55 Days	
	Hauling Truck – Borrow (Site 3)	N/A	96 Round Trips	
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	48 Round Trips	
Source: STC Traffic, Inc. 2021				

The estimated construction vehicle miles traveled (VMT) is shown in Table 9.

Table 7. Project Construction Vehicle Miles Traveled (VMT).

Activity and Working Days	Equipment	Amou nt	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin	Round Trip Distance	Number of Round Trips	Total VMT
	Site Preparation								
Traffic Control and Demolition – 15 Days	Excavators	2	15 Days	8	Average	-	33.9	2	67.8
	Loaders	2	15 Days		Average	-	33.9	2	67.8
	Rubber Tired Dozers	1	15 Days		Average	-	33.9	1	33.9
	Traffic Control Trucks	1	5 Days		Average	-	33.9	1	33.9
	Hauling Trucks - Asphalt Concrete and Concrete Recycling (Site 1)	N/A	32 Round Trips		Site 1	2.5	5	32	160
	Hauling Trucks - Construction Debris (Site 2)	N/A	10 Round Trips		Site 2	29.3	58.6	10	586
Clearing and Grubbing – 20 Days	Excavators	2	20 Days	10	Already on site	-	-	-	-
	Dozers	2	20 Days		Average	-	33.9	2	67.8
	Loaders	2	20 Days		Already on site	-	-	-	-
	Hauling Trucks - Construction	N/A	20 Round Trips		Site 2	29.3	58.6	20	1172
	Channel Grading								
	Scrapers	2	25 Days	12	Average	-	33.9	2	67.8

Activity and Working Days	Equipment	Amou nt	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin	Round Trip Distance	Number of Round Trips	Total VMT
Grading Channel Slopes – 25 Days	Excavators	3	25 Days		Already on site	-	-	-	-
	Dozers	2	25 Days		Already on site	-	-	-	-
	Backhoe Loader/Loader	2	25 Days		Average	-	33.9	2	67.8
	Hauling Trucks - Construction	N/A	10 Round Trips		Site 2	29.3	58.6	10	586
	Stage I Construction								
Bridge Construction – Foundation – 55 Days	Pile Drilling Rigs	1	55 Days	16	Average	-	33.9	1	33.9
	Cranes	2	55 Days		Average	-	33.9	2	67.8
	Excavators	2	55 Days		Already on site	-	-	-	-
	Loaders	2	55 Days		Already on site	-	-	-	-
	Ready Mix Concrete Trucks (Site 4)	N/A	120 Round Trips		Site 4	2.5	5	120	600
	Concrete/Slurry Pump Truck	2	15 Days		Site 4	2.5	5	1	5
	Generator Sets	1	55 Days		Average	-	33.9	1	33.9
Bridge Construction – Substructure – 65 Days	Cranes	2	65 Days	16	Already on site	-	-	-	-
	Excavators	1	65 Days		Already on site	-	-	-	-
	Loaders	1	65 Days		Already on site	-	-	-	-
	Ready Mix Concrete Trucks	N/A	92 Round Trips		Site 4	2.5	5	92	460
	Concrete Pump Truck	1	10 Days		Already on site	-	-	-	-

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin	Round Trip Distance	Number of Round Trips	Total VMT
	Generator Sets	1	65 days		Already on site	-	-	-	-
Bridge Construction – Superstructure – 80 Days	Cranes	1	80 Days	16	Already on site	-	-	-	-
	Ready Mix Concrete Trucks	N/A	110 Round Trips		Site 4	2.5	5	110	550
	Concrete Pump Truck	1	10 Days		Already on site	-	-	-	-
	Bid Well	1	5 Days		Average	-	33.9	1	33.9
	Generator Sets	2	80 Days		Already on site	-	-	-	-
	Forklifts	2	80 Days		Average	-	33.9	2	67.8
Grading/Embankment Backfill/Pavement – 45 Days	Scrapers	1	40 Days	12	Already on site	-	-	-	-
	Excavators	2	40 Days		Already on site	-	-	-	-
	Dozers	2	40 Days		Already on site	-	-	-	-
	Rollers	1	40 Days		Average	-	33.9	1	33.9
	Backhoe Loader/Loader	2	40 Days		Average	-	33.9	2	67.8
	Asphalt Paving Machine	1	5 Days		Average	-	33.9	1	33.9
	Asphalt Paver Finisher	1	5 Days		Average	-	33.9	1	33.9
	Generator Sets	2	45 Days		Already on site	-	-	-	-
	Hauling Truck – Borrow (Site 3)	N/A	64 Round Trips		Site 3	33.5	67	64	4288

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin	Round Trip Distance	Number of Round Trips	Total VMT
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	52 Round Trips		Site 1	2.5	5	32	160
	Stage II Construction								
Traffic Control and Demolition – 20 Days	Excavators	2	20 Days	10	Already on site	-	-	-	-
	Loaders	2	20 Days		Already on site	-	-	-	-
	Rubber Tired Dozers	1	20 Days		Average	-	33.9	1	33.9
	Traffic Control Trucks	1	5 Days		Average	-	33.9	1	33.9
	Hauling Trucks - Asphalt Concrete and Concrete Recycling (Site 1)	N/A	44 Round Trips		Site 1	2.5	5	44	220
	Hauling Trucks - Construction	N/A	10 Round Trips		Site 2	29.3	58.6	10	586
Grading/Embankment Backfill/Pavement – 55 Days	Scrapers	1	45 Days	14	Already on site	-	-	-	-
	Excavators	2	45 Days		Already on site	-	-	-	-
	Dozers	2	45 Days		Already on site	-	-	-	-
	Rollers	1	45 Days		Already on Site	-	-	-	-
	Backhoe Loader/Loader	2	45 Days		Already on Site	-	-	-	-
	Asphalt Paving Machine	1	10 Days		Already on Site	-	-	-	-
	Asphalt Paver Finisher	1	10 Days		Already on Site	-	-	-	-

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin	Round Trip Distance	Number of Round Trips	Total VMT
	Generator Sets	2	55 Days		Already on site	-	-	-	-
	Hauling Truck – Borrow (Site 3)	N/A	96 Round Trips		Site 3	33.5	67	96	6432
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	48 Round Trips		Site 3	33.5	67	96	6432
Source: STC Traffic, Inc. 2021									

2. Regulatory Setting

Many statutes, regulations, plans, and policies have been adopted at the federal, state, and local levels to address air quality issues related to transportation and other sources. The proposed project is subject to air quality regulations at each of these levels. This section introduces the pollutants governed by these regulations and describes the regulation and policies that are relevant to the proposed project.

2.1 Pollutant-Specific Overview

Air pollutants are governed by multiple federal and state standards to regulate and mitigate health impacts. At the federal level, there are six criteria pollutants for which National Ambient Air Quality Standards (NAAQS) have been established: CO, Pb, NO_2, O_3, PM ($PM_{2.5}$ and PM_{10}), and SO_2. The U.S. EPA has also identified nine priority mobile source air toxics: 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter (https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/). In California, sulfates, visibility reducing particles, hydrogen sulfide, and vinyl chloride are also regulated.

2.1.1 Criteria Pollutants

The CAA requires the U.S. EPA to set NAAQS for six criteria air contaminants: ozone, particulate matter, carbon monoxide, nitrogen dioxide, lead, and sulfur dioxide. It also permits states to adopt additional or more protective air quality standards if needed. California has set standards for certain pollutants. Table 8 documents the current air quality standards while Table 9 summarizes the sources and health effects of the six criteria pollutants and pollutants regulated in the state of California.

Table 8. Table of State and Federal Ambient Air Quality Standards. Accessed February 1, 2021, www.arb.ca.gov/research/aaqs/aaqs2.pdf.

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.070 ppm (137 µg/m^3)		
Respirable Particulate Matter (PM10)[9]	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)[9]	24 Hour	—	—	35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12.0 µg/m^3	15 µg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		0.053 ppm (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)[11]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[11]	—	
Lead[12,13]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m^3		
Visibility Reducing Particles[14]	8 Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990 California Air Resources Board (5/4/16)

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.

8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

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Table 9. State and Federal Criteria Air Pollutant Effects and Sources.

Pollutant	Principal Health and Atmospheric Effects	Typical Sources
Ozone (O_3)	High concentrations irritate lungs. Long-term exposure may cause lung tissue damage and cancer. Long-term exposure damages plant materials and reduces crop productivity. Precursor organic compounds include many known toxic air contaminants. Biogenic VOC may also contribute.	Low-altitude ozone is almost entirely formed from reactive organic gases/volatile organic compounds (ROG or VOC) and nitrogen oxides (NOx) in the presence of sunlight and heat. Common precursor emitters include motor vehicles and other internal combustion engines, solvent evaporation, boilers, furnaces, and industrial processes.
Respirable Particulate Matter (PM_{10})	Irritates eyes and respiratory tract. Decreases lung capacity. Associated with increased cancer and mortality. Contributes to haze and reduced visibility. Includes some toxic air contaminants. Many toxic and other aerosol and solid compounds are part of PM_{10}.	Dust- and fume-producing industrial and agricultural operations; combustion smoke & vehicle exhaust; atmospheric chemical reactions; construction and other dust-producing activities; unpaved road dust and re-entrained paved road dust; natural sources.
Fine Particulate Matter ($PM_{2.5}$)	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and produces surface soiling. Most diesel exhaust particulate matter – a toxic air contaminant – is in the $PM_{2.5}$ size range. Many toxic and other aerosol and solid compounds are part of $PM_{2.5}$.	Combustion including motor vehicles, other mobile sources, and industrial activities; residential and agricultural burning; also formed through atmospheric chemical and photochemical reactions involving other pollutants including NOx, sulfur oxides (SOx), ammonia, and ROG.
Carbon Monoxide (CO)	CO interferes with the transfer of oxygen to the blood and deprives sensitive tissues of oxygen. CO also is a minor precursor for photochemical ozone. Colorless, odorless.	Combustion sources, especially gasoline-powered engines and motor vehicles. CO is the traditional signature pollutant for on-road mobile sources at the local and neighborhood scale.
Nitrogen Dioxide (NO_2)	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown. Contributes to acid rain & nitrate contamination of stormwater. Part of the "NOx" group of ozone precursors.	Motor vehicles and other mobile or portable engines, especially diesel; refineries; industrial operations.
Sulfur Dioxide (SO_2)	Irritates respiratory tract; injures lung tissue. Can yellow plant leaves. Destructive to marble, iron, steel. Contributes to acid rain. Limits visibility.	Fuel combustion (especially coal and high-sulfur oil), chemical plants, sulfur recovery plants, metal processing; some natural sources like active volcanoes. Limited contribution possible from heavy-duty diesel vehicles if ultra-low sulfur fuel not used.
Lead (Pb)	Disturbs gastrointestinal system. Causes anemia, kidney disease, and neuromuscular and neurological dysfunction. Also a toxic air contaminant and water pollutant.	Lead-based industrial processes like battery production and smelters. Lead paint, leaded gasoline. Aerially deposited lead from older gasoline use may exist in soils along major roads.
Visibility-Reducing Particles (VRP)	Reduces visibility. Produces haze. NOTE: not directly related to the Regional Haze program under the Federal CAA, which is oriented primarily toward visibility issues in National Parks and other "Class I" areas. However, some issues and measurement methods are similar.	See particulate matter above. May be related more to aerosols than to solid particles.
Sulfate	Premature mortality and respiratory effects. Contributes to acid rain. Some toxic air contaminants attach to sulfate aerosol particles.	Industrial processes, refineries and oil fields, mines, natural sources like volcanic areas, salt-covered dry lakes, and large sulfide rock areas.
Hydrogen Sulfide (H_2S)	Colorless, flammable, poisonous. Respiratory irritant. Neurological damage and premature death. Headache, nausea. Strong odor.	Industrial processes such as: refineries and oil fields, asphalt plants, livestock operations, sewage treatment plants, and mines. Some natural sources like volcanic areas and hot springs.
Vinyl Chloride	Neurological effects, liver damage, cancer. Also considered a toxic air contaminant.	Industrial processes.

2.1.2 Mobile Source Air Toxics

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. EPA regulate 188 air toxics, also known as hazardous air pollutants. The U.S. EPA has assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of U.S. EPA's Integrated Risk Information System (IRIS) (https://www.epa.gov/iris). In addition, the U.S. EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-hazard contributors from the 2011 National Air Toxics Assessment (NATA) (https://www.epa.gov/national-air-toxics-assessment). These are *1,3-butadiene*, *acetaldehyde*, *acrolein*, *benzene*, *diesel particulate matter (diesel PM)*, *ethylbenzene*, *formaldehyde*, *naphthalene*, and *polycyclic organic matter*. While the Federal Highway Administration (FHWA) considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future U.S. EPA rules.

The 2007 U.S. EPA rule mentioned above requires controls that will dramatically decrease Mobile Source Air Toxics (MSAT) emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using U.S. EPA's MOVES2014a model, even if vehicle activity (vehicle-miles traveled, VMT) increases by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emission rate for the priority MSATs is projected for the same time period, as shown in Figure 3.

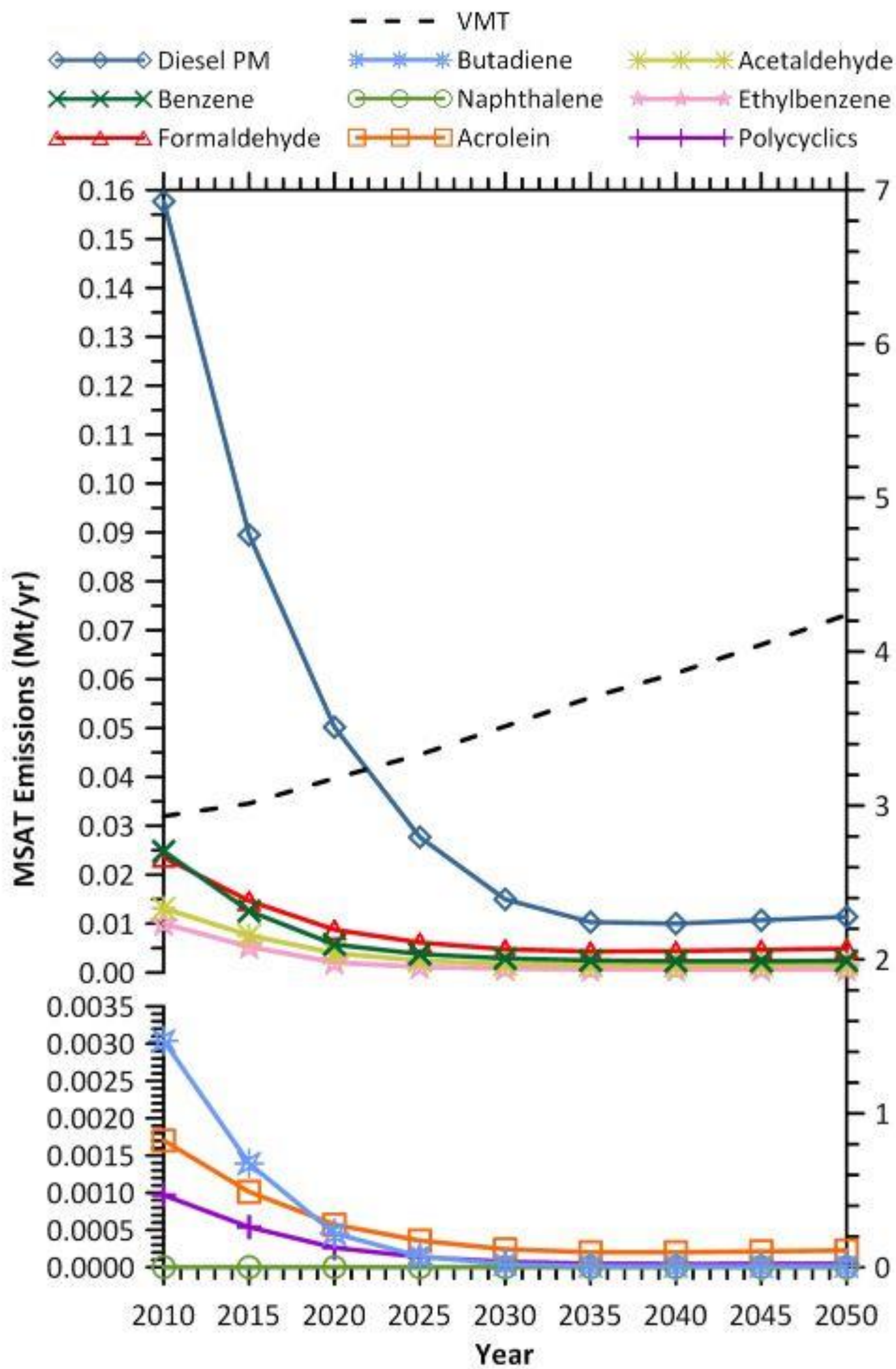

Figure 3. Projected National MSAT Trends, 2010-2050 (Source: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/).

2.1.3 Greenhouse Gases

The term greenhouse gas (GHG) is used to describe atmospheric gases that absorb solar radiation and subsequently emit radiation in the thermal infrared region of the energy spectrum, trapping heat in the Earth's atmosphere. These gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and water vapor, among others. A growing body of research attributes long-term changes in temperature, precipitation, and other elements of Earth's climate to large increases in GHG emissions since the mid-nineteenth century, particularly from human activity related to fossil fuel combustion. Anthropogenic GHG emissions of particular interest include CO_2, CH_4, N_2O, and fluorinated gases.

GHGs differ in how much heat each traps in the atmosphere (global warming potential, or GWP). CO_2 is the most important GHG, so amounts of other gases are expressed relative to CO_2, using a metric called "carbon dioxide equivalent" (CO_2e). The global warming potential of CO_2 is assigned a value of 1, and the warming potential of other gases is assessed as multiples of CO_2. For example, the 2007 International Panel on Climate Change *Fourth Assessment Report* calculates the GWP of CH_4 as 25 and the GWP of N_2O as 298, over a 100-year time horizon.[1] Generally, estimates of all GHGs are summed to obtain total emissions for a project or given time period, usually expressed in metric tons ($MTCO_2e$), or million metric tons ($MMTCO_2e$).[2]

As evidence has mounted for the relationship of climate changes to rising GHGs, federal and state governments have established numerous policies and goals targeted to improving energy efficiency and fuel economy, and reducing GHG emissions. Nationally, electricity generation is the largest source of GHG emissions, followed by transportation. In California, however, transportation is the largest contributor to GHGs.

At the federal level, the National Environmental Policy Act (NEPA) (42 United States Code [USC] Part 4332) requires federal agencies to assess the environmental effects of their proposed actions prior to making a decision on the action or project.

To date, no national standards have been established for nationwide mobile-source GHG reduction targets, nor have any regulations or legislation been enacted specifically to address climate change and GHG emissions reduction at the project level. However, the U.S. EPA and the National Highway Traffic Safety Administration (NHTSA) issued the first corporate fuel economy (CAFE) standards in 2010, requiring cars and light-duty vehicles to achieve certain fuel economy targets by 2016, with the intention of gradually increasing the targets and the range of vehicles to which they would apply.

California has enacted aggressive GHG reduction targets, starting with Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 is California's signature climate change legislation. It set the goal of reducing statewide GHG emissions to 1990 levels by 2020, and required the California Air Resources Board (ARB) to develop a Scoping Plan that describes the approach

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[1] See Table 2.14 in IPCC Fourth Assessment Report: Climate Change 2007 (AR4): The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA. http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf.

[2] See http://www.airquality.org/Businesses/CEQA-Land-Use-Planning/CEQA-Guidance-Tools.

California will take to achieve that goal and to update it every 5 years. In 2015, Governor Jerry Brown enhanced the overall adaptation planning effort with Executive Order (EO) B-30-15, establishing an interim GHG reduction goal of 40 percent below 1990 levels by 2030, and requiring state agencies to factor climate change into all planning and investment decisions.

Senate Bill (SB) 375, the Sustainable Communities and Climate Protection Act of 2008, furthered state climate action goals by mandating coordinated transportation and land use planning through preparation of SCS. The ARB sets GHG emissions reduction targets for passenger vehicles for each region. Each regional MPO must include in its regional transportation plan an SCS proposing actions toward achieving the regional emissions reduction targets.[3]

With these and other State Senate and Assembly bills and executive orders, California advances an innovative and proactive approach to dealing with GHG emissions and climate change.

2.1.4 Asbestos

Asbestos is a term used for several types of naturally occurring fibrous minerals that are a human health hazard when airborne. The most common type of asbestos is chrysotile, but other types such as tremolite and actinolite are also found in California. Asbestos is classified as a known human carcinogen by state, federal, and international agencies and was identified as a toxic air contaminant by the ARB in 1986. All types of asbestos are hazardous and may cause lung disease and cancer.

Asbestos can be released from serpentine and ultramafic rocks when the rock is broken or crushed. At the point of release, the asbestos fibers may become airborne, causing air quality and human health hazards. These rocks have been commonly used for unpaved gravel roads, landscaping, fill projects, and other improvement projects in some localities. Asbestos may be released to the atmosphere due to vehicular traffic on unpaved roads, during grading for development projects, and at quarry operations. All of these activities may have the effect of releasing potentially harmful asbestos into the air. Natural weathering and erosion processes can act on asbestos-bearing rock and make it easier for asbestos fibers to become airborne if such rock is disturbed.

Serpentine may contain chrysotile asbestos, especially near fault zones. Ultramafic rock, a rock closely related to serpentinite, may also contain asbestos minerals. Asbestos can also be associated with other rock types in California, though much less frequently than serpentinite and/or ultramafic rock. Serpentinite and/or ultramafic rock are known to be present in 44 of California's 58 counties. These rocks are particularly abundant in counties of the Sierra Nevada foothills, the Klamath Mountains, and Coast Ranges. The California Department of Conservation, Division of Mines and Geology has developed a map showing the general location of ultramafic rock in the state (www.conservation.ca.gov/cgs/minerals/hazardous_minerals/asbestos/Pages/index.aspx).

[3] https://www.arb.ca.gov/cc/sb375/sb375.htm

2.2 Regulations

2.2.1 Federal and California Clean Air Act

The Federal CAA, as amended, is the primary federal law that governs air quality while the CCAA is its companion state law. These laws and related regulations by the U.S. EPA and the ARB set standards for the concentration of pollutants in the air. At the federal level, these standards are called NAAQS. NAAQS and state ambient air quality standards have been established for six transportation-related criteria pollutants that have been linked to potential health concerns: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), which is broken down for regulatory purposes into particles of 10 micrometers or smaller (PM_{10}) and particles of 2.5 micrometers and smaller ($PM_{2.5}$), and sulfur dioxide (SO_2). In addition, national and state standards exist for lead (Pb), and state standards exist for visibility reducing particles, sulfates, hydrogen sulfide (H_2S), and vinyl chloride. The NAAQS and state standards are set at levels that protect public health with a margin of safety, and are subject to periodic review and revision. Both state and federal regulatory schemes also cover toxic air contaminants (air toxics); some criteria pollutants are also air toxics or may include certain air toxics in their general definition.

2.2.2 Transportation Conformity

The conformity requirement is based on Federal CAA Section 176(c), which prohibits the U.S. Department of Transportation (USDOT) and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to State Implementation Plan (SIP) for attaining the NAAQS. "Transportation Conformity" applies to highway and transit projects and takes place on two levels: the regional—or, planning and programming level—and the project level. The proposed project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and "maintenance" (former nonattainment) areas for the NAAQS, and only for the specific NAAQS that are or were violated. The U.S. EPA regulations at 40 CFR 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for NAAQS and do not apply at all for state standards regardless of the status of the area.

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the NAAQS for carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), and in some areas (although not in California), sulfur dioxide (SO_2). California has attainment or maintenance areas for all of these transportation-related "criteria pollutants" except SO_2, and also has a nonattainment area for lead (Pb); however, lead is not currently required by the FCAA to be covered in transportation conformity analysis. Regional conformity is based on emission analysis of RTPs and FTIPs that include all transportation projects planned for a region over a period of at least 20 years (for the RTP), and 4 years (for the FTIP). RTP and FTIP conformity uses travel demand and emission models to determine whether or not the implementation of those projects would conform to emission budgets or other tests at various analysis years showing that requirements of the CAA and the SIP are met. If the conformity analysis is successful, the Metropolitan Planning Organization (MPO), FHWA, and Federal Transit Administration (FTA), make the determinations that the RTP and FTIP are in conformity with the SIP for achieving the goals of the CAA. Otherwise, the projects in the RTP and/or FTIP must be modified until conformity is attained. If the design concept, scope, and "open-to-traffic" schedule of a proposed transportation project are the same as described in the RTP and the TIP, then the proposed project meets regional conformity requirements for purposes of project-level analysis.

Project-level conformity is achieved by demonstrating that the project comes from a conforming RTP and TIP and the project has a design concept and scope[4] that has not changed significantly from those in the RTP and TIP. If the design concept and scope have changed substantially from that used in the RTP Conformity analysis, RTP and TIP amendments may be needed. Project-level conformity also needs to demonstrate that project analyses have used the latest planning assumptions and U.S. EPA-approved emissions models; the project complies with any control measures in the SIP in PM areas. Furthermore, additional analyses (known as hot-spot analyses) may be required for projects located in CO and PM nonattainment or maintenance areas to examine localized air quality impacts.

2.2.3 National Environmental Policy Act (NEPA)

NEPA requires that policies and regulations administered by the federal government are consistent with its environmental protection goals. NEPA also requires that federal agencies use an interdisciplinary approach to planning and decision-making for any actions that could impact the environment. It requires environmental review of federal actions including the creation of Environmental Documents (EDs) that describe the environmental effects of a proposed project and its alternatives (including a section on air quality impacts).

2.2.4 California Environmental Quality Act (CEQA)

CEQA[5] is a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CEQA documents address CCAA requirements for transportation projects. While state standards are often more strict than federal standards, the state has no conformity process.

2.2.5 Local

The U.S. EPA has delegated responsibility to air districts to establish local rules to protect air quality. Caltrans' Standard Specification 14-9.02 (Caltrans, 2015) requires compliance with all applicable air quality laws and regulations including local and air district ordinances and rules.

[4] "Design concept" means the type of facility that is proposed, such as a freeway or arterial highway. "Design scope" refers to those aspects of the project that would clearly affect capacity and thus any regional emissions analysis, such as the number of lanes and the length of the project.

[5] For general information about CEQA, see: http://resources.ca.gov/ceqa/more/faq.html.

South Coast Air Quality Management District (SCAQMD) rules and regulations are extensive and most do not apply to the project. The rule most applicable to the proposed project is Rule 403, Fugitive Dust, which the project is required to comply with, and conformance will be incorporated into project specifications and procedures. Contractor compliance with Rule 403 requirements will be mandated in the contractor's specifications and shall include the measures listed below.

- Land disturbance shall be minimized to the extent feasible. Grading activities shall be limited to the disturbance of no more than five acres in the course of one day.
- Haul trucks shall be covered when loaded with fill.
- Paved streets shall be swept at least once per day where there is evidence of dirt that has been carried onto the roadway.
- Watering trucks shall be used to minimize dust. Watering should be sufficient to confine dust plumes to the project work areas. Active, disturbed areas shall have water applied to them three times daily.
- For disturbed surfaces that will not be revegetated and that will be left inactive for four or more days, a chemical stabilizer shall be applied pursuant to the manufacturer's instruction.
- For unpaved roads, chemical stabilizers shall be applied or the roads shall be watered once per hour during active operation.
- Vehicle speed on unpaved roads shall be limited to 15 miles per hour.
- For open storage piles that will remain on site for two or more days, water shall be applied once per hour, or coverings shall be installed.
- For paved road trackout, all haul vehicles shall be covered or shall comply with the vehicle freeboard requirements of Section 23114 of the *California Vehicle Code* for both public and private roads. During high wind conditions (i.e., wind speeds in excess of 25 miles per hour), all earth-moving activities shall cease or water shall

3. Affected Environment

The topography of a region can substantially impact air flow and resulting pollutant concentrations. California is divided into 15 air basins with similar topography and meteorology to better manage air quality throughout the state. Each air basin has a local air district that is responsible for identifying and implementing air quality strategies to comply with ambient air quality standards.

The project is located in the city of Temecula, within Riverside County. The SCAQMD is the local air district responsible for the administration of federal and state air quality laws, regulations, and policies. Included in the SCAQMD's tasks are monitoring of air pollution, preparation of the SIP for all of Orange County; and the non-desert of Los Angeles County, San Bernardino County, and Riverside County including the Coachella Valley and promulgation of Rules and Regulations. The population in the city of Temecula was 110,300 in 2016, and forecasted to be 138,400 in 2045 (SCAG 2020).

3.1 Climate, Meteorology, and Topography

Meteorology (weather) and terrain can influence air quality. Certain weather parameters are highly correlated to air quality, including temperature, the amount of sunlight, and the type of winds at the surface and above the surface. Winds can transport ozone and ozone precursors from one region to another, contributing to air quality problems downwind of source regions. Furthermore, mountains can act as a barrier that prevents ozone from dispersing.

The Temecula and Lake Elsinore air quality and climatological monitoring stations, maintained by the SCAQMD, are located near the project area and is representative of meteorological conditions near the project. Figure 4 shows a wind rose illustrating the predominant wind patterns near the project. The climate of the project area is generally Mediterranean in character, with cool winters (averaging a high of 65.4 degrees Fahrenheit (°F) and an average low of 36.4 °F in January) and warm, dry summers (averaging a high 98.1°F and an average low of 59.4 °F in July) (Western Region Climatic Center [WRCC] 2020). Temperature inversions are common, affecting localized pollutant concentrations in the winter and enhancing ozone formation in the summer. Mountains ranging from 2,500 to 3,000 feet in altitude tend to trap pollutants in the region by limiting air flow. Annual average rainfall is 12 inches (at the Lake Elsinore climate monitoring station COOP Id), mainly falling during the winter months.

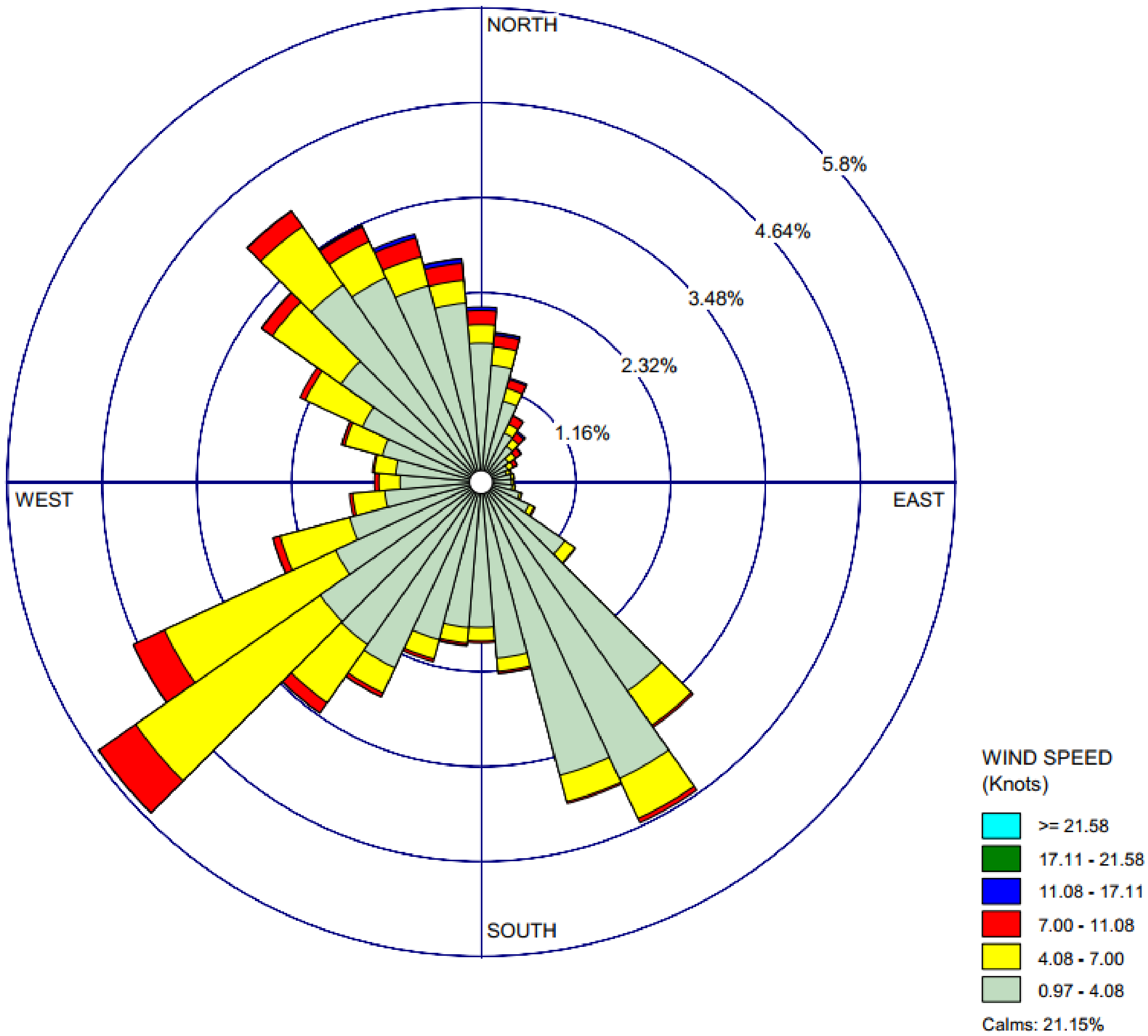

Figure 4. Predominant Wind Patterns Near the Project.

3.2 Existing Air Quality

This section summarizes existing air quality conditions near the proposed project area. It includes attainment statuses for criteria pollutants, describes local ambient concentrations of criteria pollutants for the three years, and discusses MSAT and GHG emissions. Figure 5 contains a map showing the locations of air monitoring sites relative to the proposed project site.

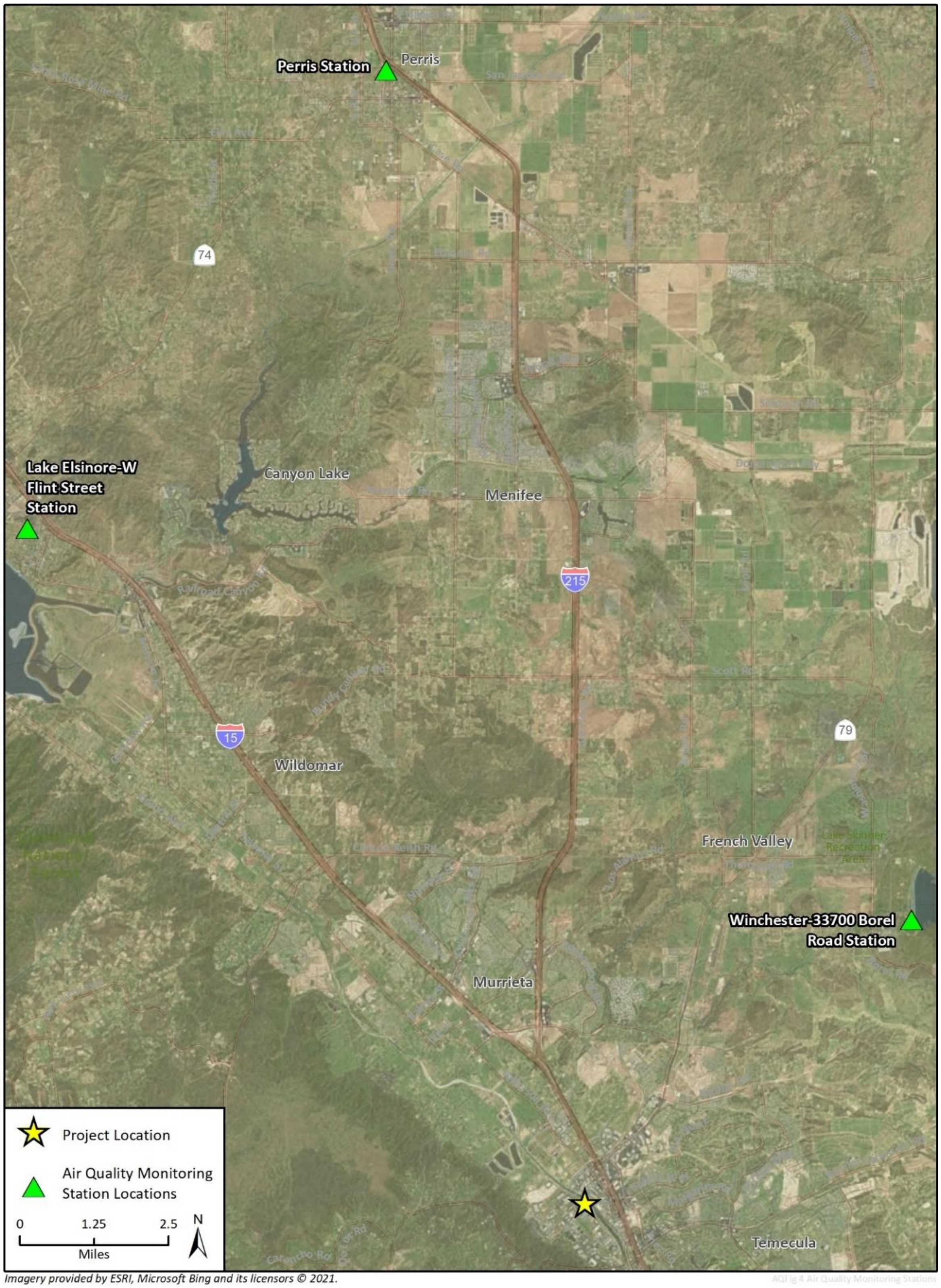

Figure 5. Map of Air Quality Monitoring Stations Located Near the Project.

3.2.1 Criteria Pollutants and Attainment Status

Riverside County currently meets the federal standards for all criteria pollutants except O_3 and $PM_{2.5}$. Riverside County was designated as an extreme non-attainment area for the 2015 8-hour O_3 standard and serious nonattainment area for $PM_{2.5}$. Riverside County is also a maintenance area for CO and PM_{10}. Riverside County meets the California standards for all criteria pollutants, except ozone, PM_{10}, and $PM_{2.5}$. Therefore, Riverside County has been designated as a state non-attainment area for ozone and PM_{10}. The state has not yet issued a formal status for $PM_{2.5}$. Table 10 lists the state and federal attainment status for all regulated pollutants. Ambient air pollutant concentrations in Riverside County are measured at eleven air quality monitoring stations operated by the SCAQMD. The SCAQMD air quality monitoring stations that represents the project area, climate, and topography in the Basin are the Temecula and Lake Elsinore monitoring stations. The Temecula monitoring station is located at 33700 Borel Road, in Winchester, approximately 6.5 miles northeast of the project area. The station monitors O_3 and $PM_{2.5}$. Because this monitoring station is new and does not monitor PM_{10}, data was supplemented from the Lake Elsinore Station, located on West Flint Street; this station is located approximately 14.5 miles northwest of the project area. Table 11 provides a summary of measurements collected at these monitoring stations for the years 2019 through 2021.

Table 10. State and Federal Attainment Status.

Pollutant	State Attainment Status	Federal Attainment Status
Ozone (O_3)	Nonattainment	Nonattainment (Extreme).
Respirable Particulate Matter (PM_{10})	Nonattainment	Attainment (Maintenance Area)
Fine Particulate Matter ($PM_{2.5}$)	Nonattainment	Nonattainment (Serious)
Carbon Monoxide (CO)	Attainment	Attainment (Maintenance Area)
Nitrogen Dioxide (NO_2)	Attainment	Unclassified
Sulfur Dioxide (SO_2)	Attainment	Attainment/Unclassifiable
Lead (Pb)	Attainment	Unclassifiable/Attainment
Visibility-Reducing Particles	Attainment	N/A
Sulfates	Attainment	N/A
Hydrogen Sulfide	Attainment	N/A
Vinyl Chloride	Attainment	N/A

Table 11. Air Quality Concentrations for the Past Three Years

Pollutant	Standard	2019	2020	2021
Ozone (33700 Borel Road Station in Temecula)				
Max 1-hr concentration		0.091	0.108	0.095
No. days exceeded: State	0.09 ppm	0	5	1
Max 8-hr concentration		0.079	0.091	0.083
No. days exceeded: State Federal	0.070 ppm 0.070 ppm	6	37	10
Carbon Monoxide (33700 Borel Road Station in Temecula)				
Max 1-hr concentration		*	*	*
No. days exceeded: State Federal	20 ppm 35 ppm	*	*	*
Max 8-hr concentration		*	*	*
No. days exceeded: State Federal	9.0 ppm 9 ppm	*	*	*
PM_{10} (West Flint Street Station in Lake Elsinore)				
Max 24-hr concentration		193.8	1092.4	90.0
No. days exceeded: State Federal	50 µg/m^3 150 µg/m^3	* 0	* 1	* 0
Max annual concentration		19.7	23.7	22.4
No. days exceeded: State	20 µg/m^3	*	*	*
$PM_{2.5}$ (West Flint Street Station in Lake Elsinore)				
Max 24-hr concentration		17.6	41.6	28.8
No. days exceeded: Federal	35 µg/m^3	*	*	*
Max annual concentration		*	7.2	6.9
No. days exceeded: State Federal	12 µg/m^3 12.0 µg/m^3	*	*	*

Pollutant	Standard	2019	2020	2021
Nitrogen Dioxide (West Flint Street Station in Lake Elsinore)				
Max 1-hr concentration		38.0	43.6	43.7
No. days exceeded: State	0.18 ppm	0	0	0
Federal	100 ppb	0	0	0
Max annual concentration		6	7	7
No. days exceeded: State	0.030 ppm	0	0	0
Federal	53 ppb			
Notes: * = No Data Available Source: ARB 2023				

3.2.2 Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are NAAQS, the EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories and refineries).

Controlling air toxic emissions became a national priority with the passage of the CAA Amendments of 1990, whereby Congress mandated the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Volume 73, No. 201, page 61,358; October 16, 2008) and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System (IRIS). In addition, the EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from its 2011 National Air Toxics Assessment. These are acrolein, benzene, 1,3-butadiene, acetaldehyde, diesel PM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the FHWA considers these the priority MSAT, the list is subject to change and may be adjusted in consideration of future EPA rules. Table 12 lists the ambient concentrations of the MSATs at the nearest station that monitors MSATs to the project site, the Riverside-Rubidoux station located at 5888 Mission Boulevard in Riverside, approximately 37 miles to the north.

Table 12. Mobile Source Air Toxic Measured Concentrations in the Project Vicinity.

MSAT	Unit	2016	2017	2018
Acrolein	ppb	1.3	0.6	2.1
Benzene	ppb	0.82	1.1	1.2
1,3-Butadiene	ppb	0.17	0.17	0.16
Acetaldehyde	ppb	2.7	2.8	*
Ethylbenzene	ppb	0.9	0.5	0.5
Formaldehyde	ppb	7.7	7.4	*

Source: ARB 2021
MSAT = Mobile Source Air Toxic
ppb = parts per billion
* = No measurements available

3.2.3 Greenhouse Gas and Climate Change

CO_2, as part of the carbon cycle, is an important compound for plant and animal life, but also accounted for 84% of California's total GHG emissions in 2015. Transportation, primarily on-road travel, is the single largest source of CO_2 emissions in the state.

The proposed project is located in Temecula, Riverside County, and is included in SCAG's 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023). The Western Riverside Council of Governments' (WRCOG) Subregional Climate Action Plan includes Temecula as a participating city and provides GHG emission inventories for the region and City (WRCOG 2014). Total emissions in 2010 for the WRCOG subregion were 5,834,400 MT CO_2e. Emissions for Temecula in 2010 were approximately 600,000 MT CO_2e, which was the second largest for participating cities behind Riverside. Emissions for the WRCOG subregion were estimated to be 9,113,087 MT CO_2e in 2035; emissions for Temecula were estimated to be approximately 1,000,000 MT CO_2e in 2035. The majority of emissions under the baseline and future scenarios are from the transportation sector.

3.3 Sensitive Receptors

Sensitive populations are more susceptible to the effects of air pollution than the general population. Sensitive populations (sensitive receptors) that are in proximity to localized sources of toxics and CO are of particular concern. Land uses considered to be sensitive receptors include residences, schools, playgrounds, childcare centers, athletic facilities, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. On the basis of research showing that the zone of greatest concern near roadways is within 500 feet (or 150 meters), sensitive receptors within 500 feet (or 150 meters) have been identified and are documented in Table 13. Only the Calvary Chapel of Temecula Valley, located to the north of the project alignment, is within 500 feet; the Virgin Mary Arabic Church is located slightly outside of 500 feet, at 525 feet, to the south of the project alignment.

Table 13. Sensitive Receptors Located Within 500 feet of the Project Site.

Receptor	Description	Distance Between Receptor and Project (ft)
Place of Worship	Calvary Chapel of Temecula Valley	350

3.4 Conformity Status

The Transportation Conformity Rule is based on CAA Section 176(c), which prohibits the U.S. Department of Transportation (USDOT) and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to the State Implementation Plan (SIP) for attaining the NAAQS. Conformity applies to highway and transit projects and takes place on two levels: the regional (or planning and programming) level and the project level. The proposed project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and maintenance (former nonattainment) areas for the NAAQS, and only for the specific NAAQS that are or were violated. EPA regulations at 40 CFR 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for the NAAQS and do not apply at all for State standards regardless of the status of the area.

3.4.1 Regional Conformity

Section 176(c) of the federal CAA requires the following:

> No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an implementation plan after it has been approved …

Conformity to an implementation plan means:

(A) conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards; and

(B) that such activities will not

- (i) cause or contribute to any new violation of any standard in any area;
- (ii) increase the frequency or severity of any existing violation of any standard in any area; or
- (iii) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The determination of conformity shall be based on the most recent estimates of emissions, and such estimates shall be determined from the most recent population, employment, travel and congestion estimates as determined by the MPO or other agency authorized to make such estimates.

In November 1993, the FHWA and U.S. EPA developed guidance for determining conformity of transportation plans, programs, and projects. This guidance is denoted as the Transportation Conformity Rule (40 CFR Section 51.390 and 40 CFR Sections 93.100–129).

The CAA requires a demonstration that federal actions conform to the SIP and similar approved plans in areas that are designated as non-attainment or have maintenance plans for criteria pollutants. Transportation measures, such as the project, are analyzed for conformity with the SIP as part of the RTP and RTIP. If the design concept and scope of a proposed transportation project are consistent with the project description in the applicable RTP and RTIP, and the assumptions in the regional emissions analysis for the RTP and RTIP, then the project would conform to the SIP, and no adverse regional air quality impact would occur as a result of the project.

As discussed, the project is included in the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023; RTP ID 991203) and the conforming 2023 FTIP (Amendment 23-03, approved June 9, 2023; FTIP ID 991203A). The project is described in the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023) as "in western Riv Co in the City of Temecula: phase 1: extend overland drive (4 lanes) from commerce center drive to Avenida Alvarado/Diaz Rd intersection. See 991203a for phase 2 bridge project." The project is described in the 2023 FTIP (Amendment 23-03, approved June 9, 2023) as "in western Riv Co in the City of Temecula: Phase 2: replace 2-lane low water crossing with 4-lane bridge (BR#00L0087) over Murrieta Creek at Avenida Alvarado. See 991203 for Phase 1."

The project was discussed among stakeholders at a Transportation Conformity Working Group (TCWG) meeting on July 28, 2020, pursuant to the interagency consultation requirement of 40 CFR 93.105(c)(1)(i). The members of the TCWG confirmed that the project, RTP Project ID 991203, would not be considered a project of air quality concern. The TCWG determination is included as Appendix D. A follow-up letter from SCAG on September 26, 2022 confirmed to the City of Temecula that this July 28, 2020 TCWG finding also applied to FTIP Project ID 991203A (included in Appendix D). SCAG cannot pass regional conformity using EMFAC2017. SCAG's 2020-2045 RTP/SCS (and Amendment #3, approved June 9, 2023) used EMFAC2014 for their regional conformity analysis. EMFAC2017 was not used.

While the project has not been part of any amendments, the FHWA made a finding of conformity on the 2020-2045 RTP/SCS through Amendment #3 on June 9, 2023, included as Appendix B. In addition, the FHWA approved the 2023 FTIP Consistency Amendment #23-03 and concurred that the associated conformity determination conformed to the applicable SIP in accordance with the provisions of 40 CFR Parts 51 and 93 on June 9, 2023, also included as Appendix B. Therefore, the project is assumed to conform to the SIP and no adverse regional or local air quality impact would occur as a result of the project. Furthermore, implementation of the project would ensure that the City would be consistent with the 2020 SCAG RTP/SCS (Amendment #3, approved June 9, 2023) and 2023 FTIP (Amendment 23-03, approved June 9, 2023). Conformity status information is summarized in Table 14. In addition, the Transportation Air Quality Conformity Findings Checklist is included as Appendix C.

Table 14. Status of Plans Related to Regional Conformity.

MPO	Plan/TIP	Date of adoption by MPO	Date of Approval by FHWA	Last Amendment	Date of Approval by FHWA of Last Amendment
SCAG	Regional Transportation Plan/Sustainable Communities Strategy	September 3, 2020	June 5, 2020	#3	06/09/2023
SCAG	Transportation Improvement Program (FSTIP approval)	October 6, 2022	November 16, 2022	23-03	06/09/2023

FHWA = Federal Highway Administration
FSTIP = Federal Statewide Transportation Improvement Program
MPO = Metropolitan Planning Organization
SCAG = Southern California Association of Governments
TIP = Transportation Improvement Program

3.4.2 Project-Level Conformity

The proposed project is located in an attainment/maintenance area for federal CO and federal PM_{10} standards, and a nonattainment area for federal $PM_{2.5}$ standards, thus a project-level hot-spot analysis is required under 40 CFR 93.109 for the pollutants. See Appendix D for the Interagency Consultation Documentation showing PM determinations. The proposed project does not cause or contribute to any new localized CO, $PM_{2.5}$, and/or PM_{10} violations, or delay timely attainment of any NAAQS or any required interim emission reductions or other milestones during the timeframe of the transportation plan (or regional emissions analysis).

3.4.3 Interagency Consultation

The project would not be a project of air quality concern for PM_{10} or $PM_{2.5}$ emissions because the project would not result in increases in the number of diesel vehicles utilizing the project area; does not involve intersections that are operating at LOS D, E, or F with a significant number of diesel vehicles; does not involve a new or expanded bus or rail terminal; and would not affect a location or category of site which are identified in the PM_{10} implementation plan as sites of violation or possible violation. The project was discussed among stakeholders at a Transportation Conformity Working Group (TCWG) meeting on July 28, 2020, pursuant to the interagency consultation requirement of 40 CFR 93.105(c)(1)(i). The members of the TCWG confirmed that the project would not be considered a project of air quality concern. The TCWG determination in included as Appendix D. A follow-up letter from SCAG on September 26, 2022 confirmed to the City of Temecula that this July 28, 2020 TCWG finding also applied to FTIP Project ID 991203A (included in Appendix D).

3.5 NEPA Analysis/Requirement

NEPA applies to all projects that receive federal funding or involve a federal action. NEPA requires that all reasonable alternatives for the proposed project are rigorously explored and objectively evaluated. As described above, the proposed project is listed in a conforming RTP and FTIP. Project construction will last less than 3 years and will not substantially impact traffic due to detours, road closures, and temporary terminations. Therefore, impacts of the resulting traffic flow changes do not need to be analyzed.

3.6 CEQA Analysis/Requirement

CEQA applies to most California transportation projects (certain projects are statutorily exempt). CEQA requires that a range of reasonable alternatives to the project that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project are explored. For CEQA, the air quality study should address pollutants for which California has established air quality standards (ozone, PM_{10}, $PM_{2.5}$, carbon monoxide, NO_2, SO_2, lead, visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride), as well as GHGs, MSATs, and asbestos. Similar to NEPA, analysis/documentation requirements for CEQA vary by pollutant (see the table in Section 4.1); ranging from a narrative describing that the pollutant is typically not a transportation issue to an emissions analysis. If construction will last more than three years and/or will substantially impact traffic due to detours, road closures, and temporary terminations, then impacts of the resulting traffic flow changes may need to be analyzed. As described above, the proposed project is listed in a conforming RTP and FTIP. Project construction will last less than three years and will not substantially impact traffic due to detours, road closures, and temporary terminations. Therefore, impacts of the resulting traffic flow changes do not need to be analyzed.

4. Environmental Consequences

This section describes the methods, impact criteria, and results of air quality analyses of the proposed project. Analyses in this report were conducted using methodology and assumptions that are consistent with the requirements of NEPA, CEQA, the CAAAs of 1990, and the CCAA of 1988. The analyses also use guidelines and procedures provided in applicable air quality analysis protocols, such as the Transportation Project-Level Carbon Monoxide Protocol (CO Protocol) (Garza et al., 1997), Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{10} and $PM_{2.5}$ Nonattainment and Maintenance Areas (U.S. EPA, 2015), and the FHWA Updated Interim Guidance on Air Toxics Analysis in NEPA Documents (FHWA, 2016c).

4.1 Impact Criteria

Project-related emissions will have an adverse environmental impact if they result in pollutant emissions levels that either create or worsen a violation of an ambient air quality standard (identified in Table 6) or contribute to an existing air quality violation.

4.2 Short-Term Effects (Construction Emissions)

4.2.1 Construction Equipment, Traffic Congestion, and Fugitive Dust

Regional Emissions

The principal criteria pollutants emitted during construction would be PM_{10} and $PM_{2.5}$. The source of the pollutants would be fugitive[6] dust created during clearing, grubbing, excavation, and grading; demolition of structures and pavement; vehicle travel on paved and unpaved roads; and material blown from unprotected graded areas, stockpiles, and haul trucks. Generally, the distance that particles drift from their source depends on their size, emission height, and wind speed.

The potential settling distance of dust particles is governed by the initial injection height of the particle, the terminal settling velocity of the particle, and the degree of atmospheric turbulence. For a typical mean wind speed of 10 miles per hour, particles larger than PM 100 microns in diameter or smaller are likely to settle out within 20 to 30 feet from the edge of the point of emission (U.S. EPA 2009). Smaller particles (PM 30 microns in diameter or smaller to PM 100 microns) are likely to settle, depending upon the extent of atmospheric turbulence, within a few hundred feet from the point of

6 "Fugitive" is a term used in air quality analysis to denote emission sources that are not confined to stacks, vents, or similar paths.

emission. Finer particles, particularly PM_{10}, which includes $PM_{2.5}$, settle much slower due to atmospheric turbulence and can travel hundreds of miles (U.S. EPA, 2009).

A secondary source of pollutants during construction would be the engine exhaust from construction equipment during all construction activities. The principal pollutants of concern would be NO_X and ROG emissions that would contribute to the formation of O_3, which is a regional non-attainment pollutant.

Federal conformity regulations require analysis of construction impacts for projects when construction activities will last for more than 5 years. Project construction would begin in 2024, and construction activities would last approximately 17 months. Therefore, no quantitative estimate of regional construction emissions is required. However, for informational purposes, construction emissions were quantified. Additionally, specific measures to control dust and particulates related to SCAQMD rules are assumed to be part of project specifications. These measures are identified in Chapter 5.0.

Construction emissions were estimated using the latest Sacramento Metropolitan Air Quality Management District's (SMAMQD's) Road Construction Emissions Model (RCEM) (http://www.airquality.org/ceqa/, Version 9.0.0). While the model was developed for Sacramento conditions in terms of fleet emission factors, silt loading, and other model assumptions, it is considered adequate for estimating road construction emissions by the SCAQMD (in its CEQA guidance) and is used for that purpose in this project analysis. The model only allows inputs under four phases: grubbing/land clearing, grading/excavation, drainage/utilities/sub-grade, and paving. Therefore, the project phases and equipment shown in Table 5 and Table 6**Error! Reference source not found.** have been combined under the listed RCEM phases as shown in Table 15. In addition, all equipment under each phase was conservatively assumed to operate for that entire phase; e.g., under Site Preparation, the equipment under Traffic Control And Demolition and Clearing and Grubbing were assumed to operate at the same time, even though they would be scheduled sequentially. The longest round trip distances identified in Table 7 were also used for each phase.

Table 15. Construction Activities and Schedule for RCEM Input.

Construction Phase	Applicable RCEM Phase
Advertisement and Award Advertisement and Award	N/A
Site Preparation Traffic Control and Demolition Clearing and Grubbing	Grubbing/Land Clearing
Channel Grading Grading Channel Slopes	Grading/Excavation

Construction Phase	Applicable RCEM Phase
Stage I Construction Bridge Construction - Foundation Bridge Construction – Substructure Bridge Construction – Superstructure Grading/Embankment Backfill/Pavement	Drainage/Utilities/Sub-Grade
Stage II Construction Traffic Control and Demolition Grading/Embankment Backfill/Pavement	Paving
Project Closure Demobilization/Project Closure	N/A

Construction-related emissions for the project are presented in Table 16. The results of the construction emission calculations are included in Appendix E. The emissions presented are based on the best information available at the time of calculations. The emissions represent the peak daily construction emissions that would be generated by the project. As shown in the table, the emissions would not exceed SCAQMD thresholds.

Table 16. Project Construction Emissions for Roadways.

	ROG (lbs/day)	PM_{10} (lbs/day)	$PM_{2.5}$ (lbs/day)	CO (lbs/day)	SO_X (lbs/day)	NO_x (lbs/day)
Grubbing/Land Clearing	1.30	15.19	3.27	30.60	0.05	3.92
Grading/Excavation	2.28	15.35	3.37	44.14	0.08	5.15
Drainage/Utilities/Sub-Grade	4.74	15.68	3.68	106.23	0.17	12.31
Paving	3.46	0.44	0.36	71.72	0.12	8.82
Maximum Daily or Average Daily	**4.74**	**15.68**	**3.68**	**106.23**	**0.17**	**12.31**
SCAQMD Significance Threshold	*75*	*150*	*55*	*550*	*150*	*100*
Significant Impact?	**No**	**No**	**No**	**No**	**No**	**No**
Project Total (Tons)	0.76	2.39	0.56	16.79	0.03	1.97

Implementation of the following measures, some of which may also be required for other purposes such as storm water pollution control, will reduce air quality impacts resulting from construction activities. Please note that although these measures are anticipated to reduce construction-related emissions, these reductions cannot be quantified at this time.

- The construction contractor must comply with the Caltrans' Standard Specifications in Section 14-9 (2018).
  - Section 14-9-02 specifically requires compliance by the contractor with all applicable laws and regulations related to air quality, including air pollution control district and air quality management district regulations and local ordinances.
- Water or a dust palliative will be applied to the site and equipment as often as necessary to control fugitive dust emissions.
- Soil binder will be spread on any unpaved roads used for construction purposes, and on all project construction parking areas.
- Trucks will be washed as they leave the right-of-way as necessary to control fugitive dust emissions.
- Construction equipment and vehicles will be properly tuned and maintained. All construction equipment will use low sulfur fuel as required by CA Code of Regulations Title 17, Section 93114.
- A dust control plan will be developed documenting sprinkling, temporary paving, speed limits, and timely re-vegetation of disturbed slopes as needed to minimize construction impacts to existing communities.
- Equipment and materials storage sites will be located as far away from residential and park uses as practicable. Construction areas will be kept clean and orderly.
- Environmentally sensitive areas will be established near sensitive air receptors. Within these areas, construction activities involving the extended idling of diesel equipment or vehicles will be prohibited, to the extent feasible.
- Track-out reduction measures, such as gravel pads at project access points to minimize dust and mud deposits on roads affected by construction traffic, will be used.
- All transported loads of soils and wet materials will be covered before transport, or adequate freeboard (space from the top of the material to the top of the truck) will be provided to minimize emission of dust during transportation.
- Dust and mud that are deposited on paved, public roads due to construction activity and traffic will be promptly and regularly removed to reduce PM emissions.
- To the extent feasible, construction traffic will be scheduled and routed to reduce congestion and related air quality impacts caused by idling vehicles along local roads during peak travel times.
- Mulch will be installed or vegetation planted as soon as practical after grading to reduce windblown PM in the area.

4.2.2 Asbestos

According to the report *A General Location Guide for Ultramafic Rocks in California-Area Likely to Contain Naturally Occurring Asbestos* (CDC 2000), within Riverside County naturally occurring asbestos are not typically found in the geological formations present on the project site (CDC 2000). Thus, hazardous exposure to asbestos-containing serpentine materials would not be a concern with the project.

4.2.3 Lead

Lead is normally not an air quality issue for transportation projects unless the project involves disturbance of soils containing high levels of aerially deposited lead or painting or modification of structures with lead-based coatings. There are no known soils containing high levels of aerially deposited lead, nor does the proposed project include painting or modification of structures with lead-based coatings. Thus, there is no requirement for an analysis of lead emissions.

4.3 Long-Term Effects (Operational Emissions)

The CAA requires a demonstration that federal actions conform to the SIP and similar approved plans in areas that are designated as non-attainment or have maintenance plans for criteria pollutants. Transportation measures, such as the project, are analyzed for conformity with the SIP as part of the RTP and RTIP. If the design concept and scope of a proposed transportation project are consistent with the project description in the applicable RTP and RTIP, and the assumptions in the regional emissions analysis for the RTP and RTIP, then the project would conform to the SIP, and no adverse regional air quality impact would occur as a result of the project.

SCAG, as the area's MPO, and the FHWA must make a determination that the applicable RTP and RTIP conform to the applicable SIP. Conformity to the SIP means that transportation activities will not create new air quality violations, worsen existing violations, or delay the attainment of the NAAQS. Federal regulations also require SCAG to conduct an air quality conformity analysis of all regionally significant projects that increase the transportation system capacity. All regionally significant capacity-increasing transportation projects, regardless of funding sources, must be included in the RTIP.

As discussed, the project is included in the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023;RTP ID 991203) and the conforming 2023 FTIP (Amendment 23-03, approved June 9, 2023; FTIP ID 991203A). The project is described in the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023) as "in western Riv Co in the City of Temecula: phase 1: extend overland drive (4 lanes) from commerce center drive to Avenida Alvarado/Diaz Rd intersection. See 991203a for phase 2 bridge project." The project is described in the 2023 FTIP (Amendment 23-03, approved June 9, 2023) as "in western Riv Co in the City of Temecula: Phase 2: replace 2-lane low water crossing with 4-lane bridge (BR#00L0087) over Murrieta Creek at Avenida Alvarado. See 991203 for Phase 1."

The project was discussed among stakeholders at a Transportation Conformity Working Group (TCWG) meeting on July 28, 2020, pursuant to the interagency consultation requirement of 40 CFR 93.105(c)(1)(i). The members of the TCWG confirmed that the project, RTP Project ID 991203, would not be considered a project of air quality concern. The TCWG determination is included as Appendix

D. A follow-up letter from SCAG on September 26, 2022 confirmed to the City of Temecula that this July 28, 2020 TCWG finding also applied to FTIP Project ID 991203A (included in Appendix D). SCAG cannot pass regional conformity using EMFAC2017. SCAG's 2020-2045 RTP/SCS (and Amendment #3, approved June 9, 2023) used EMFAC2014 for their regional conformity analysis. EMFAC2017 was not used.

While the project has not been part of any amendments, the FHWA made a finding of conformity on the 2020-2045 RTP/SCS through Amendment #3 on June 9, 2023, included as Appendix B. In addition, the FHWA approved the 2023 FTIP Consistency Amendment #23-03 and concurred that the associated conformity determination conformed to the applicable SIP in accordance with the provisions of 40 CFR Parts 51 and 93 on June 9, 2023, also included as Appendix B. Therefore, the project is assumed to conform to the SIP and no adverse regional or local air quality impact would occur as a result of the project. Furthermore, implementation of the project would ensure that the City would be consistent with the 2020 SCAG RTP/SCS (Amendment #3, approved June 9, 2023) and 2023 FTIP (Amendment 23-03, approved June 9, 2023).

In addition, while the project's VMT Analysis Technical Memorandum (STC Traffic, Inc., 2021) showed that project study area VMT will be 2,618 VMT per day under the Opening Year (2025) scenario and 2,922 VMT per day in the Horizon Year (2045), project study area VMT is only shown to be increasing because the project study area VMT analysis does not consider redistribution of traffic and potential VMT reductions on routes outside of the study area (e.g., Rancho California). The project study area was determined by the City for traffic flow purposes and not for VMT purposes. In reality, the proposed project does not increase capacity, and would reduce VMT for current trips on the network as the new roadway segment lowers VMT for journeys from Overland Drive to Diaz Road and Avenida Alvarado. The distance from the Overland Drive/Enterprise Circle intersection to the Diaz Road/ Avenida Alvarado intersection is currently 0.7 miles. The distance between the two intersections across the creek is approximately 825 feet. This is an approximate reduction of 2,870 feet traveled per vehicle trip. With a reduction in overall trip distance for the area, the project would result in emissions reductions compared to the No Build Alternative.

4.3.1 CO Analysis

The Transportation Conformity Rule requires a statement that: federal projects must not cause or contribute to any new localized CO violations or increase the frequency or severity of any existing CO violations in CO nonattainment and maintenance areas.

The CO portion of the Rule applies to the proposed project because the Basin is classified as a federal CO maintenance area. The air quality analyses of the RTP and RTIP do not include the analyses of local CO impacts; these must be addressed on a project level.

The determination of project-level CO impacts was carried out in accordance with the Project-Level Conformity Process flowchart, adopted by Caltrans in May 2022. The procedures of the Project-Level Conformity Process flowchart are provided below for the proposed project to determine the level of analysis (if any):

Page 1, Box 1: Project Area is subject to conformity

Response: Yes, the Project Area is subject to conformity.

Page 1, Box 2: Project exempt from conformity? (40 CFR 93.126, 128)

Response: No, the project is not exempt from conformity.

Page 1, Box 3: Project Exempt from Regional Analysis? (40 CFR 93.127)

Response: No, the project is not exempt from regional analysis.

Page 1, Box 4: Based on Interagency Consultation, is the project Regionally Significant and is the project located in a CO, PM10, or PM2.5 area?

Response: Based on Interagency Consultation, the project is Regionally Significant and located in a PM10 and PM2.5 area. While not mentioned in the Interagency Consultation, it is a CO maintenance area.

Page 1, Box 5: Based on Interagency Consultation concurrence, is a Conformity Hot Spot Analysis needed (in CO, PM10, PM2.5 areas)?

Response: CO is not discussed in the Interagency Consultation; therefore, proceed to CO Protocol (Page 2) .

Page 2, Box 1: Is the project in a CO nonattainment or maintenance area?

Response: The project is located in a CO maintenance area. Therefore, perform CO Hot Spot Analysis (see below).

Procedures and guidelines for use in evaluating the potential local level CO impacts of a project are contained in Transportation Project-Level Carbon Monoxide Protocol (CO Protocol) (UCD ITS 1997). The CO Protocol provides a methodology for determining the level of analysis, if any, required on a project. The guidelines comply with the CAA, federal and state conformity rules, NEPA, and CEQA.

The CO Protocol states that the determination of project-level CO impacts should be carried out in accordance with the Local CO Analysis flow charts shown as Figures 1 and 3 of the Protocol. Figure 1 of the Protocol applies to the evaluation of new projects.

The procedures of Figure 1 of the Protocol is provided for the proposed project to determine the level of analysis (if any):

Question 3.1.1: Is the project exempt from all emissions analyses?

Answer: No. The proposed project does not meet the criteria for “Projects Exempt from All Emissions Analyses,” as listed in the Protocol. Go to Question 3.1.2.

Question 3.1.2: Is the project exempt from regional emissions analyses?

Answer: No. The proposed project does not meet the criteria for "Projects Exempt from Regional Emissions Analyses," as listed in the Protocol. Go to Question 3.1.3.

Question 3.1.3: Is the project locally defined as "Regionally Significant"?

Answer: Yes. The project meets the Protocol's definition of a regionally significant transportation project as defined in 40 CFR 93.101. Go to Question 3.1.4.

Question 3.1.4: Is the project in a federal attainment area?

Answer: No. The project is located in a federal nonattainment area for O3. Go to Question 3.1.5.

Question 3.1.5: Is there a currently conforming RTP and RTIP?

Answer: Yes. The project is included in SCAG's 2020-2045 RTP (Amendment #3, approved June 9, 2023) and 2023 FTIP (Amendment 23-03, approved June 9, 2023); the FHWA and the FTA approved their air quality conformity analysis. Go to Question 3.1.6.

Question 3.1.6: Is the project included in the regional emissions analysis supporting the currently conforming RTP and RTIP?

Answer: Yes. The project is consistent with the assumptions in the SCAG's regional emissions analysis. Go to Question 3.1.7

Question 3.1.7: Has the project design concept and/or scope changed significantly from that of the regional analysis?

Answer: No. The design concept and scope of the proposed project are consistent with the project description in the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023), the 2023 FTIP (Amendment 23-03, approved June 9, 2023), and the assumptions in the SCAG's regional emissions analysis. Proceed to Step 3.1.9, Examine Local Impacts; Go to Section 4 – Figure 3 of the Protocol.

The determination of project-level CO impacts should be carried out according to the Local Analysis flow chart – Figure 3 of the CO Protocol. The procedures of Section 4 in Figure 3 of the Protocol are provided for the proposed project to identify the level of effort required.

Section 4, Local CO Analysis, Level 1

Question: Is the project in a CO nonattainment area?

Answer: No. The project is in a CO attainment-maintenance area, following a redesignation from a CO nonattainment area. Go to next question.

Question: Was the area redesignated as "attainment" after the 1990 Clean Air Act?

Answer: Yes. The area was redesignated as attainment after 1990. Go to next question.

Question: Has "continued attainment" been verified with the local air district (if appropriate)?

Answer: Yes. Continued attainment has been verified with the SCAQMD. Proceed to Level 7.

Level 7

Question: Does the project worsen air quality?

The Protocol guidance for this question states: "Only those projects that are likely to worsen air quality necessitate further analysis." To determine whether a project is likely to worsen air quality for the area substantially affected by the project, the guidance provides the following questions:

Question: Would "the project significantly increase the percentage of vehicles operating in cold start mode"? An increase of as little as 2% could be significant.

Answer: No. The project would not increase the number of vehicles operating in cold start mode. The project is to complete the local transportation network and would redistribute existing traffic in the area; the project would not create new situations where vehicles are stopping for over 720 minutes and restarting the engine (a "cold start" in EMFAC2021).

Question: Would "the project significantly increase traffic volumes"? Traffic volume increases of 5% or more could be significant. Additionally, an increase of less than 5% may still be significant, if there is also a reduction in average speeds.

Answer: No. The project does not involve development of housing, employment centers, or other attractions, and thus, would not itself generate traffic volumes. The widening would accommodate increased traffic volumes on this segment of Avenida Alvarado by providing increased efficiency via expanded connectivity.

Question: Would "the project worsen traffic flow"? A reduction in average speeds of 3 to 50 mph or an increase in average delay (LOS) at an intersection could be regarded as worsening traffic flow.

Answer: No. Based on the project traffic report, with previously identified mitigation incorporated, all affected intersection would operate at LOS D or better (STC 2019). Therefore, the project would not worsen traffic flow, defined for intersections as increasing average delay at signalized intersections operating at LOS E or F.

Project Satisfied – no further analysis needed.

According to the CO Protocol, the proposed project is considered satisfactory and no further CO analysis is required. Therefore, no localized CO impacts would occur.

4.3.2 PM Analysis

Emissions Analysis

On March 10, 2006, the U.S. EPA published a final rule that establishes the transportation conformity criteria and procedures for determining which transportation projects must be analyzed for local air quality impacts in $PM_{2.5}$ and PM_{10} non-attainment and maintenance areas. Based on that rule, the U.S. EPA and FHWA published *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (PM Guidance; FHWA 2015). As discussed, Riverside County is designated as a non-attainment area for the $PM_{2.5}$ standards and a maintenance area for the PM_{10} standard.

While the project's VMT Analysis Technical Memorandum (STC Traffic, Inc., 2021) showed that project study area VMT will be 2,618 VMT per day under the Opening Year (2025) scenario and 2,922 VMT per day in the Horizon Year (2045), project study area VMT is only shown to be increasing because the project study area VMT analysis does not consider redistribution of traffic and potential VMT reductions on routes outside of the study area (e.g., Rancho California). The project study area was determined by the City for traffic flow purposes and not for VMT purposes. In reality, the proposed project does not increase capacity, and would reduce VMT for current trips on the network as the new roadway segment lowers VMT for journeys from Overland Drive to Diaz Road and Avenida Alvarado. The distance from the Overland Drive/Enterprise Circle intersection to the Diaz Road/ Avenida Alvarado intersection is currently 0.7 miles. The distance between the two intersections across the creek is approximately 825 feet. This is an approximate reduction of 2,870 feet traveled per vehicle trip. With a reduction in overall trip distance for the area, the project would result in PM emissions reductions compared to the No Build Alternative.

Hot-Spot Analysis

A hot spot analysis is defined in 40 CFR 93.101 as an estimation of likely future localized $PM_{2.5}$ or PM_{10} pollutant concentrations and a comparison of those concentrations to the relevant air quality standards. A hot spot analysis assesses the air quality impacts on a scale smaller than an entire non-attainment or maintenance area, including, for example, congested roadway intersections and highways or transit terminals. Such an analysis is a means of demonstrating that a transportation project meets CAA conformity requirements to support state and local air quality goals with respect to potential localized air quality impacts. When a hot spot analysis is required, it is included within the project-level conformity determination that is made by the FHWA or Federal Transportation Administration.

The PM Guidance describes how to complete a quantitative hot spot analyses for certain highway and transit projects, and provides technical guidance on estimating project emissions. The $PM_{2.5}$ and PM_{10} hot spot analysis method in the November 2015 Guidance involves two steps: determining whether or not a project is a "project of air quality concern" and, if it is a "project of air quality concern", preparation of a more detailed quantitative analysis of the project. The November 2015 PM Guidance defines the following types of projects as projects of air quality concern (FHWA, 2015):

- New highway project that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles;
- Projects affecting intersections that are Level of Service (LOS) D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F, because of increased traffic volumes from a significant number of diesel vehicles related to the project;
- New bus and rail terminals, and transfer points, that have a significant number of diesel vehicles congregating at a single location;
- Expanded bus and rail terminals, and transfer points, that significantly increase the number of diesel vehicles congregating at a single location; and,
- Projects in, or affecting locations, areas, or categories of sites that are identified in the $PM_{2.5}$ or PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

A significant volume for a new highway or expressway is defined as an annual average daily traffic (AADT) volume of 125,000 or more, and a significant number of diesel vehicles is defined as 8 percent or more of that total AADT or more than 10,000 truck AADT. A significant increase in diesel truck traffic is normally considered to be approximately 10 percent.

The proposed extension of Overland Drive would improve traffic operations on the roadway network in the vicinity of the project.

The project is the extension of a roadway that does not increase the capacity of I-15 or other regional arterials. This type of project improves existing traffic network deficiencies within the city. The extension would be a 4-lane arterial with a capacity of 29,000 ADT (SCT 2019), and long-term (year 2045) projected traffic volumes ranging from 2,521 to 3,751 ADT along Avenida Alvarado between Diaz Road and Enterprise Circle (STC 2019). While the project would create a new roadway segment, the traffic volumes along Avenida Alvarado would not approach or exceed the 125,000 AADT criterion for a project of air quality concern. In addition, the total truck volume would remain below the 10,000 AADT criterion (8 percent of 125,000 AADT) for project of air quality concern. According to the traffic engineer for the project, Avenida Alvarado would carry approximately 7 percent trucks.[7] This is the current truck volume for I-15 at SR 79, and is appropriate for evaluation of the project as it is a cross-street of I-15 and runs parallel to the future extension of Avenida Alvarado. Based on 7 percent truck trips on Avenida Alvarado, the horizon year 2040 truck volume on Avenida Alvarado would range from 176 to 263 AADT. Additionally, the project is not a trip generator. Implementation of the project would redress the existing traffic network deficiencies within the city of Temecula and provide improved access to businesses and other properties south of northeast and southwest of Murrieta Creek. Travelers would no longer need to travel the additional distance required under the existing condition and would have improved direct access to I-15. Additionally, the proposed roadway improvements would not reduce levels of service below what would occur under the Near-Term No Build scenario.

The project would not be a project of air quality concern for PM_{10} or $PM_{2.5}$ emissions because the project would not result in increases in the number of diesel vehicles utilizing the project area; does not involve intersections that are operating at LOS D, E, or F with a significant number of diesel vehicles; does not involve a new or expanded bus or rail terminal; and would not affect a location or category of site which are identified in the PM_{10} implementation plan as sites of violation or possible violation. The project was discussed among stakeholders at a Transportation Conformity Working Group (TCWG) meeting on July 28, 2020, pursuant to the interagency consultation requirement of 40 CFR 93.105(c)(1)(i). The members of the TCWG confirmed that the project would not be considered a project of air quality concern. The TCWG determination in included as Appendix D. A follow-up letter from SCAG on September 26, 2022 confirmed to the City of Temecula that this July 28, 2020 TCWG finding also applied to FTIP Project ID 991203A (included in Appendix D).

4.3.3 NO_2 Analysis

The U.S. EPA modified the NO_2 NAAQS to include a 1-hour standard of 100 parts per billion (ppb) in 2010. Currently there is no federal project-level nitrogen dioxide (NO_2) analysis requirement.

[7] STC Traffic, Inc., 2020.

However, NO_2 is among the near-road pollutants of concern. Within the project area, it is unlikely that NO_2 standards will be approached or exceeded based on the relatively low ambient concentrations of NO_2 in the South Coast Basin and on the long-term trend toward reduction of NO_X emissions. Because of these factors, a specific analysis of NO_2 was not conducted for the proposed project.

4.3.4 Mobile Source Air Toxics Analysis

The following discussion is based on the FHWA Memorandum "Information: Updated Interim Guidance on Mobile Source Air Toxic Analysis (MSAT) in NEPA Documents," dated October 18, 2016 (FHWA, 2016c). The purpose of the guidance is to advise when and how to analyze MSAT in the NEPA process for highways. This guidance is provisional because MSAT science is still evolving. As the science progresses, FHWA will update the guidance.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of U.S. EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the National Air Toxics Assessment database best illustrate the levels of various toxics when aggregated to a national or State level.

The U.S. EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The U.S. EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris.

The following toxicity information for the nine prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from U.S. EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.

- **Benzene** is characterized as a known human carcinogen.
- **Diesel exhaust** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases. Diesel exhaust also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **Naphthalene** is a possible human carcinogen, based on the inadequate data of carcinogenicity in humans exposed to naphthalene via the oral and inhalation routes, and the limited evidence of carcinogenicity in animals via the inhalation route.
- **Polycyclic organic matter** is a probable human carcinogen based on sufficient evidence in animals.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by U.S. EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics.

The following recent studies have reported that proximity to roadways is related to adverse health outcomes, particularly respiratory problems: *Multiple Air Toxic Exposure Study-II*, SCAQMD (2000); *Highway Health Hazards*, Sierra Club (2004), which summarizes 24 studies on the relationship between health and air quality; and NEPA's U*ncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles*, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein. Much of this research is not specific to MSATs and instead surveys the full spectrum of both criteria and other pollutants.

It is possible to qualitatively assess the levels of future MSAT emissions under the project. A qualitative analysis cannot identify and measure health impacts from MSATs, but it can give a basis for identifying and comparing the potential differences among MSAT emissions, if any, between the project and no project conditions. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*.

Evaluation of Project MSAT Potential

The FHWA has developed a tiered approach for analyzing MSATs in NEPA documents. Depending on the specific project circumstances, the FHWA has identified three levels of analysis:

- No analysis for projects with no potential for meaningful MSAT effects, Category (1);
- Qualitative analysis for projects with low potential MSAT effects, Category (2); or
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects, Category (3).

Category (1) is limited to projects that qualify as a categorical exclusion under 23 CFR 771.117(c); are exempt under the CAA conformity rule under 40 CFR 93.126; or have no meaningful impacts on traffic volumes or vehicle mix.

The project does not meet any of the Category (1) requirements.

For a project to be of the magnitude to have a higher potential for MSAT effects, Category (3), a project must create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location; or create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000, or greater, by the design year; and be proposed to be located in proximity to populated areas or in rural areas, in proximity to concentrations of vulnerable populations (i.e., schools, nursing homes, hospitals). For these projects, the November 2015 PM Guidance describes how to complete a quantitative hot spot analyses using the U.S. EPA's MOVES2014a model or, for projects in California, the ARB's Emission Factors (EMFAC) model.

The project would extend Overland Drive from Diaz Road to Enterprise Circle as a new four-lane facility with a bridge over Murrieta Creek. The extension would be a 4-lane arterial with a General Plan capacity of 36,000 ADT. While the project would create a new roadway segment, the estimated maximum ADT would be substantially less than the threshold value of 140,000 AADT, the minimum volume for higher potential MSAT effects (FHWA, 2016c). Therefore, the project would not be included in Category (3).

Therefore, by default, the project would be included in Category (2) and would have a low potential for MSAT effects. This assessment is based on FHWA guidance that projects that do not meet the criteria for Category (1) or Category (3) should be included in Category (2).

The primary objective of the project is to resolve existing traffic network deficiencies within the City. Currently, motorists heading east from the west side of Murrieta Creek must travel along Diaz Road and cross the creek at the Via Montezuma low water crossing, which is not always accessible during wet weather. The project would provide a variety of transportation benefits. The extension of Avenida Alvarado from Diaz Road to Enterprise Circle would reduce travel distances and ensure adequate access to local businesses. This extension would also provide a direct transportation link to new developments occurring in the immediate area.

The amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same with or without the project. Because the project would construct a new portion of Avenida Alvarado, the project would result in MSAT emissions along the Avenida Alvarado extension that currently don't exist. However, there would be a corresponding reduction in MSAT emissions along the roadway network in the vicinity of the project because vehicle trips would be rerouted to the Avenida Alvarado extension.

With or without the project, emissions will likely be lower than present levels in the design year as a result of U.S. EPA's national control programs that are projected to reduce MSAT emissions. According to an FHWA analysis using U.S. EPA's MOVES2014a model, even if vehicle activity (VMT) increases by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emission rate for the priority MSATs is projected for the same time period (FHWA, 2016). Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the U.S. EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

Therefore, there would be no local or regional air quality impacts to sensitive receptors from the project

4.3.5 Greenhouse Gas Emissions Analysis

Construction

Project construction would primarily generate GHG emissions from construction equipment operation on-site, construction worker vehicle trips to and from the site, and from export of materials off-site.

Construction emissions were estimated using the latest SMAQMD's Road Construction Emissions Model (RCEM) (http://www.airquality.org/ceqa/, Version 9.0.0). While the model was developed for Sacramento conditions in terms of fleet emission factors, silt loading, and other model assumptions, it is considered adequate for estimating road construction emissions by the SCAQMD (in its CEQA guidance) and is used for that purpose in this project analysis. The model inputs are the same as described under Section 4.2.1 for air quality emissions. Construction-related GHG emissions for the project are presented in Table 17. The results of the construction emission calculations are included in Appendix E. As shown in the table, the temporary GHG emissions would total 2,631.53 tons of CO_2 over the construction period.

Table 17. Project Construction GHG Emissions.

Construction Phase	CO_2 (lbs/day)
Grubbing/Land Clearing	4,584.59
Grading/Excavation	7,830.08
Drainage/Utilities/Sub-Grade	16,372.99
Paving	11,939.52
Maximum Daily or Average Daily	**16,372.99**
Project Total (Tons)	2,631.53

Operation

While the project's VMT Analysis Technical Memorandum (STC Traffic, Inc., 2021) showed that project study area VMT will be 2,618 VMT per day under the Opening Year (2025) scenario and 2,922 VMT per day in the Horizon Year (2045), project study area VMT is only shown to be increasing because the project study area VMT analysis does not consider redistribution of traffic and potential VMT reductions on routes outside of the study area (e.g., Rancho California). The project study area was determined by the City for traffic flow purposes and not for VMT purposes. In reality, the proposed project does not increase capacity, and would reduce VMT for current trips on the network as the new roadway segment lowers VMT for journeys from Overland Drive to Diaz Road and Avenida Alvarado. The distance from the Overland Drive/Enterprise Circle intersection to the Diaz Road/ Avenida Alvarado intersection is currently 0.7 miles. The distance between the two intersections across the creek is approximately 825 feet. This is an approximate reduction of 2,870 feet traveled per vehicle trip. With a reduction in overall trip distance for the area, the project would result in GHG emissions reductions compared to the No Build Alternative.

4.4 Cumulative/Regional/Indirect Effects

The analysis of project impacts to regional air quality, as performed by SCAG and the SCAQMD in conjunction with the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023) and 2023 FTIP (Amendment 23-03, approved June 9, 2023) process, is a cumulative analysis. The project would conform to the assumptions in the conformity analyses for the 2020-2045 RTP/SCS (Amendment #3, approved June 9, 2023) and 2023 FTIP (Amendment 23-03, approved June 9, 2023), which are long-range planning documents that include roadway projects throughout the region. Therefore, the project would not result in a cumulative impact to air quality.

5. Minimization Measures

CEQA requires that feasible measures that can eliminate or substantially reduce project impacts be addressed. FHWA requires a project to incorporate measures to mitigate adverse impacts caused by the action and requires the project applicant to be responsible for the implementation of the mitigation measures (23 CFR 771).

5.1 Short-Term (Construction)

While the project does not exceed SCAQMD significance thresholds, it would implement the following measures, some of which may also be required for other purposes such as storm water pollution control, will reduce air quality impacts resulting from construction activities. Please note that although these measures are anticipated to reduce construction-related emissions, these reductions cannot be quantified at this time.

- The construction contractor must comply with the Caltrans' Standard Specifications in Section 14-9 (2015).
  - Section 14-9-02 specifically requires compliance by the contractor with all applicable laws and regulations related to air quality, including air pollution control district and air quality management district regulations and local ordinances.
- Water or a dust palliative will be applied to the site and equipment as often as necessary to control fugitive dust emissions.
- Soil binder will be spread on any unpaved roads used for construction purposes, and on all project construction parking areas.
- Trucks will be washed as they leave the right-of-way as necessary to control fugitive dust emissions.
- Construction equipment and vehicles will be properly tuned and maintained. All construction equipment will use low sulfur fuel as required by CA Code of Regulations Title 17, Section 93114.
- A dust control plan will be developed documenting sprinkling, temporary paving, speed limits, and timely re-vegetation of disturbed slopes as needed to minimize construction impacts to existing communities.
- Equipment and materials storage sites will be located as far away from residential and park uses as practicable. Construction areas will be kept clean and orderly.
- Environmentally sensitive areas will be established near sensitive air receptors. Within these areas, construction activities involving the extended idling of diesel equipment or vehicles will be prohibited, to the extent feasible.

- Track-out reduction measures, such as gravel pads at project access points to minimize dust and mud deposits on roads affected by construction traffic, will be used.
- All transported loads of soils and wet materials will be covered before transport, or adequate freeboard (space from the top of the material to the top of the truck) will be provided to minimize emission of dust during transportation.
- Dust and mud that are deposited on paved, public roads due to construction activity and traffic will be promptly and regularly removed to reduce PM emissions.
- To the extent feasible, construction traffic will be scheduled and routed to reduce congestion and related air quality impacts caused by idling vehicles along local roads during peak travel times.
- Mulch will be installed or vegetation planted as soon as practical after grading to reduce windblown PM in the area.

5.2 Long-Term (Operational)

No avoidance, minimization, and/or mitigation measures are required, as the project would not produce substantial operational air quality or GHG impacts since it would result in an overall reduction of distance traveled for vehicles in the area.

6. Conclusions

As described above, the purpose of the proposed project is to construct a bridge over and across Murrieta Creek to connect Avenida Alvarado at the intersection of Diaz Road with Overland Drive at the intersection of Enterprise Circle West in the City of Temecula. This would provide safe all-weather access across Murrieta Creek, provide reliable route for emergency vehicles, motorists, pedestrians, and bicyclists, and provide an additional access point to the City's industrial park. The project is assumed to conform to the SIP and no adverse regional or local air quality impact would occur as a result of the project. In addition, as shown in Chapter 4, neither the short-term construction impacts nor the long-term operational impacts would result in substantial air quality or GHG impacts.

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8. Appendices

Appendix A

RTP and TIP Listings for the Project

Appendix B

FHWA Conformity Determination

Appendix C

Transportation Air Quality Conformity Findings Checklist

Appendix D

Interagency Consultation Documentation

Appendix E

Construction Emissions Calculations

Appendix B

VMT Analysis Technical Memorandum (STC Traffic, Inc., February 2021)

VMT Analysis Technical Memorandum

Project: Murrieta Creek Bridge, VMT Analysis for Air Quality Assessment

Date: February 12, 2021

To: James Lu, PE, SE, CNS Engineers, Inc.

From: David DiPierro, TE, Senior Principal Manager

STC is pleased to present this technical memorandum to provide additional information on behalf of CNS Engineers, to support the Murrieta Creek Bridge project in Temecula, CA. Caltrans request to provide additional air quality analysis requires additional work to be performed to determine the change in Vehicle Miles Traveled (VMT) in the project study area. This technical memorandum addresses Caltrans request and provides additional information for the air quality consultants.

The technical memorandum is structured as follows:

- Methodology
    - Project Study Area.
    - Analysis Scenarios/Conditions.
    - Peak and Off-Peak Traffic Speeds Analysis.
    - Project Study Area VMT Analysis.
    - Construction Material and Equipment VMT Analysis.
    - Construction Employee VMT Analysis.
- Results
    - Peak and Off-Peak Traffic Speeds Analysis.
    - Project Area VMT Analysis.
    - Construction Material and Equipment VMT Analysis.
    - Construction Employee VMT Analysis.

Methodology

Project Study Area

The following project study area segments listed below and shown in **Figure 1**, were used to determine the VMT and the Peak and Off-Peak Speeds for the project. The project study area is consistent the Murrieta Creek Bridge Traffic Study Report (October 2019, STC Traffic):

1. Diaz Road from Winchester Road to Avenida Alvarado.
2. Diaz Road between Avenida Alvarado and Via Montezuma.
3. Avenida Alvarado west of Diaz Road.
4. Overland Drive between Enterprise Circle and Commerce Center Drive.
5. Overland Drive between Commerce Center Drive and Jefferson Avenue.
6. Overland Drive between Jefferson Ave and Ynez Road (VMT Analysis only).
7. Winchester Road between Diaz Road and Enterprise Circle.
8. Via Montezuma low-water crossing between Diaz Road and Del Rio Road (Existing Condition only, Peak and Off-Peak Speeds Analysis only).
9. Overland Drive between Diaz Road and Enterprise Circle (with project condition only).

Murrieta Creek Bridge - VMT Analysis for Air Quality Assessment

Figure 1
Project Study Area

Analysis Scenarios/ Conditions

The following analysis scenarios/conditions were assessed in the Project Study Area VMT Analysis and the Peak and Off-Peak Speeds Analysis:

- Existing year (2019).
- Existing Via Montezuma closed (2019).
- Opening year Without Project (2025).
- Opening year With Project (2025)
- Horizon year Without Project (2045).
- Horizon year With Project (2045).

Peak and Off-Peak Traffic Speeds Analysis

The average speeds were derived from traffic modelling software Synchro (v11). Speed is derived by dividing the link distance by the travel time including delay. The synchro network used for the preparation of the Murrieta Creek Bridge Traffic Study Report was used to derive the speed. Average speeds are automatically generated in Synchro for the AM and PM peak hours and were derived using the peak hour intersection counts. Since counts were not collected for the mid-day off peak, ADT were used to calculate an adjustment factor that was applied to the PM peak hour intersection volume. The adjustment factor was calculated by dividing the mid-day peak volume by the PM peak volume. An average of the adjustment factor for all the study area locations was calculated which was applied to the PM peak hour intersection volumes to derive the mid-day off-peak hour intersection volumes. The average adjustment factor was calculated to be 0.93.

The Overland Drive study roadway segment between Jefferson Ave and Ynez Road was excluded from the Peak and Off-Peak Speeds Analysis because Synchro requires data for intersections at both ends of the roadway segment. The Overland Drive/ Ynez Road intersection was outside of the study area and was not assessed.

Project Study Area VMT Analysis

VMT for the project study area roadway segments was calculated using the following equation:

$$Segment\ VMT = Segment\ Length \times Average\ Daily\ Traffic$$

The segment length was calculated using Google Earth. Average Daily Traffic (ADT) was obtained from the project Traffic Study Report roadway segment volumes for each scenario/condition.

To determine the project VMT for each segment, the without project VMT was subtracted from the with project VMT. This was carried out for the Opening Year (2025) and Horizon Year (2045) conditions. The Via Montezuma roadway segment between Diaz Road and Del Rio road was excluded from the analysis as the Traffic Study Report assumed that the low-water crossing would be permanently closed following the completion of the project.

Construction Material and Equipment VMT Analysis

The source/origin of the construction materials and equipment was derived using information provided by the client. **Table 1** shows contractors that are expected to be appointed for the following uses:

Table 1 Anticipated Contractor Information

Origin Reference	Equipment/ Use	Company	Location	Distance from Project Site (miles)
Site 1	Hauling Trucks - Asphalt Concrete and Concrete Recycling	Ewles Materials – Murrieta Plant	26160 Adams Avenue, Murrieta, CA 92562	2.5
Site 2	Hauling Trucks - Construction Debris, Waste Management	El Sobrate Landfill	10910 Dawson Canyon Road, Corona, CA 92883	29.3
Site 3	Hauling Truck – Materials Borrow Site	SFT Main Quarry Plant	Corona, CA 92881	33.5
Site 4	Ready Mix Concrete Trucks	Robertson's Ready Mix	26190 Adams Avenue, Murrieta, CA	2.5
			Total	67.8
			Average Distance from Site	16.95
			Average Round-Trip Distance	**33.9**

Table 1 shows that the average round-trip distance will be 33.9 miles. For a conservative analysis, this was applied as the round-trip distance for other construction equipment where origin is unknown.

The number of round trips required for each type of equipment was provided by the client. This was multiplied by either the round-trip distance provided for the known contractors or the average round trip distance for the unknown contractors, to provide the total VMT for each type of equipment. Equipment will remain on site if it is scheduled to be used in consecutive construction phases.

The construction VMT value will only apply for the duration of the construction phases. The site preparation phase of construction is expected to commence in 2024 with an anticipated construction period of 380 working days. Further information, provided by the client is shown in **Attachment A**.

Construction Employees VMT Analysis

The number of site workers for each construction phase was provided by the client. The average round-trip distance for construction equipment was also applied to construction employees. It was assumed that 50% of the workforce would stay in Temecula within a 3-mile radius of the project site, and the other 50% would commute the average round-trip distance of 33.9 miles each day. These are considered conservative assumptions for the purpose of this assessment. The construction employee VMT value will only apply for the duration of the construction phases.

Results

This section provides tabulated results of the Peak and Off-Peak Traffic Speeds Analysis, Project Study Area VMT Analysis, Construction Material and Equipment VMT Analysis, and the Construction Employees VMT Analysis.

Peak and Off-Peak Traffic Speeds Analysis

Table 2 shows the results of the Peak and Off-Peak Traffic Speeds Analysis for each study area roadway segment and for each scenario/ condition. The Synchro worksheets are provided in **Attachment B**. The table shows that speeds vary for each segment and by time of day and direction of travel. Speeds shown in the table during the With Project conditions (2025 and 2045) will be lower on the Diaz Road and Overland Drive segments.

Project Study Area VMT Analysis

Table 3 shows the results of the Project Study Area VMT Analysis for each study roadway segment and for each scenario/ condition. The results show that project study area VMT will be 2,618 VMT per day in the Opening Year (2025) and 2,922 VMT per day in the Horizon Year (2045).

These values are for the project study area only per the Traffic Study Report and do not consider redistribution of the traffic and potential VMT reductions outside of the study area.

Construction Material and Equipment VMT Analysis

Table 4 shows the projected construction traffic VMT results based on the assumptions outlined in the methodology section of this technical memorandum. The total construction material and equipment VMT will be 16,926 VMT. This is a rate of 44.5 VMT per day based on the 380 working-day construction period.

Construction Employee VMT Analysis.

Table 5 shows the projected construction employee VMT based on the assumptions outlined in the methodology section of this technical memorandum. The total construction employee VMT will be 2,148 VMT. This is a rate of 5.7 VMT per day based on the 380 working-day construction period.

Table 2 Peak and Off-Peak Travel Speeds

Roadway Segment		Travel Direction	Existing Year Via Montezuma Open (2019)			Existing Via Montezuma Closed			Opening Year Without Project (2025)			Opening Year With Project (2025)			Horizon Year Without Project (2045)			Horizon Year With Project (2045)		
			AM	MD	PM	AM	MD	PM	AM	MD	PM	AM	MD	PM	AM	MD	PM	AM	MD	PM
1	Diaz Road between Winchester Road and Avenida Alvarado	NB	19	18	14	19	18	14	19	13	12	18	13	13	16	14	13	17	13	12
		SB	45	45	45	45	45	45	45	45	45	24	25	25	45	45	45	22	23	22
2	Diaz Road between Avenida Alvarado and Via Montezuma	NB	44	45	45	44	45	45	44	45	45	34	31	31	44	45	45	32	28	27
		SB	45	43	43	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
3	Avenida Alvarado west of Diaz Road	EB	21	17	15	21	17	15	21	17	14	21	20	19	12	5	3	17	16	16
		WB	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
4	Overland Drive between Enterprise Circle and Commerce Center Drive	EB	35	35	35	35	35	35	35	35	35	14	9	9	35	35	35	13	10	9
		WB	18	18	18	18	18	18	18	18	18	24	16	16	18	18	18	15	14	14
5	Overland Drive between Commerce Center Drive and Jefferson Avenue	EB	13	7	5	13	7	5	13	8	7	12	8	7	12	9	8	11	8	7
		WB	35	35	35	35	35	35	35	35	35	22	19	18	35	35	35	24	20	20
7	Winchester Road between Diaz Road and Enterprise Circle	EB	19	12	10	19	12	10	18	9	7	19	10	7	17	11	8	18	11	9
		WB	16	13	13	16	13	13	15	13	13	15	13	13	15	10	10	15	9	9
8	Via Montezuma between Diaz Road and Del Rio Road	EB	28	27	27	Road Closed														
		WB	12	10	8															
9	Overland Drive between Diaz Road and Enterprise Circle	EB	Does not exist									20	16	16	Does not exist			21	19	18
		WB										11	14	13				13	12	12

Table 3 Project Study Area VMT

	Roadway Segment	Segment Length		Existing (2019)		Existing w/o Via Montezuma		Opening Year (2025)		Opening Year + Project (2025)		Project VMT	Horizon Year (2045)		Horizon Year + Project (2045)		Project VMT
		(Feet)	(Miles)	ADT	VMT	ADT	VMT	ADT	VMT	ADT	VMT		ADT	VMT	ADT	VMT	
1	Diaz Road from Winchester Road to Avenida Alvarado	1,230	0.233	14,335	3,340	14,335	3,340	16,055	3,741	18,863	4,395	654	18,062	4,208	21,221	4,944	736
2	Diaz Road between Avenida Alvarado and Via Montezuma	1,873	0.355	12,655	4,493	12,655	4,493	14,174	5,032	14,174	5,032	0	15,945	5,660	15,945	5,660	0
3	Avenida Alvarado west of Diaz Road	3,058	0.579	2,001	1,159	2,001	1,159	2,241	1,298	2,241	1,298	0	2,521	1,460	2,521	1,460	0
4	Overland Drive between Enterprise Circle and Commerce Center Drive	376	0.071	2,977	211	2,977	211	3,334	237	8,868	630	393	3,751	266	9,636	684	418
5	Overland Drive between Commerce Center Drive and Jefferson Avenue	947	0.179	6,959	1,246	6,959	1,246	7,794	1,395	13,328	2,386	991	8,768	1,569	14,653	2,623	1,053
6	Overland Drive between Jefferson Avenue and Ynez Road	1,904	0.361	20,215	7,298	20,215	7,298	22,641	8,173	22,641	8,173	0	25,471	9,195	25,471	9,195	0
7	Winchester Road between Diaz Road and Enterprise Circle	789	0.149	25,068	3,735	25,068	3,735	28,076	4,183	25,269	3,765	-418	31,586	4,706	28,427	4,236	-471
9	Overland Drive between Diaz Road and Enterprise Circle*	825	0.156	Not applicable		Not applicable		Not applicable		6,400	998	998	Not applicable		7,600	1,186	1,186
								OY 2025 (With Project) VMT Total				**2,618**	**OY 2045 (With Project) VMT Total**				**2,922**

** With Project condition only*

Table 4 Construction Material and Equipment VMT

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin (miles)	Round Trip Distance	No. of Round Trips	Total VMT
Site Preparation									
Traffic Control and Demolition – 15 Days	Excavators	2	15 Days	8	Average		33.9	2	67.8
	Loaders	2	15 Days		Average		33.9	2	67.8
	Robber Tired Dozers	1	15 Days		Average		33.9	1	33.9
	Traffic Control Trucks	1	5 Days		Average		33.9	1	33.9
	Hauling Trucks - **Asphalt Concrete and Concrete Recycling (Site 1)**	N/A	32 Round Trips		Site 1	2.5	5	32	160
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	10 Round Trips		Site 2	29.3	58.6	10	586
Clearing and Grubbing – 20 Days	Excavators	2	20 Days	10	Already on site				
	Dozers	2	20 Days		Average		33.9	2	67.8
	Loaders	2	20 Days		Already on site				
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	20 Round Trips		Site 2	29.3	58.6	20	1172
Channel Grading									
Grading Channel Slopes – 25 Days	Scrapers	2	25 Days	12	Average		33.9	2	67.8
	Excavators	3	25 Days		Already on site				
	Dozers	2	25 Days		Already on site				
	Backhoe Loader/Loader	2	25 Days		Average		33.9	2	67.8
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	10 Round Trips		Site 2	29.3	58.6	10	586

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin (miles)	Round Trip Distance	No. of Round Trips	Total VMT
Stage I Construction									
Bridge Construction – Foundation – 55 Days	Pile Drilling Rigs	1	55 Days	16	Average		33.9	1	33.9
	Cranes	2	55 Days		Average		33.9	2	67.8
	Excavators	2	55 Days		Already on site				
	Loaders	2	55 Days		Already on site				
	Ready Mix Concrete Trucks (Site 4)	N/A	120 Round Trips		Site 4	2.5	5	120	600
	Concrete/Slurry Pump Truck	2	15 Days		Site 4	2.5	5	1	5
	Generator Sets	1	55 Days		Average		33.9	1	33.9
Bridge Construction – Substructure – 65 Days	Cranes	2	65 Days	16	Already on site				
	Excavators	1	65 Days		Already on site				
	Loaders	1	65 Days		Already on site				
	Ready Mix Concrete Trucks	N/A	92 Round Trips		Site 4	2.5	5	92	460
	Concrete Pump Truck	1	10 Days		Already on site				
	Generator Sets	1	65 days		Already on site				
Bridge Construction – Superstructure – 80 Days	Cranes	1	80 Days	16	Already on site				
	Ready Mix Concrete Trucks	N/A	110 Round Trips		Site 4	2.5	5	110	550
	Concrete Pump Truck	1	10 Days		Already on site				
	Bid Well	1	5 Days		Average		33.9	1	33.9
	Generator Sets	2	80 Days		Already on site				
	Forklifts	2	80 Days		Average		33.9	2	67.8
Grading/Embankment Backfill/Pavement – 45 Days	Scrapers	1	40 Days	12	Already on site				
	Excavators	2	40 Days		Already on site				
	Dozers	2	40 Days		Already on site				
	Rollers	1	40 Days		Average		33.9	1	33.9
	Backhoe Loader/Loader	2	40 Days		Average		33.9	2	67.8
	Asphalt Paving Machine	1	5 Days		Average		33.9	1	33.9
	Asphalt Paver Finisher	1	5 Days		Average		33.9	1	33.9
	Generator Sets	2	45 Days		Already on site				
	Hauling Truck – Borrow (Site 3)	N/A	64 Round Trips		Site 3	33.5	67	64	4288
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	52 Round Trips		Site 1	2.5	5	32	160

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	Equipment Origin	Distance from Origin (miles)	Round Trip Distance	No. of Round Trips	Total VMT
Stage II Construction									
Traffic Control and Demolition – 20 Days	Excavators	2	20 Days	10	Already on site				
	Loaders	2	20 Days		Already on site				
	Rubber Tired Dozers	1	20 Days		Average		33.9	1	33.9
	Traffic Control Trucks	1	5 Days		Average		33.9	1	33.9
	Hauling Trucks - **Asphalt Concrete and Concrete Recycling (Site 1)**	N/A	44 Round Trips		Site 1	2.5	5	44	220
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	10 Round Trips		Site 2	29.3	58.6	10	586
Grading/Embankment Backfill/Pavement – 55 Days	Scrapers	1	45 Days	14	Already on site				
	Excavators	2	45 Days		Already on site				
	Dozers	2	45 Days		Already on site				
	Rollers	1	45 Days		Already on Site				
	Backhoe Loader/Loader	2	45 Days		Already on Site				
	Asphalt Paving Machine	1	10 Days		Already on Site				
	Asphalt Paver Finisher	1	10 Days		Already on Site				
	Generator Sets	2	55 Days		Already on site				
	Hauling Truck – Borrow (Site 3)	N/A	96 Round Trips		Site 3	33.5	67	96	6432
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	48 Round Trips		Site 1	2.5	5	48	240
						Total Construction VMT			16,926
						Construction period (working days)			380
						VMT per day			**44.5**

Table 5 Construction Employee VMT

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	# Stay Local	Local Round Trip Dist.	Stay Local VMT	# Commute Daily	Average Round Trip Distance*	Commuter VMT	All Worker VMT
			Site Preparation								
Traffic Control and Demolition – 15 Days	Excavators	2	15 Days	8	4	6	24	4	33.9	135.6	159.6
	Loaders	2	15 Days								
	Robber Tired Dozers	1	15 Days								
	Traffic Control Trucks	1	5 Days								
	Hauling Trucks - **Asphalt Concrete and Concrete Recycling (Site 1)**	N/A	32 Round Trips								
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	10 Round Trips								
Clearing and Grubbing – 20 Days	Excavators	2	20 Days	10	5	6	24	5	33.9	169.5	193.5
	Dozers	2	20 Days								
	Loaders	2	20 Days								
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	20 Round Trips								
			Channel Grading								
Grading Channel Slopes – 25 Days	Scrapers	2	25 Days	12	6	6	24	6	33.9	203.4	227.4
	Excavators	3	25 Days								
	Dozers	2	25 Days								
	Backhoe Loader/Loader	2	25 Days								
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	10 Round Trips								

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	# Stay Local	Local Round Trip Dist.	Stay Local VMT	# Commute Daily	Average Round Trip Distance*	Commuter VMT	All Worker VMT
Stage I Construction											
Bridge Construction – Foundation – 55 Days	Pile Drilling Rigs	1	55 Days	16	8	6	24	8	33.9	271.2	295.2
	Cranes	2	55 Days								
	Excavators	2	55 Days								
	Loaders	2	55 Days								
	Ready Mix Concrete Trucks (Site 4)	N/A	120 Round Trips								
	Concrete/Slurry Pump Truck	2	15 Days								
	Generator Sets	1	55 Days								
Bridge Construction – Substructure – 65 Days	Cranes	2	65 Days	16	8	6	24	8	33.9	271.2	295.2
	Excavators	1	65 Days								
	Loaders	1	65 Days								
	Ready Mix Concrete Trucks	N/A	92 Round Trips								
	Concrete Pump Truck	1	10 Days								
	Generator Sets	1	65 days								
Bridge Construction – Superstructure – 80 Days	Cranes	1	80 Days	16	8	6	24	8	33.9	271.2	295.2
	Ready Mix Concrete Trucks	N/A	110 Round Trips								
	Concrete Pump Truck	1	10 Days								
	Bid Well	1	5 Days								
	Generator Sets	2	80 Days								
	Forklifts	2	80 Days								

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	# Stay Local	Local Round Trip Dist.	Stay Local VMT	# Commute Daily	Average Round Trip Distance*	Commuter VMT	All Worker VMT
Grading/Embankment Backfill/Pavement – 45 Days	Scrapers	1	40 Days	12	6	6	24	6	33.9	203.4	227.4
	Excavators	2	40 Days								
	Dozers	2	40 Days								
	Rollers	1	40 Days								
	Backhoe Loader/Loader	2	40 Days								
	Asphalt Paving Machine	1	5 Days								
	Asphalt Paver Finisher	1	5 Days								
	Generator Sets	2	45 Days								
	Hauling Truck – Borrow (Site 3)	N/A	64 Round Trips								
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	52 Round Trips								
Stage II Construction											
Traffic Control and Demolition – 20 Days	Excavators	2	20 Days	10	5	6	24	5	33.9	169.5	193.5
	Loaders	2	20 Days								
	Rubber Tired Dozers	1	20 Days								
	Traffic Control Trucks	1	5 Days								
	Hauling Trucks - **Asphalt Concrete and Concrete Recycling (Site 1)**	N/A	44 Round Trips								
	Hauling Trucks - **Construction Debris (Site 2)**	N/A	10 Round Trips								

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers	# Stay Local	Local Round Trip Dist.	Stay Local VMT	# Commute Daily	Average Round Trip Distance*	Commuter VMT	All Worker VMT
Grading/Embankment Backfill/Pavement – 55 Days	Scrapers	1	45 Days	14	7	6	24	7	33.9	237.3	261.3
	Excavators	2	45 Days								
	Dozers	2	45 Days								
	Rollers	1	45 Days								
	Backhoe Loader/Loader	2	45 Days								
	Asphalt Paving Machine	1	10 Days								
	Asphalt Paver Finisher	1	10 Days								
	Generator Sets	2	55 Days								
	Hauling Truck – Borrow (Site 3)	N/A	96 Round Trips								
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	48 Round Trips								

* Based on average round trip distance for construction equipment = 33.9 miles

Total Worker VMT	2,148
Construction period (working days)	380
VMT per day	**5.7**

Conclusion and Recommendations

The Peak and Off-Peak Speeds Analysis shows that during the With Project conditions (2025 and 2045), speeds will be lower on the Diaz Road and Overland Drive segments.

The Project Study Area VMT Analysis showed that project study area VMT will be 2,618 VMT per day in the Opening Year (2025) and 2,922 VMT per day in the Horizon Year (2045). The analysis does not consider redistribution of traffic and potential VMT reductions on routes outside of the study area.

The Construction Material and Equipment VMT Analysis shows that the Construction Material and Equipment VMT will be 44.5 VMT per day.

The Construction Employee VMT Analysis shows that the Construction Employee VMT will be 5.7 VMT per day.

The construction VMT rates will only apply during the 380 working-day construction period which is expected to commence in 2024. The project is expected to be complete in September 2025.

Sincerely,
STC Traffic

David DiPierro, TE
Senior Principal Manager

Attachment A: Construction Contractor Information from Client
Attachment B: Peak and Off-Peak Traffic Speeds Analysis Synchro Worksheets

Attachment A - Client Information

TABLE 1-1: CONSTRUCTION PHASES AND DURATION

Activity	Work Description	Start Date	End Date	Working Days
Advertisement and Award				
Advertisement and Award	N/A	10/2/2023	1/31/2024	N/A
Site Preparation				
Traffic Control and Demolition	Shift traffic on Diaz Road and remove asphalt pavement	2/1/2024	2/22/2024	15
Clearing and Grubbing	Prepare the site to access the channel bottom from east and west approaches	2/23/2024	3/25/2024	20
Channel Grading				
Grading Channel Slopes	Grade channel slopes at bridge and tie in to upstream and downstream transition	3/26/2024	4/29/2024	25
Stage I Construction				
Bridge Construction - Foundation	Install pile foundations	5/1/2024	7/17/2024	55
Bridge Construction – Substructure	Construct pier columns, abutment walls, and slope linings	7/18/2024	10/17/2025	65
Bridge Construction – Superstructure	Construct girders and railings	10/18/2025	2/7/2025	80
Grading/Embankment Backfill/Pavement	Construct east and west approaches, and east side of Diaz Road	2/10/2025	4/11/2025	45
Stage II Construction				
Traffic Control and Demolition	Shift traffic on Diaz Road and remove pavement	4/14/2025	5/12/2025	20
Grading/Embankment Backfill/Pavement	Construct west side of Diaz Road and extend Avenida Alvarado	5/13/2025	7/29/2025	55
Project Closure				
Demobilization/Project Closure	N/A	7/30/2025	9/30/2025	N/A

TABLE 1-2: CONSTRUCTION EQUIPMENT ASSUMPTIONS

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers
Site Preparation				
Traffic Control and Demolition – 15 Days	Excavators	2	15 Days	8
	Loaders	2	15 Days	
	Robber Tired Dozers	1	15 Days	
	Traffic Control Trucks	1	5 Days	
	Hauling Trucks - Asphalt Concrete and Concrete Recycling (Site 1)	N/A	32 Round Trips	
	Hauling Trucks - Construction Debris (Site 2)	N/A	10 Round Trips	
Clearing and Grubbing – 20 Days	Excavators	2	20 Days	10
	Dozers	2	20 Days	
	Loaders	2	20 Days	
	Hauling Trucks - Construction Debris (Site 2)	N/A	20 Round Trips	
Channel Grading				
Grading Channel Slopes – 25 Days	Scrapers	2	25 Days	12
	Excavators	3	25 Days	
	Dozers	2	25 Days	
	Backhoe Loader/Loader	2	25 Days	
	Hauling Trucks - Construction Debris (Site 2)	N/A	10 Round Trips	
Stage I Construction				
Bridge Construction – Foundation – 55 Days	Pile Drilling Rigs	1	55 Days	16
	Cranes	2	55 Days	
	Excavators	2	55 Days	
	Loaders	2	55 Days	
	Ready Mix Concrete Trucks (Site 4)	N/A	120 Round Trips	
	Concrete/Slurry Pump Truck	2	15 Days	
	Generator Sets	1	55 Days	
Bridge Construction – Substructure – 65 Days	Cranes	2	65 Days	16
	Excavators	1	65 Days	
	Loaders	1	65 Days	
	Ready Mix Concrete Trucks	N/A	92 Round Trips	
	Concrete Pump Truck	1	10 Days	
	Generator Sets	1	65 days	
	Cranes	1	80 Days	16

Activity and Working Days	Equipment	Amount	8-Hour Days or Total Round Trips	# of Site Workers
Bridge Construction – Superstructure – 80 Days	Ready Mix Concrete Trucks	N/A	110 Round Trips	
	Concrete Pump Truck	1	10 Days	
	Bid Well	1	5 Days	
	Generator Sets	2	80 Days	
	Forklifts	2	80 Days	
Grading/Embankment Backfill/Pavement – 45 Days	Scrapers	1	40 Days	12
	Excavators	2	40 Days	
	Dozers	2	40 Days	
	Rollers	1	40 Days	
	Backhoe Loader/Loader	2	40 Days	
	Asphalt Paving Machine	1	5 Days	
	Asphalt Paver Finisher	1	5 Days	
	Generator Sets	2	45 Days	
	Hauling Truck – Borrow (Site 3)	N/A	64 Round Trips	
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	52 Round Trips	
Stage II Construction				
Traffic Control and Demolition – 20 Days	Excavators	2	20 Days	10
	Loaders	2	20 Days	
	Rubber Tired Dozers	1	20 Days	
	Traffic Control Trucks	1	5 Days	
	Hauling Trucks - Asphalt Concrete and Concrete Recycling (Site 1)	N/A	44 Round Trips	
	Hauling Trucks - Construction Debris (Site 2)	N/A	10 Round Trips	
Grading/Embankment Backfill/Pavement – 55 Days	Scrapers	1	45 Days	14
	Excavators	2	45 Days	
	Dozers	2	45 Days	
	Rollers	1	45 Days	
	Backhoe Loader/Loader	2	45 Days	
	Asphalt Paving Machine	1	10 Days	
	Asphalt Paver Finisher	1	10 Days	
	Generator Sets	2	55 Days	
	Hauling Truck – Borrow (Site 3)	N/A	96 Round Trips	
	Hauling Truck – Asphalt Concrete (Site 1)	N/A	48 Round Trips	

Site 1 - Asphalt Concrete Recycling and Supply Site: Ewles Materials - Murrieta Plant at 26160 Adams Avenue, Murrieta, CA 92562

Site 2 - Construction Debris Dump Site: Waste Management - El Sobrante Landfill at 10910 Dawson Canyon Road, Corona, CA 92883

Site 3 – Materials Borrow Site: FST Main Quarry Plant, Corona, CA 92881

Site 4 – Ready Mix Concrete Plant: Robertson's Ready Mix at 26190 Adams Avenue, Murrieta, CA 92562

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	21	35	28
Total Travel Time (hr)	1	1	1
Distance Traveled (mi)	13	24	37
Performance Index	0.4	0.0	0.4

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	44	45	44
Total Travel Time (hr)	5	4	9
Distance Traveled (mi)	208	188	396
Performance Index	0.3	0.1	0.4

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	19	45	30
Total Travel Time (hr)	4	3	7
Distance Traveled (mi)	76	129	205
Performance Index	2.6	0.0	2.6

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	13	35	23
Total Travel Time (hr)	2	2	4
Distance Traveled (mi)	30	66	96
Performance Index	1.8	1.0	2.9

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	20
Total Travel Time (hr)	0	1	1
Distance Traveled (mi)	3	12	15
Performance Index	0.1	0.8	0.9

Via Montezuma

Direction	EB	WB	All
Average Speed (mph)	28	12	14
Total Travel Time (hr)	0	1	2
Distance Traveled (mi)	8	15	23
Performance Index	0.0	1.1	1.1

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	19	16	16
Total Travel Time (hr)	4	24	28
Distance Traveled (mi)	70	371	441
Performance Index	2.8	18.6	21.4

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	17	35	19
Total Travel Time (hr)	2	0	3
Distance Traveled (mi)	39	10	49
Performance Index	1.6	0.0	1.6

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	43	44
Total Travel Time (hr)	5	7	12
Distance Traveled (mi)	209	325	534
Performance Index	0.1	0.8	1.0

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	18	45	26
Total Travel Time (hr)	7	3	11
Distance Traveled (mi)	136	143	279
Performance Index	5.6	0.0	5.6

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	7	35	8
Total Travel Time (hr)	15	1	17
Distance Traveled (mi)	101	40	140
Performance Index	13.8	0.6	14.4

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	0	0	1
Distance Traveled (mi)	17	5	22
Performance Index	0.7	0.3	1.0

Via Montezuma

Direction	EB	WB	All
Average Speed (mph)	27	10	20
Total Travel Time (hr)	2	1	2
Distance Traveled (mi)	41	9	50
Performance Index	0.0	0.8	0.8

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	12	13	12
Total Travel Time (hr)	23	9	32
Distance Traveled (mi)	270	119	389
Performance Index	20.2	7.4	27.7

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	15	35	17
Total Travel Time (hr)	3	0	3
Distance Traveled (mi)	42	11	53
Performance Index	2.1	0.0	2.1

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	43	44
Total Travel Time (hr)	5	8	13
Distance Traveled (mi)	224	349	573
Performance Index	0.2	0.9	1.1

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	14	45	22
Total Travel Time (hr)	10	3	14
Distance Traveled (mi)	146	153	300
Performance Index	8.5	0.0	8.5

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	5	35	6
Total Travel Time (hr)	22	1	23
Distance Traveled (mi)	108	43	151
Performance Index	20.5	0.7	21.1

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	1	0	1
Distance Traveled (mi)	18	6	24
Performance Index	0.7	0.4	1.1

Via Montezuma

Direction	EB	WB	All
Average Speed (mph)	27	8	19
Total Travel Time (hr)	2	1	3
Distance Traveled (mi)	44	9	53
Performance Index	0.0	1.0	1.0

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	10	13	11
Total Travel Time (hr)	28	10	38
Distance Traveled (mi)	291	127	418
Performance Index	25.7	8.2	33.9

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	21	35	28
Total Travel Time (hr)	1	1	1
Distance Traveled (mi)	13	24	37
Performance Index	0.4	0.0	0.4

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	44	45	45
Total Travel Time (hr)	5	4	9
Distance Traveled (mi)	208	192	401
Performance Index	0.3	0.0	0.3

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	19	45	30
Total Travel Time (hr)	4	3	7
Distance Traveled (mi)	76	129	205
Performance Index	2.6	0.0	2.6

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	13	35	23
Total Travel Time (hr)	2	2	4
Distance Traveled (mi)	30	66	96
Performance Index	1.8	1.0	2.9

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	20
Total Travel Time (hr)	0	1	1
Distance Traveled (mi)	3	12	15
Performance Index	0.1	0.8	0.9

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	19	16	16
Total Travel Time (hr)	4	24	28
Distance Traveled (mi)	70	371	441
Performance Index	2.8	18.6	21.4

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	17	35	19
Total Travel Time (hr)	2	0	3
Distance Traveled (mi)	40	10	50
Performance Index	1.6	0.0	1.6

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	45	45
Total Travel Time (hr)	5	7	11
Distance Traveled (mi)	209	307	516
Performance Index	0.1	0.0	0.1

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	18	45	26
Total Travel Time (hr)	7	3	11
Distance Traveled (mi)	136	143	279
Performance Index	5.6	0.0	5.6

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	7	35	8
Total Travel Time (hr)	15	1	17
Distance Traveled (mi)	101	40	140
Performance Index	13.8	0.6	14.4

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	0	0	1
Distance Traveled (mi)	17	5	22
Performance Index	0.7	0.3	1.0

Via Montezuma

Direction	EB	WB	All
Average Speed (mph)	15	30	17
Total Travel Time (hr)	3	0	3
Distance Traveled (mi)	41	13	54
Performance Index	1.7	0.0	1.7

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	12	13	12
Total Travel Time (hr)	22	9	31
Distance Traveled (mi)	270	118	389
Performance Index	19.8	7.4	27.2

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	15	35	17
Total Travel Time (hr)	3	0	3
Distance Traveled (mi)	43	11	53
Performance Index	2.1	0.0	2.1

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	45	45
Total Travel Time (hr)	5	7	12
Distance Traveled (mi)	224	330	554
Performance Index	0.2	0.0	0.2

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	14	45	22
Total Travel Time (hr)	10	3	14
Distance Traveled (mi)	146	153	300
Performance Index	8.5	0.0	8.5

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	5	35	6
Total Travel Time (hr)	22	1	23
Distance Traveled (mi)	108	43	151
Performance Index	20.5	0.7	21.1

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	1	0	1
Distance Traveled (mi)	18	6	24
Performance Index	0.7	0.4	1.1

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	10	13	11
Total Travel Time (hr)	28	10	38
Distance Traveled (mi)	291	127	418
Performance Index	25.2	8.2	33.4

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	21	35	28
Total Travel Time (hr)	1	1	1
Distance Traveled (mi)	14	26	41
Performance Index	0.5	0.0	0.5

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	44	45	45
Total Travel Time (hr)	5	5	10
Distance Traveled (mi)	233	215	448
Performance Index	0.3	0.0	0.3

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	19	45	30
Total Travel Time (hr)	4	3	8
Distance Traveled (mi)	85	144	230
Performance Index	3.0	0.0	3.0

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	13	35	23
Total Travel Time (hr)	3	2	5
Distance Traveled (mi)	34	74	107
Performance Index	2.0	1.1	3.1

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	20
Total Travel Time (hr)	0	1	1
Distance Traveled (mi)	3	14	17
Performance Index	0.1	0.9	1.0

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	18	15	15
Total Travel Time (hr)	4	28	33
Distance Traveled (mi)	79	416	495
Performance Index	3.4	23.0	26.4

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	17	35	19
Total Travel Time (hr)	3	0	3
Distance Traveled (mi)	48	11	59
Performance Index	2.0	0.0	2.0

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	45	45
Total Travel Time (hr)	5	8	13
Distance Traveled (mi)	233	343	577
Performance Index	0.2	0.0	0.2

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	13	45	20
Total Travel Time (hr)	12	4	15
Distance Traveled (mi)	152	160	312
Performance Index	10.0	0.0	10.0

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	8	35	11
Total Travel Time (hr)	14	1	15
Distance Traveled (mi)	113	44	157
Performance Index	12.0	0.7	12.6

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	1	0	1
Distance Traveled (mi)	19	6	25
Performance Index	0.7	0.4	1.1

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	9	13	10
Total Travel Time (hr)	32	10	42
Distance Traveled (mi)	303	132	435
Performance Index	29.3	8.6	38.0

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	14	35	16
Total Travel Time (hr)	4	0	4
Distance Traveled (mi)	52	12	64
Performance Index	2.7	0.0	2.7

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	45	45
Total Travel Time (hr)	6	8	14
Distance Traveled (mi)	251	370	621
Performance Index	0.2	0.0	0.2

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	12	45	19
Total Travel Time (hr)	14	4	18
Distance Traveled (mi)	164	172	336
Performance Index	11.8	0.0	11.8

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	7	35	10
Total Travel Time (hr)	16	1	18
Distance Traveled (mi)	121	48	169
Performance Index	14.6	0.7	15.3

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	1	0	1
Distance Traveled (mi)	21	6	27
Performance Index	0.8	0.4	1.2

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	7	13	8
Total Travel Time (hr)	46	11	57
Distance Traveled (mi)	326	142	468
Performance Index	43.1	9.5	52.6

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	21	35	28
Total Travel Time (hr)	1	1	1
Distance Traveled (mi)	15	27	42
Performance Index	0.4	0.0	0.4

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	34	45	38
Total Travel Time (hr)	7	5	12
Distance Traveled (mi)	231	215	446
Performance Index	2.5	0.0	2.5

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	18	24	22
Total Travel Time (hr)	5	6	11
Distance Traveled (mi)	85	147	232
Performance Index	3.2	4.1	7.3

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	12	22	18
Total Travel Time (hr)	4	6	10
Distance Traveled (mi)	52	124	176
Performance Index	3.5	3.2	6.7

Overland Dr D-E

Direction	EB	WB	All
Average Speed (mph)	20	11	13
Total Travel Time (hr)	1	5	5
Distance Traveled (mi)	20	51	70
Performance Index	0.7	3.5	4.2

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	14	24	20
Total Travel Time (hr)	1	2	3
Distance Traveled (mi)	13	38	51
Performance Index	0.9	0.9	1.8

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	19	15	16
Total Travel Time (hr)	4	25	29
Distance Traveled (mi)	79	380	459
Performance Index	3.0	20.2	23.2

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	20	35	21
Total Travel Time (hr)	2	0	3
Distance Traveled (mi)	46	11	57
Performance Index	1.4	0.0	1.4

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	31	45	38
Total Travel Time (hr)	8	8	15
Distance Traveled (mi)	232	343	576
Performance Index	3.2	0.0	3.2

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	13	25	18
Total Travel Time (hr)	11	7	19
Distance Traveled (mi)	152	180	332
Performance Index	9.6	4.5	14.1

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	8	19	10
Total Travel Time (hr)	19	4	23
Distance Traveled (mi)	151	79	230
Performance Index	16.6	2.6	19.3

Overland Dr D-E

Direction	EB	WB	All
Average Speed (mph)	16	14	15
Total Travel Time (hr)	3	3	6
Distance Traveled (mi)	52	35	88
Performance Index	2.5	1.9	4.4

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	9	16	11
Total Travel Time (hr)	5	1	6
Distance Traveled (mi)	44	23	67
Performance Index	4.7	1.2	5.9

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	10	13	10
Total Travel Time (hr)	32	10	41
Distance Traveled (mi)	303	123	426
Performance Index	29.0	7.9	36.9

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	19	35	21
Total Travel Time (hr)	3	0	3
Distance Traveled (mi)	50	12	61
Performance Index	1.5	0.0	1.5

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	31	45	38
Total Travel Time (hr)	8	8	16
Distance Traveled (mi)	249	370	619
Performance Index	3.5	0.0	3.5

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	13	25	17
Total Travel Time (hr)	13	8	21
Distance Traveled (mi)	163	194	358
Performance Index	10.9	4.9	15.8

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	7	18	9
Total Travel Time (hr)	23	5	28
Distance Traveled (mi)	163	85	248
Performance Index	20.4	3.1	23.5

Overland Dr D-E

Direction	EB	WB	All
Average Speed (mph)	16	13	14
Total Travel Time (hr)	4	3	7
Distance Traveled (mi)	56	38	94
Performance Index	2.8	2.2	5.0

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	9	16	10
Total Travel Time (hr)	6	2	7
Distance Traveled (mi)	48	25	72
Performance Index	5.4	1.3	6.7

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	7	13	8
Total Travel Time (hr)	46	10	56
Distance Traveled (mi)	326	132	458
Performance Index	42.6	8.7	51.4

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	12	35	21
Total Travel Time (hr)	1	1	2
Distance Traveled (mi)	15	29	44
Performance Index	1.1	0.0	1.1

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	44	45	45
Total Travel Time (hr)	8	12	20
Distance Traveled (mi)	355	555	909
Performance Index	0.4	0.0	0.4

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	16	45	28
Total Travel Time (hr)	11	7	18
Distance Traveled (mi)	179	324	504
Performance Index	8.1	0.0	8.1

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	12	35	21
Total Travel Time (hr)	4	2	6
Distance Traveled (mi)	48	84	133
Performance Index	3.2	1.3	4.5

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	20
Total Travel Time (hr)	0	1	1
Distance Traveled (mi)	4	15	20
Performance Index	0.2	1.0	1.2

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	17	15	15
Total Travel Time (hr)	5	29	34
Distance Traveled (mi)	90	424	515
Performance Index	4.3	23.8	28.1

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	5	35	7
Total Travel Time (hr)	9	0	9
Distance Traveled (mi)	47	13	60
Performance Index	7.9	0.0	7.9

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	45	45
Total Travel Time (hr)	12	11	22
Distance Traveled (mi)	524	480	1004
Performance Index	0.2	0.0	0.2

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	14	45	20
Total Travel Time (hr)	23	6	29
Distance Traveled (mi)	325	251	576
Performance Index	19.4	0.0	19.4

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	9	35	11
Total Travel Time (hr)	14	1	16
Distance Traveled (mi)	126	51	177
Performance Index	12.2	0.8	13.0

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	1	0	1
Distance Traveled (mi)	22	6	29
Performance Index	0.8	0.4	1.3

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	11	10	11
Total Travel Time (hr)	31	14	46
Distance Traveled (mi)	336	150	486
Performance Index	28.6	12.6	41.2

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	3	35	4
Total Travel Time (hr)	16	0	17
Distance Traveled (mi)	51	14	64
Performance Index	15.3	0.0	15.3

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	45	45	45
Total Travel Time (hr)	13	11	24
Distance Traveled (mi)	564	516	1080
Performance Index	0.2	0.0	0.2

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	13	45	19
Total Travel Time (hr)	27	6	33
Distance Traveled (mi)	349	270	619
Performance Index	22.6	0.0	22.6

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	8	35	11
Total Travel Time (hr)	16	2	18
Distance Traveled (mi)	135	55	190
Performance Index	14.4	0.8	15.2

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	35	18	29
Total Travel Time (hr)	1	0	1
Distance Traveled (mi)	24	7	31
Performance Index	0.9	0.5	1.4

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	8	10	9
Total Travel Time (hr)	44	16	60
Distance Traveled (mi)	362	161	522
Performance Index	41.4	14.1	55.5

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	17	35	26
Total Travel Time (hr)	1	1	2
Distance Traveled (mi)	17	35	52
Performance Index	0.7	0.0	0.7

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	32	45	39
Total Travel Time (hr)	11	12	23
Distance Traveled (mi)	356	553	909
Performance Index	4.4	0.0	4.4

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	17	22	20
Total Travel Time (hr)	11	15	26
Distance Traveled (mi)	179	334	513
Performance Index	8.0	10.7	18.7

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	11	24	17
Total Travel Time (hr)	6	6	13
Distance Traveled (mi)	72	143	215
Performance Index	5.3	3.1	8.5

Overland Dr D-E

Direction	EB	WB	All
Average Speed (mph)	21	13	15
Total Travel Time (hr)	1	4	6
Distance Traveled (mi)	27	59	86
Performance Index	0.9	3.3	4.2

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	13	15	15
Total Travel Time (hr)	1	3	4
Distance Traveled (mi)	16	43	59
Performance Index	1.2	2.5	3.6

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	18	15	15
Total Travel Time (hr)	5	26	31
Distance Traveled (mi)	90	389	479
Performance Index	3.6	21.4	25.0

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	16	35	19
Total Travel Time (hr)	3	0	3
Distance Traveled (mi)	47	16	64
Performance Index	1.9	0.0	1.9

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	28	45	34
Total Travel Time (hr)	19	11	30
Distance Traveled (mi)	524	480	1004
Performance Index	9.5	0.0	9.5

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	13	23	16
Total Travel Time (hr)	25	12	37
Distance Traveled (mi)	325	274	599
Performance Index	20.9	8.0	28.9

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	8	20	10
Total Travel Time (hr)	20	4	24
Distance Traveled (mi)	159	84	244
Performance Index	17.7	2.4	20.0

Overland Dr D-E

Direction	EB	WB	All
Average Speed (mph)	19	12	15
Total Travel Time (hr)	3	3	7
Distance Traveled (mi)	57	43	100
Performance Index	2.2	2.7	4.9

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	10	14	11
Total Travel Time (hr)	5	2	7
Distance Traveled (mi)	49	25	74
Performance Index	4.9	1.7	6.6

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	11	9	11
Total Travel Time (hr)	30	15	45
Distance Traveled (mi)	336	139	475
Performance Index	26.9	13.1	40.0

Ave Alvarado

Direction	EB	WB	All
Average Speed (mph)	16	35	18
Total Travel Time (hr)	3	1	4
Distance Traveled (mi)	51	18	69
Performance Index	2.2	0.0	2.2

Diaz Rd AA-VM

Direction	NB	SB	All
Average Speed (mph)	27	45	33
Total Travel Time (hr)	21	11	32
Distance Traveled (mi)	564	516	1080
Performance Index	10.6	0.0	10.6

Diaz Rd W-AA

Direction	NB	SB	All
Average Speed (mph)	12	22	15
Total Travel Time (hr)	28	13	42
Distance Traveled (mi)	349	294	644
Performance Index	24.2	9.0	33.2

Overland Dr CC-J

Direction	EB	WB	All
Average Speed (mph)	7	20	9
Total Travel Time (hr)	25	5	29
Distance Traveled (mi)	171	91	262
Performance Index	22.3	2.7	25.0

Overland Dr D-E

Direction	EB	WB	All
Average Speed (mph)	18	12	15
Total Travel Time (hr)	3	4	7
Distance Traveled (mi)	61	46	107
Performance Index	2.4	3.1	5.5

Overland Dr E-CC

Direction	EB	WB	All
Average Speed (mph)	9	14	10
Total Travel Time (hr)	6	2	8
Distance Traveled (mi)	53	27	80
Performance Index	5.7	1.8	7.5

Winchester Rd

Direction	EB	WB	All
Average Speed (mph)	9	9	9
Total Travel Time (hr)	43	17	59
Distance Traveled (mi)	362	149	511
Performance Index	38.8	15.0	53.8

Appendix C

Road Construction Emissions Model Methodology (Rincon Consultants Inc., February 2022)

Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> Murietta Creek Bridge Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.68	27.35	15.97	15.75	0.75	15.00	3.78	0.66	3.12	0.05	4,588.26	1.24	0.13	4,658.29
Grading/Excavation	3.90	34.95	37.76	16.73	1.73	15.00	4.64	1.52	3.12	0.08	7,832.38	2.18	0.14	7,927.75
Drainage/Utilities/Sub-Grade	7.09	87.23	66.09	17.96	2.96	15.00	5.85	2.73	3.12	0.17	16,376.92	3.66	0.24	16,541.30
Paving	4.97	56.87	47.38	2.01	2.01	0.00	1.82	1.82	0.00	0.12	11,944.51	3.14	0.24	12,094.99
Maximum (pounds/day)	7.09	87.23	66.09	17.96	2.96	15.00	5.85	2.73	3.12	0.17	16,376.92	3.66	0.24	16,541.30
Total (tons/construction project)	1.13	13.73	10.62	2.76	0.47	2.29	0.91	0.43	0.48	0.03	2,632.29	0.61	0.04	2,660.49

Notes: Project Start Year -> 2024

Project Length (months) -> 17

Total Project Area (acres) -> 2

Maximum Area Disturbed/Day (acres) -> 2

Water Truck Used? -> Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	0	837	117	0	200	40
Grading/Excavation	0	0	59	0	1,120	40
Drainage/Utilities/Sub-Grade	0	0	134	0	720	40
Paving	0	837	201	0	320	40

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> Murietta Creek Bridge Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.03	0.48	0.28	0.28	0.01	0.26	0.07	0.01	0.05	0.00	80.29	0.02	0.00	73.95
Grading/Excavation	0.05	0.44	0.47	0.21	0.02	0.19	0.06	0.02	0.04	0.00	97.90	0.03	0.00	89.90
Drainage/Utilities/Sub-Grade	0.87	10.69	8.10	2.20	0.36	1.84	0.72	0.33	0.38	0.02	2,006.17	0.45	0.03	1,838.26
Paving	0.19	2.13	1.78	0.08	0.08	0.00	0.07	0.07	0.00	0.00	447.92	0.12	0.01	411.47
Maximum (tons/phase)	0.87	10.69	8.10	2.20	0.36	1.84	0.72	0.33	0.38	0.02	2006.17	0.45	0.03	1,838.26
Total (tons/construction project)	1.13	13.73	10.62	2.76	0.47	2.29	0.91	0.43	0.48	0.03	2632.29	0.61	0.04	2,413.58

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Road Construction Emissions Model **Version 9.0.0**
Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells D10 through D24, E28 through G35, and D38 through D41 for all project types.
Please use "Clear Data Input & User Overrides" button first before changing the Project Type or begin a new project.

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type

Project Name	Murietta Creek Bridge	
Construction Start Year	2024	Enter a Year between 2014 and 2040 (inclusive)
Project Type	3	1) New Road Construction : Project to build a roadway from bare ground, which generally requires more site preparation than widening an existing roadway 2) Road Widening : Project to add a new lane to an existing roadway 3) Bridge/Overpass Construction : Project to build an elevated roadway, which generally requires some different equipment than a new roadway, such as a crane 4) Other Linear Project Type: Non-roadway project such as a pipeline, transmission line, or levee construction
Project Construction Time	17.00	months
Working Days per Month	22.00	days (assume 22 if unknown)
Predominant Soil/Site Type: Enter 1, 2, or 3 (for project within "Sacramento County", follow soil type selection instructions in cells E18 to E20 otherwise see instructions provided in cells J18 to J22)	1	1) Sand Gravel : Use for quaternary deposits (Delta/West County) 2) Weathered Rock-Earth : Use for Laguna formation (Jackson Highway area) or the Ione formation (Scott Road, Rancho Murieta) 3) Blasted Rock : Use for Salt Springs Slate or Copper Hill Volcanics (Folsom South of Highway 50, Rancho Murieta)
Project Length	0.14	miles
Total Project Area	1.50	acres
Maximum Area Disturbed/Day	1.50	acres
Water Trucks Used?	1	1. Yes 2. No

Please note that the soil type instructions provided in cells E18 to E20 are specific to Sacramento County. Maps available from the California Geologic Survey (see weblink below) can be used to determine soil type outside Sacramento County.

http://www.conservation.ca.gov/cgs/information/geologic_mapping/Pages/googlemaps.aspx#regionalseries

Material Hauling Quantity Input

Material Type	Phase	Haul Truck Capacity (yd^3) (assume 20 if unknown)	Import Volume (yd^3/day)	Export Volume (yd^3/day)
Soil	Grubbing/Land Clearing	20.00		
	Grading/Excavation	20.00		
	Drainage/Utilities/Sub-Grade	20.00		
	Paving	20.00		
Asphalt	Grubbing/Land Clearing	0.00		837.00
	Grading/Excavation	0.00		
	Drainage/Utilities/Sub-Grade	0.00		
	Paving	0.00	837.00	

Mitigation Options

On-road Fleet Emissions Mitigation	No Mitigation	Select "2010 and Newer On-road Vehicles Fleet" option when the on-road heavy-duty truck fleet for the project will be limited to vehicles of model year 2010 or newer
Off-road Equipment Emissions Mitigation	No Mitigation	Select "20% NOx and 45% Exhaust PM reduction" option if the project will be required to use a lower emitting off-road construction fleet. The SMAQMD Construction Mitigation Calculator can be used to confirm compliance with this mitigation measure (http://www.airquality.org/Businesses/CEQA-Land-Use-Planning/Mitigation). Select "Tier 4 Equipment" option if some or all off-road equipment used for the project meets CARB Tier 4 Standard

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells D50 through D53, and F50 through F53.

Construction Periods	User Override of Construction Months	Program Calculated Months	User Override of Phase Starting Date	Program Default Phase Starting Date
Grubbing/Land Clearing	1.59	1.70	2/1/2024	1/1/2024
Grading/Excavation	1.14	6.80	3/26/2024	2/19/2024
Drainage/Utilities/Sub-Grade	11.14	5.95	5/1/2024	3/25/2024
Paving	3.41	2.55	4/14/2025	2/27/2025
Totals (Months)	17			

Please note: You have entered a different number of months than the project length shown in cell D16.
Note: Soil Hauling emission default values can be overridden in cells D61 through D64, and F61 through F64.

Soil Hauling Emissions	User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT
User Input					
Miles/round trip: Grubbing/Land Clearing	58.60	30.00	2	0	117.20
Miles/round trip: Grading/Excavation	58.60	30.00	1	0	58.60
Miles/round trip: Drainage/Utilities/Sub-Grade	67.00	30.00	2	0	134.00
Miles/round trip: Paving	67.00	30.00	3	0	201.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile)	0.04	0.43	3.49	0.12	0.05	0.02	1,704.13	0.00	0.27	1,784.00
Grading/Excavation (grams/mile)	0.04	0.43	3.49	0.12	0.05	0.02	1,704.13	0.00	0.27	1,784.00
Draining/Utilities/Sub-Grade (grams/mile)	0.04	0.43	3.48	0.12	0.05	0.02	1,698.02	0.00	0.27	1,777.60
Paving (grams/mile)	0.04	0.43	3.46	0.12	0.05	0.02	1,682.27	0.00	0.26	1,761.12
Grubbing/Land Clearing (grams/trip)	0.00	0.00	4.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	4.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)	0.00	0.00	4.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	4.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.01	0.11	0.92	0.03	0.01	0.00	440.32	0.00	0.07	460.95
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.02	0.00	0.00	0.00	7.71	0.00	0.00	8.07
Pounds per day - Grading/Excavation	0.01	0.06	0.46	0.01	0.01	0.00	220.16	0.00	0.03	230.48
Tons per const. Period - Grading/Excavation	0.00	0.00	0.01	0.00	0.00	0.00	2.75	0.00	0.00	2.88
Pounds per day - Drainage/Utilities/Sub-Grade	0.01	0.13	1.05	0.03	0.02	0.00	501.63	0.00	0.08	525.14
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.02	0.13	0.00	0.00	0.00	61.45	0.00	0.01	64.33
Pounds per day - Paving	0.02	0.19	1.56	0.05	0.02	0.01	745.46	0.00	0.12	780.40
Tons per const. Period - Paving	0.00	0.01	0.06	0.00	0.00	0.00	27.95	0.00	0.00	29.27
Total tons per construction project	0.00	0.03	0.21	0.01	0.00	0.00	99.86	0.00	0.02	104.54

Note: Asphalt Hauling emission default values can be overridden in cells D91 through D94, and F91 through F94.

Asphalt Hauling Emissions	User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT
User Input					
Miles/round trip: Grubbing/Land Clearing		30.00		0	0.00
Miles/round trip: Grading/Excavation		30.00		0	0.00
Miles/round trip: Drainage/Utilities/Sub-Grade		30.00		0	0.00
Miles/round trip: Paving		30.00		0	0.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile)	0.04	0.43	3.49	0.12	0.05	0.02	1,704.13	0.00	0.27	1,784.00
Grading/Excavation (grams/mile)	0.04	0.43	3.49	0.12	0.05	0.02	1,704.13	0.00	0.27	1,784.00
Draining/Utilities/Sub-Grade (grams/mile)	0.04	0.43	3.48	0.12	0.05	0.02	1,698.02	0.00	0.27	1,777.60
Paving (grams/mile)	0.04	0.43	3.46	0.12	0.05	0.02	1,682.27	0.00	0.26	1,761.12
Grubbing/Land Clearing (grams/trip)	0.00	0.00	4.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	4.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)	0.00	0.00	4.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	4.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction project	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Worker commute default values can be overridden in cells D121 through D126.

Worker Commute Emissions	User Override of Worker			
User Input	Commute Default Values	Default Values		
Miles/ one-way trip		20	Calculated	Calculated
One-way trips/day		2	Daily Trips	Daily VMT
No. of employees: Grubbing/Land Clearing		5	10	200.00
No. of employees: Grading/Excavation		28	56	1,120.00
No. of employees: Drainage/Utilities/Sub-Grade		18	36	720.00
No. of employees: Paving		8	16	320.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile)	0.01	0.84	0.06	0.05	0.02	0.00	306.70	0.00	0.01	308.54
Grading/Excavation (grams/mile)	0.01	0.84	0.06	0.05	0.02	0.00	306.70	0.00	0.01	308.54
Draining/Utilities/Sub-Grade (grams/mile)	0.01	0.82	0.06	0.05	0.02	0.00	303.66	0.00	0.01	305.46
Paving (grams/mile)	0.01	0.78	0.06	0.05	0.02	0.00	295.84	0.00	0.01	297.52
Grubbing/Land Clearing (grams/trip)	0.98	2.66	0.27	0.00	0.00	0.00	65.99	0.07	0.03	76.61
Grading/Excavation (grams/trip)	0.98	2.66	0.27	0.00	0.00	0.00	65.99	0.07	0.03	76.61
Draining/Utilities/Sub-Grade (grams/trip)	0.97	2.63	0.26	0.00	0.00	0.00	65.36	0.06	0.03	75.82
Paving (grams/trip)	0.93	2.56	0.25	0.00	0.00	0.00	63.73	0.06	0.03	73.77
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.03	0.43	0.03	0.02	0.01	0.00	136.69	0.00	0.00	137.73
Tons per const. Period - Grubbing/Land Clearing	0.00	0.01	0.00	0.00	0.00	0.00	2.39	0.00	0.00	2.41
Pounds per day - Grading/Excavation	0.15	2.40	0.19	0.11	0.05	0.01	765.44	0.02	0.02	771.30
Tons per const. Period - Grading/Excavation	0.00	0.03	0.00	0.00	0.00	0.00	9.57	0.00	0.00	9.64
Pounds per day - Drainage/Utilities/Sub-Grade	0.10	1.51	0.12	0.07	0.03	0.00	487.20	0.01	0.01	490.88
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.01	0.19	0.01	0.01	0.00	0.00	59.68	0.00	0.00	60.13
Pounds per day - Paving	0.04	0.64	0.05	0.03	0.01	0.00	210.95	0.00	0.00	212.50
Tons per const. Period - Paving	0.00	0.02	0.00	0.00	0.00	0.00	7.91	0.00	0.00	7.97
Total tons per construction project	0.02	0.25	0.02	0.01	0.00	0.00	79.55	0.00	0.00	80.15

Note: Water Truck default values can be overridden in cells D153 through D156, I153 through I156, and F153 through F156.

Water Truck Emissions	User Override of	Program Estimate of	User Override of Truck	Default Values	Calculated	User Override of	Default Values	Calculated
User Input	Default # Water Trucks	Number of Water Trucks	Round Trips/Vehicle/Day	Round Trips/Vehicle/Day	Trips/day	Miles/Round Trip	Miles/Round Trip	Daily VMT
Grubbing/Land Clearing - Exhaust		1		5	5		8.00	40.00
Grading/Excavation - Exhaust		1		5	5		8.00	40.00
Drainage/Utilities/Subgrade		1		5	5		8.00	40.00
Paving		1		5	5		8.00	40.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile)	0.04	0.43	3.49	0.12	0.05	0.02	1,704.13	0.00	0.27	1,784.00
Grading/Excavation (grams/mile)	0.04	0.43	3.49	0.12	0.05	0.02	1,704.13	0.00	0.27	1,784.00
Draining/Utilities/Sub-Grade (grams/mile)	0.04	0.43	3.48	0.12	0.05	0.02	1,698.02	0.00	0.27	1,777.60
Paving (grams/mile)	0.04	0.43	3.46	0.12	0.05	0.02	1,682.27	0.00	0.26	1,761.12
Grubbing/Land Clearing (grams/trip)	0.00	0.00	4.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	4.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)	0.00	0.00	4.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	4.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.00	0.04	0.36	0.01	0.00	0.00	150.28	0.00	0.02	157.32
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.01	0.00	0.00	0.00	2.63	0.00	0.00	2.75
Pounds per day - Grading/Excavation	0.00	0.04	0.36	0.01	0.00	0.00	150.28	0.00	0.02	157.32
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	1.88	0.00	0.00	1.97
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.04	0.36	0.01	0.00	0.00	149.74	0.00	0.02	156.76
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.04	0.00	0.00	0.00	18.34	0.00	0.00	19.20
Pounds per day - Paving	0.00	0.04	0.35	0.01	0.00	0.00	148.35	0.00	0.02	155.30
Tons per const. Period - Paving	0.00	0.00	0.01	0.00	0.00	0.00	5.56	0.00	0.00	5.82
Total tons per construction project	0.00	0.01	0.07	0.00	0.00	0.00	28.41	0.00	0.00	29.75

Note: Fugitive dust default values can be overridden in cells D183 through D185.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		1.50	15.00	0.26	3.12	0.05
Fugitive Dust - Grading/Excavation		1.50	15.00	0.19	3.12	0.04
Fugitive Dust - Drainage/Utilities/Subgrade		1.50	15.00	1.84	3.12	0.38

Off-Road Equipment Emissions

Grubbing/Land Clearing	Default Number of Vehicles	Mitigation Option Override of	Current		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Override of Default Number of Vehicles	*Program-estimate*	Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Equipment Tier	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1		Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	2		Model Default Tier	Excavators	0.72	13.06	5.61	0.28	0.25	0.02	2,001.06	0.65	0.02	2,022.64
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Signal Boards	0.06	0.30	0.36	0.01	0.01	0.00	49.31	0.01	0.00	49.56
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00			Model Default Tier	Tractors/Loaders/Backhoes	0.86	13.41	8.69	0.40	0.37	0.02	1,810.60	0.59	0.02	1,830.08
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab

Number of Vehicles	Equipment Tier	Type		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
				pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing	pounds per day	1.64	26.77	14.66	0.69	0.63	0.04	3,860.98	1.24	0.03	3,902.28
Grubbing/Land Clearing	tons per phase	0.03	0.47	0.26	0.01	0.01	0.00	67.57	0.02	0.00	68.29

Grading/Excavation	Default Number of Vehicles	Mitigation Option Override of	Current		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Override of Default Number of Vehicles	*Program-estimate*	Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Equipment Tier	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1		Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2		Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	4		Model Default Tier	Excavators	0.54	9.80	4.21	0.21	0.19	0.02	1,500.80	0.49	0.01	1,516.98
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2		Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3		Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00			Model Default Tier	Rubber Tired Dozers	1.39	6.26	14.26	0.64	0.59	0.02	1,653.96	0.53	0.01	1,671.78
0.00	3		Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	4		Model Default Tier	Scrapers	1.52	11.93	15.39	0.61	0.56	0.03	2,938.20	0.95	0.03	2,969.87
0.00	1		Model Default Tier	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	2		Model Default Tier	Tractors/Loaders/Backhoes	0.29	4.47	2.90	0.13	0.12	0.01	603.53	0.20	0.01	610.03
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment	If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab			ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Number of Vehicles	Equipment Tier	Type		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Grading/Excavation	pounds per day		3.74	32.46	36.75	1.59	1.46	0.07	6,696.49	2.17	0.06	6,768.65
	Grading/Excavation	tons per phase		0.05	0.41	0.46	0.02	0.02	0.00	83.71	0.03	0.00	84.61

Drainage/Utilities/Subgrade Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Current Equipment Tier		ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1		Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tier	Bore/Drill Rigs	0.21	2.04	1.89	0.06	0.06	0.01	917.33	0.30	0.01	927.23
4.00			Model Default Tier	Cement and Mortar Mixers	0.24	1.23	1.47	0.06	0.06	0.00	202.07	0.02	0.00	203.09
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00			Model Default Tier	Cranes	0.98	5.29	10.23	0.43	0.39	0.02	1,676.44	0.54	0.02	1,694.51
			Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00			Model Default Tier	Excavators	0.88	16.32	6.76	0.33	0.31	0.03	2,501.43	0.81	0.02	2,528.40
2.00			Model Default Tier	Forklifts	0.18	2.28	1.73	0.10	0.09	0.00	296.06	0.10	0.00	299.26
7.00	1		Model Default Tier	Generator Sets	1.96	25.64	17.52	0.75	0.75	0.05	4,361.25	0.17	0.03	4,375.32
0.00	2		Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tier	Other Construction Equipment	0.32	4.01	3.09	0.16	0.15	0.01	598.35	0.19	0.01	604.81
			Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tier	Pavers	0.18	2.89	1.70	0.08	0.07	0.00	455.12	0.15	0.00	460.02
1.00			Model Default Tier	Paving Equipment	0.16	2.56	1.43	0.07	0.06	0.00	394.42	0.13	0.00	398.68
0.00	1		Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1		Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tier	Rollers	0.14	1.85	1.50	0.08	0.07	0.00	254.12	0.08	0.00	256.86
0.00	1		Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00	4		Model Default Tier	Scrapers	0.74	5.80	7.33	0.29	0.27	0.02	1,468.83	0.47	0.01	1,484.66
0.00	1		Model Default Tier	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	2		Model Default Tier	Tractors/Loaders/Backhoes	0.98	15.64	9.92	0.44	0.41	0.02	2,112.93	0.68	0.02	2,135.66
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab

Number of Vehicles	Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Drainage/Utilities/Sub-Grade	pounds per day	6.98	85.55	64.56	2.84	2.68	0.16	15,238.36	3.65	0.13	15,368.52
Drainage/Utilities/Sub-Grade	tons per phase	0.85	10.48	7.91	0.35	0.33	0.02	1,866.70	0.45	0.02	1,882.64

Paving

Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Current Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00			Model Default Tier	Excavators	0.67	13.04	4.89	0.24	0.22	0.02	2,001.35	0.65	0.02	2,022.93
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00			Model Default Tier	Generator Sets	0.53	7.32	4.79	0.19	0.19	0.01	1,246.07	0.05	0.01	1,250.01
			Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Pavers	0.17	2.90	1.58	0.07	0.07	0.00	454.99	0.15	0.00	459.90
	1		Model Default Tier	Paving Equipment	0.15	2.55	1.26	0.06	0.06	0.00	394.32	0.13	0.00	398.57
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Rollers	0.14	1.85	1.44	0.07	0.07	0.00	254.06	0.08	0.00	256.80
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tier	Rubber Tired Dozers	0.65	3.00	6.63	0.29	0.27	0.01	826.96	0.27	0.01	835.87
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00			Model Default Tier	Scrapers	2.02	16.14	19.11	0.75	0.69	0.05	4,404.44	1.42	0.04	4,451.92
	1		Model Default Tier	Signal Boards	0.06	0.30	0.36	0.01	0.01	0.00	49.31	0.01	0.00	49.56
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	2		Model Default Tier	Tractors/Loaders/Backhoes	0.53	8.92	5.34	0.22	0.20	0.01	1,208.22	0.39	0.01	1,221.22
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment

If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab

Number of Vehicles	Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Paving	pounds per day	4.91	56.00	45.41	1.91	1.78	0.11	10,839.74	3.14	0.10	10,946.78
Paving	tons per phase	0.18	2.10	1.70	0.07	0.07	0.00	406.49	0.12	0.00	410.50
Total Emissions all Phases (tons per construction period) =>		1.11	13.45	10.33	0.45	0.42	0.03	2,424.46	0.61	0.02	2,446.05

Equipment default values for horsepower and hours/day can be overridden in cells D403 through D436 and F403 through F436.

Equipment	User Override of Horsepower	Default Values Horsepower	User Override of Hours/day	Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		78		8
Bore/Drill Rigs		221		8
Cement and Mortar Mixers		9		8
Concrete/Industrial Saws		81		8
Cranes		231		8
Crawler Tractors		212		8
Crushing/Proc. Equipment		85		8
Excavators		158		8
Forklifts		89		8
Generator Sets		84		8
Graders		187		8
Off-Highway Tractors		124		8
Off-Highway Trucks		402		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		168		8
Pavers		130		8
Paving Equipment		132		8
Plate Compactors		8		8
Pressure Washers		13		8
Pumps		84		8
Rollers		80		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		247		8
Rubber Tired Loaders		203		8
Scrapers		367		8
Signal Boards		6		8
Skid Steer Loaders		65		8
Surfacing Equipment		263		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		97		8
Trenchers		78		8
Welders		46		8

END OF DATA ENTRY SHEET

Appendix D

Amended Determination of Biologically Equivalent or Superior Preservation (Rincon Consultants, March 2022)

Murrieta Creek Bridge and Overland Drive Extension Project

Amended Determination of Biologically Equivalent or Superior Preservation

prepared for

City of Temecula
41000 Main Street
Temecula, California 92590

prepared by

Bonterra Consulting
2 Executive Circle, Suite 175
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February 21, 2013
Amended March 2022

RINCON CONSULTANTS, INC.
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Appendices

1 Introduction

A Determination of Biologically Equivalent or Superior Preservation (DBESP) report, prepared by Bonterra Consulting dated February 21, 2013, was written to satisfy requirements of the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) for impacts on Riparian/Riverine resources, and least Bell's vireo (*Vireo bellii pusillus*) as a result of the Murrieta Creek and Overland Drive Extension Project (hereinafter referred to as the "Proposed Project"). The Proposed Project comprises two phases; Phase I has been completed as was approved under the Bonterra Consulting 2013 DBESP, Phase II will be constructed under this amended DBESP to address changes from the 2013 DBESP. Phase I extended Overland Drive from Commerce Center Drive to Enterprise Circle West. Phase II involves the further extension of Overland Drive, including construction of a bridge over Murrieta Creek connecting Overland Drive to the Diaz Road/Avenida Alvarado intersection, and is the focus of this Amended DBESP.

This amended DBESP is required for Phase II of the Proposed Project because it would result in impacts on the aforementioned biological resources in the survey area. Most of Phase II limits are within the same footprint as described in the previously approved DBESP. This Amended DBESP addresses the reduced scope of work and modifications to the project footprint for Phase II. The Phase II changes eliminate the need for dredging the channel and the placement of Amorflex and riprap within Murrieta Creek. The permanent impacts, subject to regulations, are derived from the foundations of pier columns, which will support the bridge above Murrieta Creek, the abutment concrete slope lining and cutoff wall for scour protection, and the bridge approach pavements and abutment foundations that will be constructed on both sides of the creek. Phase II has resulted in a reduction of impacts to vegetation and jurisdictional resources compared to the way Phase II was previously proposed. Due to the nature of Phase II, there is no feasible alternative that would allow for avoidance of impacts on Riparian/Riverine resources and least Bell's vireo; however, impacts on these resources have been minimized to the extent practicable. The objective of this report is to demonstrate that the proposed mitigation would provide an equivalent or superior preservation of habitat function and value of Riparian/Riverine resources and species associated with Riparian/Riverine resources (i.e., least Bell's vireo).

This report was provided to the Western Riverside County Regional Conservation Authority (WRC RCA) for comment, which includes representatives from the County of Riverside, the United States (U.S.) Fish and Wildlife Service (USFWS), the California Department of Fish and Wildlife (CDFW)[1], the San Diego Regional Water Quality Control Board, and the U.S. Army Corps of Engineers (USACE). One comment was received from USFWS on June 17, 2022, to which Rincon responded on July 11, 2022. No additional agency comments were received within the 60-day response period between July 11, 2022 and September 05, 2022.

1.1 Project Location

The Proposed Project is located southwest of the intersection of Interstate Freeway 15 (I-15) and Winchester Road in the City of Temecula in Riverside County, California (Figure 1). The survey area for the Proposed Project consists of the Project impact area plus a 500-foot buffer around the

[1] As of January 1, 2013, the California Department of Fish and Game (CDFG) is known as the California Department of Fish and Wildlife (CDFW).

Project impact area (in order to evaluate potential indirect effects). It is located on the U.S. Geological Survey's (USGS') Murrieta 7.5-minute quadrangle map and within Township 8 South, Range 3 West, Section 2 (San Bernardino baseline and Meridian; Figure 2). Commercial development is located along both sides of Murrieta Creek. Topography in the survey area is relatively flat with an elevation of approximately 1,020 feet above mean sea level (msl).

The survey area is located within Subunit 1 (Murrieta Creek) of the Western Riverside MSHCP's Southwest Area Plan. The survey area is located within Criteria Area Cells 6783 and 6890, which would contribute to Proposed Constrained Linkage 13 (Figure 3). The land along Murrieta Creek is owned by the Riverside County Flood Control and Water Conservation District (RCFC&WCD), however none of the land within Phase II has been designated as Public/Quasi-Public Lands per the MSHCP (Dudek 2003).

1.2 Project Description

Phase II would extend a four-lane bridge from the existing terminus of Avenida Alvarado at Diaz Road (west of Murrieta Creek) to connect with Overland Drive at Enterprise Circle West (east of Murrieta Creek). Amendment to Phase II construction reduces the total project footprint permanent impacts by 4.5 acres and temporary impacts by 3.3 acres (Figure 4, Figure 5). Construction of the bridge would include earthen approach embankments with asphalt concrete pavement and concrete slabs, abutment walls and foundations, and concrete slope linings and cutoff walls for scour protection, piers and foundations, bridge cell openings for future utilities; and electrical conduits for street lights and traffic signals.

It should be noted that construction would occur in two phases: (1) Phase I would include the demolition of existing structures and construction of Overland Drive up to Enterprise Circle West (City Project No. PW 16-06); (2) Phase II would construct the bridge across Murrieta Creek (City Project No. PW 16-05). Phase I was completed and has extended Overland Drive to Enterprise Circle West. After Phase II is constructed, the USACE will implement a Murrieta Creek Flood Control/Environmental Restoration Project.[2] The USACE channel improvement project will lower the channel bottom by approximately 10 feet at the Phase II Bridge.

Phase II is considered a covered roadway, as described in Section 7.3.5 of the MSHCP and is therefore subject to design considerations to ensure that it remains characterized as a secondary road. As such, the completed road including all landscaping, safety requirements, and curbs/gutters will be within the maximum allowable width (100 feet).

Phase II implementation does not require any off-site impacts or staging areas (Figure 5).

As part of the bridge construction, one abutment would be constructed on each end of the bridge, along with two piers within Murrieta Creek. Earthen embankments with concrete slope protection

[2] The USACE's 13,000-linear-foot project is located from approximately 200 feet upstream of Winchester Road to approximately 1,000 feet downstream of 1st Street. The project will include (1) variable channel widths of 140 to 364 feet; (2) placement of buried riprap for slope toe protection along areas with a slope between 2:1 and 3:1; (3) soil cement protection in areas with slopes steeper than 2:1; (4) an unmaintained vegetated corridor (averaging 70 feet in width); (5) 4 grade-control structures; (6) removal of Via Montezuma, an existing low-water crossing that crosses Murrieta Creek; (7) future operation and maintenance and emergency repairs; and (8) an equestrian trail (a degraded granite surface extending along the creek's west side) and a bicycle trail (a paved maintenance road extending along the creek's east side). The southern portion (Phase 2A) of the creek widening project's construction has been completed, while the northern portion (Phase 2B) that covers the Phase II Bridge is scheduled to begin in approximately 5 to 10 years due to delay in funding.

and cutoff walls buried underground would also be installed on the east and west side of Murrieta Creek. Each pier will consist of three 4-foot-diameter concrete columns. The columns will be supported by a 6-foot-diameter cast-in-drilled-hole (CIDH) concrete piles, deep enough for protection from scour. The channel bottom will remain earthen without any concrete or rip rap lining. The bridge girder would provide cell openings to accommodate future utilities and electrical conduits for streetlights and traffic signal communication.

Construction Traffic Controls

Upon completion the bridge would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 6-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross. The existing bike trail on the west side of Murrieta Creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

In addition to the construction of the bridge, various roadway and utility improvements would occur at the western and eastern bridge approaches. To match the roadway section on Avenida Alvarado on the west side of the bridge, Phase II would transition the lane configuration in the eastern portion of Avenida Alvarado to be consistent with the four-lane configuration of the bridge. Intersection improvements to Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado would include the installation of traffic signals and associated signing, striping, streetlights, and utilities. Reconstruction and roadway improvements along Diaz Road and Avenida Alvarado would include undergrounding electrical utilities, construction of curb, gutter, and sidewalks, relocating sewer and water facilities, and adding traffic signage and striping.

Phase II will also include the following additional improvements:

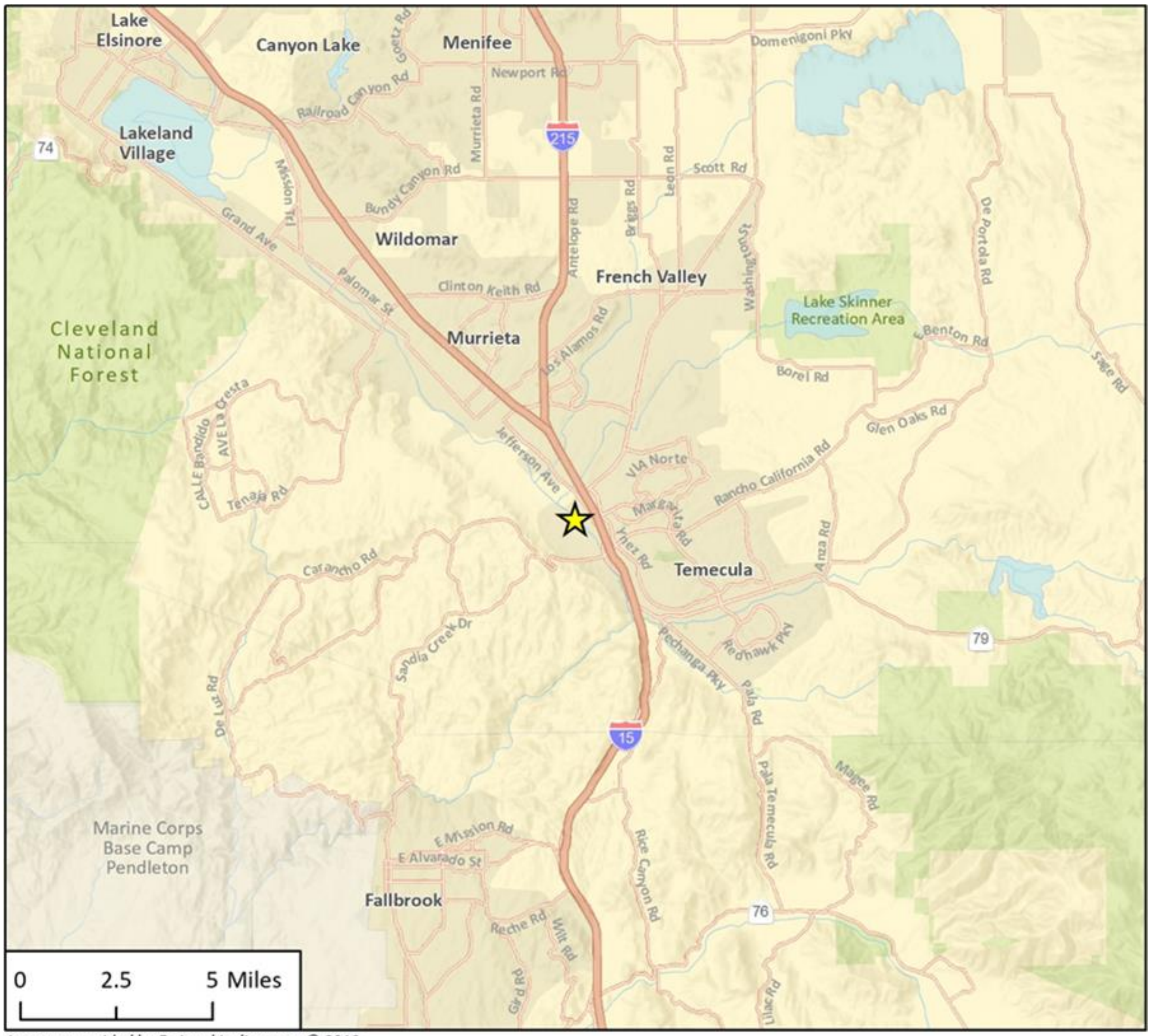
- **Railing Architectural Treatment.** The bridge design will incorporate concrete barriers, metal hand and bicycle railings, and standard architectural treatments.
- **Landscaping.** Landscaping modifications or improvements in the right-of-way along the bridge approach, Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado intersections, and along Diaz Road and Overland Drive.

Throughout construction, Diaz Road, Avenida Alvarado, and Overland Drive will include temporary striping to divert traffic away from work areas. The temporary striping will allow for staged construction of roadway and intersection improvements to always maintain vehicle, pedestrian, and bicyclist access. Temporary and short-term access impacts may occur during construction, and will require coordination with property owners, the public, and other stakeholders.

Right-of-Way Requirements

The right of way on the east side of Murrieta Creek has been acquired by the City as part of the completed Phase I Overland Drive Extension Project (City Project PW 16-06). Phase II right of way on the west side of Murrieta Creek involves acquiring a part of Diaz Road and Avenida Alvarado. Portions of four driveways and parkways in three private properties are to be reconstructed. Temporary construction easements (TCE’s) will be acquired at these locations. There will be a street easement for the bridge and its approaches in Murrieta Creek, which is to be acquired from RCFC&WCD. The TCE for grading in the channel is to be acquired through an encroachment permit from RCFC&WCD. Permanent and temporary construction easements in four private properties at the easterly side of the Creek may be required to construct storm drains, a retaining wall, and the bridge approach embankment.

Figure 1 Project Location



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☆ Project Location - Federal Project No. BR-NBIL(543)

N

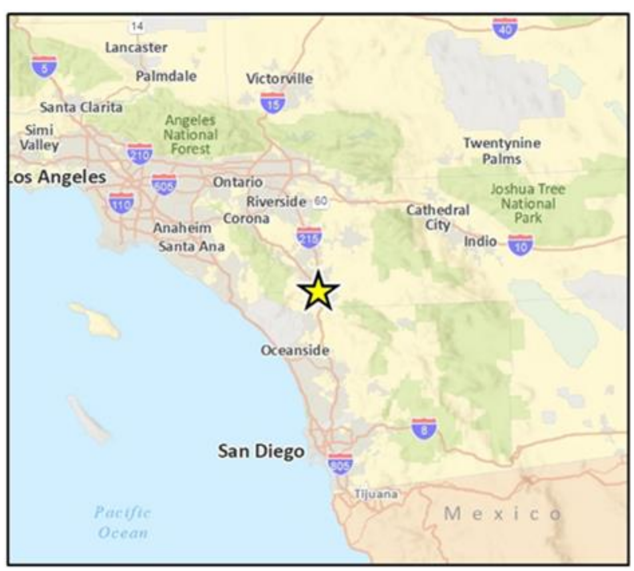

Figure 2 Survey Area with USGS Topographic Map

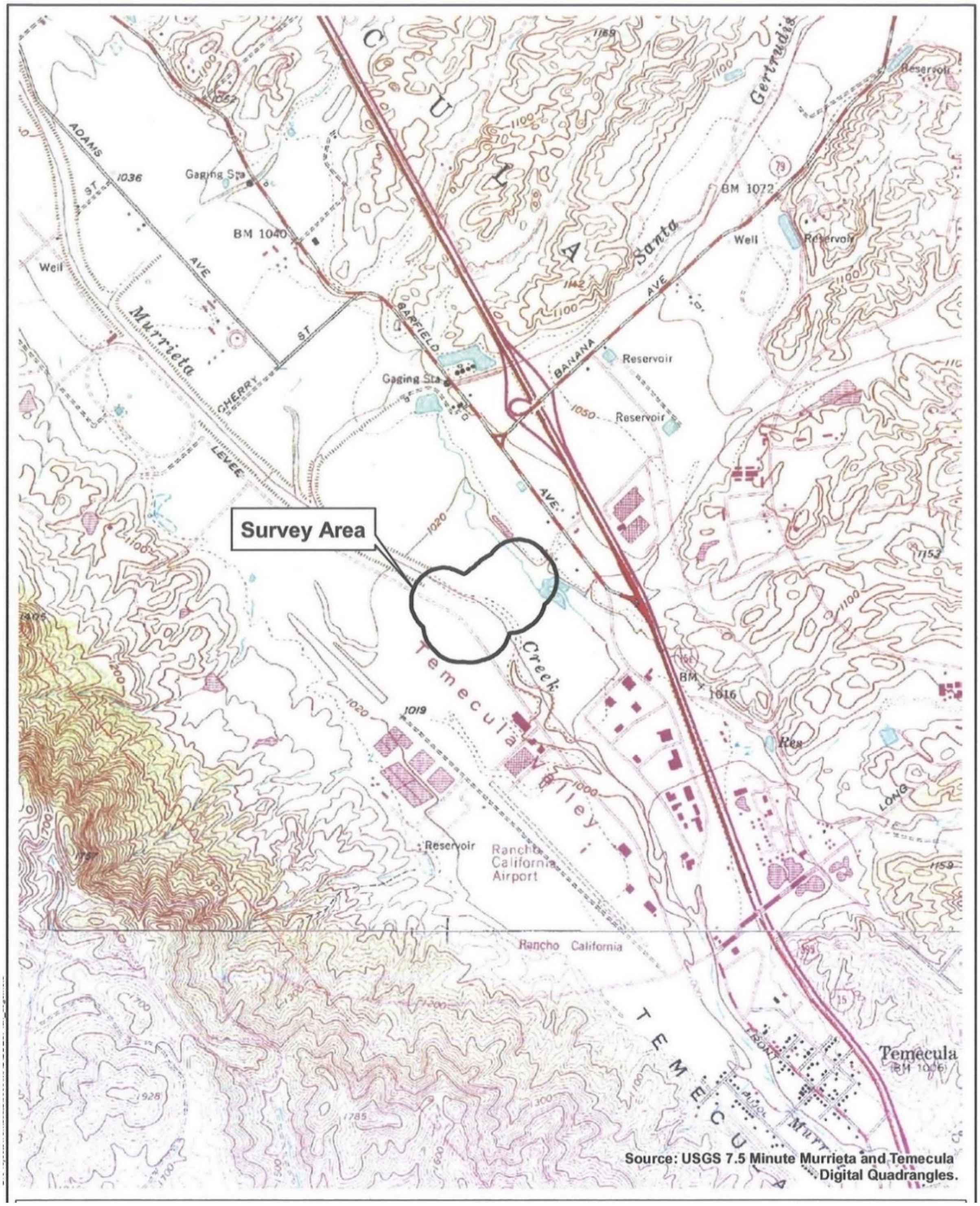

Figure 3 Western Riverside County Multiple Species Habitat Conservation Plan

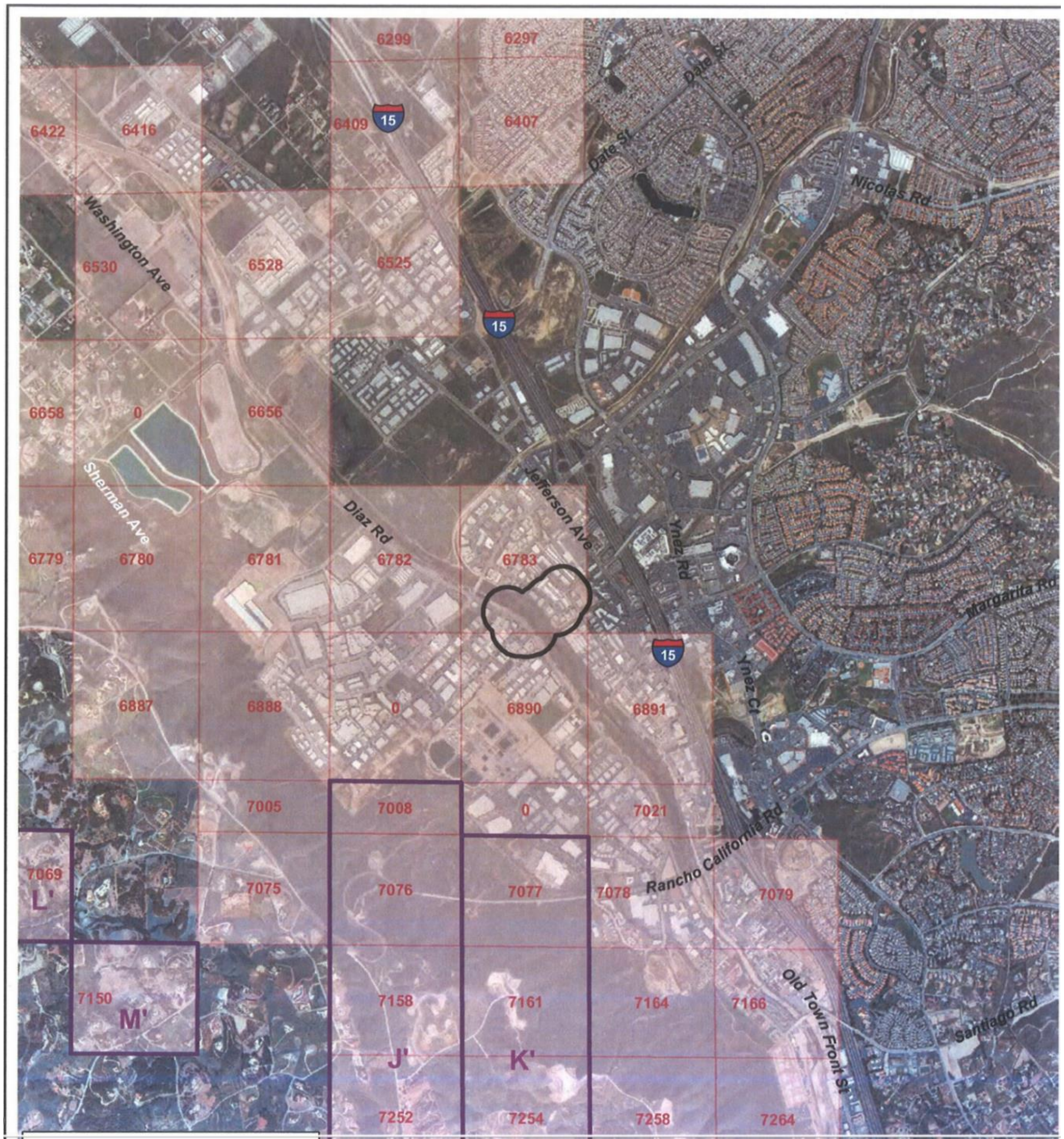

Figure 4 Project Changes 2013-2020

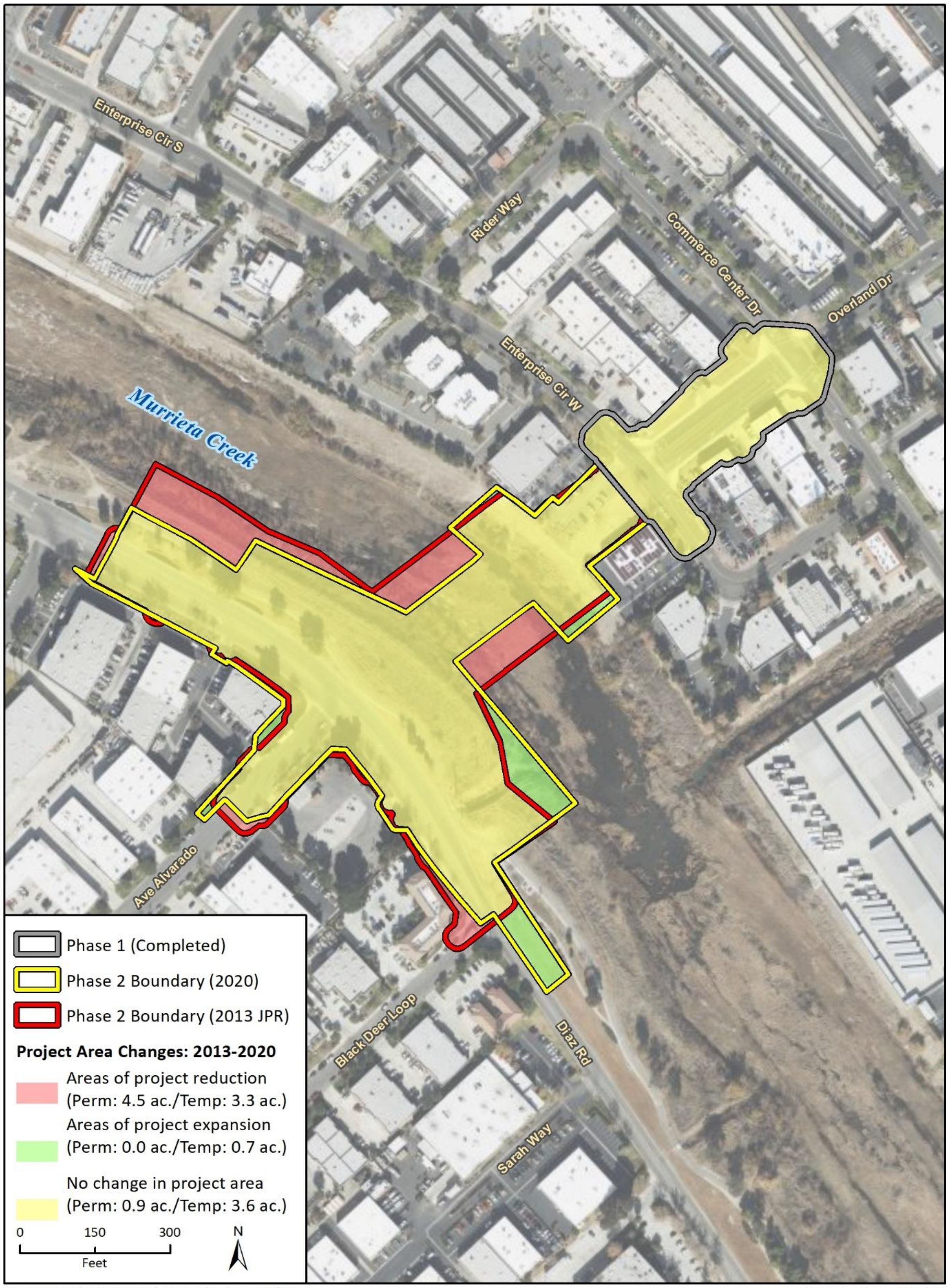

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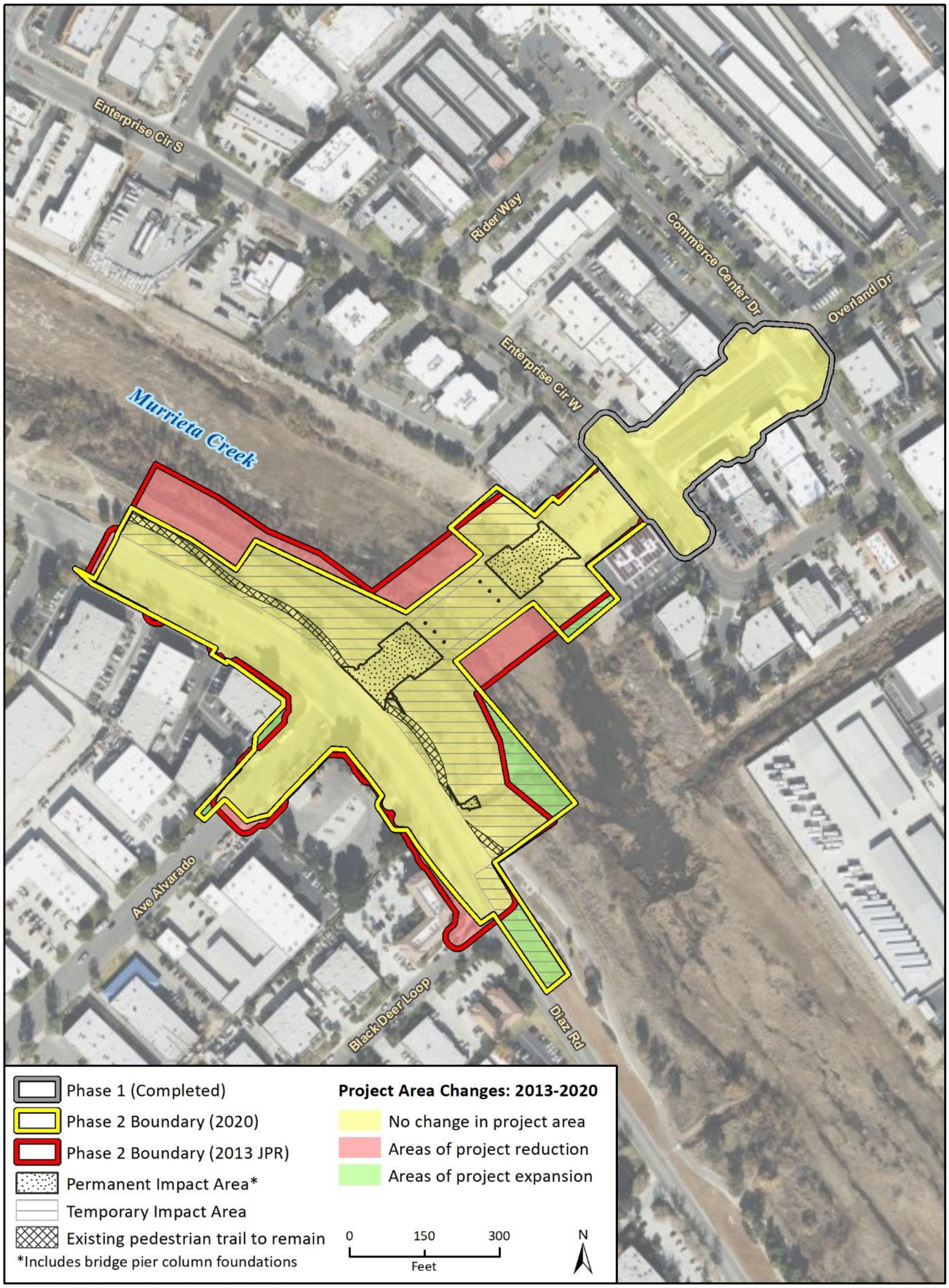
Figure 5 Project Impacts



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2 Methods

2.1 Literature Review

A literature review was conducted prior to the field surveys to identify special status plant and wildlife species known to occur in the survey area vicinity. The Riverside County Integrated Project (RCIP) Summary Report Generator (RCIP 2009), the California Native Plant Society's (CNPS's) Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2012), and the CDFG's California Natural Diversity Database (CNDDB) (CDFG 2012) were reviewed for special status plant and wildlife species reported from the project vicinity. This review includes Assessor Parcel Numbers (APNs) 909-120-006, 909-120-016, 909-251-001, 909-251-002, 909-252-025, 921-030-042, 921-480080, 921-480-012, 921-480-013, 921-480-014, 921-480-018, 921-480-019, 921-480-020, 921-480-021, 921-480-030, 921-480-031, 921-480-032, 921-480-042, 921-480-055, and 921-740-004.

In addition, the Report and General Soil Maps for the Western Riverside Area (USDA NRCS 2007) was reviewed to determine whether suitable soils are present to support special status plant and wildlife species.

2.2 Biological Surveys Conducted for Phase II

The data provided in this report is derived from general and focused surveys of the survey area conducted in 2012 and in 2019. All 2012 surveys referenced below are included as attachments to the Habitat Assessment Report for the Proposed Project (BonTerra Consulting 2012a). The 2019 Least Bell's Vireo Protocol Survey Report (Rincon Consultants, Inc. [Rincon] 2019) is attached to this amended DBESP as Appendix B. Rincon conducted update surveys for Phase II in preparation of this DBESP amendment.

2.2.1 Habitat Assessment

A habitat assessment was conducted in the survey area on April 17, 2012, by BonTerra Consulting Biologists Kristin Smith and Allison Rudalevige (BonTerra Consulting 2012a). The weather was clear with temperatures between 70- and 85-degrees Fahrenheit (°F) and winds less than 5 miles per hour. Subsequently, a second habitat assessment was conducted in the survey area on May 10, 2019, by Rincon Biologist Megan Minter. The weather was clear with temperatures between 58 and 64°F and winds less than 5 miles per hour.

For both surveys the general assessment was conducted by walking the survey area and recording plant and wildlife data. Vegetation was mapped in the field on an aerial photograph at a scale of 1-inch equals 300 feet (1"=300'). Vegetation types were mapped and were generally described using categories outlined in the MSHCP (Dudek 2003).

2.2.2 Jurisdictional Delineation

A formal jurisdictional delineation was conducted in the survey area concurrent with the habitat assessment by Bon Terra Consulting in 2012 (BonTerra Consulting 2012b). The delineation was conducted in accordance with the *Regional Supplement to the Corps of Engineers Wetland*

Delineation Manual: Arid West Region (USACE 2008) and the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987).

2.2.3 Least Bell's Vireo

Focused surveys for least Bell's vireo were conducted by BonTerra Consulting Biologist Jonathan Aguayo (BonTerra Consulting 2012c). The least Bell's vireo surveys were conducted within all suitable riparian vegetation. In accordance with the USFWS protocol for this species (USFWS 2001), a total of 8 surveys were conducted at least 10 days apart on May 2, 18, and 30; June 14 and 25; and July 5, 15, and 30, 2012. Mr. Aguayo systematically surveyed the riparian habitat either by walking slowly and methodically along the margins of riparian habitat or by using meandering transects through riparian habitat. All surveys were conducted under optimal weather conditions (i.e., between 55°F and 95°F with wind speeds between 0 and 15 miles per hour) and during early morning hours when bird activity is at a peak.

Update focused surveys for least Bell's vireo were conducted in 2019 by Rincon Biologist Megan Minter within a 500-foot buffer around the Phase II site (Study Area). The surveys were conducted in accordance with the U.S. Fish and Wildlife Service (USFWS) *Least Bell's Vireo Survey Guidelines*, issued January 19, 2001. Eight (8) surveys were conducted at least nine (9) days apart between May 10 and July 19. The surveys occurred between dawn and 11:00 a.m. each day within all portions of the Study Area containing potentially suitable riparian habitat. Surveys were not conducted during inclement weather conditions (e.g., excessive or abnormal heat, cold, wind, rain, or fog).

As the least Bell's vireo survey protocol does not require the playback of least Bell's vireo vocalizations, these recordings were not used during the surveys. The previous DBESP, completed by Bonterra Consulting, used "Pishing" sounds opportunistically to elicit responses from any potential least Bell's vireo present. Detections of least Bell's vireo were marked on an aerial photograph and recorded using a Global Positioning (GPS) System unit. A point was marked at each location where individuals were observed or detected singing within the survey area.

2.2.4 Burrowing Owl

Focused surveys for western burrowing owl *(Athene cunicularia hypugaea)* were conducted within several portions of the project site where owls had a potential to occur based on the results of the habitat assessment and the burrow survey. These surveys were conducted from either one hour before sunrise to two hours after, or from two hours before sunset to one hour after. These surveys are conducted only with sufficient light to follow burrowing owl flights.

Step I Habitat Assessment and Step II focused surveys were completed in 2012 and in 2019. The first survey completed in 2012 was conducted by BonTerra consulting by Mr. Aguayo in 2012. 2012 survey results indicate no burrowing owls, occupied owl feathers, or other evidence of owl's presence. Mr. Aguayo conducted the crepuscular surveys on June 14; July 6 and 30; and August 31, 2012. All potential habitat on the project site was surveyed to achieve 100 percent visual coverage of the area. Binoculars were also used to inspect holes; crevices; and potential perches such as rocks, fence posts, and other elevated structures for the presence of owls while listening for owl calls. A second set of burrowing owl surveys was completed by Rincon biologist Megan Minter on May 10, 2019, and May 20, 2019 in accordance with methods outlined in *Burrowing Owl Survey Instructions for the Western Riverside Multiple Species Habitat Conservation Plan Area* (County of Riverside 2006).

3 Existing Biological Resources

3.1 Vegetation

The following vegetation types and other areas occur in the survey area: freshwater marsh, riparian scrub, southern willow scrub, non-native grassland/ruderal, and developed/ornamental (Figure 6; Table 1). Site photographs were taken and are included in Attachment A.

Table 1 Vegetation Types in the Survey Area

Vegetation Type	Existing (acres)
Freshwater Marsh	7.63
Riparian Scrub	0.85
Southern Willow Scrub	2.24
Non-Native Grassland/Ruderal	5.96
Developed/Ornamental	48.51
Total	65.19

3.1.1 Freshwater Marsh

Freshwater marsh is the vegetation type that occurs across most of Murrieta Creek in the survey area. Freshwater marsh is a subassociation of freshwater wetlands described in the MSHCP (Dudek 2003). This vegetation type is dominated by a mix of broad-leaved cattail *(Typha* sp.), bulrush *(Scirpus* spp.), and sedge (*Carex* spp.).

3.1.2 Riparian Scrub

Riparian scrub occurs along the northeastern edge of Murrieta Creek. This vegetation type is a subassociation of riparian forest/woodland/scrub described in the MSHCP (Dudek 2003). This vegetation type is comprised of a mix of arroyo willow (*Salix lasiolepis),* red willow (*Salix laevigata),* Goodding's black willow (*Salix gooddingii),* narrow-leaved willow (*Salix exigua),* and mule fat *(Baccharis salicifolia).* Tamarix *(Tamarix* sp.) and giant reed *(Arundo donax),* both exotic invasive species, also occur within this vegetation type.

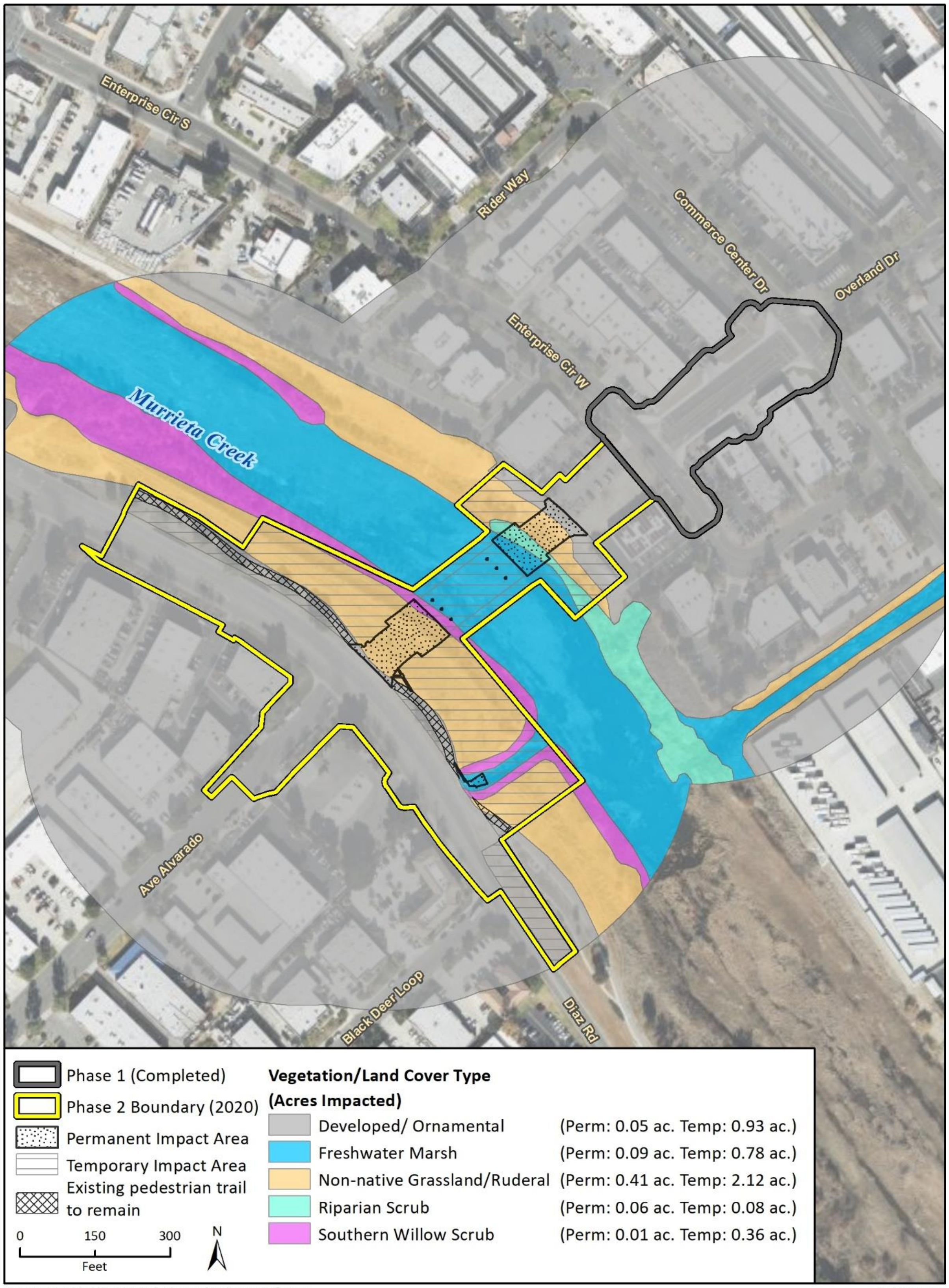
3.1.3 Southern Willow Scrub

Southern willow scrub occurs along the southwestern and northwestern bank of Murrieta Creek. This scrubland is a subassociation of riparian forest/woodland/scrub described in the MSHCP (Dudek 2003). This vegetation type is dominated by narrow-leaved willow.

3.1.4 Non-Native Grassland/Ruderal

Non-native grassland/ruderal occurs along the banks of Murrieta Creek. This vegetation type is dominated by wild oat *(Avena* fatua), ripgut grass *(Bromus diandrus),* barley *(Hordeum* sp.), annual beard grass *(Polypogon monspeliensis),* Mediterranean schismus *(Schismus barbatus),* cheeseweed

Figure 6 Vegetation Type



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(Malva parviflora), red-stemmed filaree *(Erodium cicutarium),* shortpod mustard *(Hirschfeldia incana),* and common sow thistle (*Sonchus oleraceus).*

3.1.5 Developed/Ornamental

The developed/ornamental areas consist of commercial development and associated landscaping. A bike trail is also included in this mapping unit. Ornamental plantings include, but are not limited to, pine *(Pinus sp.),* Peruvian pepper *(Schinus molle),* London plane *(Platanus x hispanica),* India hawthorn *(Rhaphiolepis indica),* hottentot fig *(Carpobrotus edulis),* sweet alyssum *(Lobularia maritima),* gazania *(Gazania linearis),* California poppy *(Eschscholzia californica),* and turf grass. This mapping unit also includes some barren, graded areas above the northeastern bank of Murrieta Creek and areas containing riprap along the channel northeast of Murrieta Creek.

3.2 Wildlife

Although the survey area is located in an urban setting and habitat along the banks is generally considered to have relatively low quality for wildlife, the riparian habitat within Murrieta Creek is generally considered of high biological value.

Murrieta Creek contained flowing water at the time of the survey. A small fish species was observed during the survey; however, it was not identified to species. Tadpoles were also observed but were not identified to species. Bullfrog *(Lithobates catesbeianus [Rana catesbeiana])* was observed in the survey area. Other amphibian species expected to occur in the survey area include Baja California treefrog *(Pseudacris hypochondriaca)* and western toad *(Anaxyrus boreas).*

The only reptile species observed during the survey was the side-blotched lizard (*Uta stansburiana).* Western fence lizard *(Sceloporus occidentalis)* and gopher snake *(Pituophis catenifer)* are also expected to occur.

Some of the bird species observed in the survey area include mallard *(Ana platyrhynchos),* great blue heron *(Ardea herodias),* great egret *(Ardea alba),* Virginia rail *(Rallus limicola),* killdeer *(Charadrius vociferous),* mourning dove *(Zenaida macroura),* Anna's hummingbird *(Calypte anna),* black phoebe (*Sayomis nigricans),* ash-throated flycatcher *(Myiarchus cinerascens),* tree swallow *(Tachycineta bicolor),* northern rough-winged swallow *(Stelgidopteryx serripennis),* cliff swallow *(Petrochelidon pyrrhonota),* barn swallow *(Hirundo rustica),* American crow *(Corvus brachyrhynchos),* marsh wren *(Cistothorus palustris),* northern mockingbird *(Mimus polyglottos),* European starling *(Sturnus vulgaris),* common yellowthroat *(Geothlypis trichas),* Wilson's warbler *(Wilsonia pusilla),* yellow-breasted chat *(Icteria virens),* song sparrow *(Melospiza melodia),* red-winged blackbird *(Agelaius phoeniceus),* brown-headed cowbird *(Molothrus ater),* hooded oriole *(Icterus cucullatus),* and house finch *(Haemorhous mexicanus).*

Mammal species observed during the surveys include the Virginia opossum *(Didelphis virginiana),* desert cottontail *(Sylvilagus audubonii),* and California ground squirrel *(Spermophilus beecheyi).* Black-tailed jackrabbit *(Lepus californicus)* and coyote *(Canis latrans)* are also expected to occur.

Several bat species would be expected to occur in the survey area, including Brazilian free-tailed bat *(Tadarida brasiliensis),* big brown bat *(Eptesicus fuscus),* and California myotis *(Myotis californicus).*

3.2.1 Wildlife Movement

Wildlife corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization creates isolated “islands” of wildlife habitat. In the absence of habitat linkages that allow movement to adjoining open space areas, various studies have concluded that some wildlife species, especially the larger and more mobile mammals, will not likely persist over time in fragmented or isolated habitat areas because they prohibit the infusion of new individuals and genetic information (MacArthur and Wilson 1967; Soule 1987; Harris and Gallagher 1989; Bennett 1990). Once open space areas become constrained and/or fragmented as a result of urban development or construction of physical obstacles (such as roads and highways), the remaining landscape features or travel routes that connect the larger open space areas become corridors as long as they provide adequate space, cover, food and water, and do not contain obstacles or distractions (e.g., man-made noise, lighting) that would generally hinder wildlife movement.

The survey area is located in an urban setting; Murrieta Creek provides a wildlife movement corridor through the developed areas. The MSHCP has designated Murrieta Creek as Proposed Constrained Linkage 13. Murrieta Creek connects “Core”4 habitat at the Santa Rosa Plateau and Proposed Linkage 10 (Tenaja Corridor) to conserved habitats in San Diego County. The MSHCP states that Proposed Constrained Linkage 13 (Murrieta Creek) contains riparian habitat for key populations of yellow warbler (*Setophaga petechia* [*Dendroica petechia*]), yellow-breasted chat, and least Bell’s vireo. It also states that existing floodplain processes and water quality along the creek must be maintained to support Pacific [western] pond turtle (*Actinemys* [*Emys*] *marmorata*) and arroyo chub (*Gila orcutti*) in this area. Murrieta Creek is constrained on all sides by existing urban development; therefore, wildlife is constrained to moving along the creek.

The proposed bridge across Murrieta Creek would be similar to the Winchester Road bridge located immediately upstream of the survey area. It is assumed that wildlife species that currently move along the creek under the Winchester Road Bridge would continue along the creek under the new proposed bridge. Therefore, following construction of the proposed bridge, wildlife would be expected to continue to move along the creek as they currently do. However, night lighting along the proposed bridge and/or vehicle headlights could substantially increase light levels within the creek, which could discourage nocturnal wildlife movement. Additionally, if vehicle noise and/or the noise of vehicles driving over the bridge substantially increases above ambient conditions in the creek, this could also discourage wildlife movement. It is important that the bridge design follow guidelines in Section 6.1.4 of the MSHCP related to Urban/Wildlands interface in order to minimize indirect impacts on the creek that could affect wildlife movement and use.

Construction of the proposed bridge is expected to occur primarily during daylight hours; therefore, it would not be expected to deter nocturnal wildlife movement for coyotes and bobcats (*Lynx rufus*). Most wildlife moving along the creek during the day would be expected to be fairly acclimated to noise given the urban setting, and birds could move through the construction area quickly to reach quieter areas in the creek. Therefore, construction activities are not expected to substantially affect wildlife movement.

3.3 Summary of MSHCP Findings

The MSHCP requires that survey areas be evaluated for a number of factors in order to assess how they meet the criteria identified for conservation in the Western Riverside MSHCP. According to the

RCIP Conservation Summary Report Generator, Phase II is located within designated MSHCP "Criteria Area" cells 6783 and 6890 (Proposed Linkage 13 along Murrieta Creek). The RCIP Report Generator also indicates that the survey area must be assessed for other issues, which are addressed below (RCIP 2009).

3.3.1 Criteria Area/Cores and Linkages

The survey area is located within designated MSHCP "Criteria Area" cells 6783 and 6890, which contribute to Proposed Constrained Linkage 13 along Murrieta Creek. Murrieta Creek connects "Core" habitat at the Santa Rosa Plateau and Proposed Linkage 10 (Tenaja Corridor) to conserved habitats in San Diego County. The MSHCP states that Proposed Constrained Linkage 13 (Murrieta Creek) contains riparian habitat for key populations of yellow warbler, yellow-breasted chat, and least Bell's vireo. It also states that existing floodplain processes and water quality along the creek must be maintained to support Pacific pond turtle and arroyo chub in this area. Murrieta Creek is constrained on all sides by existing urban development; therefore, wildlife is constrained to moving along the creek. Potential impacts on wildlife movement were discussed above in Section 3.2.1.

3.3.2 Riparian/Riverine Resources and Vernal Pools

Riparian/Riverine areas, as defined in Section 6.1.2 of the MSHCP, are "dominated by trees, shrubs, persistent emergents, or emergent mosses and lichens, which occur close to or which depend upon soil moisture from a nearby freshwater source; or areas with fresh water flow during all or a portion of the year" (Dudek 2003). The survey area contains 10.72 acres of freshwater marsh, riparian scrub, and southern willow scrub that would meet the definition of Riparian/Riverine resources.

Vernal pools, also defined in Section 6.1.2 of the MSHCP, are "seasonal wetlands that occur in depression areas that have wetlands indicators of all three parameters (soils, vegetation and hydrology) during the wetter portion of the growing season but normally lack wetlands indicators of hydrology and/or vegetation during the drier portion of the growing season" (Dudek 2003). No areas that would be considered vernal pools were observed during the surveys; no soils typical of vernal pools occur in the survey area.

3.3.3 Species Associated with Riparian/Riverine Areas

Suitable habitat for the least Bell's vireo is present in the survey area; however, habitat is not considered extensive enough to support the southwestern willow flycatcher (*Empidonax traillii extimus*) or western yellow-billed cuckoo (*Coccyzus americanus*). Focused surveys for the least Bell's vireo were conducted in spring/summer of 2012 and 2019. Two least Bell's vireo territories were observed in the survey area in 2012. One territory consisted of a pair of vireos; the other territory consisted of an unpaired male (Figure 7).

Territory 1: This territory was observed on seven of the eight survey visits. This territory is located on the northern side of Murrieta Creek. Habitat in this territory is dominated by a mix of arroyo willow, Goodding's black willow, and mule fat. This vireo sang continuously during the early visits and intermittently on the later visits. This suggests that he was unpaired at the beginning of the survey and became paired over the course of the surveys.

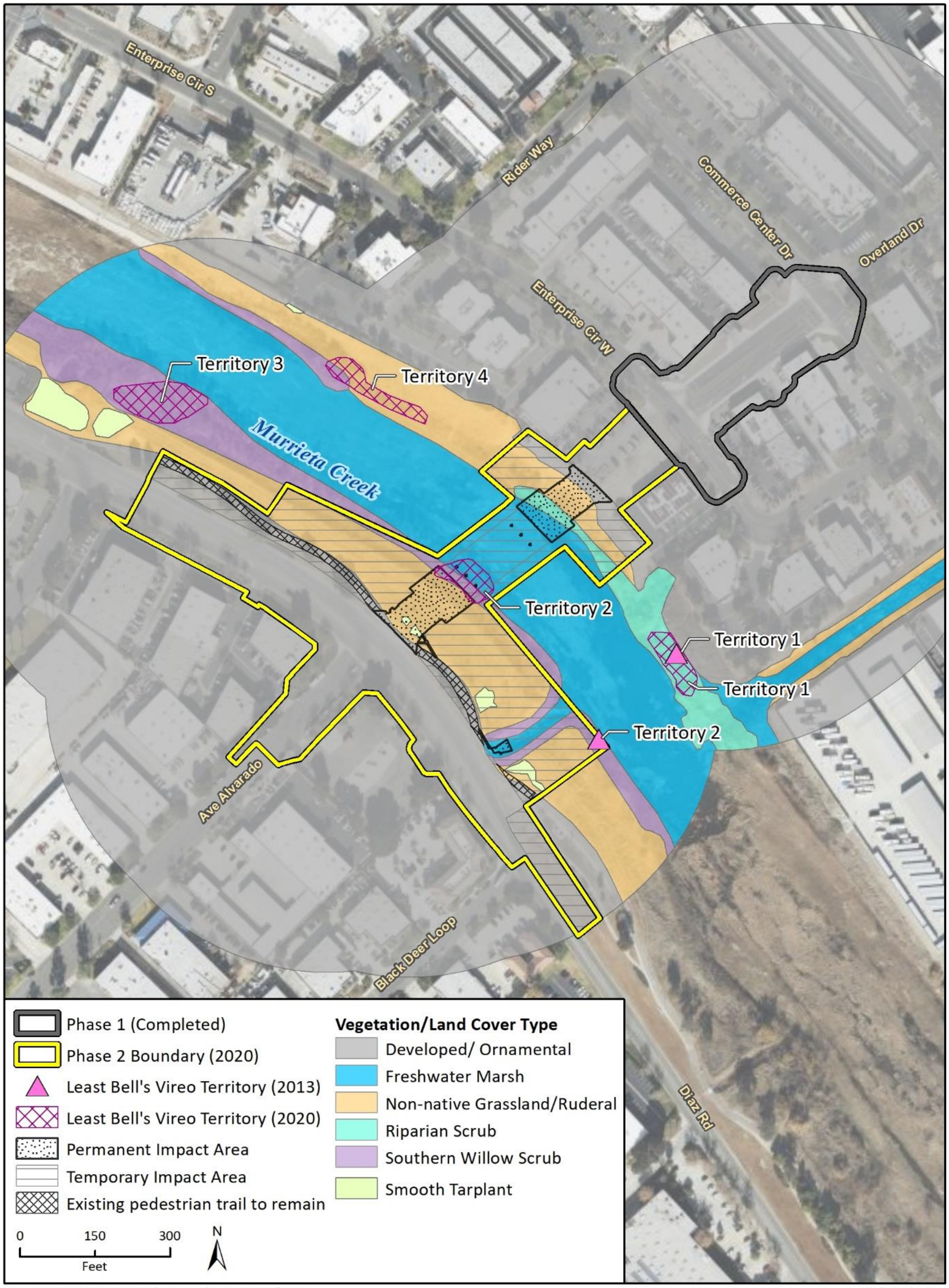
Territory 2: This territory was detected on five of the eight survey visits. This vireo was observed directly across Murrieta Creek from Territory 1 and was counter singing with the male from Territory 1. This vireo's territory consists of a small patch of willows on the southern side of Murrieta Creek. The habitat in this territory consists of narrow-leaved willow with a minimal understory of sedge. This vireo sang continuously and moved around frequently, indicating that he was likely unpaired.

Focused surveys in 2019 were conducted by Rincon Biologist Megan Minter. Survey results indicate the number of observed least Bell's vireo territories in the region has increased from two to four.

In 2019 no banded least Bell's vireo were observed, and no brown-headed cowbirds were observed. One territory was observed on the east side of Murrieta Creek, south of the proposed bridge, within a patch of pepper tree groves interspersed with arroyo willow (Territory 1, Figure 7).
This territory consisted of a lone male that was observed for the first four survey visits. He was observed singing from a small arroyo willow during the first three survey visits but was never observed exhibiting nesting behavior. This male was not observed after the fourth survey visit. A second territory (Territory 2, Figure 7) was observed on the west side of Murrieta Creek, within the proposed bridge footprint. A lone male was observed singing from an arroyo willow in a patch of southern willow scrub. No nest-building behavior was observed. This male was observed consistently for the first five survey visits but was not observed after the fifth survey visit. A third territory (Territory 3, Figure 7) was observed on the west bank of Murrieta Creek northwest of the proposed bridge footprint area. A male least Bell's vireo was observed singing within this territory for the first three survey visits; no female was observed to be present. On the fourth survey visit, this male was observed to be paired with a female. The pair was observed constructing a nest in an arroyo willow near the edge of the streambank. This pair was observed with an active nest for survey visits five through seven. Due to the location of the nest deep within the dense arroyo willow foliage, the biologist was unable to observe the nest directly. However, no fledglings were observed, and it is assumed that the nest failed. The pair were not observed on the eighth and final survey visit. A fourth territory (Territory 4, Figure 7) was observed on the east bank of Murrieta Creek, north of the proposed bridge location. This territory was observed to contain a lone male for survey visits two through six. The lone male was observed singing from an arroyo willow near the south bank of the creek. This male was never observed to be paired and was not observed after the sixth survey visit.

The existence of least Bell's vireo within the survey area along with dense areas of riparian vegetation make Murrieta Creek in this location a current and future possible nesting area for least Bell's vireo. Based on the project's design plans, direct impacts to 2019-occupied least Bell's vireo breeding habitat would include the loss of riparian vegetation along the Murrieta Creek. The MSHCP states that key populations of yellow warbler and yellow-breasted chat occur along Murrieta Creek; one pair of yellow-breasted chats was observed consistently during the least Bell's vireo surveys. The MSHCP also states that Pacific pond turtle and arroyo chub occur in Murrieta Creek. These special status species have potential to occur in the survey area. The MSHCP does not require surveys for these species. However, guidelines in Section 6.1.4 of the MSHCP should be followed to ensure that these species are not indirectly impacted by changes in water quality, increased noise, or increased night lighting.

Figure 7 Least Bell's Vireo Territories



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3.3.4 Narrow Endemic Species

According to the RCIP Summary Report Generator, focused plant surveys are not required for Criteria Area or Narrow Endemic plant species (RCIP 2009). Smooth tarplant (*Centromadia pungens* ssp. *laevis*), a California Rare Plant Rank (CRPR) 1B.1 species, was incidentally observed during the habitat assessment. A total of 2,023 individuals of smooth tarplant were observed in non-native grassland/ruderal vegetation in the survey area (Exhibit 4; BonTerra Consulting 2012a). Phase II would impact approximately 1,243 smooth tarplant individuals (all locations except Locations 1 and 9). Smooth tarplant is a Criteria Area species covered by the MSHCP. Because the survey area is located outside an "Additional Survey Needs Area" for smooth tarplant, all impacts are considered mitigated with the City's participation in the MSHCP (Correa 2012). However, if possible, it is recommended that seed be collected for use in restoration efforts.

Potentially suitable habitat for other species not covered by the MSHCP occurs in the survey area. These species include Parry's spineflower (*Chorizanthe parryi* var. *parryi;* CRPR 1B.1), long-spined spineflower (*Chorizanthe polygonoides* var. *longispina;* CRPR 1B.2), Santa Lucia dwarf rush (*Juncus luciensis;* CRPR 1B.2), Robinson's peppergrass (*Lepidium virginicum* var. *robinsonii;* CRPR 1B.2), and white rabbit-tobacco (*Pseudognaphalium leucocephalum;* CRPR 2.2). None of these species were observed during focused surveys; therefore, these species are considered absent and there would be no impact on these species.

3.3.5 Additional Survey Needs Species

The survey area is located within the additional survey needs area for the burrowing owl. Potentially suitable habitat (i.e., suitable burrows) is present in the survey area. Focused surveys were conducted in spring/summer 2012 and an updated habitat assessment and focused burrow survey was conducted in 2019. Surveys did not detect burrowing owls or owl sign (e.g., prey remains, cast pellets, white-wash, or feathers) were observed in the survey area (BonTerra Consulting 2012d, Rincon 2019). Therefore, burrowing owl is not expected to occur in the survey area. Pursuant to MSHCP requirements, a pre-construction survey would be required 30 days prior to construction to confirm the absence of this species.

3.3.6 Urban/Wildlife Interface

The survey area is located in MSHCP Criteria Area Cells 6783 and 6890. Potential indirect impacts are discussed in Section 4.3 below. The City should follow the Urban/Wildlands Interface Guidelines in Section 6.1.4 of the MSHCP to minimize urban/wildlands interface issues (Attachment B). These include measures related to indirect impacts such as water quality (drainage); use of toxics; night lighting; indirect noise; invasive plant and wildlife species; protection of habitat areas (barriers); and grading/land development adjacent to habitat areas. It should be noted that Phase II should follow the guidelines discussed in Section 7.5.3 of the Western Riverside MSHCP in order to minimize indirect impacts on adjacent habitat areas during construction.

4 Quantification of Unavoidable Impacts to Riparian/Riverine Resources and Associated Species

4.1 Approach to Analysis

The determination of impacts in this analysis is based on a comparison of maps depicting Phase II grading limits and maps of biological resources in the survey area. All construction activities, including staging and equipment areas, are assumed to be within the limits of grading identified on Figure 4 and Figure 5. Should any of the impact areas extend beyond the limits shown, additional analysis would be required. Both direct and indirect impacts on biological resources have been evaluated. Direct impacts are those that involve the initial loss of habitats due to grading, construction, and construction-related activities. Indirect impacts are those that would be related to impacts on the adjacent remaining habitat due to construction activities (e.g., noise, dust) or operation of the Project (e.g., human activity, indirect lighting).

Phase II impacts on Riparian/Riverine resources and associated species were evaluated with respect to the requirements of Section 6.1.2 of the Western Riverside MSHCP. Phase II impacts on Additional Survey Needs species were evaluated with respect to the requirements of Section 6.3.2 of the MSHCP. Phase II's impact on USACE, Regional Water Quality Control Board (RWQCB), and CDFW jurisdictional resources were also evaluated. Phase I impacts were discussed in 2013 DBESP. This amended DBESP covers Phase II changes.

4.2 Direct Impacts

4.2.1 Vegetation Impacts

Phase II would impact a total of 4.89 acres, which includes 1.38 acres of impacts on Riparian/Riverine areas, 3.51 acres of impacts on upland areas (Figure 6, Amended Table 2). Of this, Phase II has reduced temporary impacts to Riparian/Riverine areas by a total of 0.23 acre and has reduced its permanent impact to Riparian/Riverine areas by a total of 0.68 acre (Figure 4). The updated project footprint for Phase II has reduced its impact areas to Riparian/Riverine through project design. No additional Riparian/Riverine areas will be permanently impacted from the expanded portions of Phase II.

Phase II would impact a total of 3.44 acres under the jurisdiction of the USACE and CDFW, respectively (Figure 8, and amended Table 3). Of this, 0.96 acre, under the jurisdiction of the USACE, and 2.48 acre, under the jurisdiction of CDFW, will be temporarily impacted from the expanded portions of Phase II (Figure 4). No additional areas under the jurisdiction of the USACE and CDFW will be permanently impacted from the expanded portions of Phase II. The amended Tables 2 and 3 supersede the original Tables 2 and 3 included in the original DBESP. Only Riparian/Riverine areas, their associated species (i.e., least Bell's vireo) are discussed in this report. A complete discussion of impacts on other biological resources is included in the Habitat Assessment Report (BonTerra Consulting 2012a). Impacts within the 2013 footprint will be analyzed in accordance with regulations in place at that time and that the temporary impacts outside of the 2013 footprint will be analyzed under current regulations.

Figure 8 Jurisdictional Features

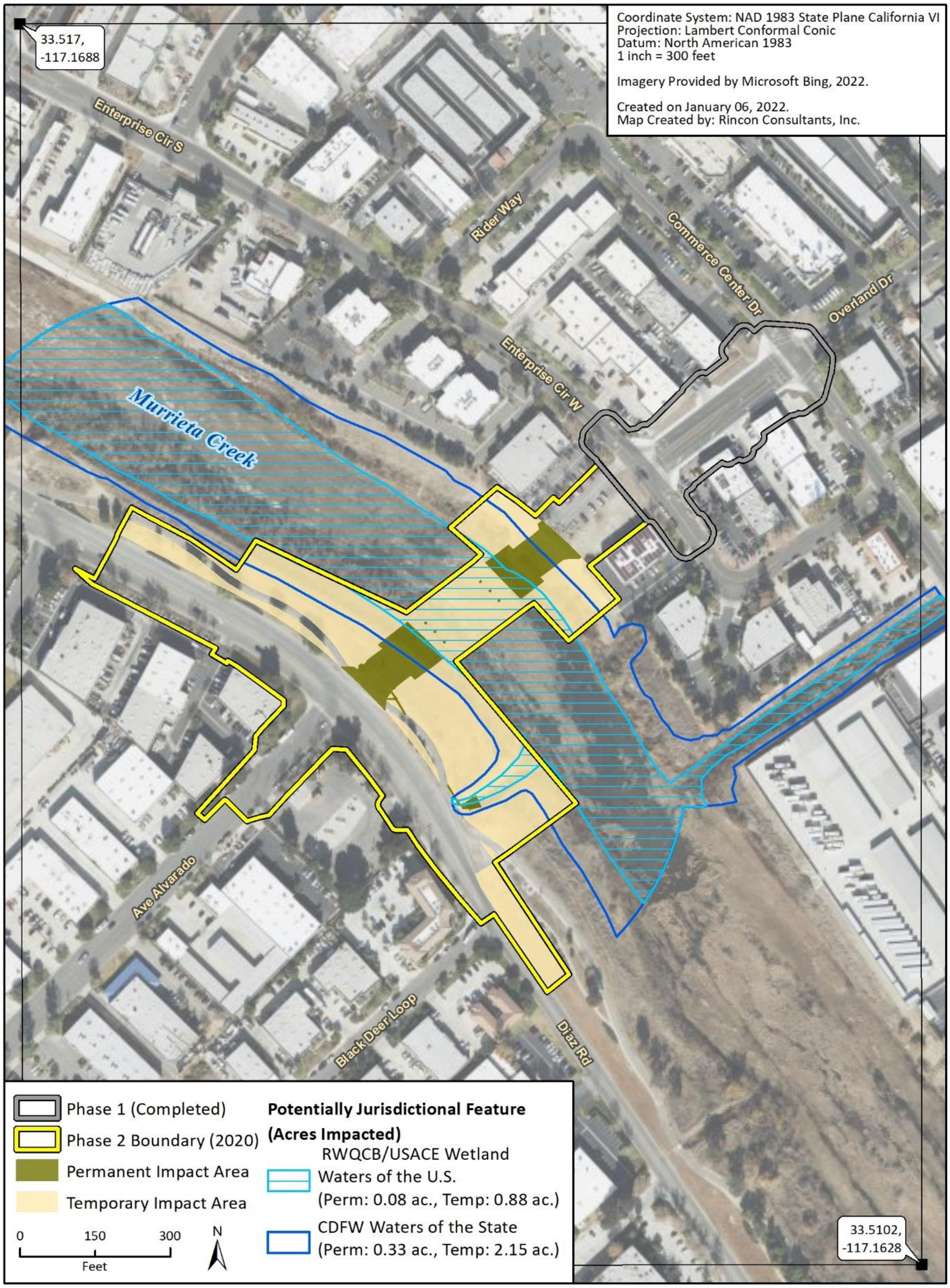

Table 2 Amended Vegetation Impacts of the Project (most impacts are from Phase II)

Vegetation Type and Other Areas	Existing (acres)	Permanent Impacts (acres)	Temporary Impacts (acres)	Total Impact (acres)
Riparian/Riverine				
Freshwater Marsh	7.63	0.09	0.78*	0.87
Riparian Scrub	0.85	0.06	0.08**	0.14
Southern Willow Scrub	2.24	0.01	0.36	0.37
Total Riparian/Riverine	*10.72*	*0.16*	*1.22*	***1.38***
Upland Areas				
Non-Native Grassland/Ruderal	5.96	0.41	2.12***	2.53
Developed/Ornamental	48.51	0.05	0.93	0.98
Total Upland Areas	*54.47*	*0.46*	*3.05*	**3.51**
Total	**65.19**	**0.62**	**4.27**	**4.89**

*0.01 acres will be temporarily impacted by the expanded portions of Phase II.
**0.03 acres will be temporarily impacted by the expanded portions of Phase II.
***0.04 acres will be temporarily impacted by the expanded portions of Phase II.

Table 3 Amended Jurisdictional Impacts of the Project (most impacts are from Phase II)

Jurisdiction	Existing (Acres)	Permanent Impact* (Acres)	Temporary Impact* (Acres)	Total Impact* (Acres)
Wetland “Waters of the U.S.”	9.16	0.08	0.88	**0.96**
“Waters of the State”	14.01	0.33	2.15	**2.48**

*Impact acres may not add up due to rounding. Once the scour protection component is installed, storm flows will deposit sediment over this structure and herbaceous vegetation will re-establish except in the location of the piers and concrete structural approaches which total 472.56 square feet of impacts to wetland waters resources under the jurisdiction of the USACE and 927.06 square feet impacts to resources under the jurisdiction of CDFW.

4.2.2 Riparian/Riverine Functions and Values

Murrieta Creek occurs in the Santa Margarita River Basin (Hydrologic Unit Code 18070302) and has a drainage area of 222 square miles (USGS 2011). It traverses the cities of Temecula and Murrieta in the densely populated southwest region of Riverside County. Murrieta Creek flows into Temecula Creek which, in turn, flows into the Santa Margarita River and then empties into the Pacific Ocean.

Stream gauge data from 1931 to 1973 indicate that the majority of flow in Murrieta Creek occurs in the late winter/early spring with a maximum of 604 cubic feet per second (averaged over the time period) in February (USGS 2011). In contrast, a minimum flow of 0.55 cubic foot per second (averaged over the time period) occurs in November (USGS 2011). Therefore, Murrieta Creek provides for significant seasonal flows and would be considered a relatively permanent water as defined in the *Rapanos Guidance Memorandum* (USACE and USEPA 2008). In periods of high flow (e.g., during large storm events), the creek may overflow and expand into the wider floodplain within the survey area.

The survey area is occupied by the following special status species listed in Section 6.1.2 of the MSHCP: smooth tarplant, yellow-breasted chat, and least Bell’s vireo (discussed in more detail below); arroyo chub and Pacific pond turtle may also occur.

Phase II would impact 1.38 acres (0.16 acre permanent, 1.22 acres temporary) of Riparian/Riverine areas and 2.53 acres (0.41 acre permanent, 2.12 acres temporary) of non-native grassland/ruderal habitat areas. Of this, 0.96 acre (0.08 acre permanent, 0.88 acre temporary) would be under the jurisdiction of the USACE, and 2.48 acres (0.33 acre permanent, 2.15 acres temporary) would be within the jurisdiction of CDFW.

Phase II would permanently impact three percent of Riparian/Riverine habitat in the survey area; however, there is additional suitable habitat upstream and downstream of the survey area. Phase II would be similar to the existing Winchester Road Bridge across the creek approximately 1,300 feet northwest of the Phase II. Wildlife that currently exist in the survey area are assumed to be somewhat urban-tolerant with commercial development, traffic, and human activity along the City's Murrieta Creek Trail adjacent to the creek; therefore, an additional creek crossing would not be expected to substantially change the nature of Murrieta Creek in this area. Mitigation measures are included below to compensate for the loss of Riparian/Riverine/jurisdictional areas.

The existing riparian vegetation currently provides nutrient, sediment, and toxic trapping that improves water quality. Following implementation of Phase II, temporary impact areas (those impacted for construction access areas) are expected to be covered over in natural soils and to re-establish with riparian vegetation similar to the vegetation currently present. The permanent removal of 0.07 acre of Riparian/Riverine areas would not be expected to alter the nutrient, sediment, and toxic trapping function of vegetation in Murrieta Creek. In the survey area, the creek is constrained on all sides by existing urban development and functions as a wildlife movement corridor. Implementation of the proposed compensatory mitigation will meet the DBESP standard, project impacts with implementation of the proposed compensatory mitigation is biologically superior to an avoidance alternative. In the vicinity of Phase II, Murrieta Creek is approximately 450 feet wide. The proposed bridge across Murrieta Creek would be similar to the Winchester Road Bridge located immediately upstream of the survey area. It is assumed that wildlife species that currently move along the creek under the Winchester Road Bridge would continue along the creek under the new proposed bridge, assuming indirect effects of noise and lighting are minimized. Therefore, following construction of the proposed bridge, wildlife would be expected to continue to move along the creek as they currently do. Mitigation measures are included below to ensure that the Phase II would not alter wildlife movement along Murrieta Creek.

4.2.3 Species Associated with Riparian/Riverine Areas

Of the additional survey needs species associated with Riparian/Riverine areas listed in Section 6.1.2 of the MSHCP, the survey area is occupied by least Bell's vireo; two territories were observed in spring/summer 2012 and four territories were observed in spring/summer 2019 (Figure 7). Phase II would directly impact 0.51 acre (0.07 acre permanent, 0.44 acre temporary) of habitat for this species (i.e., riparian scrub and southern willow scrub; Figure 6 and amended **Error! Reference source not found.**). If vegetation were removed during the breeding season (March 15 to September 15), it could also result in the direct mortality of individuals and/or the loss of an active nest. The loss of any least Bell's vireo or their habitat would be considered significant. Mitigation measures are included below to avoid and minimize direct impacts on the least Bell's vireo and to compensate for the loss of habitat for this species. All direct impacts on the vireo and its habitat would be related to Phase II. Indirect effects are discussed below.

If construction activities occur during the breeding season (March 15 to September 15), noise and human activity from construction could indirectly impact any vireos nesting within 500 feet of the construction area. Additionally, once the bridge is operational, traffic noise and night lighting could potentially impact any least Bell's vireo within 500 feet of the bridge. These impacts are discussed in Section 4.3.4 below.

4.2.4 Additional Survey Needs Species

Burrowing Owl

Although potentially suitable burrowing owl habitat is present in the survey area, no burrowing owls or suitable burrows (e.g., burrows of suitable size and/or sign of owls [whitewash or pellets] within riprap) were observed in the survey area during the focused surveys (BonTerra Consulting 2012d) or during the 2019 surveys. Therefore, burrowing owl is not expected to occur in the survey area at this time and no impact on this species is expected. Pursuant to MSHCP requirements, a pre-construction survey would be required 30 days prior to construction to confirm the absence of this species.

4.3 Indirect Impacts on Riparian/Riverine Functions and Values

Phase II would result in potential indirect impacts to Riparian/Riverine resources within the survey area and within downstream, off-site Riparian/Riverine areas of Murrieta Creek. Potential indirect impacts would occur during and after construction of the proposed bridge. These include increased human activity; dust; noise; possible toxin-laden runoff from construction equipment; and increased operational noise and night lighting during operation of the Project.

Indirect impacts are addressed by guidelines in Section 6.1.4 of the Western Riverside MSHCP that pertain to the Urban/Wildlands Interface. Development in close proximity to a Western Riverside MSHCP Criteria Area (Murrieta Creek) may result in edge effects that could adversely affect biological resources acquired to assemble the MSHCP Reserve (Proposed Constrained Linkage 13). To minimize these edge effects, the Western Riverside MSHCP provides guidelines for these indirect impacts. Areas within and adjacent to the impact area along Murrieta Creek provide open space that contributes to the conservation of Covered Species. Indirect impacts on biological resources are discussed below.

4.3.1 Urban and Storm Water Runoff

Phase II could impact water quality. During construction, runoff carrying petroleum residues from construction equipment or concrete washing used to construct Phase II could potentially impact water quality and, in turn, affect plant and wildlife species using Riparian/Riverine habitats within and adjacent to the impact area.

Murrieta Creek is a 303(d) impaired drainage; pollutants of concern include phosphorus (a nutrient) and metals. Runoff from the operational road/bridge over the creek would drain into Murrieta Creek via the municipal storm drain system. Water quality treatment will include inlet inserts to remove sediment, and nutrients and metals to minimize impacts to water quality. With implementation of mitigation measures to protect water quality, impacts are expected to be less than significant. A Water Quality Management Plan will be prepared upon preparation of final Project design in conformance with the San Diego Regional Water Quality Control Board requirements.

4.3.2 Toxic Materials

Phase II would not use chemicals or generate toxic bioproducts (e.g., manure) that are potentially toxic. Therefore, there would be no toxic materials impacts as a result of Phase II.

4.3.3 Lighting

Night lighting used during construction could inadvertently affect the behavior patterns of nocturnal and crepuscular (active at dawn and dusk) wildlife adjacent to these areas. Of greatest concern are the effects on small ground-dwelling animals that use the darkness to hide from predators and on owls that are specialized night foragers. In addition, night lighting could deter wildlife movement adjacent to Phase II and could inhibit wildlife from using the habitat adjacent to lighted areas. No construction activities would occur at night; therefore, there would be no impact due to night lighting during construction.

The operational road/bridge would have directed/shielded night lighting to minimize spillover of light into areas adjacent to the creek. Additionally, approved wildlife-friendly night lighting will be used. With the implementation of mitigation measures to minimize night lighting effects, impacts are expected to be less than significant.

4.3.4 Noise

Noise levels would increase over present levels during construction of the proposed bridge. During construction, temporary noise impacts have the potential to disrupt foraging, nesting, roosting, and denning activities for a variety of wildlife species, including the least Bell's vireo. Wildlife species stressed by noise may temporarily disperse from the habitat in the vicinity of Phase II; habitat near the construction site may be uninhabitable due to the noise and human activity present. If construction occurred during the beginning of the bird breeding season when territories are being selected, birds (such as the vireo) may establish territories away from the construction area, increasing competition in other areas where birds are already present. If construction is initiated during the breeding season near an existing nest, it could cause a pair to abandon their nest, causing the nest to fail. This could reduce productivity of the birds during the season. If construction occurs at the end of the breeding season when nesting is complete, family groups would likely be able to disperse away from the construction site and forage in other areas. Therefore, the severity of this indirect effect would depend on the timing of construction in relation to the breeding season and how close any active nests are located in proximity to the construction site.

The bridge concrete deck would receive grinding and grooving treatment per California Department of Transportation (Caltrans) bridge design standards to reduce vehicular tire noise. The operational road/bridge would incrementally increase the traffic noise along this portion of Murrieta Creek. Because traffic noise is similar to existing noise from adjacent developed areas, wildlife (including vireo) currently using the creek are expected to be relatively acclimated to traffic noise. While adverse, the additional traffic noise is expected to be less than significant.

4.3.5 Trash/Debris

Construction activities could introduce trash or other construction material debris into the survey area. Construction Minimization Measures (Section 7.5.3 of the Western Riverside MSHCP) prohibit depositing trash on native habitat.

The operational road/bridge also has potential to increase the amount of trash running off into the creek. As mentioned above, best engineering practices are being used in the design of the bridge and devices would be included to capture trash before it enters the creek. These measures would include actions such as street sweeping. With the implementation of mitigation measures to protect the creek's water quality, impacts are expected to be less than significant.

4.3.6 Exotic Plant and Animal Infestations

Seeds of invasive exotic plant species can be carried into a construction site within the mud on the tires of construction equipment. Construction Minimization Measures from Section 7.5.3 of the MSHCP will be followed; these guidelines require the use of vehicle washing stations to minimize the spread of invasive species.

For areas where construction impacts will remove landscape and vegetation, those areas will be replanted to mitigate the landscape impact and improve the visual views of the area; however, Phase II does not include landscaping. Therefore, Phase II would not introduce invasive non-native plant species that could degrade adjacent open space areas.

Murrieta Creek already provides a source of water for invasive wildlife species, and is already occupied by the invasive bullfrog, which is known to prey upon native aquatic wildlife species. Phase II would not create any conditions that would expand the distribution of the bullfrog or any other invasive wildlife species.

4.3.7 Dust

Construction activities may generate dust that could settle on the leaves of trees, shrubs, and herbs in the vicinity of the construction site. The respiratory function of the plants in the adjacent areas could be impaired if dust accumulation is excessive. Construction Minimization Measures (Section 7.5.3 of the Western Riverside MSHCP) would minimize these impacts.

4.3.8 Trampling and Unauthorized Recreational Use (Barriers)

Although there is currently no barrier to unauthorized access to Murrieta Creek, there is a developed city trail along the west bank of the creek; presumably, recreational use is concentrated along the existing trail. Phase II would not change the public's access along Murrieta Creek.

4.3.9 Grading/Land Development

Although construction activity would occur within and adjacent to Murrieta Creek, limited grading would be required for the construction of the bridge. Construction of the bridge would include the placement of concrete embankments/abutments, piers and concrete structural approaches. Once completed, the herbaceous vegetation removed during construction of the bridge is expected to re-establish over temporary impact areas except in the location of the six 6-foot-diameter pier foundations, abutment scour-protection concrete slopes, and concrete structural approaches.

4.4 Infeasibility of Avoidance and/or Alternative

If complete avoidance is not considered feasible, the Western Riverside MSHCP requires avoidance of 90 percent of the Riparian/Riverine resources in the survey area. The purpose of Phase II is to construct a four-lane bridge that extends from the existing terminus of Avenida Alvarado at Diaz Road northeast over Murrieta Creek to the existing terminus of Overland Drive at Enterprise Circle

West. In order to allow for the construction of the bridge over Murrieta Creek, Riparian/Riverine habitat must be impacted. The City has determined that additional traffic capacity is needed in this locality and the location of the bridge is limited to the connection of these existing roadways. Resources are similar upstream and downstream of the survey area along Murrieta Creek; thus, a small shift upstream or downstream would affect similar resources. Therefore, there is no feasible alternative to accomplish Phase II.

5 Mitigation and Minimization Measures

The City of Temecula is a participant in the MSHCP. As such, impacts on special status species covered by the MSHCP are considered fully mitigated by the City's participation in the MSHCP. This section addresses mitigation that is not covered by the MSHCP and measures that are required by the MSHCP.

5.1 Riparian/Riverine Resources

Phase II has been designed to minimize impacts on Riparian/Riverine Resources. Riparian/Riverine resources mapped in the survey area generally overlap with resources under the jurisdiction of the USACE, the CDFW, and the RWQCB. Therefore, the following mitigation would satisfy the MSHCP's requirements for the loss of Riparian/Riverine resources, and jurisdictional resources.

Prior to the initiation of any construction-related activities that result in any ground disturbances and subsequent direct and/or indirect impacts on areas within these agencies' jurisdictions, the City of Temecula shall obtain all required permits/agreements/certifications from the USACE, the CDFW, the RWQCB, and the RCFC&WCD.

The Project Applicant shall obtain all appropriate permits for impacts on USACE, CDFW, and RWQCB jurisdictional areas. Mitigation for the loss of jurisdictional areas and Riparian/Riverine resources may include (1) preservation of existing riparian habitat (preferably within or adjacent to an area identified as a Criteria Area, Core, or Linkage by the MSHCP) or (2) restoration of riparian habitat (preferably within or adjacent to an area identified as a Criteria Area, Core, or Linkage by the MSHCP). If the Project Applicant chooses to mitigate Riparian/Riverine habitat through purchase or restoration, acreage shall be of equivalent or superior quality habitat at no less than a 1:1 ratio. Currently, the proposed mitigation strategy would: (1) restore areas temporarily impacted by the project onsite at a 1:1 ratio; and (2) provide offsite restoration for areas permanently impacted by Phase II. The resource agencies, including the WRC RCA and the USFWS, will review the proposed acquisition during the permitting process to ensure that the lands to be acquired by the City of Temecula are of equivalent or superior quality to the resources impacted by Phase II. During site meetings, the resource agencies gave preliminary approval to restoring Riparian/Riverine habitat along Temecula Creek as mitigation for Phase II (Appendix C).

If Phase II would mitigate for impacts on Riparian/Riverine resources through restoration of riparian habitat (as currently planned), a detailed restoration program shall be prepared for approval by the USACE and the CDFW prior to construction and shall contain the following items:

- **Responsibilities and qualifications.** Responsibilities and qualifications of the personnel to implement and supervise the plan. The responsibilities of the Project Applicant, specialists, and maintenance personnel that will supervise and implement the plan shall be specified.
- **Site Selection.** Site selection for restoration and enhancement mitigation shall be determined in coordination with the City and the resource agencies. The mitigation site(s) shall be located in a dedicated open space area. The restoration site selected is located along Temecula Creek,
- **Site Preparation and Planting Implementation.** Site preparation shall include (1) protection of existing native species; (2) trash and weed removal; (3) native species salvage and reuse (i.e., duff); (4) soil treatments (i.e., imprinting, decompacting); (5) temporary irrigation installation;

(6) erosion-control measures (i.e., rice or willow wattles); (7) seed mix application; and (8) container species, if appropriate.

- **Schedule.** A schedule shall be developed which includes planting to occur in late fall and early winter, between October 1 and January 30.
- **Maintenance Plan/Guidelines.** The maintenance plan shall include (1) weed control; (2) herbivory control; (3) trash removal; (4) irrigation system maintenance; (5) maintenance training; (6) replacement planting; and (7) biological monitoring during maintenance activities that occur during the breeding season.
- **Monitoring Plan.** The monitoring plan shall include (1) qualitative monitoring (i.e., photographs and general observations); (2) quantitative monitoring (i.e., randomly placed transects); (3) performance criteria as approved by the resource agencies; (4) monthly reports for the first year, and every other month for following years; and (5) annual reports for three to five years, which will be submitted to the resource agencies. The site shall be monitored and maintained for five years to ensure successful establishment of riparian habitat within the restored and created areas; however, if there is successful coverage prior to five years, the Project Applicant may be released from monitoring requirements with the approval of the resource agencies.
- **Long-term Preservation.** Long-term preservation of the site shall also be outlined in the conceptual mitigation plan to ensure the mitigation site is not impacted by future projects.

5.2 Least Bell's Vireo

The limits of Phase II construction shall be clearly delineated with the use of fencing (lathe and rope, orange snow fencing, or stakes and flagging) prior to the initiation of construction. All removal of riparian vegetation shall be conducted during the non-breeding season for this species (i.e., September 16 to March 14). Vegetation removal within the creek shall be monitored by a qualified Biological Monitor.

To the extent practicable, construction of Phase II shall be conducted during the non-breeding season for the least Bell's vireo (i.e., September 16 to March 14) in order to avoid indirect noise impacts on this species. If Phase II construction begins during the vireo nesting season, a qualified Biologist shall survey all riparian habitat within 500 feet of the construction limits for the presence of least Bell's vireo nests/territories prior to the start of construction. Three surveys shall be conducted within one week prior to the initiation of construction within or adjacent to riparian habitat. Any active nests/territories shall be mapped on an aerial photograph by the Biologist, and the location information shall be given to the USFWS and CDFW. The location of any least Bell's vireo nests/territories shall be marked on applicable construction plans. If no active nests/territories are found, construction may proceed. Surveys shall be updated once per week as long as construction is within 500 feet of riparian habitat. Surveys may be discontinued after if no vireos have been detected after eight weekly visits; if a vireo territory is observed, monitoring surveys shall be continued until vireo leave for the wintering grounds (August/September). A pre-construction least Bell's vireo survey report (including mapping of any active territories) shall be prepared by a qualified Biologist and shall be submitted to the USFWS and CDFW.

Any active territories shall be protected as Environmentally Sensitive Areas (ESAs) until no longer occupied to ensure compliance with the Federal and State Endangered Species Acts and Migratory Bird Treaty Act. To protect any active territory sites, the following restrictions on construction are required between March 15 and September 15 (or until territories are no longer active, as determined by a qualified Biologist): (1) no clearing of habitat shall be allowed within Murrieta

Creek and (2) access and surveying shall not be allowed within approximately 100 feet of nests/territories (or as otherwise determined by a qualified Biologist). Any construction activities that would occur within Murrieta Creek during the breeding season shall be monitored by a qualified Biologist.

If construction would result in noise readings greater than 60 A-weighted decibels (dBA) at the edge of least Bell's vireo habitat (Murrieta Creek), construction shall not be allowed during the breeding season (March 15 to September 15) unless appropriate noise measures are implemented, as approved by the USFWS and the CDFW. Noise measures may include, but would not be limited to, soundwalls to reduce noise between the construction site and the vireo territory; use of construction equipment with noise-reducing alterations; or delay of noise-intensive construction (e.g., pile driving, demolition) until after the breeding season. Soundwalls shall be installed, as-needed, to maintain a noise level of less than 60 dBA at the edge of riparian habitat. Installation of the noise barriers shall be monitored by a qualified Biologist to ensure that riparian habitat is not inadvertently affected.

A noise monitoring methodology shall be used during the breeding season for construction within 500 feet of occupied habitat along Murrieta Creek. Noise monitoring stations shall be monitored weekly between March 15 and September 15 to ensure that noise levels remain less than 60 dBA. If noise monitoring determines that the noise level exceeds 60 dBA, noise barriers shall be modified, as recommended by a qualified Acoustical Technician, to reduce noise levels below 60 dBA.

5.3 Burrowing Owl

A pre-construction survey for burrowing owl will be conducted 30 days prior to construction in accordance with Section 6.3.2 of the MSHCP. If burrowing owl is present in the impact area during the breeding season (March 1 to August 31), the burrow will be protected until nesting activity has ended. To protect the active burrow, a 500-foot buffer will be established around the active burrow. Any encroachment into the buffer area around the active burrow will only be allowed if the Biologist determines that the proposed activity will not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest. If burrowing owl is present in the impact area during the non-breeding season (September 1 to February 28), the burrowing owl will be flushed from the burrow and the burrow will be closed using CDFW-approved burrow-closing procedures. If no burrowing owls are observed, construction may proceed.

5.4 Wildlife Movement

One potential effect has been identified as related to wildlife movement: night lighting from the bridge could affect the habitat areas along the creek.

Night Lighting

Permanent night lighting used to light the bridge shall use best engineering practices to direct lighting to the roadway and shall minimize spillage of light into adjacent habitat areas to the extent practicable. Additionally, approved wildlife-friendly night lighting will be used. Lighting designs shall be submitted to the City of Temecula Planning Department for review and approval prior to the issuance of a grading permit for Phase II of the Project.

Noise

The bridge concrete deck would receive grinding and grooving treatment per Caltrans bridge design standards to reduce vehicular tire noise.

5.5 Construction Minimization Measures

In order to minimize Urban/Wildlands interface issues, the following Construction Minimization Measures (from Section 7.5.3 of the MSHCP) will be implemented during Phase II construction to minimize impacts on biological resources during construction:

- Plans for water pollution and erosion control will be prepared for all discretionary projects involving the movement of earth in excess of 50 cubic yards. The plans will describe sediment and hazardous materials control; dewatering or diversion structures; fueling and equipment management practices; and use of plant material for erosion control. Plans will be reviewed and approved by the City of Temecula, prior to the initiation of construction.
- Timing of construction activities will consider seasonal requirements for breeding birds and migratory non-resident species. Habitat clearing will be avoided during species' active breeding season (defined as March 1 to June 30).
- Sediment- and erosion-control measures will be implemented until such time as soils are determined to be successfully stabilized.
- Short-term stream diversions will be accomplished by the use of sand bags or other methods that will result in minimal in-stream impacts. Short-term diversions will consider effects on wildlife.
- Silt fencing or other sediment-trapping materials will be installed at the downstream end of construction activities to minimize the transport of sediments off site.
- Settling ponds where sediment is collected will be cleaned in a manner that prevents sediment from re-entering the stream or damaging/disturbing adjacent areas. Sediment from settling ponds will be removed to a location where sediment cannot re-enter the stream or surrounding drainage area. Care will be exercised during removal of silt fencing to minimize release of debris or sediment into streams.
- No erodible materials will be deposited into water courses. Brush, loose soils, or other debris material will not be stockpiled within stream channels or on adjacent banks.
- The footprint of disturbance will be minimized to the maximum extent feasible. Access to sites will occur on pre-existing access routes to the greatest extent possible.
- Equipment storage, fueling, and staging areas will be sited on non-sensitive upland habitat types with minimal risk of direct discharge into riparian areas or other sensitive habitat types.
- The limits of disturbance (including the upstream, downstream, and lateral extents) will be clearly defined and marked in the field. Monitoring personnel will review the limits of disturbance prior to initiation of construction activities.
- During construction, the placement of equipment within the stream or on adjacent banks or adjacent upland habitats occupied by Covered Species that are outside of the Phase II footprint will be avoided.
- Exotic species removed during construction will be properly handled to prevent sprouting or regrowth.
- Training of construction personnel will be provided.

- Ongoing monitoring and reporting will occur for the duration of the construction activity to ensure implementation of best management practices.
- When work is conducted during the fire season (as identified by the Riverside County Fire Department) adjacent to coastal sage scrub or chaparral vegetation, appropriate fire-fighting equipment (e.g., extinguishers, shovels, water tankers) shall be available on the site during Phase II construction to help minimize the chance of human-caused wildfires. Shields, protective mats, and/or other fire-prevention methods shall be used during grinding, welding, and other spark-inducing activities. Personnel trained in fire hazards, preventative actions, and responses to fires shall advise contractors regarding fire risk from all construction-related activities.
- Active construction areas shall be watered regularly to control dust and to minimize impacts to adjacent vegetation.
- All equipment maintenance, staging, and dispensing of fuel, oil, coolant, or any other toxic substances shall occur only in designated areas within the proposed grading limits of Phase II. These designated areas shall be clearly marked and located in such a manner as to contain run-off.
- Waste, dirt, rubble, or trash shall not be deposited in the Conservation Area or on native habitat.

6 Biologically Equivalent or Superior Alternative Conclusion and Determination

Phase II would result in a limited loss of Riparian/Riverine habitat that provides foraging and nesting habitat for the least Bell's vireo. Following construction of the bridge over Murrieta Creek, riparian habitat within the creek would be similar in character to its current condition; wildlife that use this portion of Murrieta Creek are assumed to be relatively urban-tolerant given that the Project is surrounded by existing development. The Project's primary impacts are related to indirect impacts, including indirect noise impacts on least Bell's vireo and night lighting on wildlife movement. Avoidance and minimization measures have been included to mitigate these inadvertent effects of Phase II (Section 5.0). In addition, compensatory mitigation for impacts on Riparian/Riverine resources have been provided in Section 5.0. Although the loss of Riparian/Riverine resources would be considered adverse, the compensatory mitigation provided for Riparian/Resources (e.g., temporary impact areas restored onsite at a 1:1 ratio; permanent impact areas restored at a 3:1 ratio) would be considered biologically equivalent or superior to the habitat lost as a result of the Project. Areas temporarily impacted by the Project are expected to re-establish with riparian vegetation. Off-site preservation/restoration of at least 0.24 acre (0.08 acre permanent impact at a 3:1 ratio) of USACE jurisdictional resources and 0.99 acre (0.33 acre permanent impact at a 3:1 ratio) of CDFW jurisdictional resources would ensure that there is no net loss of Riparian/Riverine habitat in the watershed. The off-site restoration is planned to occur along Temecula Creek and would supplement two existing City mitigation sites by expanding the amount of riparian habitat in this area (Appendix C). Least Bell's vireo are also known to occur in the vicinity of the proposed Temecula Creek mitigation site, thus increasing the amount of habitat available for the vireo near Temecula Creek. The preservation/restoration of this habitat is expected to be biologically equivalent to allowing the habitat to remain in place, and may be considered superior because it would be in addition to the habitat function that would remain in the Murrieta Creek following Phase II implementation until construction of the USACE Phase 2B project since the downstream Phase 2A has been built. It may also be considered superior if the habitat that is preserved/restored is connected to other regionally significant high quality habitat areas occupied by the least Bell's vireo (as currently proposed for mitigation). With implementation of Construction Minimization Measures, the functions and values of Murrieta Creek would not be substantially altered by Phase II. The preserved/restored mitigation site would provide similar functions and values in an area that will be protected by a conservation easement or other similar agreement, and is outlined in the Mitigation Plan (Appendix C). Therefore, the mitigation strategy is considered biologically equivalent or superior preservation.

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Appendix A

Site Photographs

Photograph 1. Murrieta Creek from the north bank, looking south across the proposed bridge location.

Photograph 2. View of southern willow scrub habitat on the south bank of Murrieta Creek. Photo facing northwest.

Photograph 3. View across Murrieta Creek from the north bank. Photo facing south.

Photograph 4. View of least Bell's vireo habitat on the south bank of Murrieta Creek; photo facing north.

Photograph 5. View of least Bell's vireo habitat on the north side of Murrieta Creek; photo facing south.

Photograph 6. View across the small side channel that enters Murrieta Creek from the north side within the survey area.

Photograph 7. View of smooth tarplant present on the south side of Murrieta Creek.

Appendix B

Least Bell's Vireo Survey Report

Murrieta Creek Bridge at Overland Drive

Least Bell's Vireo Protocol Survey Report

prepared by

Rincon Consultants, Inc.
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Redlands, California 9237

September 2019

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Murrieta Creek Bridge at Overland Drive

Least Bell's Vireo Protocol Survey Report

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September 2019

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1 Introduction

This report presents the results of protocol surveys for the federally and state endangered least Bell's vireo (*Vireo bellii pusillus*; LBVI) for the Murrieta Creek Bridge (bridge) and Overland Drive Extension project (project). The project is located southwest of the intersection of Interstate (I) 15 and Winchester Road in the City of Temecula in Riverside County, California (project site). The bridge is proposed to span Murrieta Creek from the terminus of Avenida Alvarado at Diaz Road to Commerce Center Drive. The site is located on the U.S. Geological Survey's (USGS') Murrieta 7.5-minute quadrangle map (Figure 1). The project site is surrounded by developed land used as an industrial park (Figure 2).

The project proposes to construct a bridge over the Murrieta Creek to connect Avenida Alvarado with Overland Drive in the City of Temecula, Riverside County. The Murrieta Creek Bridge at Overland Drive is anticipated to be a concrete girder structure spanning approximately 348 linear feet over Murrieta Creek. The bridge would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 5-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

The riparian area along Murrieta Creek contains potential habitat for LBVI. In 2012, BonTerra Consulting, conducted surveys to determine the presence/absence of LBVI in all suitable willow (*Salix* spp.) and riparian habitat within 500 feet of the project site (BonTerra 2012). During these surveys two LBVI territories were observed. One territory consisted of a pair of vireos; the other territory consisted of an unpaired male. In 2019, Rincon Consultants, Inc. (Rincon) conducted new surveys to determine the current presence/absence of LBVI.

Figure 1 Project Vicinity Map

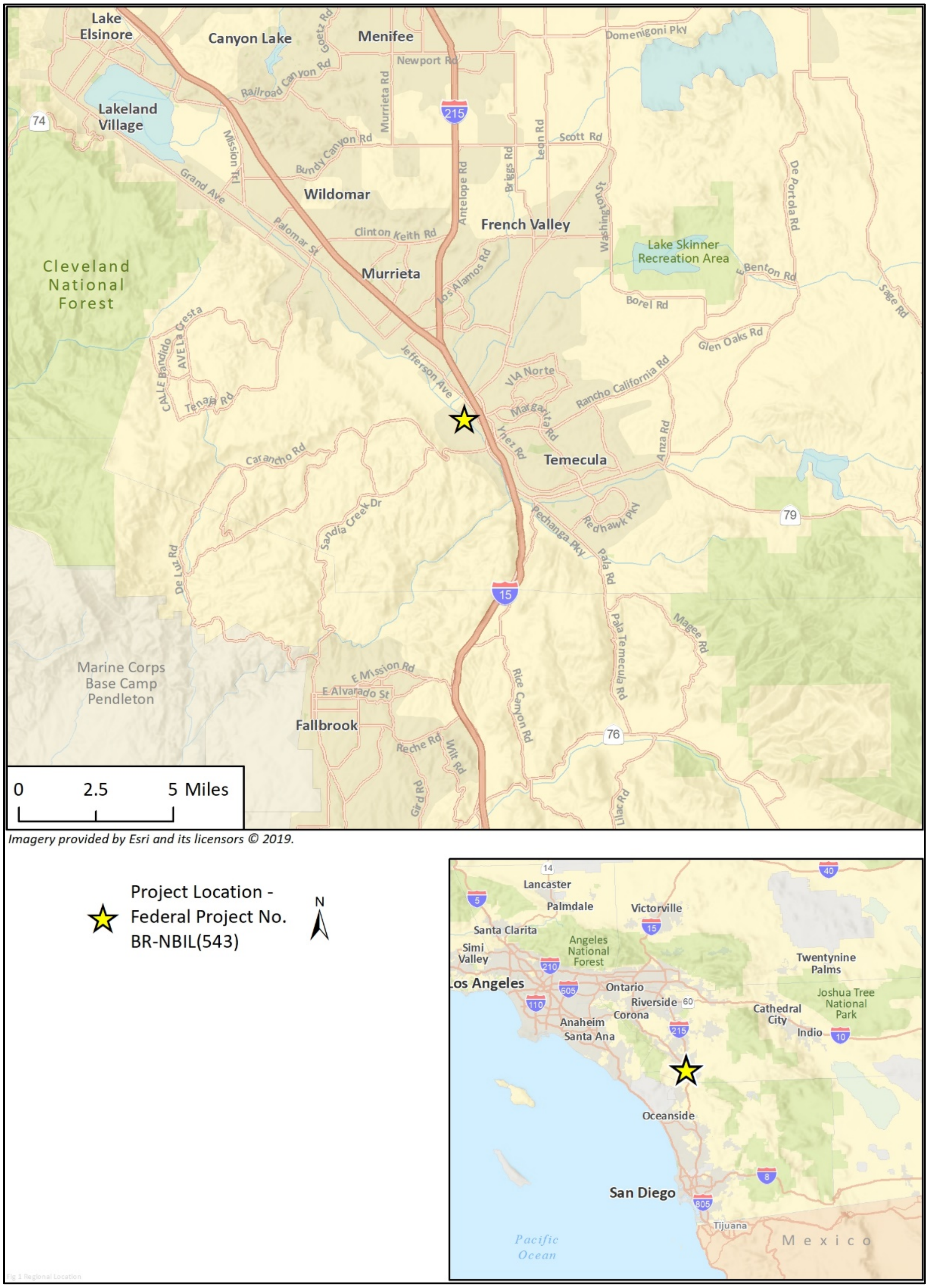
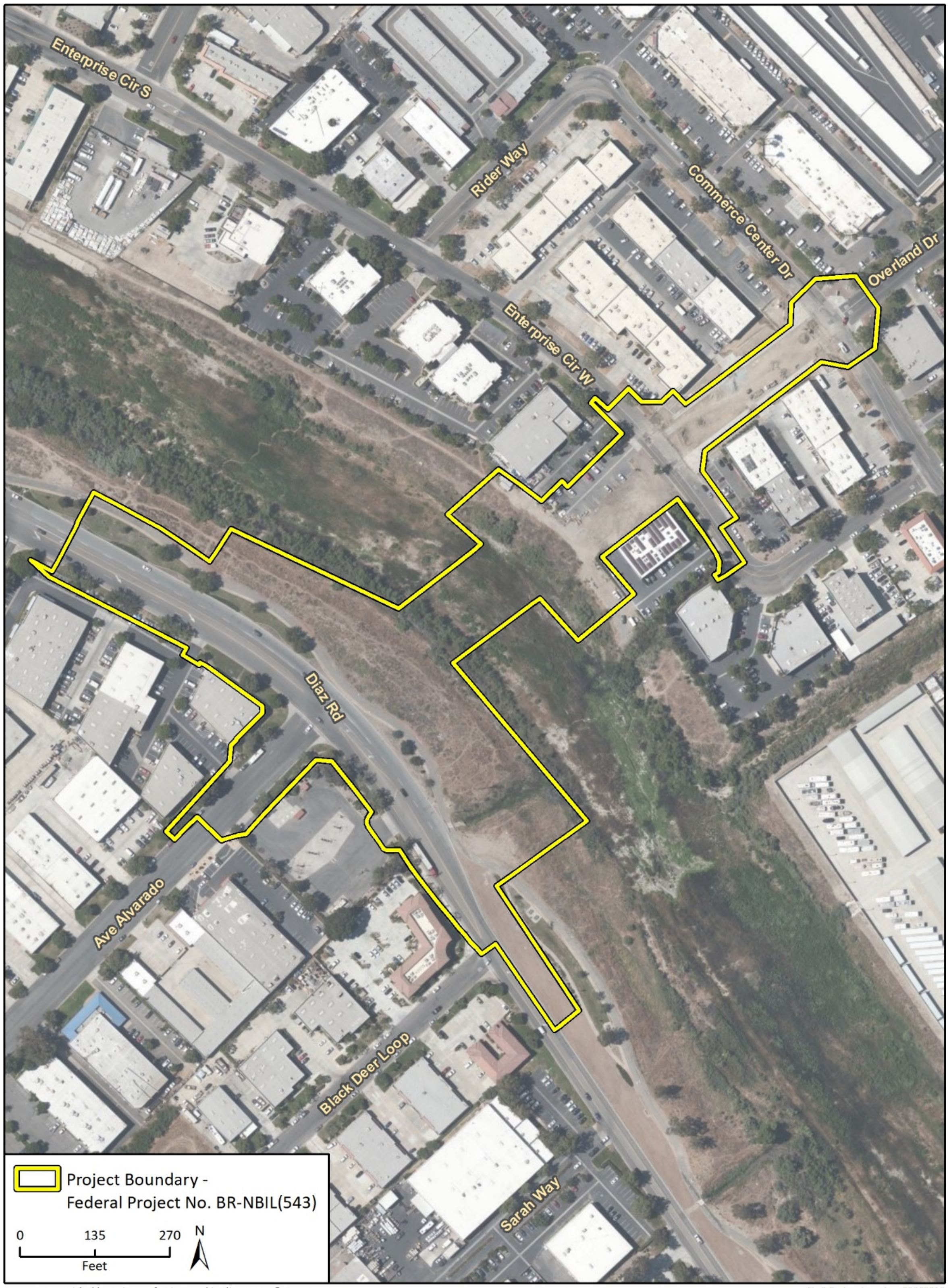


Figure 2 Project Location Map



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2 Methodology

Surveys for LBVI were conducted in 2019 by Rincon biologist Megan Minter within a 500 ft buffer around the project site (Study Area). The surveys were conducted in accordance with the U.S. Fish and Wildlife Service (USFWS) *Least Bell's Vireo Survey Guidelines*, issued January 19, 2001. Eight (8) surveys were conducted at least nine (9) days apart between May 10 and July 19 (Table 1). The surveys occurred between dawn and 11:00 am each day within all portions of the Study Area containing potentially suitable riparian habitat. The habitat types are shown in Figure 3 and described below. Surveys were not conducted during inclement weather conditions (e.g. excessive or abnormal heat, cold, wind, rain, or fog).

During each survey visit, the surveyor slowly walked the Study Area, stopping at approximate 25-foot intervals to listen for LBVI songs and calls, and observe habitat with the aid of binoculars (10x40) for adults and fledglings. Nest searching was not conducted. Age, sex, breeding status, and behavioral characteristics were recorded, if vireo were observed. Play back vocalizations were not used and observations were made from locations where birds would not be disturbed.

Table 1 Least Bell's Vireo Survey Conditions

		Time		Temperature (°F)		Wind Speed (mph)		Cloud Cover (%)	
Date	Survey Visit	Begin	End	Begin	End	Begin	End	Begin	End
5/10/19	1	0700	1100	58	64	0	0	0	0
5/20/19	2	0700	1030	58	62	1-3	1-3	50	60
5/30/19	3	0645	1030	58	64	1-3	1-3	0	0
6/10/19	4	0645	1045	60	64	1	1	10	0
6/20/19	5	0700	1030	69	71	0	0	20	0
7/1/19	6	0700	1030	69	71	1-3	1-3	70	60
7/10/19	7	0700	1045	65	75	0	0	50	50
7/19/19	8	0700	1030	68	74	1-5	1-5	0	0

3 Environmental Setting

The Murrieta Creek Bridge project site is located in Riverside County, California southwest of the intersection of I-15 and Winchester Road (Figure 1). Topography at the project site is relatively flat with an elevation of approximately 1,020 feet above mean sea level. The project site is primarily composed of developed land bisected by Murrieta Creek, a large intermittent tributary to the Santa Margarita River. Adjacent land use is developed and consists of an industrial park.

The Study Area for the project site includes all suitable LBVI riparian habitat (i.e., riparian scrub, southern willow scrub) of appropriate size and stature within 500 feet of the project site. The online edition of A Manual of California Vegetation (Sawyer et al. 2009) was utilized in classifying observed vegetation alliances. Five vegetation alliances / land cover types were identified in the Study Area: arroyo willow thickets (*Salix lasiolepis* Shrubland Alliance), cattail marshes (*Typha angustifolia* Herbaceous Alliance), and pepper tree groves (*Schinus molle*) woodland Semi-natural Alliance) (Figure 3). Of these, arroyo willow thickets and pepper tree groves were considered to be suitable habitat for nesting LBVI.

Arroyo Willow Thickets

This vegetation type is dominated by dense stands of arroyo willow interspersed with red willow (*Salix laevigata*), black willow (*Salix gooddingii*), mulefat (*Baccharis salicifolia*), and Fremont cottonwood (*Populus fremontii*). Salt cedar (*Tamarix* sp.), pepper trees (*Schinus mole*) and giant reed (*Arundo donax*), both exotic invasive species, also occur within this vegetation type.

Cattail Marshes

This vegetation type is located within the banks of Murrieta Creek and is dominated by cattails (*Typha angustifolia, T. latifolia*). This vegetation type occurs where soils are periodically flooded. Understory species present include rush (*Juncus* sp.), umbrella sedge (*Cyperus* sp.), bermuda grass (*Cynodon dactylon*), and curly dock (*Rumex crispus*).

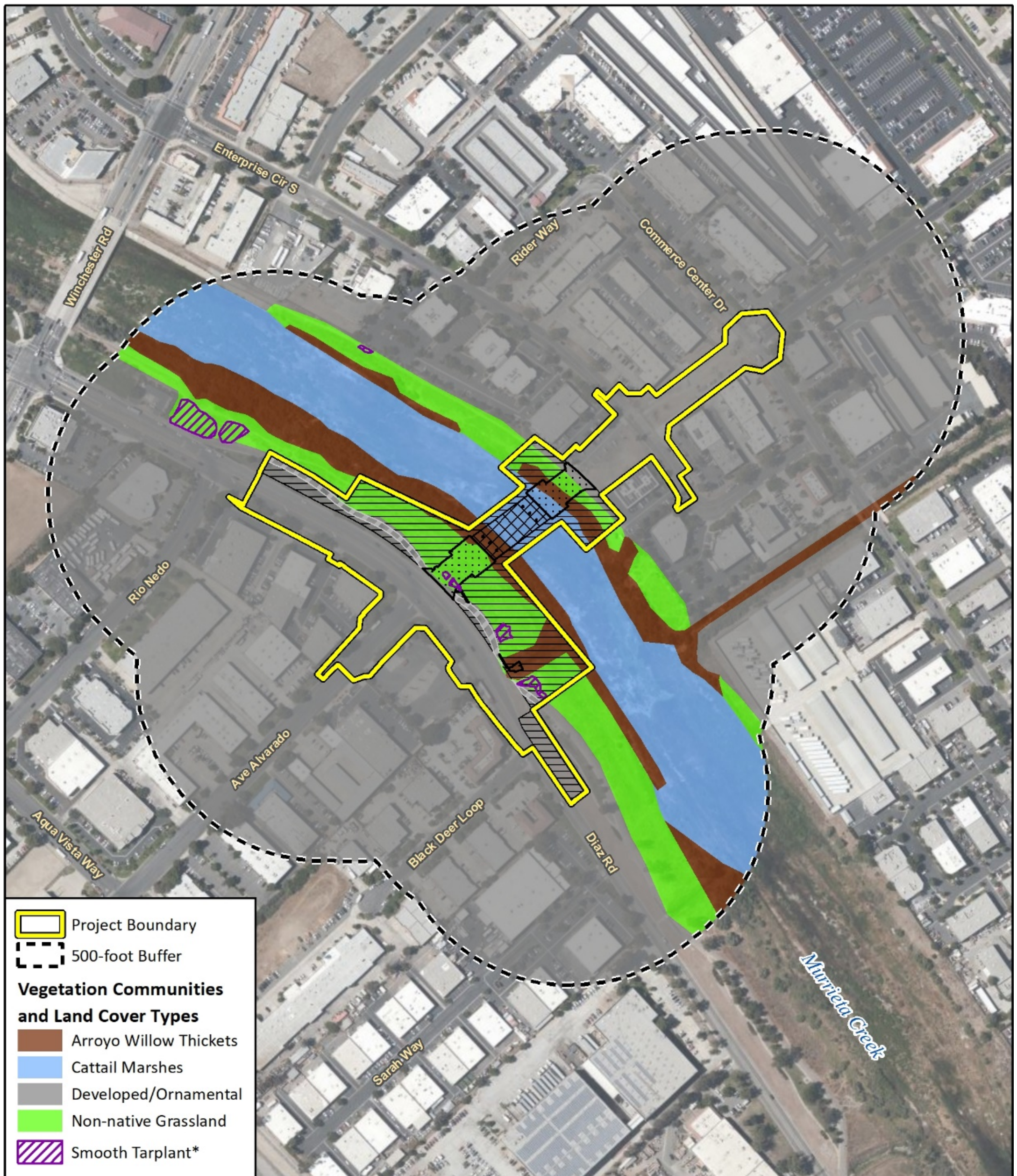
Non-Native Grassland / Ruderal

This vegetation type is located along the edges of Murrieta Creek, outside of the streambanks. Dominant species within the community include: brome grasses, shortpod mustard, London rocket, Russian thistle (*Salsola tragus*), and telegraph weed (*Heterotheca grandiflora*). Large areas of this community contain smooth tarplant (*Centromadia pungens* ssp. *laevis*), a sensitive species covered by the Western Riverside County Multiple Species Habitat Conservation Plan.

Developed / Ornamental

This land cover type consists of developed lands, paved areas, and areas containing ornamental vegetation supported by irrigation.

Figure 3 Vegetation Communities Within Survey Area



Vegetation Communities and Land Cover Types	Impacts (acres)				
	No Impact	Existing Permanent	Permanent	Temporary	Total
Arroyo Willow Thickets	4.36	-	0.23	0.82	5.41
Cattail Marshes	9.35	-	0.37	0.29	10.01
Developed/Ornamental	65.56	0.29	0.08	0.87	66.80
Non-native Grassland	4.66	<0.01	0.36	1.90	6.93
Total	83.93	0.30	1.03	3.89	89.15

*Smooth Tarplant included in Non-native Grassland calculations.

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JD Fig 8 Veg Impacts_20200326

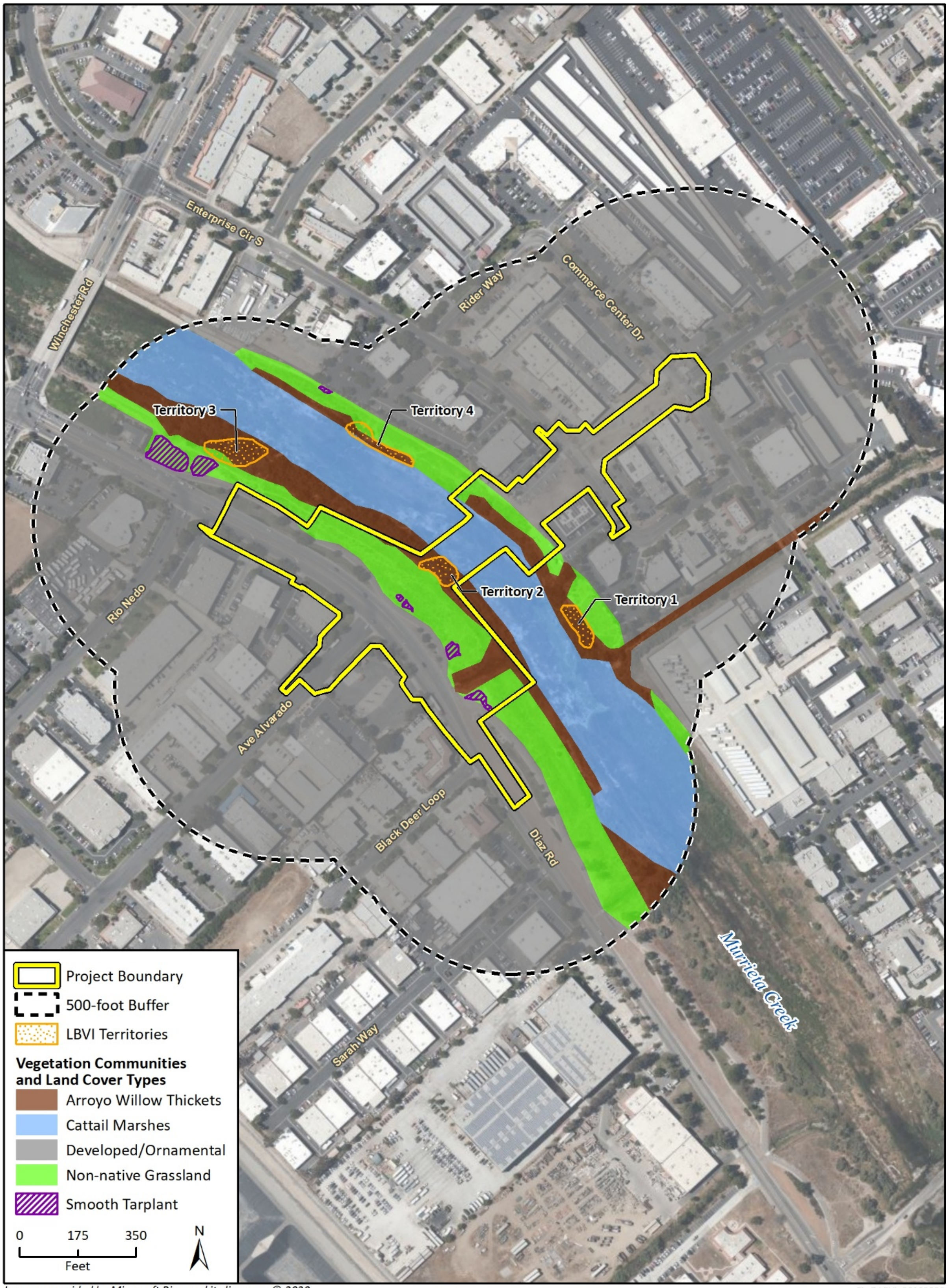
4 Results and Discussion

Overall avian activity and diversity was moderate to high during the surveys and common avian species expected to occur within riparian habitats were observed. A list of avian species observed/detected during the surveys is provided in Appendix A. Other than LBVI, no sensitive avian species were observed during the surveys.

Four least Bell's vireo territories were observed (Figure 4). No banded LBVI were observed and no brown-headed cowbirds were observed. One territory was observed on the east side of Murrieta Creek, south of the proposed bridge, within a patch of pepper tree groves interspersed with arroyo willow (Territory 1, Figure 4). This territory consisted of a lone male that was observed for the first four survey visits. He was observed singing from a small arroyo willow during the first three survey visits, but was never observed exhibiting nesting behavior. This male was not observed after the fourth survey visit. A second territory (Territory 2, Figure 4) was observed on the west side of Murrieta Creek, within the proposed bridge footprint. A lone male was observed singing from an arroyo willow in a patch of southern willow scrub. No nest-building behavior was observed. This male was observed consistently for the first five survey visits but was not observed after the fifth survey visit. A third territory (Territory 3, Figure 4) was observed on the west bank of Murrieta Creek northwest of the proposed bridge footprint area. A male LBVI was observed singing within this territory for the first three survey visits; no female was observed to be present. On the fourth survey visit, this male was observed to be paired with a female. The pair was observed constructing a nest in an arroyo willow near the edge of the streambank. This pair was observed with an active nest for survey visits five through seven. Due to the location of the nest deep within the dense arroyo willow foliage, the biologist was unable to observe the nest directly. However, no fledglings were observed and it is assumed that the nest failed. The pair were not observed on the eighth and final survey visit. A fourth territory (Territory 4, Figure 4) was observed on the east bank of Murrieta Creek, north of the proposed bridge location. This territory was observed to contain a lone male for survey visits two through six. The lone male was observed singing from an arroyo willow near the south bank of the creek. This male was never observed to be paired and was not observed after the sixth survey visit.

The existence of LBVI within the survey area along with dense areas of riparian vegetation make Murrieta Creek in this location a current and future possible nesting area for LBVI. Based on the project's design plans, direct impacts to 2019-occupied LBVI breeding habitat would include the loss of riparian vegetation along the Murrieta Creek.

Figure 4 Least Bell's Vireo Territories Within the Survey Area



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5 Certification

I hereby certify that the statements furnished in this report and in the attached figures present data and information required for these LBVI protocol surveys. The facts, statements, and information presented are true and correct to the best of my knowledge and belief.

Signed: ______________________________ Date: September 5, 2019

Megan Minter
Senior Biologist

6 References

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Appendix A

Avian Compendium

Avian Compendium

Accipitridae	**Kites, Hawks, Eagles**
Buteo lineatus	red-shouldered hawk
Buteo jamaicensis	red-tailed hawk
Aegithalidae	**Bushtits**
Psaltriparus minimus	bushtit
Anatidae	**Duck**
Anas platyrhynchos	mallard
Branta canadensis	Canada goose
Ardeidae	**Herons**
Ardea alba	great egret
Nycticorax nycticorax	black-crowned night-heron
Charadriidae	**Plover**
Charadrius vociferus	killdeer
Columbidae	**Pigeons, Doves**
Columba livia	rock pigeon
Patagioenas fasciata	band-tailed pigeon
Streptopelia decaocto	Eurasian collared-dove
Zenaida macroura	mourning dove
Corvidae	**Crows, Jays**
Aphelocoma californica	California scrub-jay
Corvus brachyrhynchos	American crow
Cuculidae	**Roadrunners**
Geococcyx californianus	greater roadrunner
Emberizidae	**Emberizids**
Melozone crissalis	California towhee
Pipilo maculatus	spotted towhee
Melospiza melodia	song sparrow
Falconidae	**Caracaras, Falcons**
Falco sparverius	American kestrel
Fringillidae	**Finches**
Spinus tristis	American goldfinch
Haemorhous mexicanus	house finch
Spinus psaltria	lesser goldfinch
Spinus tristis	American goldfinch
Hirundinidae	**Swallows**
Petrochelidon pyrrhonota	cliff swallow
Icteridae	**Blackbirds**
Euphagus cyanocephalus	Brewer’s blackbird
Icterus bullockii	Bullock’s oriole
Icterus cucullatus	hooded oriole

Mimidae	**Thrashers**
Mimus polyglottos	northern mockingbird
Toxostoma redivivum	California thrasher
Ptilogonatidae	**Silky- flycatchers**
Phainopepla nitens	phainopepla
Parulidae	**Wood-warblers**
Geothlypis trichas	common yellowthroat
Passerellidae	**New World Sparrows**
Spizella passerina	chipping sparrow
Zonotrichia leucophrys	white-crowned sparrow
Passeridae	**Old World Sparrows**
Passer domesticus	house sparrow
Sturnidae	**Starling**
Sturnus vulgaris	European starling
Trochilidae	**Hummingbirds**
Calypte anna	Anna's hummingbird
Tyrannidae	**Tyrant Flycatchers**
Sayornis nigricans	black phoebe
Sayornis saya	Say's phoebe
Myiarchus cinerascens	ash-throated flycatcher
Tyrannus verticalis	western kingbird
Tyrannus vociferans	Cassin's kingbird
Troglodytidae	**Wrens**
Troglodytes aedon	house wren
Thryomanes bewickii	Bewick's wren
Turdidae	**Thrushes**
Turdus migratorius	American robin
Vireonidae	**Vireo**
Vireo bellii pusillus	Least Bell's vireo
Vireo huttoni	Hutton's vireo

Appendix C

Proposed Mitigation Plan

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Prepared by: Bonterra Consulting
Amended: January 7, 2013
Revised by: Rincon Consultants, Inc.
March 30, 2022

Rincon Project No: 18-06574

Peggy Bartels, U.S. Army Corps of Engineers
Darren Bradford, Regional Water Quality Control Board
Heather Pert, California Department of Fish and Wildlife

Subject: Summary of Proposed Riparian Mitigation for the Murrieta Creek Bridge/Overland Drive Project (Phase II)

This memorandum provides a brief summary of the proposed mitigation strategy for Phase II of the Murrieta Creek Bridge/Overland Drive Project. The proposed Phase II consists of the construction of a new bridge over Murrieta Creek at Overland Drive from its current terminus near Enterprise Circle West. The bridge will be 340 feet long and 77 feet wide. The bridge deck will consist of four through travel lanes (two lanes in each direction), a left-turn lane in the median, two 6-foot-wide shoulders that serve as Class II bike lanes, and a 6-foot-wide sidewalk. Construction of the bridge will include earthen approach embankments with asphalt concrete pavement and concrete slabs, abutment walls and foundations, and concrete slope lining and cutoff walls for scour protection, piers and foundations. Within Murrieta Creek each pier will consist of three 4-foot-diameter concrete columns. The column will be supported by a 6-foot-diameter cast-in-drilled-hole (CIDH) concrete piles, deep enough for protection from scour. The channel bottom will remain earthen without any concrete or rip rap lining. The project also includes roadway improvements to Overland Drive, Diaz Road, Avenida Alverado, and Enterprise Circle West.

Vegetation types found within the project site consist of freshwater marsh, riparian scrub, southern willow scrub, non-native grassland/ruderal, and developed/ornamental. Open water, while not mapped separately, was also present in Murrieta Creek. Murrieta Creek is an intermittent stream located in the Santa Margarita Watershed. Note that the Riverside County Flood Control District mows the vegetation within Murrieta Creek on an annual basis which has resulted in low species and structural diversity and prohibits the development of a mature successional riparian community. Project construction will result in temporary and permanent impacts to 0.96 acre of wetland 'Waters of the U.S.' (U.S. Army Corps of Engineers [USACE]) and 2.48 acres of 'Waters of the State' (California Department of Fish and Wildlife [CDFW]), as summarized in Table 1. Detailed information regarding jurisdictional resources within the project site and project impacts to these resources is provided in the Jurisdictional Delineation Report, Murrieta Creek Bridge and Overland Extension (BonTerra Consulting, 2012).

The proposed mitigation strategy to offset impacts to areas under the jurisdiction of the USACE, Regional Water Quality Control Board (RWQCB), and CDFW consists of both passive and active restoration of 4.27 acres of temporary project impact areas and the active restoration and enhancement of 0.99 acre at an offsite location along Temecula Creek, a tributary to Murrieta Creek. Table 1 summarizes the proposed mitigation acreages and associated activities for both onsite restoration areas and offsite enhancement areas along Temecula Creek.

Table 1 Proposed Mitigation, Murrieta Creek Bridge

Impact Type	Impact Acreage[a]	Ratio	Mitigation Acreage[b]	Description
Onsite- Mitigation for Temporary Impacts				
Temporary Impacts Within Low Flow Area	1.22	1:1	1.22	Self-mitigate; vegetation in the temporary impact areas in the low flow portion of the creek will re-establish based on wet conditions in the creek and proximity to extensive native plant seed sources
Temporary Impacts Outside of Low Flow Area	3.05	1:1	3.05	Apply a native seed mix to temporary impact areas to re-establish native plant species.
Total	**4.27**		**4.27**	
Offsite- Mitigation for Permanent Impacts				
Permanent Impacts	0.33	3:1	0.99	Establish riparian plant species on City-owned parcel along Temecula Creek (adjacent to French Valley and Pechanga Parkway mitigation sites)

[a] **Project impacts to State and federal jurisdictional resources are as follows:**

USACE

Temporary Impacts to Wetland 'Waters of the U.S.': 0.88 acre

Permanent Impacts to Wetland 'Waters of the U.S.': 0.08 acre

Total USACE Impacts: 0.96 acre

CDFW

Temporary Impacts to 'Waters of the State': 2.15 acres

Permanent Impacts to 'Waters of the State': 0.33 acre

Total CDFW Impacts: 2.48 acres

[b] Mitigation requirements are based on the greater CDFW impact areas (which include USACE jurisdictional areas) andproposed mitigation provides concurrent compensation for both CDFW and USACE jurisdictional impacts.

USACE Mitigation Requirements (based on completed Ratio Setting Checklist for temporary and permanent impacts) are as follows:

Temporary Impacts (1:1 Mitigation Ratio): 1.22 ac. X 1= 1.22 acres to be accomplished on onsite temporary impact restoration areas (2.3 acres)

Permanent Impacts (3:1 Mitigation Ratio): 0.33 ac. X 3= 0.99 acres to be accomplished as part of mitigation effort at the offsite City-owned parcel along Temecula Creek.

It is anticipated that the low-flow channel portions of the temporary impact areas (1.22 acres) will rapidly re-establish with native riparian species due to the hydrology of the channel and proximity to abundant native riparian seed sources throughout the channel. A native riparian seed mix and suitable erosion control measures will be applied to temporary impact areas along the channel side slopes (3.05 acres) to facilitate the establishment of native plant species in these areas. The proposed seed mix for these side slope areas is summarized in Table 2.

Table 2 Temporary Impact Site Seed Mix Project Site (3.05 Acres)

		Pounds of Seed[a]	
Common Name	**Botanical Name**	**lbs/acre**	**Per 3.05 Acres[b]**
deerweed	*Acmispon glaber*	3	9
California sagebrush	*Artemisia californica*	4	12
mugwort	*Artemisia douglasiana*	1	3
bush sunflower	*Encelia californica*	3	9
brittlebush	*Encelia farinosa*	3	9
California buckwheat	*Eriogonum fasciculatum*	5	15
golden-yarrow	*Eriophyllum confertiflorum*	3	9
coast goldenbush	*Isocoma menziesii*	3	9
blue-eyed grass	*Sisyrinchium bellum*	1	3
Total		**26**	**78**

[a] Actual seed mix species/quantities will depend on species availability for collection in the project vicinity. Seed materials will be collected within Murrieta Creek and generally within the Upper Santa Margarita RiverWatershed and should be obtained from areas that have similar habitat conditions to the project site.

[b] Total quantities are rounded up/down.

The proposed 0.99 acre offsite mitigation area is located in the Temecula Creek floodplain, within a parcel owned by the City of Temecula (Figure 1). The proposed site is located immediately adjacent (west) to the approved 3.4-acre Pechanga Parkway and 2.73-acre French Valley Parkway mitigation sites. Installation at the French Valley site was completed in November 2012; installation at the Pechanga Parkway site was completed in fall 2013. The proposed 0.99-acre site is located on a low-elevation terrace north of and includes the active creek channel, and currently supports 90-95% non-native vegetation coverage. Soil types (per USDA) include Riverwash and Gorgonio loamy sand (2-8 percent slopes). There are small patches of existing willow riparian habitat within the polygon; however, the understory in these areas is also weedy/non-native and would benefit from restoration with native species. A commercial site is located along the north boundary of the proposed site providing excellent access for installation/maintenance, and the site would be properly fenced and signage installed as needed to deter public entry. The City has installed five piezometers with a maximum depth of 12 feet in this reach of Temecula Creek to assess groundwater resources on an ongoing basis. Groundwater was encountered at 11.5 feet at only one piezometer location in the southwest corner of the proposed mitigation site near the active creek channel during groundwater assessments performed in February 2012. BonTerra Consulting incidentally detected a least Bell's vireo (*Vireo bellii pusillus*)(vireo) within the proposed mitigation site in 2011 and 2012 during monitoring tasks associated with preliminary weed abatement within the adjacent 2.73-acre French Valley mitigation site. Additional vireos were detected within and adjacent to the proposed mitigation site during protocol surveys conducted by Rincon Consultants, Inc. in spring and summer 2021. Proposed activities within the 0.99-acre site consist of the eradication of non-native plant species and the subsequent establishment of a mix of riparian tree, shrub, and herbaceous species such as willows (*Salix* spp.), mule fat (*Baccharis salicifolia*), mugwort (*Artemisia douglasiana*), California wild rose (*Rosa californica*), etc., to benefit a range of wildlife species and in particular the vireo (a plant palette that is similar to the approved Pechanga Parkway and French Valley mitigation programs). A list of proposed plant species is provided in Table 3 and Table 4. All maintenance and monitoring procedures would comply with resource agency conditions and would consist of a five-year program. In particular, mitigation site preparation, installation, and long-term maintenance activities would be performed in a manner that avoids adverse impacts to the vireo and other sensitive biological resources. A conservation easement would be placed over the 0.99-acre mitigation site.

Table 3 Seed Mix Species Offsite Mitigation At Temecula Creek Parcel

Common Name	Botanical Name	Pounds of Seed[a] Per 1.0 Acre	Pounds of Seed[a] Per 0.99 Acres[b]
Western ragweed	*Ambrosia psilostachya*	3	3
Mugwort	*Artemisia douglasiana*	5	5
Tarragon	*Artemisia dracunculus*	3	3
Western goldenrod	*Euthamia occidentalis*	3	3
Creeping wild rye	*Leymus triticoides*	5	5
Deergrass	*Muhlenbergia rigens*	3	3
Branching phacelia	*Phacelia ramosissima*	3	3
Giant nettle	*Urtica dioica ssp. holosericea*	3	3
Total		**28**	**28**

[a] Actual seed mix species/quantities will depend on species availability for collection in the project vicinity. Seed materials will be collected within Temecula Creek and generally within the Upper Santa Margarita River Watershed and should be obtained from areas that have similar habitat conditions to the mitigation site.

[b] Total quantities are rounded up/down.

Table 4 Containers And Cuttings Offsite Mitigation At Temecula Creek Parcel

Common Name	Botanical Name	Size	Quantity[a] Per 1.0 Acre	Quantity[a] Per 0.99 Acres[b]
Desert indigobush	*Amorpha fruticosa*	1-gallon	50	50
Mugwort	*Artemisia douglasiana*	1-gallon	50	50
Tarragon	*Artemisia dracunculus*	1-gallon	50	50
Emory's baccharis	*Baccharis emoryi*	1-gallon	100	99
Mule fat	*Baccharis salicifolia*	1-gallon	100	99
Mule fat	*Baccharis salicifolia*	Cuttings	100	99
Western goldenrod	*Euthamia occidentalis*	1-gallon	50	50
Velvet ash	*Fraxinus velutina*	1-gallon	5	5
Creeping wild rye	*Leymus triticoides*	1-gallon	50	50
Deergrass	*Muhlenbergia rigens*	1-gallon	50	50
Western sycamore	*Platanus racemosa*	1-gallon	10	10
Black cottonwood	*Populus balsamifera*	1-gallon	5	5
Fremont cottonwood	*Populus fremontii*	1-gallon	5	5
California wild rose	*Rosa californica*	1-gallon	50	50
California blackberry	*Rubus ursinus*	1-gallon	50	50
Sandbar willow	*Salix exigua*	Cuttings	20	20

			Quantity[a]	
Common Name	**Botanical Name**	**Size**	**Per 1.0 Acre**	**Per 0.99 Acres[b]**
Black willow	*Salix gooddingii*	Cuttings	20	20
Red willow	*Salix laevigata*	Cuttings	20	20
Arroyo willow	*Salix lasiolepis*	Cuttings	20	20
California figwort	*Scrophularia californica*	1-gallon	50	50
Hedge nettle	*Stachys ajugoides*	1-gallon	50	50
Giant nettle	*Urtica dioica* ssp. *holosericea*	1-gallon	50	50
Total			**955**	**952**

[a] Actual container plant species/quantities will depend on species availability for collection within the project Seed materials will be collected within Temecula Creek and generally within the Upper Santa Margarita River Watershed and should be obtained from areas that have similar habitat conditions to the mitigation site.

[b] Total quantities are rounded up/down.

Sincerely,

Rincon Consultants, Inc.

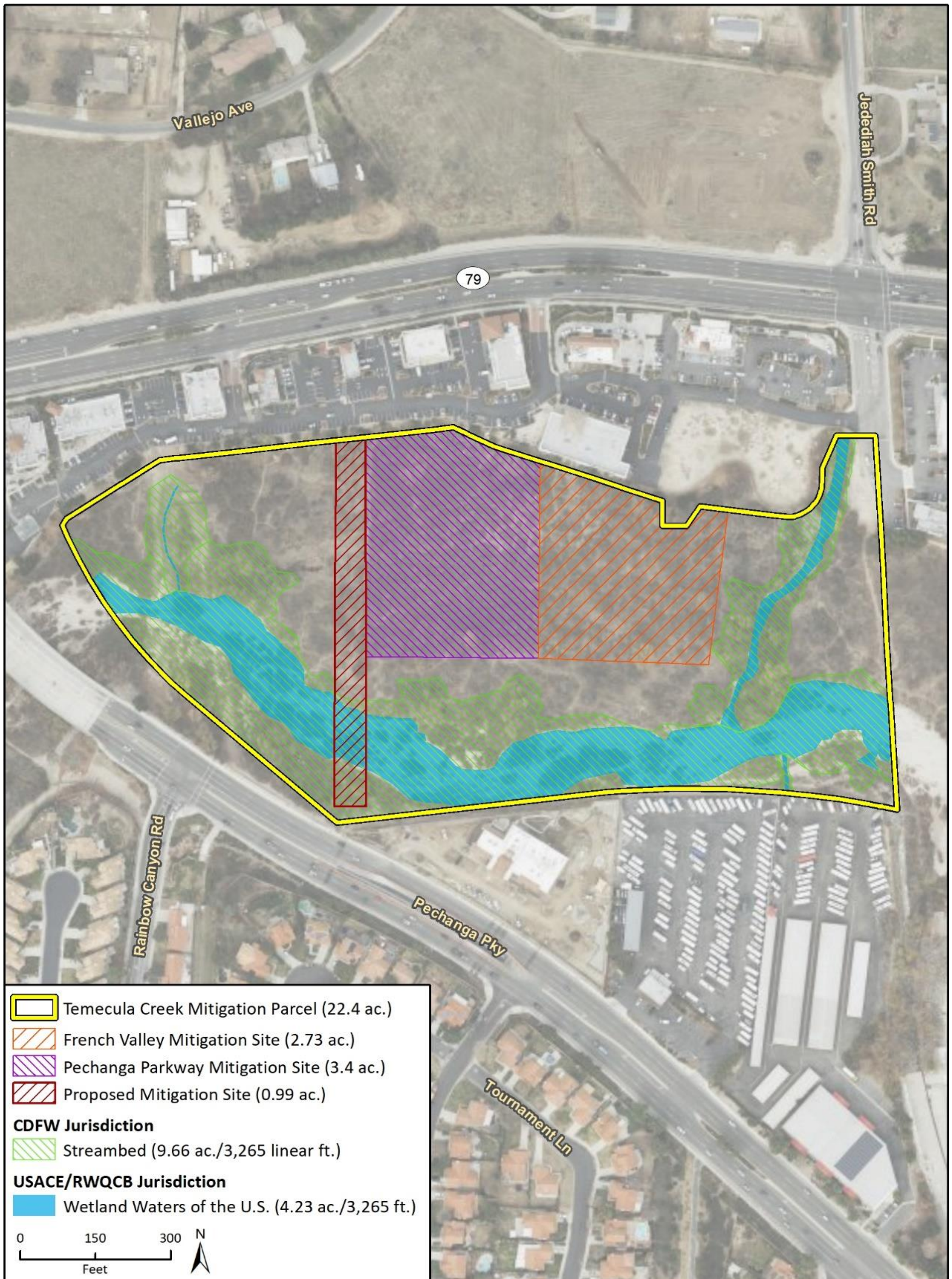
Christopher Hughes
Biologist IV/Marine Scientist

Jared Reed
Senior Biologist/Project Manager

Attachments

Figure 1 Temecula Creek Proposed Mitigation Site

Figure 1 Temecula Creek Proposed Mitigation Site



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Appendix E

Energy Calculation Methodology (Rincon Consultants Inc., February 2022)

Murrietta Creek Bridge Project

Last Updated: 2/21/2022

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors **[1]**:

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529

Values above are expressed in gallons per horsepower-hour/BSFC.

CONSTRUCTION EQUIPMENT

Construction Equipment	#	Hours per Day	Horsepower	Load Factor	Construction Phase	Fuel Used (gallons)
Excavators	4	8	158	0.38	Grubbing/Land Clearing	3,554
Signal Boards	1	8	6	0.82	Grubbing/Land Clearing	81
Tractors/Loaders/Backhoes	6	8	97	0.37	Grubbing/Land Clearing	3,543
Crushing/Proc. Equipment	3	8	85	0.78	Grading/Excavation	2,338
Rubber Tired Dozers	2	8	247	0.4	Grading/Excavation	2,089
Scrapers	2	8	367	0.48	Grading/Excavation	3,725
Tractors/Loaders/Backhoes	2	8	97	0.37	Grading/Excavation	844
Bore/Drill Rigs	3	8	221	0.5	Drainage/Utilities/Sub-Grade	34,345
Cement and Mortar Mixers	4	8	9	0.56	Drainage/Utilities/Sub-Grade	2,322
Cranes	3	8	231	0.29	Drainage/Utilities/Sub-Grade	20,821
Excavators	5	8	158	0.38	Drainage/Utilities/Sub-Grade	31,102
Forklifts	2	8	89	0.2	Drainage/Utilities/Sub-Grade	4,100
Generator Sets	7	8	84	0.74	Drainage/Utilities/Sub-Grade	50,116
Other Construction Equipment	1	8	172	0.42	Drainage/Utilities/Sub-Grade	7,484
Pavers	1	8	130	0.42	Drainage/Utilities/Sub-Grade	5,657
Paving Equipment	1	8	132	0.36	Drainage/Utilities/Sub-Grade	4,923
Rollers	1	8	80	0.38	Drainage/Utilities/Sub-Grade	3,501
Scrapers	1	8	367	0.48	Drainage/Utilities/Sub-Grade	18,251
Tractors/Loaders/Backhoes	7	8	97	0.37	Drainage/Utilities/Sub-Grade	28,936
Excavators	4	8	158	0.38	Paving	7,617
Generator Sets	2	8	84	0.74	Paving	4,383
Rubber Tired Dozers	1	8	247	0.4	Paving	3,133
Scrapers	3	8	367	0.48	Paving	16,761
Tractors/Loaders/Backhoes	4	8	97	0.37	Paving	5,062
					Total Fuel Used	**264,689**
						(Gallons)

Construction Phase	Days of Operation
Grubbing/Land Clearing	35
Grading/Excavation	25
Drainage/Utilities/Sub-Grade	245
Paving	75
Total Days	380

WORKER TRIPS

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Grubbing/Land Clearing	24.1	10	20.0	290.46
Grading/Excavation	24.1	56	20.0	1161.83
Drainage/Utilities/Sub-Grade	24.1	36	20.0	7319.50
Paving	24.1	16	20.0	995.85
		Total		**9,767.63**

HAULING AND VENDOR TRIPS				
Trip Class	**MPG [2]**	**Trips**	**Trip Length (miles)**	**Fuel Used (gallons)**
		HAULING TRIPS		
Grubbing/Land Clearing	7.5	2	58.6	15.63
Grading/Excavation	7.5	1	58.6	7.81
Drainage/Utilities/Sub-Grade	7.5	2	67.0	17.87
Paving	7.5	3	67.0	26.80
			Total	**68.11**
		VENDOR TRIPS		
Grubbing/Land Clearing	7.5	5	8.0	186.67
Grading/Excavation	7.5	5	8.0	133.33
Drainage/Utilities/Sub-Grade	7.5	5	8.0	1306.67
Paving	7.5	5	8.0	400.00
			Total	**2,026.67**

Total Gasoline Consumption (gallons)	**9,768**
Total Diesel Consumption (gallons)	**266,783**

Sources:

[1] United States Environmental Protection Agency. 2021. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES3.0.2* . September. Available at: https://www.epa.gov/system/files/documents/2021-08/420r21021.pdf.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2021. *National Transportation Statistics* . Available at: https://www.bts.gov/topics/national-transportation-statistics.

Appendix F

Water Quality Assessment Report (Engineering Resources of Southern California Inc., October 2019)

Water Quality Assessment Report

For the

Murrieta Creek Bridge at Overland Drive

(Avenida Alvarado over Murrieta Creek)
Federal Aid Project No. BR-NBIL(543)
City Project No. PW-16-05

Submitted to:

Caltrans District 8
Planning and Local Assistance
464 West 4th Street, 6th Floor (MS-760)
San Bernardino, CA 92401-1400

Prepared For:

City of Temecula
41000 Main Street
Temecula, CA 92590
&
CNS Engineers, Inc.
11870 Pierce Street, Suite 265
Riverside, CA 92505

Prepared By:

Engineering Resources of Southern California, Inc.
1861 W Redlands Blvd. Bldg. 7B
Redlands, CA 92373
Project File No. 19009001

October 2019

Prepared By: ______________________ Date: 11/22/2019

Craig Brudin, QSP, CESSWI
(909) 890-1255 x102
Engineering Resources of Southern California
1861 W Redlands Blvd.
Redlands, CA 92373

Approved By: ______________________ Date: 11/22/2019

Steven Latino, PE, TE/Director of Engineering
(909) 890-1255 x108
Engineering Resources of Southern California
1861 W Redlands Blvd.
Redlands, CA 92373

Approved By: ______________________ Date: 12/2/19

Nino Abad, PE, QSD/P, Associate Civil Engineer/Project Manager
951-308-6385
Public Works Department
City of Temecula
41000 Main Street
Temecula, CA 92589

Executive Summary

The Water Quality Assessment Report (WQAR) identifies potential water quality impacts associated with the Murrieta Creek Bridge at Overland Drive Project. The purpose of this document is to describe the existing water resources, determine potential project impacts and whether they would be adverse based on the preliminary project data. This WQAR is intended to assist with compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

The Murrieta Creek Project is within the Santa Margarita Hydrologic Unit of the San Diego Regional Water Quality Control Board located in Riverside County. The City of Temecula (City) proposes the construction of a bridge spanning approximately 348 linear feet over the Murrieta Creek to connect Avenida Alvarado with the extension of Overland Drive within the City of Temecula, Riverside County. This project will include the installation of traffic signals and associated signing, striping, street lights, and utilities. Additional street improvements will also include underground utilities, construction of curb, gutter, and sidewalks, and the relocation of sewer and water facilities.

The project consists of one no build alternative, the no build alternative would have this segment of the Murrieta Creek between Overland Drive and Avenida Alvarado remain in its current state which would require traffic to continue to cross the creek using the Winchester Road Bridge approximately 0.3 miles north and the Montezuma low-water crossing approximately 0.5 miles south.

The construction, use, operation and maintenance of the proposed bridge and roadway improvements have the potential to contribute pollutants to stormwater runoff from the Project. Stormwater runoff from the Project may enter Murrieta Creek by direct discharge or by indirect discharge through the municipal separate storm sewer system (MS4), measures to control, reduce, or eliminate the discharge of pollutants to the Project’s stormwater runoff are required. These pollutant control measures, known as Best Management Practices (BMPs) are implemented during construction and post-construction.

The federal Clean Water Act and the California Porter-Cologne Water Quality Act implement the National Pollutant Discharge Elimination System (NPDES) program in California. The NPDES program controls water pollutants by regulating sources of the pollutants and thus protecting water quality. The state wide program is administered by the California State Water Resources Control Board (SWRCB) and the California Regional Water Quality Control Boards (RWQCB). The SWRCB and RWQCB programs require the control of pollutants both during the construction of the project and the duration of the project.

The Santa Margarita Watershed drains the southwest portion of Riverside County including all of the City of Temecula. Stormwater runoff collects into Murrieta and Temecula creeks and combines to form the Santa Margarita River. The Santa Margarita River flows through the "Gorge" and into San Diego County where it flows past Camp Pendleton into the Santa Margarita Lagoon at the Pacific Ocean.

The City of Temecula holds an NPDES permit for discharges from its MS4 system. The City of Temecula is a named permittee on Order No. R9-2013-0001, as amended by R9-2015-0001 and R9-2015-0100 issued by the California Regional Water Quality Control Board, San Diego Region (Regional Board) on November 18th, 2015. Some of the requirements of this order became effective January 7th, 2016, and many new requirements will not be in effect until after the Regional Board approves the Co-Permittees compliance documents.

All pertinent environmental and water quality permitting such as the USACE 404, RWQCB Section 401, California Fish and Game Code FGC Section 1602, RWQCB 404 Water Quality Certification, and Jurisdiction Determination are currently in process. However, the Project has not been reviewed by the California Department of Fish and Wildlife, the US Army Corps of Engineers, or the Regional Water Quality Control Board. A delineation of potential wetlands and waters subject to the jurisdiction of the United States Army Corps of Engineers (USACE), the California Department of Fish and Wildlife (CDFW), and the Regional Water Quality Control Board (RWQCB) was prepared in 2013 as part of the evaluation for potential permit requirements for the first phase of the project under Section 404 of the Federal Clean Water Act (CWA), for Streambed Alteration Agreement processing under Section 1600 et seq. of the California Fish and Game Code, and for water quality certification under Section 401 of the CWA, respectively. The analysis in the jurisdictional delineation resulted in 10.78 acres of wetland Waters of the U.S. (WoUS) and 15.60 acres of Waters of the State within the survey area. The delineation concluded that the project would impact 0.87 acres of WoUS and 2.12 acres of Waters of the State. Since there are areas within the Project area subject to USACE and CDFW jurisdiction, RWQCB jurisdiction in this case is coincident with USACE jurisdiction for purposes of the Section 401 water quality certification.

The Project is subject to the provisions of the Western Riverside County Multiple-Species Habitat Conservation Plan (MSHCP). An MSHCP consistency analysis has been prepared for the Project since the Project cannot avoid all impacts to riparian/riverine areas, a Determination of Biologically Superior or Equivalent Preservation (DBESP) analysis is required to mitigate for any impacts. At the minimum, compensation for riparian/riverine impacts in the DBESP will include off-site participation in an in-lieu fee program, and/or purchase of credits from a mitigation bank for habitat creation. Mitigation in the DBESP will be equivalent or superior to that which would occur if impacts to the riparian/riverine resources were avoided. The Project will be reviewed by the Western Riverside County Regional Conservation Authority (RCA), who manages the MSHCP. Compensatory mitigation is anticipated to be required by the USACE, the CDFW, the RWQCB, and for MSHCP consistency to offset the loss of jurisdictional waters and riparian/riverine habitat.

The City of Temecula requires the project to develop and implement two separate plans to control water quality, The Storm Water Pollution Prevention Plan (SWPPP) and a Water Quality Management Plan (WQMP). The SWPPP and WQMP will both identify the potential pollutants associated with construction of the project and the BMPs that will be incorporated during construction to control, reduce, or eliminate these pollutants in storm water runoff. These actions will be taken both during construction of the project and the duration or life of the project.

To efficiently and effectively comply with both the City of Temecula’s requirements for water quality control, two documents are being prepared for this Project:

- Storm Water Pollution Prevention Plan (SWPPP) – The SWPPP will include treatment BMPs to control the discharge of pollutants in stormwater runoff associated with the construction of the Project. The SWPPP will include a description of the post construction BMPs identified in the WQMP for the Project. Some of the construction phase BMPs for the Project include:

    - Scheduling
    - Streambank Stabilization
    - Wind Erosion Controls
    - Storm Drain Inlet Protection
    - Gravel Bag Berm
    - Gravel Bag Check Dams
    - Sediment Sweeping and Vacuuming
    - Material and Waste Handling and Storage

- Water Quality Management Plan (WQMP) – The WQMP is a post-construction plan for managing the quality and quantity of stormwater runoff that flows from the Project after construction is completed and the Project is operational. The WQMP will describe the site design, source control and treatment control Best Management Practices (BMPs) that will be implemented and maintained throughout the life of Project to prevent and minimize water pollution that can be caused by stormwater runoff. The WQMP includes the following three major categories of BMPs:

    - Site Design BMPs (also known as Low Impact Development strategies) – are Project features that are designed or incorporated into a project to minimize the increase in stormwater runoff from the developed project site. Examples of Site Design BMPs include the use of porous pavement or pavers, minimizing the use of impervious pavement areas, directing roof drains to landscaped areas, disconnecting impervious areas, and conserving natural areas, etc., to allow water to percolate into the ground.
    - Source Control BMPs – Activities or structures aimed at eliminating or minimizing contact between pollutant sources and stormwater/urban runoff. Examples of Source Control BMPs include education, contractor training, storm drain markings, sweeping, litter collection, canopies over fueling islands, and awnings or tarps to cover materials stored outdoors. These BMPs help keep water from carrying pollutants to storm drain systems and then to Murrieta Creek.
    - Treatment Control BMPs – Engineered devices or systems incorporated into the project's drainage system to remove pollutants from stormwater runoff before the runoff leaves the project site. Examples of Treatment Control BMPs include vegetated swales, infiltration trenches, detention/retention basins, catch basin filters, and vortex separators. These devices help remove potential pollutants from stormwater runoff prior to leaving site and entering storm drain systems and then to Murrieta Creek.

The Post-Construction BMPs for the Project may include:

- Education for Property Owners
- Drainage Facility Inspection and Maintenance
- Street Sweeping
- MS4 Stenciling and Signage
- Channel and Slope Protection

Collectively, the BMPs described in the SWPPP and/or the WQMP are expected to mitigate the discharge of pollutants associated with the construction, use, operation, and maintenance of the Project to levels that are less than significant.

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1. INTRODUCTION

1.1 Approach to Water Quality Assessment

The purpose of the Water Quality Assessment Report (WQAR) is to fulfill the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), and to provide information for National Pollutant Discharge Elimination System (NPDES) permitting. The document includes a discussion of the proposed project, the general environmental setting of the project area, and the regulatory framework with respect to water quality; it also provides data on surface water and groundwater resources within the project area and the water quality of these waters, describes water quality impairments and beneficial uses, and identifies potential water quality impacts/benefits associated with the proposed project, and recommends avoidance and/or minimization measures for potentially adverse impacts.

1.2 Project Description

Project Purpose: The purpose of the project is to construct a bridge over and across Murrieta Creek to connect Avenida Alvarado at the intersection of Diaz Road with Overland Drive at the intersection of Enterprise Circle West in the City of Temecula.

The proposed improvements will accomplish the following in the project area:

1. Provide safe all-weather access across Murrieta Creek
2. Provide reliable route for emergency vehicles, motorists, pedestrians, and bicyclists
3. Provide additional access points to the City's industrial park

Project Need: Murrieta Creek bisects the City of Temecula west of Interstate 15 (I-15) and separates industrial park and open space areas in the western City limits from the rest of the City. Murrieta Creek is an important riparian resource within the City, which protects water quality, conveys stormwater, and contains important biological resources and habitats. In addition, the Creek is an important archaeological area with known and unknown archaeological sites. Therefore, there are limited creek crossings in the City.

A low-water crossing of Murrieta Creek currently exists at Via Montezuma, approximately 0.5 miles south of Overland Drive. The low-water crossing frequently closed in wet seasons is not a reliable route to cross the Creek during storm and flooding events, and the crossing is scheduled to be removed in the future by a separate channel improvements project. Therefore, there is a need for an additional all-weather creek crossing location for employees and residents to access the industrial and open space areas to the west of Murrieta Creek.

For delineations of the project features please refer to the figures presented below, subsequent to the narrative for this section. Figure 1 & 4 below present the project vicinity and location map along with the key features under evaluation for impacts as a result of this project. Figure 2 below presents the typical ultimate roadway section for Overland Drive that will tie into the proposed bridge. Figure 3 below presents the typical section of the proposed bridge that will continue overland drive over Murrieta Creek and tie into Avenida Alvarado.

Existing Conditions: The project is located in the northwest area in the City of Temecula, within and adjacent to Murrieta Creek. The project would extend from the terminus of Overland Drive near the Enterprise Circle West intersection, over Murrieta Creek, along Diaz Road, approximately 600 feet on either side of Avenida Alvarado, and about 500 feet along Avenida Alvarado.

Roadways at the location of the proposed bridge consist of the intersection of Diaz Road and Avenida Alvarado on the west side of the Creek. Diaz Road parallels the Creek and has a width of 76 feet and consists of two northbound and two southbound through lanes, and Avenida Alvarado has a width of 64 feet with one eastbound and one westbound travel lane. To the east of the Creek, Overland Drive terminates at Commerce Center Drive. Overland Drive was recently extended to Enterprise Circle West under a separate Overland Drive Extension Project (City Project PW 16-06). The project involved the demolition of two buildings, roadway improvements including construction of curbs and gutters, sidewalks, storm drains, utility facilities, traffic signage, and intersection improvements at Overland Drive/Commerce Center Drive and Overland Drive/Enterprise Circle West. Enterprise Circle West is 44 feet in width with one northbound and one southbound lane and Overland Drive between Enterprise Circle West and Commerce Center Drive is 68 feet in width with two westbound and two eastbound lanes.

An existing pedestrian and bike trail parallels the west side of the Creek to the east of Diaz Road. Nearby Creek crossings include the Winchester Road Bridge, approximately 0.3 miles north, and the Via Montezuma low-water crossing, approximately 0.5 miles south.

Proposed Improvements: The project proposes to construct a bridge over the Murrieta Creek to connect Avenida Alvarado with Overland Drive in the City of Temecula, Riverside County. The Murrieta Creek Bridge at Overland Drive is anticipated to be a concrete girder structure spanning approximately 348 linear feet over Murrieta Creek. The bridge would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 5-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

Upon completion of the Murrieta Creek Bridge project, the proposed street configuration would be consistent with the four-lane roadway segment on Overland Drive to the east. In addition to the construction of the bridge, various roadway and utility improvements would occur at the western and eastern bridge approaches. In order to match the roadway section on Avenida Alvarado on the west side of the bridge, the project would transition the lane configuration in the eastern portion of Avenida Alvarado to be consistent with the four-lane configuration of the bridge. Intersection improvements to Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado would include the installation of traffic signals and associated signing, striping, street lights, and utilities. Traffic signals and street lights will be installed at the Overland Drive/ Commerce Centre Drive intersection as well. Traffic signals and street light will be installed at the overland drive/commerce center drive intersection as well. Reconstruction and roadway improvements along Diaz Road and Avenida Alvarado would include undergrounding electrical utilities, construction of curbs, gutters, and sidewalks, relocating sewer and water facilities, and adding traffic signage and striping.

As a part of the bridge construction, one abutment would be constructed on each end of the bridge, along with two piers within the Murrieta Creek. Earth embankments with concrete slope protection and cutoff walls buried underground for scour protection would also be installed on the east and west side of the Creek. The foundation of the bridge piers involving large-diameter cast-in-drilled-hole concrete piles will be installed below the channel bottom, which is deep enough for protection from scour. The channel bottom will remain earthen without any concrete or rip rap lining. The bridge girder would provide cell openings to accommodate future utilities and electrical conduits for street lights and traffic signal communication.

The project will also include the following additional improvements:

- **Railing Architectural treatment.** The bridge design will incorporate concrete barriers, metal hand and bicycle railings, and standard architectural treatments such as formliner textures to control graffiti.
- **Landscaping.** Landscaping modifications or improvements in the right-of-way along the bridge approach, Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado intersections, and along Diaz Road and Overland Drive.

Right-of-Way Requirements: The right of way on the east side of the Creek has been acquired by the City as part of the completed Overland Drive Extension Project (City Project PW 16-06); however, due to raise of the Diaz Road and Avenida Alvarado street grade, portions of four driveways in private properties at the westerly approach will be reconstructed. Temporary construction easements (TCE's) will be acquired at these locations. There will be a street easement for the bridge and its approaches in the Creek, which is to be acquired from Riverside County Flood Control and Water Conservation District (RCFC&WCD). A temporary construction easement at the northeast corner of the Overland Drive/Enterprise Circle West intersection may be required to reconstruct an ADA-compliant curb ramp.

Construction Traffic Controls: Diaz Road, Avenida Alvarado, and Overland Drive will include temporary striping to divert traffic away from work areas. The temporary striping will allow for staged construction of roadway and intersection improvements to maintaining vehicle and pedestrian and bicyclist access at all times. Temporary and short term access impact may occur during construction, and will require coordination with property owners, the public, and other stakeholders.

A Risk Level Assessment was performed and from its findings, the project has a high receiving waters risk with a medium sediment risk leading to the combined risk of the project to be a Level 2.

1.2.1 No Project Alternative

The No Project Alternative would have this segment of the Murrieta Creek between Overland Drive and Avenida Alvarado remain in its current state which would require traffic to continue to cross the creek using the Winchester Road Bridge approximately 0.3 miles north and the Montezuma low-water crossing approximately 0.5 miles south.

1.2.2 Build Alternative

The Build Alternative proposes to construct a bridge over the Murrieta Creek to connect Avenida Alvarado with Overland Drive in the City of Temecula, Riverside County. The Murrieta Creek Bridge at Overland Drive is anticipated to be a concrete girder structure spanning approximately 348 linear feet over Murrieta Creek. The bridge would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 6-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

The right of way on the east side of the Creek has been acquired by the City as part of the completed Overland Drive Extension Project (City Project PW 16-06); however, due to the raising of the Diaz Road and Avenida Alvarado street grade, portions of four driveways in private properties at the westerly approach will be reconstructed. Temporary construction easements (TCE's) will be acquired at these locations. There will be a street easement for the bridge and its approaches in the Creek, which is to be acquired from Riverside County Flood Control and Water Conservation District (RCFC&WCD). A temporary construction easement at the northeast corner of the Overland Drive/Enterprise Circle West intersection may be required to reconstruct an ADA-compliant curb ramp.

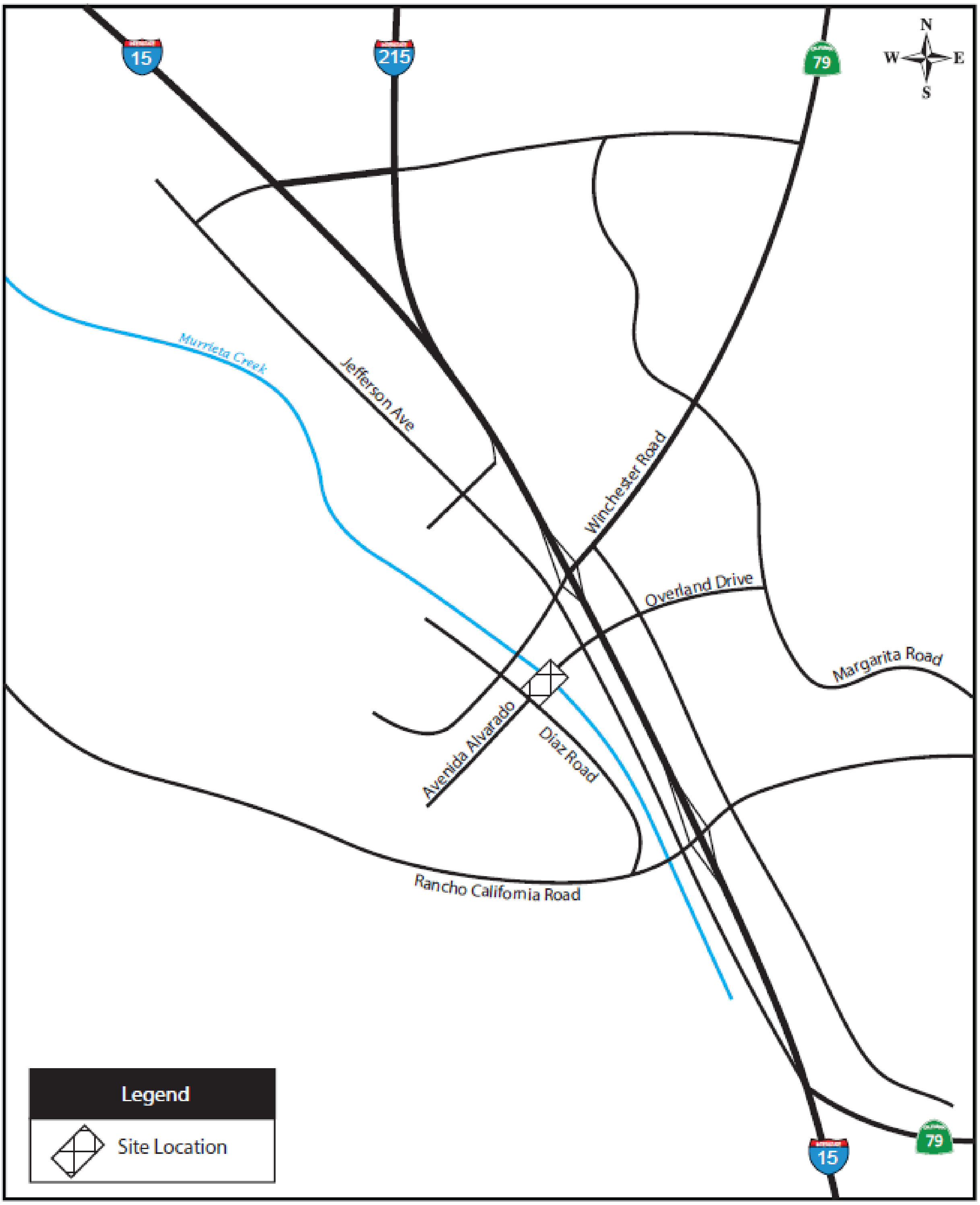

Figure 1: Project Vicinity

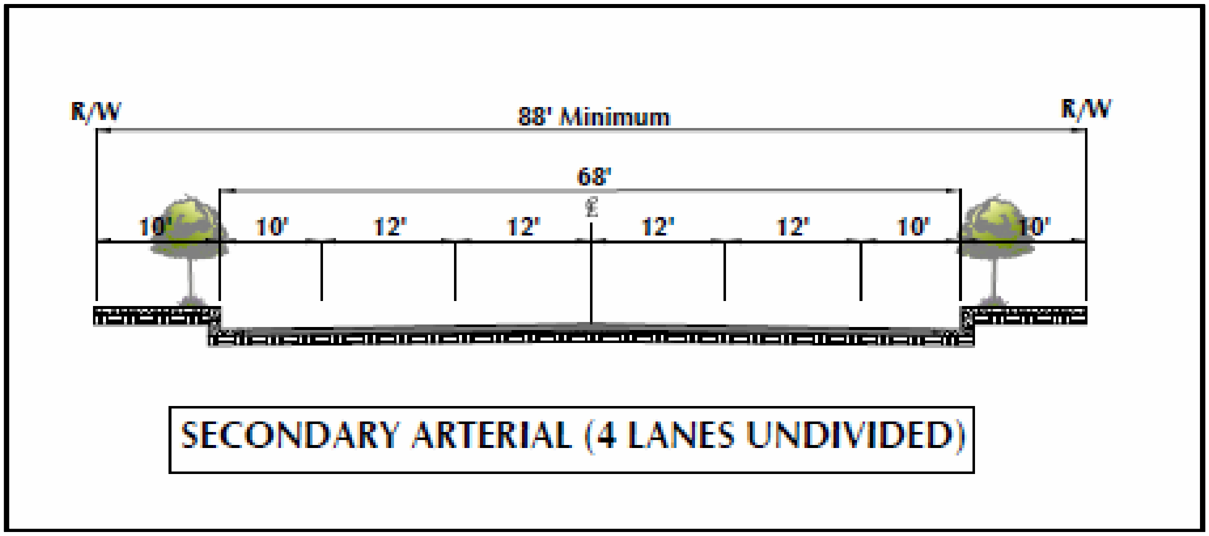

Figure 2: Typical Section of Ultimate Overland Drive (City of Temecula General Plan)

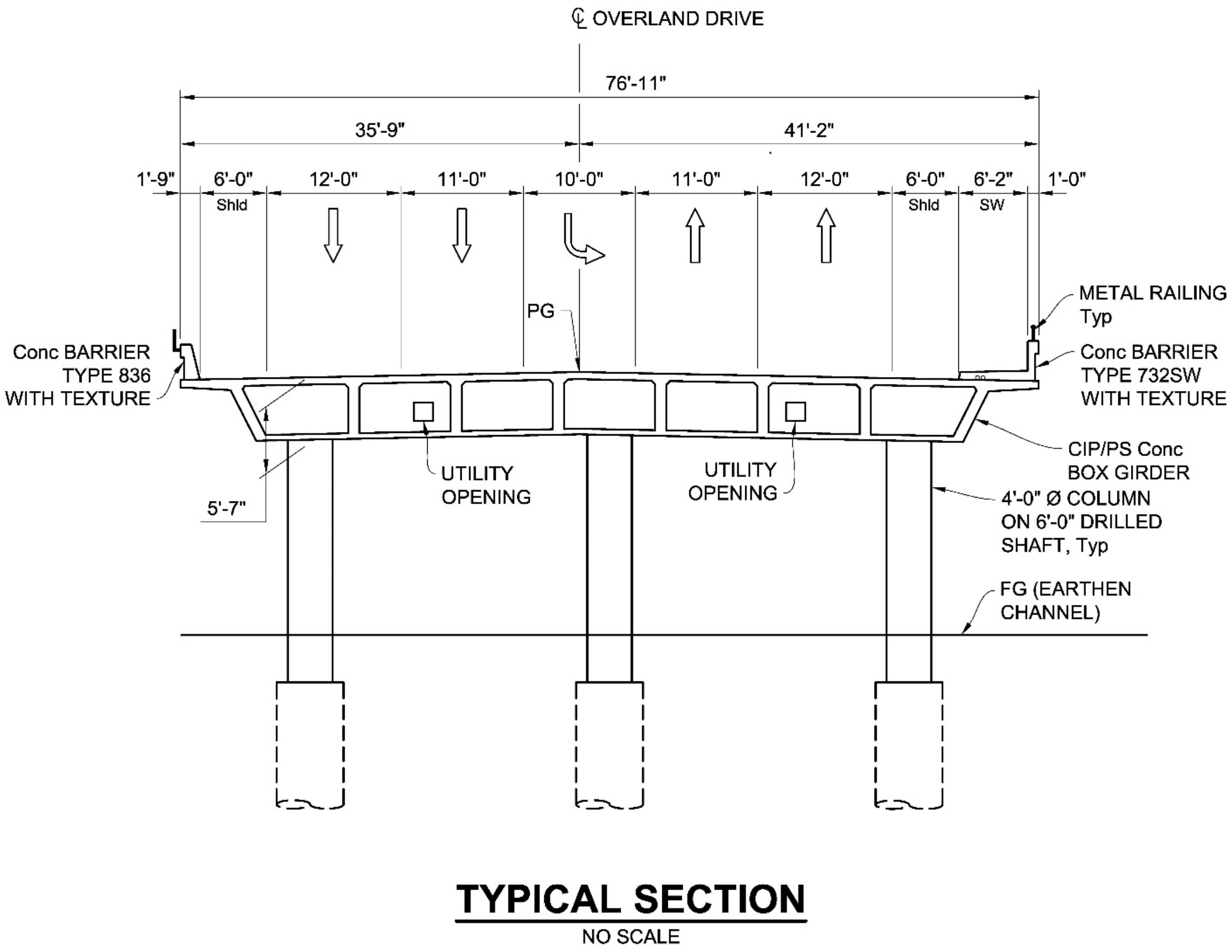

Figure 3: Typical Section of Proposed Overland Drive Bridge

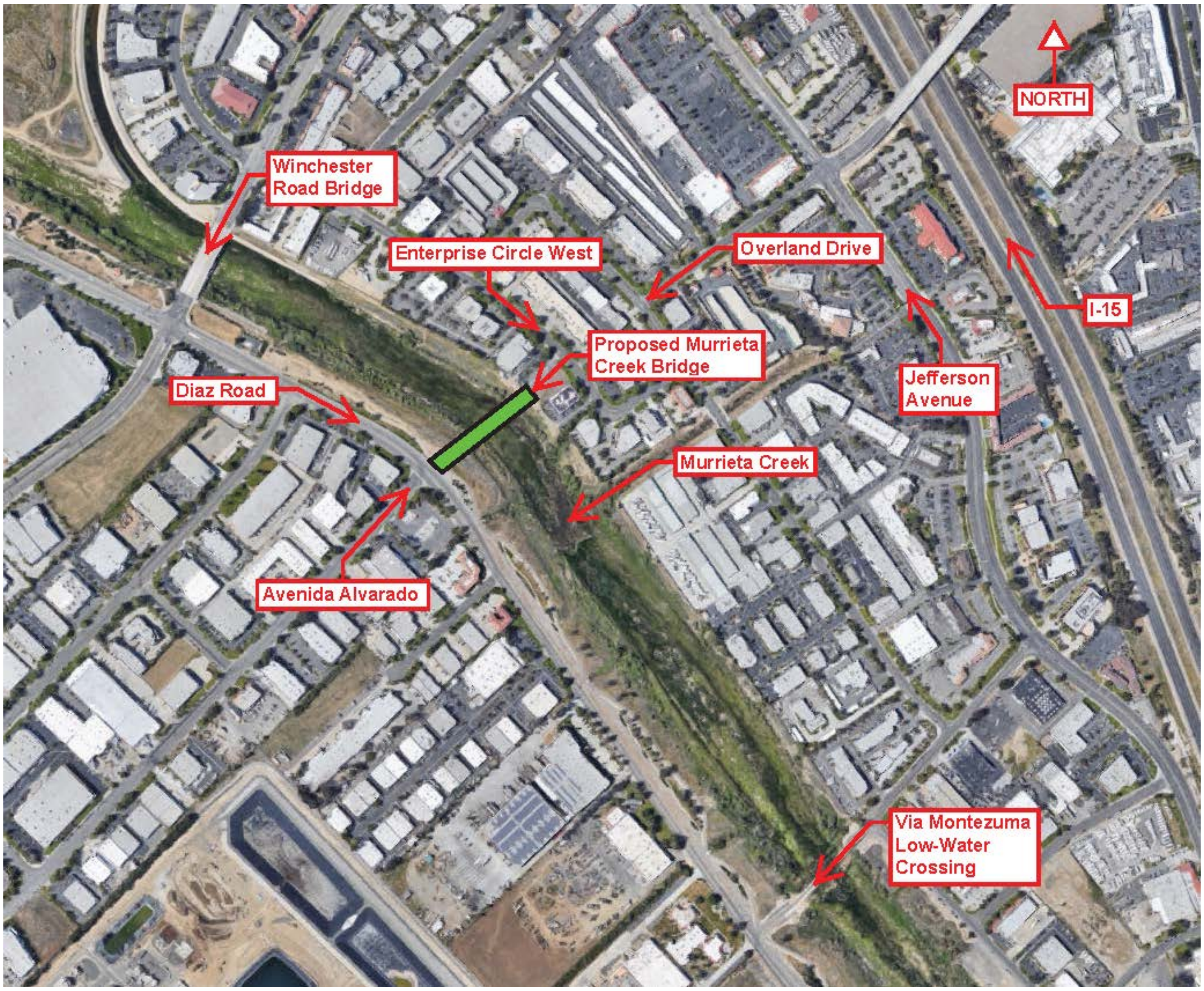

Figure 4: Project Location

2. Regulatory Setting

2.1 Federal Laws and Requirements

Clean Water Act

In 1972 Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the waters of the United States (U.S.) from any point source unlawful unless the discharge is in compliance with a NPDES permit. Known today as the Clean Water Act (CWA), Congress has amended it several times. In the 1987 amendments, Congress directed dischargers of stormwater from municipal and industrial/construction point sources to comply with the NPDES permit program. Important CWA sections are:

- Sections 303 and 304 require states to promulgate water quality standards, criteria, and guidelines.

- Section 401 requires an applicant for a federal license or permit to conduct any activity, which may result in a discharge to waters of the U.S., to obtain certification from the State that the discharge will comply with other provisions of the act. (Most frequently required in tandem with a Section 404 permit request. See below).

- Section 402 establishes the NPDES, a permitting system for the discharges (except for dredge or fill material) of any pollutant into waters of the U.S. The Federal Environmental Protection Agency delegated to the California State Water Resources Control Board (SWRCB) the implementation and administration of the NPDES program in California. The SWRCB established nine Regional Water Quality Control Boards (RWQCBs). The SWRCB enacts and enforces the Federal NPDES program and all water quality programs and regulations that cross Regional boundaries. The nine RWQCBs enact, administer and enforce all programs, including NPDES permitting, within their jurisdictional boundaries. Section 402(p) requires permits for discharges of stormwater from industrial, construction, and Municipal Separate Storm Sewer Systems (MS4s).

- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the U.S, including wetlands. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

The objective of the CWA is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”

The USACE issues two types of 404 permits: General and Individual. There are two types of General permits: Regional and Nationwide permits. Regional permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to authorize a variety of minor project activities with no more than minimal effects.

There are also two types of Individual permits: Standard Individual permit and Letter of Permission. Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of USACE’s Individual permits. For Standard Individual permit, the

USACE decision to approve is based on compliance with U.S. Environmental Protection Agency's (EPA) Section 404 (b)(1) Guidelines (U.S. EPA CFR 40 Part 230), and whether permit approval is in the public interest. The 404(b)(1) Guidelines were developed by the U.S. EPA in conjunction with USACE, and allow the discharge of dredged or fill material into the aquatic system (waters of the U.S.) only if there is no practicable alternative which would have less adverse effects. The Guidelines state that USACE may not issue a permit if there is a least environmentally damaging practicable alternative (LEDPA), to the proposed discharge that would have less effects on waters of the U.S., and not have any other significant adverse environmental consequences. Per Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures have been followed, in that order. The Guidelines also restrict permitting activities that violate water quality or toxic effluent standards, jeopardize the continued existence of listed species, violate marine sanctuary protections, or cause "significant degradation" to waters of the U.S. In addition, every permit from the USACE, even if not subject to the 404(b)(1) Guidelines, must meet general requirements. See 33 CFR 320.4.

2.2 State Laws and Requirements

Lake and Streambed Alteration Agreement

An LSA Agreement is a type of permit that includes measures necessary to protect existing fish and wildlife resources. Common activities that are permitted by LSA Agreements include installation, repair, or maintenance of water diversions, culverts, stream crossings (e.g., bridges, rock fords), or any other modification of a lake or stream's bed, bank, or channel including extraction of material from them (i.e., sand, rock, or gravel) or deposition of material into them (CDFW).

California Department of Fish and Wildlife (CDFW) is responsible for protecting and conserving fish and wildlife resources, and the habitats upon which they depend. The Lake and Streambed Alteration (LSA) Program reviews projects that would alter any river, stream, or lake and conditions projects to conserve existing fish and wildlife resources. Under Section 1602 of the CDFW, any project that may: Substantially divert or obstruct the natural flow of any river, stream, or lake; Substantially change or use any material from the bed, channel, or bank of any river, stream, or lake; or Deposit or dispose of debris, waste, or other materials containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake will require a Lake and Streambed Alteration agreement. CDFW will review your notification and issue a Lake or Streambed Alteration Agreement when necessary to protect fish and wildlife resources (CFWD).

Porter-Cologne Water Quality Control Act

California's Porter-Cologne Act, enacted in 1969, provides the legal basis for water quality regulation within California. This Act requires a "Report of Waste Discharge" for any discharge of waste (liquid, solid, or gaseous) to land or surface waters that may impair beneficial uses for surface and/or groundwater of the State. It predates the CWA and regulates discharges to waters of the State. Waters of the State include more than just waters of the U.S., since groundwater and surface waters are not considered waters of the U.S. Additionally, it prohibits discharges of “waste” as defined and this definition is broader than the CWA definition of “pollutant”. Discharges under the Porter-Cologne Act are permitted by Waste Discharge Requirements (WDRs) and may be required even when the discharge is already permitted or exempt under the CWA.

The State Water Resources Control Board (SWRCB) and RWQCBs are responsible for establishing the water quality standards as required by the CWA, and regulating discharges to protect beneficial uses of water bodies. Details regarding water quality standards in a project area are contained in the applicable RWQCB Basin Plan. In California, Regional Boards designate beneficial uses for all water body segments in their jurisdictions, and then set standards necessary to protect these uses. Consequently, the water quality standards developed for particular water body segments are based on the designated use and vary depending on such use. Water body segments that fail to meet standards for specific pollutants are included in a Statewide List in accordance with CWA Section 303(d). If a Regional Board determines that waters are impaired for one or more constituents and the standards cannot be met through point source or non-source point controls (NPDES permits or Waste Discharge Requirements), the CWA requires the establishment of Total Maximum Daily Loads (TMDLs). TMDLs specify allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed. The SWRCB implemented the requirements of CWA Section 303(d) through Attachment IV of the Caltrans Statewide MS4, as it includes specific TMDLs for which Caltrans is the named stakeholder.

State Water Resources Control Board and Regional Water Quality Control Boards
The SWRCB adjudicates water rights, sets water pollution control policy, and issues water board orders on matters of statewide application, and oversees water quality functions throughout the state by approving Basin Plans, TMDLs, and NPDES permits. RWCQBs are responsible for protecting beneficial uses of water resources within their regional jurisdiction using planning, permitting, and enforcement authorities to meet this responsibility.

- **National Pollutant Discharge Elimination System (NPDES) Program**

Municipal Separate Storm Sewer Systems (MS4)
Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of stormwater dischargers, including MS4s. The U.S. EPA defines an MS4 as “any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over storm water, that are designed or used for collecting or conveying stormwater.” The SWRCB has identified the Department as an owner/operator of an MS4 pursuant to federal regulations. The Department’s MS4 permit covers all Department rights-of-way, properties, facilities, and activities in the state. The SWRCB or the RWQCB issues NPDES permits for five years, and permit requirements remain active until a new permit has been adopted.

Construction General Permit
Construction General Permit (NPDES No. CAS000002, SWRCB Order No. 2009-0009-DWQ, adopted on November 16, 2010) became effective on February 14, 2011 and was amended by Order No. 2010-0014-DWQ and Order No. 2012-0006-DWQ. The permit

regulates stormwater discharges from construction sites which result in a Disturbed Soil Area (DSA) of one acre or greater, and/or are smaller sites that are part of a larger common plan of development.

For all projects subject to the CGP, the applicant is required to hire a Qualified Storm Water Pollution Prevention Plan (SWPPP) Developer (QSD) to develop and implement an effective SWPPP. All Project Registration Documents, including the SWPPP, are required to be uploaded into the SWRCB's on-line Stormwater Multiple Application and Report Tracking System (SMARTS), at least 30 days prior to construction.

Waivers from CGP coverage.

Projects that disturb over 1.0 acre but less than 5 acres of soil, may qualify for waiver of CGP coverage. This occurs whenever the R factor of the **Watershed Erosion Estimate (=RxKxLS) in tons/acre** is less than 5. Within this CGP formula, there is a factor related to when and where the construction will take place. This factor, the 'R' factor, may be low, medium or high. When the R factor is below the numeric value of 5, projects can be waived from coverage under the CGP, and are instead covered by the Caltrans Statewide MS4.

In accordance with SWMP, a Water Pollution Control Plan (WPCP) is necessary for construction of a Caltrans project not covered by the CGP.

Construction activity that results in soil disturbances of less than one acre is subject to this CGP if there is potential for significant water quality impairment resulting from the activity as determined by the RWQCB. Operators of regulated construction sites are required to develop a SWPPP, to implement soil erosion and pollution prevention control measures, and to obtain coverage under the CGP.

The CGP contains a risk-based permitting approach by establishing three levels of risk possible for a construction site. Risk levels are determined during the planning, design, and construction phases, and are based on project risk of generating sediments and receiving water risk of becoming impaired. Requirements apply according to the Risk Level determined. For example, a Risk Level 3 (highest risk) project would require compulsory stormwater runoff pH and turbidity monitoring, and pre- and post-construction aquatic biological assessments during specified seasonal windows.

Section 401 Permitting

Under Section 401 of the CWA, any project requiring a federal license or permit that may result in a discharge to a water of the United States must obtain a 401 Certification, which certifies that the project will be in compliance with State water quality standards. The most common federal permit triggering 401 Certification is a CWA Section 404 permit, issued by USACE. The 401 permit certifications are obtained from the appropriate RWQCB, dependent on the project location, and are required before USACE issues a 404 permit.

In some cases the RWQCB may have specific concerns with discharges associated with a project. As a result, the RWQCB may prescribe a set of requirements known as Waste Discharge Requirements (WDRs) under the State Water Code (Porter-Cologne Act). WDRs may specify the inclusion of additional project features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. WDRs can be issued to address both permanent and temporary discharges of a project.

2.3 Regional and Local Requirements

Regional Water Quality Control Board (RWQCB)

The proposed project lies within the jurisdiction of the San Diego Regional Water Quality Control Board (Region 9). The San Diego RWQCB prepared the *1994 Water Quality Control Plan for the San Diego Basin* (with amendments effective on or before May 17, 2016) to help manage and preserve the state's water quality and supply. The Basin Plan for the San Diego Region is a collection of water quality goals and policies, descriptions of conditions and discussions of solutions. The Basin Plan establishes water quality standards for all surface and ground water in the region. The Basin Plan establishes an implementation plan describing the actions taken by the Regional Board and others that are necessary to meet the water quality standards identified in the Basin Plan. Known water quality problems are listed in the Basin Plan, along with the causes, if they are known. Plans for improving water quality are included for bodies of water that do not meet the necessary quality standards.

Local Regulations

The City of Temecula is a named permittee on Order No. R9-2013-0001, as amended by R9-2015-0001 and R9-2015-0100 issued by the California Regional Water Quality Control Board, San Diego Region (Regional Board) on November 18th, 2015. Some of the requirements of this order became effective January 7th, 2016, and many new requirements will not be in effect until after the Regional Board approves the Co-Permittees compliance documents.

In the interim, the previous Order No. 2010-0016 is referenced. These permits outline programs and requirements that the Member Agencies must implement to comply with State and Federal Water Quality laws and to protect receiving waters from pollution. These requirements include the creation and implementation of plans to prevent the discharge of pollutants to the storm drain system and to our waterways, and annual report requirements.

3. AFFECTED ENVIRONMENT

The City of Temecula is located in Riverside County, California, United States. The city is approximately 50 miles North of San Diego. According to the 2010 census, the population of Temecula was 100,097. The population was recorded as 57,716 per the 2000 census.

3.1 General Environmental Setting

- Temecula is located at 33.4936° N, 117.1484° W. According to the United States Census Bureau, the city has a total area of 37.28 square miles, 37.27 square miles of it is land and the other 0.012 square miles is water.

- The City of Temecula receives about 12 inches of rain, on average, per year. The US average is 38 inches of rain per year. On average it snows 0 days out of the year in Temecula.

- There are approximately 276 sunny days per year in Temecula. The July high is around 94 degrees and the January low is around 41 degrees.

- Climatological data since 1999 for the City of Temecula includes the following:
  i. On average the hottest month is August.
  ii. The highest recorded temperature was 113.8°F (45.4°C) (2018).
  iii. On average the coldest month is December.
  iv. The lowest recorded temperature was 22.9°F (-5.1°C) (2007).
  v. The average high temperature is 78.6°F (25.9°C).
  vi. The average low temperature is 51.1°F (10.6°C).

- The project is located in the Temecula Valley Groundwater Basin (Groundwater Basin Number: 9-05)

- There are no known wellhead protection areas in the project site.

- No 404(b)(1) water body is triggered for the Project.

3.1.1 Population and Land Use

Land use within the Region varies considerably. The region is experiencing and is expected to continue to experience population growth. Table 1-1 shows population projections for San Diego, Riverside, And Orange counties. The Population of Temecula was recorded as 114,327 in 2017. Land Use in the city varies from residential, commercial and office, light industrial, public/institutional, and open space areas. (Temecula General Plan & San Diego Region-The Basin Plan)

TABLE 1-1. POPULATION PROJECTIONS FOR THE STATE OF CALIFORNIA AND SAN DIEGO, RIVERSIDE, AND ORANGE COUNTIES

Location	Year 1990	1995	2000	2005	2010	2015
San Diego County	2,421,233	2,677,058	2,915,692	3,143,155	3,373,422	3,618,554
Riverside County	1,195,400	1,493,558	1,771,276	2,076,538	2,402,889	2,759,172
Orange County	2,415,269	2,667,706	2,862,106	2,992,855	3,099,374	3,193,64
Total for California	29,777,448	32,958,921	36,214,623	39,194,880	42,178,903	45,344,961

3.1.2 Topography

The terrain of the project vicinity is relatively flat with an expected drop in elevation near the Murrieta Creek. The project will not impact the existing topography.

3.1.3 Hydrology

3.1.3.1 Regional Hydrology

The San Diego Region occurs within the Peninsula Range Physiographic Province of California. The Peninsula Range includes from north to south, the Santa Ana, Agua Tibia, Palomar, Volcan, Cuyamaca and Laguna mountains. This area exhibits gently dissecting western surface and a steep eastern slope and is separated by the West Colorado River area by abrupt fault scarps of marked relief.

The San Diego Region is divided into three separate areas, a coastal plain area, a central mountain valley area and an eastern mountain valley area. The coastal plain area consists of a series of wave cut benched that are covered by thin terrace deposits. This terraced surface has been dissected by passing streams draining to the sea, and the surface has been smoothed by erosion. The surface of this area ranges from sea level to about 1,200 feet and extends from the coast inland in a band of about 10 miles in width.

The central mountain valley area is characterized by ridges and intermontane basins that extend from the coastal plain, northeastward to the Elsinore fault zone. The surface of this area range in elevation from 500 to about 5,000 feet and are typically fault block origin modified form erosion. The floors of the intermontane valleys are generally underlain by moderate thickness of alluvium and residuum. Notable examples of this occur near El Cajon, Escondido and Ramona. At higher elevation plateau surfaces have been developed in the central mountain valley area. These occur at elevations from 2,000 to 6,000 feet near the Laguna Mountains, Santa Ysabel and Valley Center.

The eastern mountain valley area is characterized by relatively flat valleys which are structurally of block fault origin. Locally, the grabens contain thick sections of alluvial deposits. These valleys generally rise to the southeast from 1,000 feet elevations near Temecula to the rolling plateaus of Glenoak, Lewis and Reed Valleys which range from 3,000 to 3,500 feet in elevation. Surrounding mountains include the Red mountain, Cahuilla mountain and Bachelor mountain and have an elevation range from 4,000 to 7,500 feet. (San Diego Region-The Basin Plan).

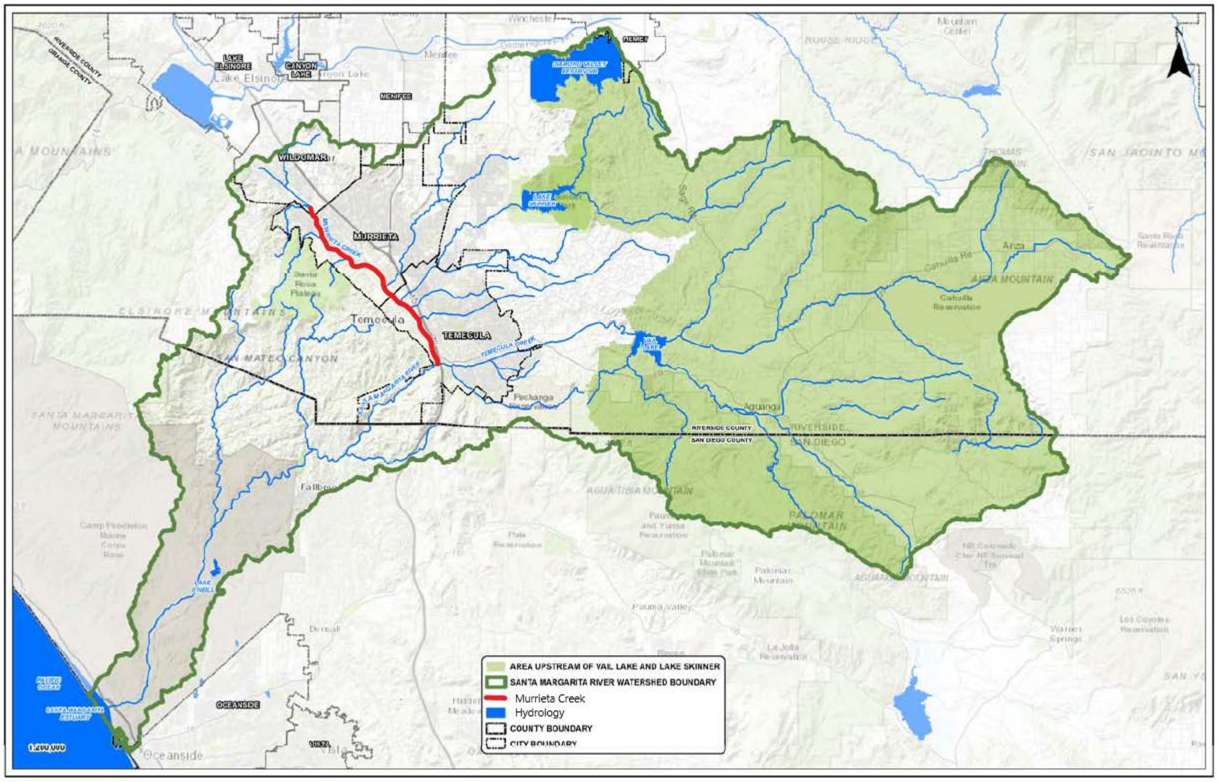

Figure 5: Hydrology Map

3.1.3.2 Local Hydrology

3.1.3.2.1 Precipitation and Climate

Riverside County's Climate is classified as a Semi-Arid Mediterranean Climate, characterized by mild hot and dry summers and mild winters that are relatively wet. Temperatures average about 55 degrees in December to 80 degrees in August. The average annual rainfall at the project limits are approximately 10-13 inches with most of the rainfall occurring during November through February.

- City of Temecula gets approximately 12 inches of rain per year, while the US average is 38 inches. Temecula averages 0 inches of snow per year, while the US average is 28 inches. Temecula will have some kind of precipitation 31 days out of the year.

- On average, Temecula will have 276 sunny days per year, while the average in the US is 205 days. The January Low is 41 degrees Fahrenheit, while the July High is 94 degrees Fahrenheit. Temecula has a comfort rating of 73 out of 100 which indicates a comfortable year-round weather. The higher the comfort score rating the more comfortable the weather is year-round in that location; the US average comfort rating is 54 out of 100.

3.1.3.2.2 Surface Waters

The nearest major drainage course to the project site is the Murrieta Creek which flows within and adjacent to the project site.

3.1.3.2.3 Floodplains

According to FEMA Flood Map Number 06065C2720G, the project is located within in a regulatory flood plain and also mapped as Zone AE, which means that the area subject to inundation by the 1-percent-annual-chance flood event with Base Flood Elevations.

3.1.3.2.4 Municipal Supply

Rancho California Water District (RCWD) is the main water purveyor for the City of Temecula. RCWD's water supply is obtained from the following primary water sources: Local ground water from the Murrieta-Temecula Basin; 2) imported State Water Project (SWP) and Colorado River water from the Metropolitan Water District of Southern California (MWDSC) through the Eastern Municipal Water District (EMWD) and the Western Municipal Water District (WMWD); 3) recycled water from both the district and EMWD facilities. Annual water production for RCWD is around 66,100 acre-feet. (RCWD Water Facilities Master Plan).

3.1.3.3 Groundwater Hydrology

Rancho California Water District's (RCWD's) current service area represents 99,000 acres, and the District has 878 miles of water mains, 35 storage reservoirs, one surface reservoir (Lake Vail), 53 groundwater wells, and 36,759 service connections. Approximately 109,000 people are served by RCWD.

RCWD relies on imported water from MWD to meet much of its water demands. MWD obtains its water from the Colorado River and Northern California, via the State Water Project (SWP). Both sources are over-allocated and water supplies can be significantly limited during dry weather years and droughts. Additionally, water quality and Endangered Species Act requirements in the Sacramento-San Joaquin Bay Delta (Bay-Delta) could reduce further MWD's SWP allocations. Water delivered to homes and businesses is a blend of groundwater (35%) and import water (65%).

Per RCWD's 2018 Water Quality Report, the water supplied generally falls below the Public Health Goal. Below is a list of know contaminants that exceed this goal (average data used):

- Inorganic Chemicals
  - Arsenic
- Radionuclides
  - Gross Alpha
  - Uranium

Even though the above listed items exceed the PHG, they are still in compliance with State and Federal Regulation.

3.1.4 Geology/Soils

The US Department of Agriculture Web Soil Survey for the project area shows the potential for three soil types in the area:

- Cf – Chino Silt Loam, drained, saline-alkali (high erosion potential)
- GuB – Grangeville fine sandy loam, poorly drained, saline-alkali, 0 to 5 percent slopes (slight)
- GvB – Grangeville fine sandy loam, saline-alkali, 0 to 5 percent slopes.

3.1.4.1 Soil Erosion Potential

Dependent on soil conditions, there could be the potential for erosion with the Chino Silt Loam. Grangeville has a low erosion potential in comparison. A preliminary geotechnical report will be completed during the early stages of the project and any erosion potential will be further noted.

3.1.5 Biological Communities

3.1.5.1 Aquatic Habitat

3.1.5.1.1 Special Status Species

The southern willow scrub and riparian scrub habitats in the project area provide habitat that is occupied by the federally-endangered least Bell's vireo (*Vireo bellii pusillus*). Minimization and avoidance measures will be developed for the project in conjunction with USFWS and CDFW to reduce or avoid potential impacts to this species.

Smooth tarplant (*Centromadia pungens* ssp. *laevis*), a California Rare Plant Rank (CRPR) 1B.1 species, has been observed on site. Smooth tarplant is a Criteria Area species covered by the MSHCP. Because the survey area is located outside an "Additional Survey Needs Area" for smooth tarplant as defined by the MSHCP, all impacts are considered mitigated with the City's participation in the MSHCP

3.1.5.1.2 Stream/Riparian Habitats

The project would impact riparian/riverine resources as defined by the MSHCP including Southern willow scrub, riparian scrub, and freshwater marsh riparian habitats. The project would be required to comply with any applicable land use and conservation requirements as a part of the MSHCP, which would reduce potential impacts to sensitive species and habitats. Since avoidance is not feasible based on the nature of the proposed project, an analysis supporting a Determination of Biologically Equivalent or Superior Preservation (DBESP) will be prepared. The DBESP will outline a mitigation strategy to provide riparian/riverine resources of equivalent or superior habitat value to those being impacted.

3.1.5.1.3 Wetlands

The project is located on a riverine (Murrieta Creek) resource that contains wetland habitat. (FWS national wetlands inventory). A wetland delineation and assessment will be prepared to establish the extents of jurisdictional resources within the project area. As described above, since avoidance is not feasible based on the nature of the proposed project an analysis supporting a DBESP will be prepared. The DBESP will outline a mitigation strategy to provide wetland resources of equivalent or superior habitat value to those being impacted.

3.1.5.1.4 Fish Passage

According to the University of California, Division of Agriculture and Natural Resources, California Fish Website, freshwater native fish species such as the Arroyo Chub, Coastal Rainbow Trout, and Southern California Steelhead can be found in the Murrieta Creek. Non-native fish species such as Black Bullhead, Black Crappie, Blue Catfish, White Catfish, Channel Catfish, Redear Sunfish, and Threadfin Shad can be found in Murrieta Creek.

The reach of Murrieta Creek where the project is located is typically dry or with intermittent water with little flow. It is not likely to find native fish within this reach. The proposed project will temporary impact the creek bed for the installation of erosion control features. However, the features will be installed flushed with the creek bed and would not impede the ability for fish to move through the area.

4. ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

The Project will have a minimal adverse effect on stormwater quality because the impacts associated with the construction of the new bridge will be offset by the removal of existing buildings and the construction of new curbs, gutters, storm drains and utility facilities. Both during and after construction BMPs will be implemented and maintained to ensure local and regional stormwater runoff quality is improved.

4.2 Potential Impacts to Water Quality

It is anticipated that construction of the proposed project will increase impervious surface areas that could affect downstream water bodies. Construction of the project and the increase in runoff would potentially cause or contribute to water quality impacts and could have the potential for adverse impacts. The following summarizes the impacts of the project and the introduction of pollutants into the environment with a particular focus on stormwater runoff.

4.2.1 Anticipated changes to the Physical/Chemical Characteristics of the Aquatic Environment

4.2.1.1 Substrate

Substrate, which for the purpose of this section, would pertain to habitats, refuges and nesting sites of aquatic life. During construction, the potential impacts would be associated with sedimentation (soil disturbance). Disturbed soils are susceptible to erosion, resulting in sediment transport.

The completed project would result in an increase in impervious surface, which could potentially increase stormwater runoff. Generally, roadway/bridge projects are associated with sediment, nutrients, nitrate discharges, litter and metals. Pollutants associated with the operation of the project also have the potential to impact areas on which organisms live and grow.

It is not anticipated that the construction or operational use of the project will cause a change in sedimentation of the receiving water bodies. Due to the area of the project, a very minor increase in runoff compared to the entire hydrologic area is anticipated. The proposed construction would be stabilized with Temporary Construction BMPs, and Post Construction BMPs would be put in place once the project is complete to mitigate concerns.

4.2.1.2 Currents, Circulation or Drainage Patterns

As per the existing condition, the Project will allow Murrieta Creek to flow unimpeded and provide adequate conveyance. The project will also allow the bridge and roadway flows to discharge to the Creek. It is anticipated that there will be no significant increase to the flow, volume, rate, depth or seasonal changes.

4.2.1.3 Suspended Particulates (Turbidity)

Sediment is likely to occur as a result of the construction and operation of the proposed projects; however, Temporary Construction BMPs and Post Construction BMPs would be implemented to mitigate this potential impact.

4.2.1.4 Oil, Grease and Chemical Pollutants

Generally, roadway/bridge projects are associated with oil, grease and chemicals due to the need to accommodate vehicular and non-vehicular traffic. The project will be replacing an existing low water crossing along via montezuma, so generally the pollutants will remain the same.

4.2.1.5 Temperature, Oxygen, Depletion and Other Parameters

Not applicable; however, trash is always present at any time of this project type, regardless of landuse.

4.2.1.6 Flood Control Functions

The proposed bridge will provide adequate conveyance capacity for the 100-year flow in the Murrieta Creek. The project will include minimal drainage improvements within the creek. Activities will include minor re-grading of the creek near the bridge and construction of concrete slope protection and cutoff wall to protect the bridge abutments from scour.

4.2.1.7 Storm, Wave and Erosion Buffers

Wetlands may serve as buffer zones, shielding upland areas from wave actions, storm damage and erosion, per 40 CFR 230.41. Other features of the design, such as Design Pollution Prevention BMPs would be implemented to minimize erosion due to storm damage.

4.2.1.8 Erosion and Accretion Patterns

The project is generally surrounded by a relatively flat area and which has pervious surfaces. Potential for erosion and accretion due to the construction of the project is unlikely and negligible.

4.2.1.9 Aquifer Recharge/Groundwater

During the construction of the bridge piers, should dewatering be necessary there may be impacts to the aquifer recharge or groundwater supply. Dewatering activities for excavations below the water table could result in the discharge of unsuitable and untreated water if discharged directly into the environment.

4.2.1.10 Baseflow

According to the Department of Water Resources, depth to groundwater in the area of the project range from 5 to 25 feet below ground surface. USGS monitors stream flow conditions for Murrieta Creek within the project area. Based on USGS data, base flow would have to be considered when conducting a Unit Hydrograph Analysis for a catchment, and changes in base flow are anticipated with implementation of the project.

4.2.2 Anticipated Changes to the Biological Characteristics of the Aquatic Environment

4.2.2.1 Special aquatic sites

In addition to wetlands, special aquatic sites include sanctuaries and refuges, mudflats, vegetated shallows, coral reefs, and riffle and pool complexes. See 40 CFR Subpart E § 230.40-45. According to the National Wetlands Inventory of the U.S. Fish & Wildlife Services, there are no refuges adjacent to the project site; therefore, there are no anticipated changes to any special aquatic sites.

4.2.2.2 Habitat for Fish and Other Aquatic Organisms

4.2.2.2.1 Fish Passage (Beneficial Uses)

The reach of Murrieta Creek where the project is located is typically dry or with intermittent water with little flow. It is not likely to find native fish within this reach. The proposed project will temporary impact the creek bed for the installation of erosion control features. However, the features will be installed flushed with the creek bed and would not impede the ability for fish to move through the area.

4.2.2.3 Wildlife Habitat

4.2.2.3.1 Wildlife Passage (Beneficial Uses)

Murrieta Creek provides a wildlife movement corridor and is designated in the MSHCP as a Proposed Constrained Linkage. According to the MSHCP, the Murrieta Creek contains riparian habitat for the movement of yellow warbler (*Setophaga petechia* [*Dendroica petechia*]), yellow-breasted chat (*Icteria virens*), and least Bell's vireo (*Vireo bellii pusillus*). It also states that existing floodplain processes and water quality along the creek must be maintained to support Pacific western pond turtle (*Actinemys* [*Emys*] *marmorata*) and arroyo chub (*Gila orcutti*) in this area. The proposed bridge across Murrieta Creek would be similar to the Winchester Road Bridge located immediately upstream of the survey area. It is assumed that wildlife species that currently move along the creek under the Winchester Road Bridge would continue along the creek under the new proposed bridge, assuming indirect effects of noise and lighting are minimized. Therefore, following construction of the proposed bridge, wildlife would be expected continue to move along the creek as they currently do.

4.2.2.4 Endangered or Threatened Species

The proposed project area contains suitable habitat for the federally-endangered least Bell's vireo and this species has been observed on site. Minimization and avoidance measures will be developed for the project in conjunction with USFWS and CDFW to reduce or avoid potential impacts to this species.

4.2.2.5 Invasive Species

Seeds of invasive exotic plant species can be carried into a construction site within the mud on the tires of construction equipment. Construction Minimization Measures from Section 7.5.3 of the MSHCP will be followed; these guidelines require the use of vehicle washing stations to minimize the spread of invasive species.

The proposed project does includes minimal landscaping along a trail near the bridge approach, however the project will not introduce invasive, non-native plant species that could degrade adjacent open space areas. Tamarix (*Tamarix* sp.) and giant reed (*Arundo donax*) already occur throughout the proposed project area and throughout Murrieta Creek. Murrieta Creek already provides a source of water for invasive wildlife species, and is already occupied by the invasive bullfrog, which is known to prey upon native aquatic wildlife species. The proposed project would not create any conditions that would expand the distribution of the bullfrog or any other invasive plant or wildlife species.

4.2.3 Anticipated Changes to the Human Use Characteristics of the Aquatic Environment

4.2.3.1 Existing and Potential Water Supplies; Water Conservation

The proposed project is not sited in a location used by a local water district for existing or potential water supplies, or water conservation; therefore, no changes to existing water supplies, potential water supplies, or water conservation are anticipated.

4.2.3.2 Recreational or Commercial Fisheries

No known commercial or recreational fishing is permitted (or occurs) in the receiving water body within the proposed project boundary; therefore, no changes are anticipated.

4.2.3.3 Other Water Related Recreation

There are no impacts to existing water related recreation within the project boundary.

4.2.3.4 Aesthetics of the Aquatic Ecosystem

The proposed project would have direct permanent changes during construction to the aesthetics of the aquatic ecosystem through the disturbance and/or removal of existing riparian vegetation. After the proposed project is constructed, the remaining riparian vegetation would not be impacted by operation of the proposed project.

4.2.3.5 Parks, National and Historic Monuments, National Seashores, Wild and Scenic Rivers, Wilderness Areas, etc.

There are no impacts to Parks, National and Historic Monuments, National Seashores, Wild and Scenic Rivers, Wilderness Areas, etc. due to the project.

4.2.3.6 Traffic/Transportation Patterns

During the construction there would be no impacts to Traffic/Transportation patterns as there currently is no crossing at Overland Drive and Murrieta Creek. Post construction, vehicles will utilize this corridor to reroute from nearby Winchester Road and Via

Montezuma. Once completed, the Via Montezuma low water crossing will be eliminated, shifting traffic to the newly constructed bridge.

4.2.3.7 Energy Consumption of Generation

No energy consumption or generation uses in the project boundary would be impacted by the proposed project (during and post construction).

4.2.3.8 Navigation

Navigation would not be impacted by the proposed project.

4.2.3.9 Safety

Construction of the proposed project may cause changes to human safety within the project boundaries; however, after construction of the proposed project no changes to safety would occur based on current information.

4.2.4 Temporary Impacts to Water Quality

4.2.4.1 No Build Alternative

If the No Build Alternative was implemented there would be no impacts to water quality.

4.2.4.2 Build Alternative – Construct Overland Bridge at Murrieta Creek

During the construction of the proposed project, there is a potential to contribute pollutants to the receiving water body. These pollutants would include sediment and silt from ground disturbances, and chemical pollutants associated with the construction equipment and materials that are brought onto the project site. Silt and sediment can carry pollutants and well as impact plant production, obscure food sources, habitats, refuges, and nesting sites. In addition, equipment access, along with construction workers will have impacts to the receiving water body in the project location.

4.2.5 Long-term Impacts During Operation and Maintenance

4.2.5.1 No Build Alternative

If the No Build Alternative was implemented there would be no new impacts; however, the existing low Water Crossing at Via Montezuma allows for oil, grease, fuel, metal and chemicals to enter the creek since vehicular traffic crosses at the creek bottom.

4.2.5.2 Build Alternative – Construct Overland Bridge at Murrieta Creek

Operation of the proposed project will have the potential to impact the receiving water body due to the increase in impervious surface area, which would result in stormwater runoff. Potential pollutants associated with the operation of transportation facilities include: sediment from erosion, nutrients (i.e. phosphorus and nitrogen), mineralized organic matter in soils, nitrite discharges (atmospheric and vehicular), litter and metals.

4.3 Impact Assessment Methodology

The proposed project was assessed for the potential impacts to Murrieta Creek. Construction of the bridge could have potential impacts; however, the removal of the low water crossing at Via Montezuma would reduce the impacts that currently happen at that low water crossing and through the implementation of Temporary and Permanent BMPs reduce the impacts of that crossing.

The proposed project will pose the same potential pollutants during the construction as it will in the post-construction phase. The project is not rare, with the construction of a bridge and road and utility improvements to the surrounding area.

4.4 Cumulative Impacts

There will be very little impervious area added to the watershed since the bridge will ultimately replace the existing low water crossing at Via Montezuma. In comparison the bridge and roadway improvements are diminutive in comparison to the overall area of the watershed. Other cumulative impacts such as silt and sediment, litter, nutrients and metals will be mitigated through the use of Temporary and Permanent BMPs on the project site.

5. AVOIDANCE AND MINIMIZATION MEASURES

WQ-1
The project will comply with the provisions of the National Pollutant Discharge Elimination system (NPDES) Permit Order No. R9-2013-0001, as amended by R9-2015-0001 and R9-2015-0100 issued by the California Regional Water Quality Control Board, San Diego Region (Regional Board) on November 18th, 2015.

WQ-2
The project will comply with the Construction General Permit by preparing and implementing a Storm Water Pollution Prevention Plan (SWPPP) to address all construction related activities and equipment, as well as materials that have the potential to impact water quality for the appropriate Risk Level. The SWPPP will identify the sources of pollutants that may affect the quality of storm water and include BMPs to control the pollutants, such as sediment control, catch basin inlet protection, construction materials management and non-storm water BMPs.

WQ -3:
The types of activities allowed within the Project will be limited to and in accordance with the City of Temecula codes, regulations and zoning ordinances. Activities such as staging or stockpiling construction materials or wastes in areas where they can be discharged into storm drains will be prohibited. Activities associated with street maintenance, which can discharge pollutants into Murrieta Creek will be prohibited. Vehicle maintenance and washing will be prohibited since it is not a feature of the project or associated with Project activities.

WQ-4:
Design Pollution Prevention Best Management Practices (BMPs) shall be implemented such as preservation of existing vegetation, slope/ surface protection systems (permanent soil stabilization), concentrated flow conveyance systems such as ditches, berms, dikes and swales, over side drains, flared end sections, and outlet protection/ velocity dissipation devices.

WQ-5:
All proposed slopes with slope gradient of 2:1 or flatter will be planted with deep rooted, drought tolerant erosion protection vegetation native to the area. Slopes steeper than 2:1 gradient will be lined with concrete for erosion protection and slope stability.

WQ-6:
If dewatering is required, Construction site dewatering must comply with the General Waste Discharge Requirements for Groundwater Extraction Discharges to Surface Waters within the San Diego Region (Order No. R9-2015-0013, NPDES No. CAG919003) and any subsequent updates to the permit at the time of Construction. This permit addresses temporary dewatering operation during construction. Dewatering BMPs must be used to control sediment and pollutants, and the discharges must comply with the WDRs issued by the San Diego RWQCB.

6. REFERENCES

Caltrans Division of Design Stormwater homepage for guidance and tools (Project Risk Level, Estimating for CGP, Erosion Prediction software, etc.):
http://www.dot.ca.gov/design/hsd/index.html

Caltrans Division of Environmental Analysis Stormwater Homepage:
http://www.dot.ca.gov/hq/env/stormwater/

Caltrans Standard Environmental Reference (SER) Volume I

- For wetlands, hydromorphic method and water assessment information, see Chapter 15 - Waters of the U.S. and the State:
  http://www.dot.ca.gov/ser/vol1/sec3/natural/ch15wetland/ch15wetland.htm

- For hydraulic studies and floodplain encroachment information, see Chapter 17 - Floodplains: http://www.dot.ca.gov/ser/vol1/sec3/special/ch17flood/chap17.htm

- For Coastal Zone permits information, see Volume 5 - Coastal Zone:
  http://www.dot.ca.gov/ser/vol5/vol5.htm

- For Wild and Scenic Rivers information, see Chapter 19 - Wild and Scenic Rivers:
  http://www.dot.ca.gov/ser/vol1/sec3/special/ch19wsrivers/chap19.htm

Caltrans Stormwater Quality Handbook Project Planning and Design Guide (PPDG):
http://www.dot.ca.gov/design/hsd/ppdg/PPDG-Final_2017-07.pdf

Caltrans Stormwater Quality Practice Guidelines:
http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/management_ar_rwp/CTSW-RT-02-009.pdf

Caltrans Water Quality Planning Tool: http://www.water-programs.com/wqpt.htm

Regional Water Quality Control Board website and Basin Plans:
http://www.swrcb.ca.gov/plans_policies/

State Water Resources Control Board Storm Water Program, 2009-0009-DWQ Construction General Permit:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

State Water Resources Control Board Watershed Management:
http://www.swrcb.ca.gov/water_issues/programs/watershed/

United States (U.S.) Environmental Protection Agency Section 404(b)(1) guidelines:
http://www.epa.gov/owow/wetlands/pdf/40cfrPart230.pdf

U.S. Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

6.1 Works Cited

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https://www.bestplaces.net/climate/city/california/temecula

FEMA Flood Map Service:
https://msc.fema.gov/portal/search?AddressQuery=temecula#searchresultsanchor

Rancho California Water District – Water Facilities Master Plan:
https://www.ranchowater.com/DocumentCenter/View/1802/2015-Water-Facilities-Master-Plan

Temecula, California All-Time Records, Archive, and Climate Information:
https://weathercurrents.com/temecula/Archive.do

Temecula General Plan:
https://temeculaca.gov/345/General-Plan

The San Diego Region – The Basin Plan:
https://www.waterboards.ca.gov/rwqcb9/water_issues/programs/basin_plan/index.html

United States Census Bureau:
https://www.census.gov/quickfacts/fact/table/temeculacitycalifornia,US/PST045218

U.S. Fish and Wildlife Service - National Wetlands Inventory:
https://www.fws.gov/wetlands/data/mapper.html

California Department of Water Resources
https://water.ca.gov

USGS Water Data for the Nation
https://waterdata.usgs.gov/nwis

Riverside County Watershed Protection
http://rcflood.org/npdes/

California Department of Fish and Wildlife
https://www.wildlife.ca.gov/Conservation

6.2 Preparer(s) Qualifications

Steve Latino, P.E., T.E.
Mr. Latino holds a BSCE and has 15+ years in Civil Engineering experience including public and private sector experience. Mr. Latino has been involved with numerous federally and state funded projects that have gone through the local assistance process. Mr. Latino holds a bachelor's of science degree in Civil Engineering from Purdue University.
Engineering Resources of Southern California
1861 W. Redlands Blvd. BLDG. 7B
Redlands, CA 92373

Craig Brudin, QSP, CESSWI
Mr. Brudin brings 6 years of specialized education and training in the Environmental Field. Mr. Brudin holds a Bachelor's in Environmental Policy and Management and Business Management Studies from the University of Redlands.
Engineering Resources of Southern California
1861 W. Redlands Blvd. BLDG. 7B
Redlands, CA 92373

Travis Moffatt
B.A. Biology
Almost two years working in Engineering
Engineering Resources of Southern California
1861 W. Redlands Blvd. BLDG. 7B
Redlands, CA 92373

APPENDIX A

National Flood Hazard Layer FIRMette

FEMA

33°31'25.13"N

117°10'58.43"W

117°10'20.98"W

33°30'55.14"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/20/2019 at 6:44:05 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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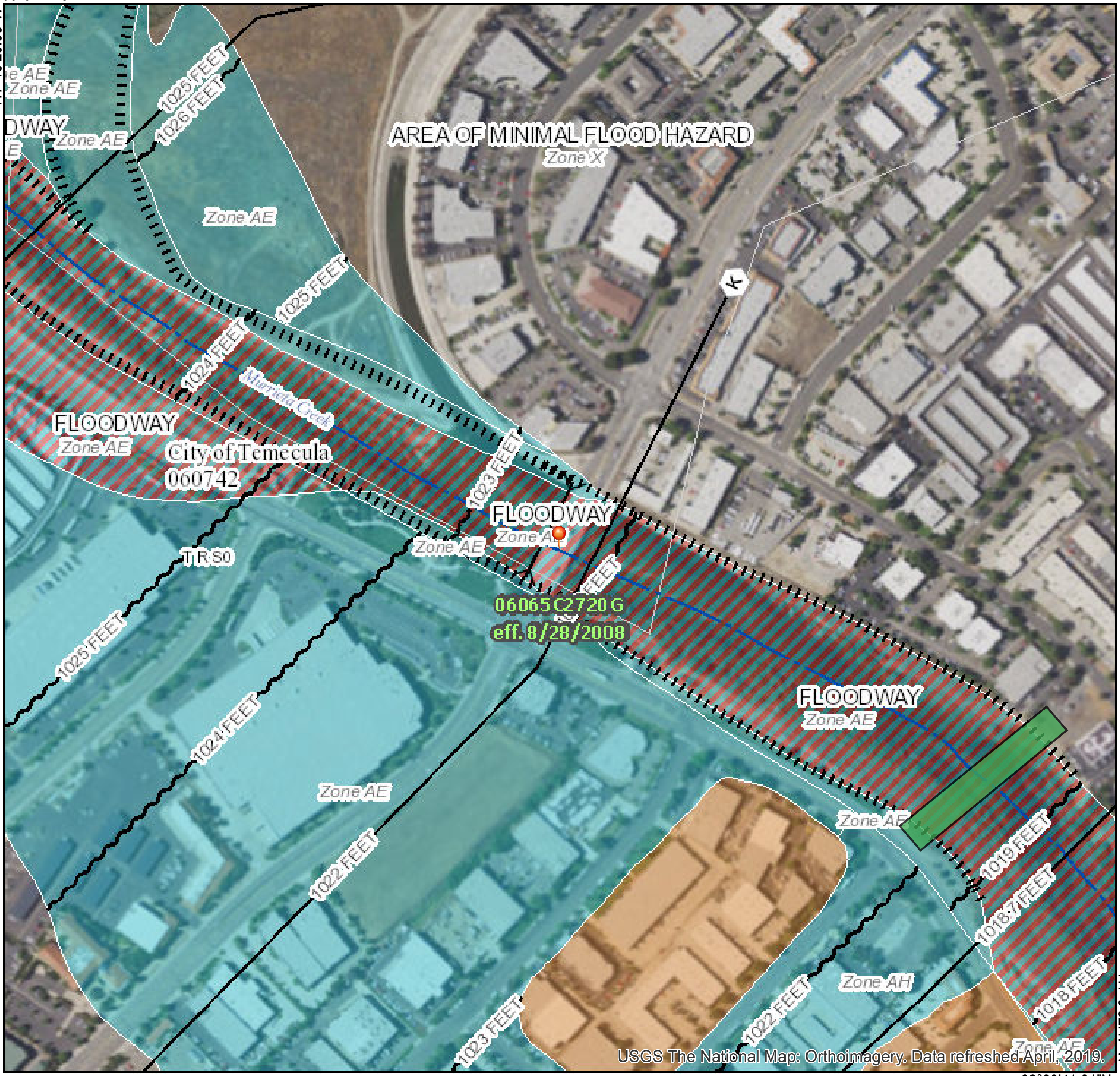
National Flood Hazard Layer FIRMette

FEMA

33°31'11.61"N

117°10'29.93"W



117°9'52.47"W

33°30'41.61"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

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- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 — Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Proposed Bridge Location - FPN: BR-NBIL(543)

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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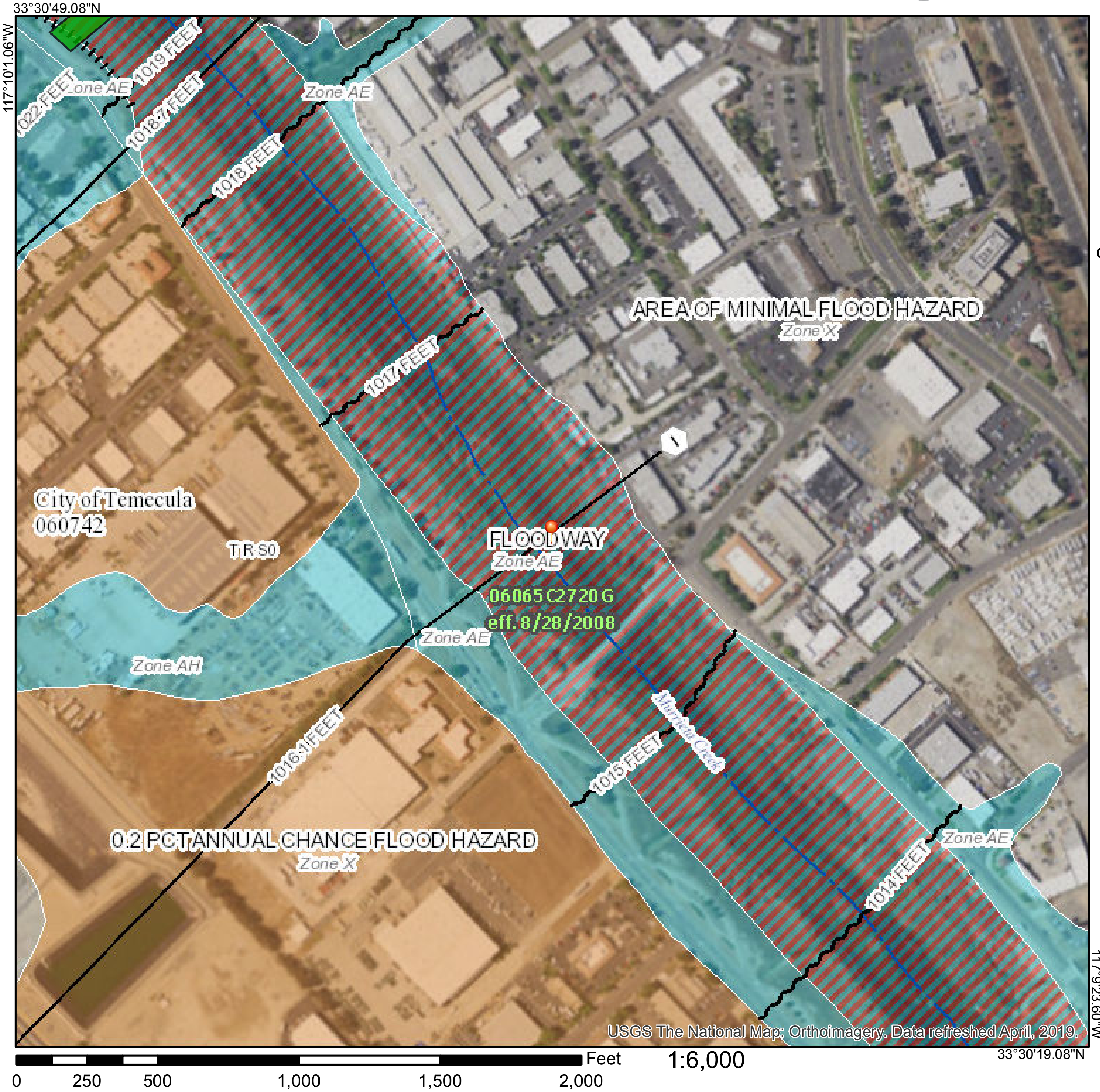
National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
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	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
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	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	Proposed Bridge Location - FPN:NBIL(543)
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

N

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Appendix G

Noise Study Report (Rincon Inc., Dec 2020)

Noise Study Report

Murrieta Creek Bridge at Overland Drive (Avenida Alvarado over Murrieta Creek)

City of Temecula, California

District 8, County of Riverside

Federal Aid Project No. BR-NBIL (543); City Project No. PW16-05

December 2020

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Noise Study Report

Murrieta Creek Bridge at Overland Drive
(Avenida Alvarado over Murrieta Creek)

City of Temecula, California

District 8, County of Riverside

Federal Aid Project No. BR-NBIL (543); City Project No. PW16-05

December 2020

Prepared By: ______________________ Date: December 2, 2020
William Maddux, Senior Environmental Specialist

Phone Number (760) 518-9444
Company Rincon Consultants, Inc.

Approved By: ______________________ Date: December 9, 2020
Nino Abad, Associate Civil Engineer

Phone Number (951) 308-6385
City of Temecula

Concurred By: ______________________ Date: ______________
Sean Yeung, PE,
Senior Environmental Engineer
Caltrans, District 8, Local Assistance

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Summary

The purpose of this Noise Study Report (NSR) is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise." 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards.

The City of Temecula, in cooperation with the California Department of Transportation (Caltrans) District 8 proposes the construction of a bridge over and across Murrieta Creek to connect Avenida Alvarado at the intersection of Diaz Road with Overland Drive at the intersection of Enterprise Circle West in the City of Temecula.

The proposed improvements will accomplish the following in the project area:

1. Provide safe all-weather access across Murrieta Creek
2. Provide reliable route for emergency vehicles, motorists, pedestrians, and bicyclists
3. Provide an additional access point to the City's industrial park

The project is located in the northwest area in the City of Temecula, within and adjacent to Murrieta Creek. The project would extend from the terminus of Overland Drive near the Enterprise Circle West intersection, over Murrieta Creek, along Diaz Road, approximately 600 feet on either side of Avenida Alvarado, and about 500 feet along Avenida Alvarado. The project area is primarily commercial and industrial land uses; however, the Calvary Church, a place of worship, is located approximately 215 feet to the north of proposed improvements. The terrain in the project area is relatively flat and does not have large topographic features that would shield land uses adjacent to the project alignment.

Based on field surveys, the existing hourly equivalent noise levels (L_{eq}) east of Murrieta Creek ranged from 60 to 62 A-weighted decibels (dBA). West of Murrieta Creek, along Diaz Road, existing noise levels ranged from 72 to 73 dBA L_{eq}.

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project alignment. The following land uses were identified in the project area:

- Places of worship: Activity Categories C and D
- Commercial and light industrial land uses: Activity Category F

Land uses in the project area were grouped into four lettered analysis areas, i.e. Areas A through D. Each of these analysis areas is considered to be acoustically equivalent.

The traffic noise modeling results indicate that traffic noise levels at the church in Area A are predicted to be in the range of 61 to 63 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is predicted to be up to 7 dB. Because the predicted noise levels in the design-year would not approach or exceed the noise abatement criterion at the Calvary Church (Categories C and D) or result in a substantial increase in noise, no traffic noise impacts are predicted in Area A.

The traffic noise modeling results indicate traffic noise levels n Area B are predicted to be in the range of 57 to 65 dBA L_{eq} in the design-year, and that the increase in noise will be up to 7 dB in the design-year. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in Area B.

The traffic noise modeling results indicate traffic noise levels at commercial uses in Area C will be 48 to 70 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is 2 dB. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in this area.

The traffic noise modeling results indicate traffic noise levels at commercial uses in Area D will be 60 to 72 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is 0 dB. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in this area.

Because the church has an interior noise abatement criterion in addition to the exterior criterion, interior noise must be considered at the church as well. From Table 6 in the FHWA Highway Traffic Noise Analysis and Abatement Guidance document, the building noise reduction factor for standard construction with ordinary windows closed is 20 dB. The interior noise level in the church in the design-year is therefore predicted to be 41 dBA L_{eq}(h). Because this predicted design-year noise level does not exceed the interior NAC of 52 dBA Leq(h), no interior traffic noise impacts are predicted at the church.

No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans Standard Specifications Section 14.8-02. Construction noise would be short-term and intermittent.

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List of Abbreviated Terms

CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibels
dBA	A-Weighted Decibel
FHWA	Federal Highway Administration
Hz	Hertz
kHz	Kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
$L_{eq(h)}$	Equivalent Sound Level over one hour
L_{max}	Maximum Sound Level
LOS	Level of Service
L_{xx}	Percentile-Exceeded Sound Level
mPa	micro-Pascals
mph	miles per hour
NAC	noise abatement criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSR	Noise Study Report
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SPL	sound pressure level
TeNS	Caltrans' Technical Noise Supplement
TNM 2.5	FHWA Traffic Noise Model Version 2.5

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Chapter 1. Introduction

1.1. Purpose of the Noise Study Report

The purpose of this NSR is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise." 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and Federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards. Compliance with 23 CFR 772 provides compliance with the noise impact assessment requirements of the National Environmental Policy Act (NEPA).

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) (Caltrans 2011) provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol outlines the requirements for preparing noise study reports (NSR). Noise impacts associated with this project under the California Environmental Quality Act (CEQA) are evaluated separately in the Mitigated Negative Declaration.

1.2. Project Purpose and Need

The purpose of the project is to construct a bridge over and across Murrieta Creek to connect Avenida Alvarado at the intersection of Diaz Road with Overland Drive at the intersection of Enterprise Circle West in the City of Temecula.

The proposed improvements will accomplish the following in the project area:

1. Provide safe all-weather access across Murrieta Creek
2. Provide reliable route for emergency vehicles, motorists, pedestrians, and bicyclists
3. Provide an additional access point to the City's industrial park

A low-water crossing of Murrieta Creek currently exists at Via Montezuma, approximately 0.5 miles south of Overland Drive. The low-water crossing is frequently closed in wet seasons and is not a reliable route to cross the Creek during storm and flooding events. The crossing is scheduled to be removed in the future by a separate channel improvements project. Therefore, there is a need for an additional all-weather creek crossing location for employees and residents to access the industrial and open space areas to the west of Murrieta Creek.

Chapter 2. Project Description

2.1. Existing Conditions

The project is located in the northwest area in the City of Temecula, within and adjacent to Murrieta Creek. The project would extend from the terminus of Overland Drive near the Enterprise Circle West intersection, over Murrieta Creek, along Diaz Road, approximately 600 feet on either side of Avenida Alvarado, and about 500 feet along Avenida Alvarado. See Figure 1 for the project location on a regional map and Figure 2 for a Vicinity Map.

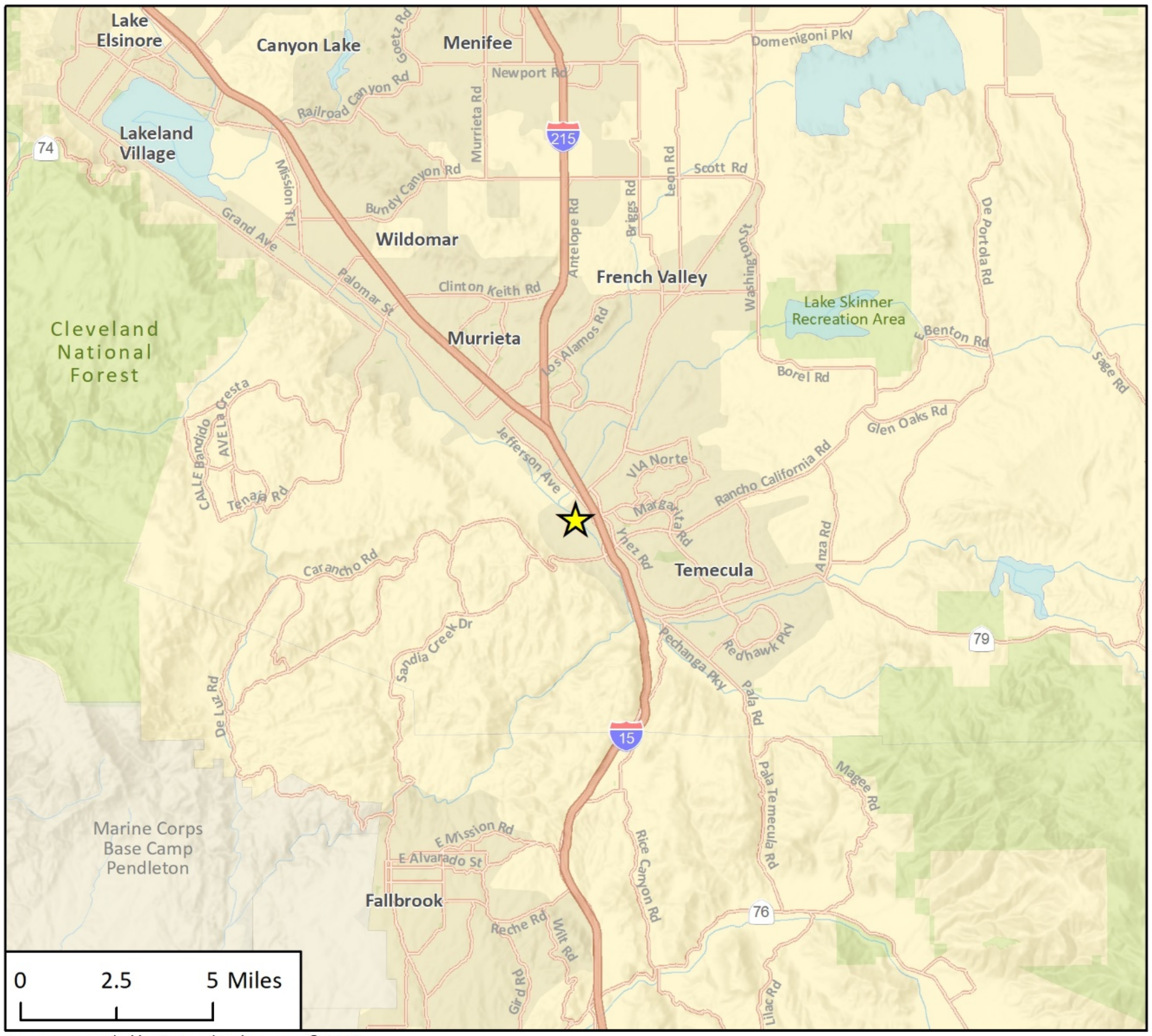
Roadways at the location of the proposed bridge consist of the intersection of Diaz Road and Avenida Alvarado on the west side of the Creek. Diaz Road parallels the Creek and has a width of 76 feet and consists of two northbound and two southbound through lanes, and Avenida Alvarado has a width of 64 feet with one eastbound and one westbound travel lane. To the east of the Creek, Overland Drive terminates at Commerce Center Drive. Overland Drive was recently extended to Enterprise Circle West under a separate Overland Drive Extension Project (City Project PW 16-06). The project involved the demolition of two buildings, roadway improvements including construction of curbs and gutters, sidewalks, storm drains, utility facilities, traffic signage, and intersection improvements at Overland Drive/Commerce Center Drive and Overland Drive/Enterprise Circle West. Enterprise Circle West is 44 feet in width with one northbound and one southbound lane and Overland Drive between Enterprise Circle West and Commerce Center Drive is 68 feet in width with two westbound and two eastbound lanes.

An existing pedestrian and bike trail parallels the west side of the Creek to the east of Diaz Road. Nearby Creek crossings include the Winchester Road Bridge, approximately 0.3 mile north, and the Via Montezuma low-water crossing, approximately 0.5 mile south.

2.1.1. Proposed Improvements

The project proposes to construct a bridge over the Murrieta Creek to connect Avenida Alvarado with Overland Drive in the City of Temecula, Riverside County. The Murrieta Creek Bridge at Overland Drive is anticipated to be a concrete girder structure spanning approximately 348 linear feet over Murrieta Creek. The bridge would accommodate four

Figure 1 Regional Location Map



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Project Location - Federal Project No. BR-NBIL(543)

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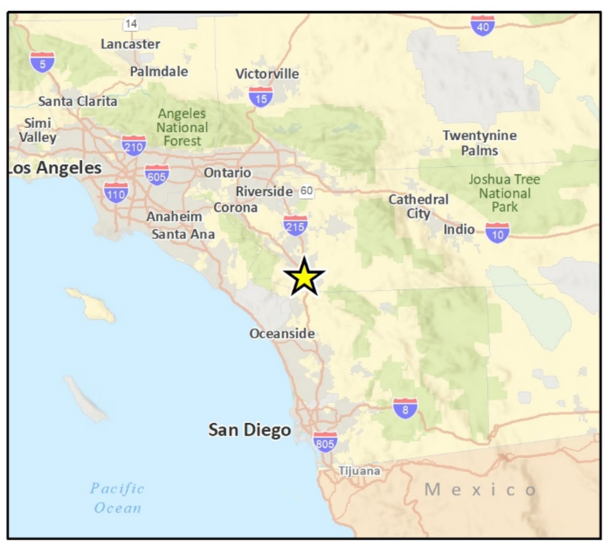
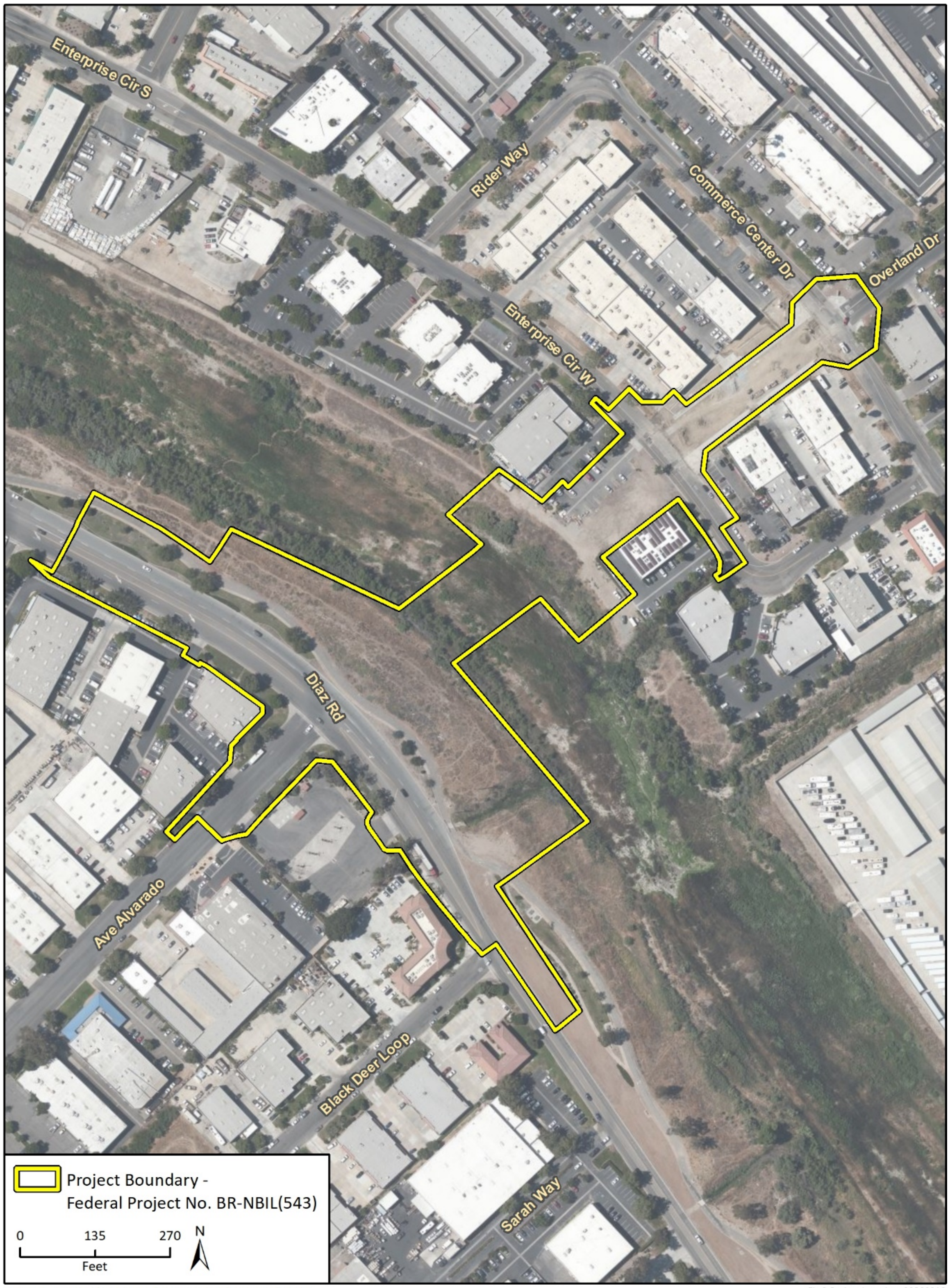


Figure 2 Project Vicinity Map



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through travel lanes (two lanes in each direction), left-turn lane(s), and two 6-foot-wide shoulders would serve as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing. The proposed project alignment is shown in Figure 3.

Upon completion of the Murrieta Creek Bridge project, the proposed street configuration would be consistent with the four-lane roadway segment on Overland Drive to the east. In addition to the construction of the bridge, various roadway and utility improvements would occur at the western and eastern bridge approaches. In order to match the roadway section on Avenida Alvarado on the west side of the bridge, the project would transition the lane configuration in the eastern portion of Avenida Alvarado to be consistent with the four-lane configuration of the bridge. Intersection improvements to Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado would include the installation of traffic signals and associated signing, striping, street lights, and utilities. Traffic signals and street lights would be installed at the Overland Drive/ Commerce Center Drive intersection as well. Reconstruction and roadway improvements along Diaz Road and Avenida Alvarado would include undergrounding electrical utilities, construction of curbs, gutters, and sidewalks, relocating sewer and water facilities, and adding traffic signage and striping.

As a part of the bridge construction, one abutment would be constructed on each end of the bridge, along with two piers within the Murrieta Creek. Earth embankments with concrete slope protection and cutoff walls buried underground for scour protection would also be installed on the east and west side of the Creek. The foundation of the bridge piers involving large-diameter cast-in-drilled-hole concrete piles will be installed below the channel bottom, which is deep enough for protection from scour. The channel bottom will remain earthen without any concrete or rip rap lining. The bridge girder would provide cell openings to accommodate future utilities and electrical conduits for street lights and traffic signal communication.

Figure 3   Project Alignment

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The project will also include the following additional improvements:

- **Railing Architectural treatment.** The bridge design will incorporate concrete barriers, metal hand and bicycle railings, and standard architectural treatments such as formliner textures to control graffiti.
- **Landscaping.** Landscaping modifications or improvements in the right-of-way along the bridge approach, Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado intersections, and along Diaz Road and Overland Drive.

2.1.2. Right-of-Way Requirements

The right of way on the east side of the Creek has been acquired by the City as part of the completed Overland Drive Extension Project (City Project PW 16-06); however, due to raise of Diaz Road and Avenida Alvarado street grade, portions of four driveways in private properties at the westerly approach will be reconstructed. Temporary construction easements (TCE's) will be acquired at these locations. There will be a street easement for the bridge and its approaches in the Creek, which is to be acquired from Riverside County Flood Control and Water Conservation District (RCFC&WCD). The TCE for grading in the channel is to be acquired through an encroachment permit from RCFC&WCD. Permanent and temporary construction easements in four private properties at the easterly side of the Creek may be required to construct storm drains, retaining wall, and the bridge approach embankment.

2.1.3. Construction Traffic Controls

Diaz Road, Avenida Alvarado, and Overland Drive will include temporary striping to divert traffic away from work areas. The temporary striping will allow for staged construction of roadway and intersection improvements to maintaining vehicle and pedestrian and bicyclist access at all times. Temporary and short term access impact may occur during construction, and will require coordination with property owners, the public, and other stakeholders.

2.2. No-Build

Under the No-Build Alternative, no bridge would be constructed in the project area.

Chapter 3. Fundamentals of Traffic Noise

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, please refer to Caltrans' Technical Noise Supplement (TeNS) (Caltrans 2013), a technical supplement to the Protocol that is available on Caltrans Web site (https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf).

3.1. Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receptor, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receptor determine the sound level and characteristics of the noise perceived by the receptor. The field of acoustics deals primarily with the propagation and control of sound.

3.2. Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

3.3. Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this huge range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is about 0 dB, which corresponds to 20 mPa.

3.4. Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB—rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dB louder than one source.

3.5. A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an “A-weighted” sound level (expressed in units of dBA) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels or dBA. Table 1 describes typical A-weighted noise levels for various noise sources.

Table 1 Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 2013.

3.6. Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3-dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency (“pure-tone”) signals in the midfrequency (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound, would generally be perceived as barely detectable.

3.7. Noise Descriptors

Noise in our daily environment fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis.

- **Equivalent Sound Level (Leq):** Leq represents an average of the sound energy occurring over a specified period. In effect, Leq is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level (Leq[h]) is the energy average of A-weighted sound levels occurring during a one-hour period, and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.
- **Percentile-Exceeded Sound Level (L_{xx}):** L_{xx} represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10% of the time, and L_{90} is the sound level exceeded 90% of the time).
- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured during a specified period.
- **Day-Night Level (L_{dn}):** L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m.
- **Community Noise Equivalent Level (CNEL):** Similar to L_{dn}, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during the

nighttime hours between 10 p.m. and 7 a.m., and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

3.8. Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the following factors.

3.8.1. Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 decibels for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 decibels for each doubling of distance from a line source.

3.8.2. Ground Absorption

The propagation path of noise from a highway to a receptor is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receptor, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receptor, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 decibels per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 decibels per doubling of distance.

3.8.3. Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels.

Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

3.8.4. Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receptor specifically to reduce noise. A barrier that breaks the line of sight between a source and a receptor will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and receptor is rarely effective in reducing noise because it does not create a solid barrier.

Chapter 4. Federal Regulations and State Policies

This report focuses on the requirements of 23 CFR 772, as discussed below.

4.1. Federal Regulations

4.1.1. 23 CFR 772

23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and Federal-aid highway projects. Under 23 CFR 772.7, projects are categorized as Type I, Type II, or Type III projects.

- FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment of the highway. The following projects are also considered to be Type I projects:
- The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a high-occupancy vehicle (HOV) lane, high-occupancy toll (HOT) lane, bus lane, or truck climbing lane,
- The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane,
- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange,
- Restriping existing pavement for the purpose of adding a through traffic lane or an auxiliary lane,
- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza.

If a project is determined to be a Type I project under this definition, the entire project area as defined in the environmental document is a Type I project.

A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Under 23 CFR 772.11, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor “consider” noise abatement before adoption of the final NEPA document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the predicted noise level in the design-year approaches or exceeds the NAC specified in 23 CFR 772, or a predicted noise level substantially exceeds the existing noise level (a “substantial” noise increase). 23 CFR 772 does not specifically define the terms “substantial increase” or “approach”; these criteria are defined in the Protocol, as described below.

Table 2 summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual or permitted land use in a given area.

4.1.2. Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or Federal-aid highway projects. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA or more. The Protocol also states that a sound level is considered to approach an NAC level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The Technical Noise Supplement to the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

Table 2 Activity Categories and Noise Abatement Criteria (23 CFR 772)

Activity Category	Activity $L_{eq}[h]$[1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F			Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G			Undeveloped lands that are not permitted.

[1] The L_{eq}(h) activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).
[2] Includes undeveloped lands permitted for this activity category.

4.2. State Regulations and Policies

4.2.1. California Environmental Quality Act (CEQA)

Noise analysis under the California Environmental Quality Act (CEQA) may be required regardless of whether or not the project is a Type I project. The CEQA noise analysis is completely independent of the 23 CFR 772 analysis done for NEPA. Under CEQA, the baseline noise level is compared to the build noise level. The assessment entails looking at the setting of the noise impact and then how large or perceptible any noise increase would be in the given area. Key considerations include: the uniqueness of the setting, the sensitive nature of the noise receptors, the magnitude of the noise increase, the number of residences affected, and the absolute noise level

The significance of noise impacts under CEQA are addressed in the environmental document rather than the NSR. Even though the NSR (or noise technical memorandum) does not specifically evaluate the significance of noise impacts under CEQA, it must contain the technical information that is needed to make that determination in the environmental document.

4.2.2. Section 216 of the California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA-L_{eq}(h) in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. This requirement does not replace the “approach or exceed” NAC criterion for FHWA Activity Category E for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23 CFR 772.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA-L_{eq}(h). If the noise levels generated from freeway and roadway sources exceed 52 dBA-L_{eq}(h) prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

Chapter 5. Study Methods and Procedures

5.1. Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receiver Locations

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Existing land uses in the project area were categorized by land use type and Activity Category as defined in Table 2, and the extent of frequent human use. As stated in the Protocol, noise abatement is only considered where frequent human use occurs and where a lowered noise level would be of benefit. Although all land uses are evaluated in this analysis, the focus is on locations of frequent human use that would benefit from a lowered noise level. However, based on the surrounding land uses, there are no locations with defined outdoor activity areas.

The geometry of the project relative to nearby existing and planned land uses was also identified. In general, nearby existing and planned land uses are slightly below the grade of the proposed bridge alignment.

Noise level measurements were taken at each major developed area within the project vicinity to determine the ambient noise levels in the project area. Short-term measurement locations were selected to identify ambient noise levels at locations primarily affected by the project and verify site conditions.

The representative areas share similar acoustical characteristics. Primary characteristics include the geometric relationship with the roadway (i.e. distance to the roadway and orientation of the roadway) and topographic profile between these locations and roadways.

5.2. Field Measurement Procedures

A field noise study was conducted in accordance with recommended procedures in TeNS. The following is a summary of the procedures used to collect short-term sound level data.

5.2.1. Short-term Measurements

Short-term monitoring was conducted at four locations on Wednesday, June 17, 2020, using an Extech 407780A Type 2 sound level meter (serial number 160507863). The calibration of the meter was checked before and after the measurement using an Extech 407744 professional acoustic calibrator (serial number H373147). Measurements were taken over a 20-minute period at each site. Short-term monitoring was conducted along the alignment. The short-term measurement locations are identified in Figure 4. A summary of noise measurements are provided in Table 3.

Table 3 Summary of Short-Term Noise Level Measurements

Measurement Location	Measurement Location	Sample Times	Approximate Distance to Primary Noise Source	Leq (dBA)[1]	Lmin (dBA)	Lmax (dBA)
1	27525 Enterprise Circle West	10:00 – 10:20 a.m.	50 feet from Enterprise Circle West	58.2	54.4	76.3
2	27462 Enterprise Circle West	10:30 – 10:50 a.m.	50 feet from Enterprise Circle West	60.1	57.6	81.2
3	27495 Diaz Road	12:30 – 12:50 p.m.	50 feet from Diaz Road	70.1	56.9	83.4
4	41976 Avenida Alvarado	1:00 – 1:20 p.m.	60 feet from Diaz Road	69.8	57.1	85.6

See Figure 4 for Noise Measurement Locations.

[1] The equivalent noise level (Leq) is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level).

During the short-term measurements, field staff attended each meter. Minute-to-minute L_{eq} values collected during the measurement period (typically 20 minutes in duration) were logged automatically, and dominant noise sources observed during each measurement period were also identified and logged. Using this approach, those minutes when traffic noise was observed to be a dominant contributor to noise levels at a given measurement location could be distinguished from one-minute noise levels where other nontraffic noise sources (such as parking lot activities and industrial equipment) contributed substantially to existing noise levels.

Temperature, wind speed, and humidity were recorded manually during the short-term monitoring session using a Kestrel 3000 Pocket Weather Meter. During the short-term measurements, average wind speeds ranged from 0.7 to 3.1 miles per hour (mph).

Figure 4 Noise Measurement Locations

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Temperatures ranged from 30–41 degrees Celsius (86–105 degrees Fahrenheit), with relative humidity from 15–29 percent.

During short-term noise measurements, traffic on the adjacent roadway segments were classified and counted. Vehicles were classified as automobiles, medium-duty trucks, heavy-duty trucks, motorcycles, or buses. An automobile was defined as a vehicle with two axles and four tires that is designed primarily to carry passengers. Small passenger vans and pick-up trucks were included in the automobile category. Medium-duty trucks included all cargo vehicles with two axles and six tires. Heavy-duty trucks included all vehicles with three or more axles. The posted speed limit on Overland Drive and Avenida Alvarado is 35 miles per hour (MPH); 50 MPH on Diaz Road, and 25 MPH on Enterprise Circle West.

5.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model (TNM) Version 2.5 (TNM 2.5). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 2004a, 2004b). Key inputs to TNM 2.5 were the locations of roadways, traffic mix and speed, shielding features (e.g., topography and buildings), noise barriers, ground type, and receptors. Three-dimensional representations of these inputs were developed using computer-aided design drawings, aerials, and topographic contours provided by Project Design Consultants.

5.3.1. Physical Parameters

Existing topographic contours were based on the topographic survey for the proposed project. Topographic data for receiver locations was estimated based on available terrain data from project plans: Murrieta Creek Bridge and Overland Drive Extension Project No. PW 16-05, March 26, 2010. The project alignment and profile were based on the project plans.

5.3.2. Vehicle Traffic Parameters

Traffic noise was evaluated under existing conditions, and design-year conditions with the project. Traffic noise was evaluated under existing and design-year conditions with the project. Traffic parameters include vehicle speeds, peak hour traffic volumes, and vehicle classification mix. Loudest-hour traffic volumes on local roadways were modeled as 10 percent of the total average daily trips. Modeled hourly traffic volumes and speeds are summarized in Table 4.

Table 4 Summary of Modeled Vehicle Speeds and Volumes

Road	Segment	Speed	Existing	2045 No Project	2045 With Project
Avenida Alvarado	West of Diaz Rd.	35	2,001	2,521	2,521
Overland Drive	Jefferson Ave. to Commerce Center Dr.	35	2,977	3,751	9,636
	Commerce Center Dr. to Enterprise Circle W.	35	6,959	8,768	14,653
	Enterprise Circle W. to Diaz Rd.	35	DNE	DNE	7,600
Diaz Road	Winchester Rd. to Overland Dr.	50	14,335	18,062	21,221
	Overland Dr. to Via Montezuma	50	12,665	15,945	15,945
Enterprise Circle West	Rider Way to Overland Dr.	25	4,066	5,165	5,275
	Overland Dr. to Commerce Center Dr.	25	1,154	1,516	1,538

DNE = Does not exist

Source: SCE 2019.

The vehicle classification mix for local roadways was based on Caltrans' Traffic Census Program truck traffic data for Interstate 15 (I-15), which is located approximately 2,000 feet east of the proposed project alignment. These truck volume counts indicate a traffic mix of 93.09 percent automobiles and 6.91 percent trucks (Caltrans 2018). Trucks with two or three axles were modeled as medium trucks and trucks with four or more axles were modeled as heavy trucks, thus, the 6.91 percent trucks was further broken down to a mix of 2.58 percent medium-duty trucks and 4.33 percent heavy-duty trucks (Caltrans 2018).

5.4. Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts are considered to occur at receptor locations where predicted noise levels would be 12 dB or greater than existing ambient noise levels, or where predicted noise levels approach or exceed the NAC for the applicable activity category.

Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Protocol.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at impacted receptor locations is predicted with implementation of the abatement measures. In addition, barriers should be designed to intercept the line-of-sight from the exhaust stack of a truck to the first tier of receptors, as required by the Highway Design Manual, Chapter 1100. Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations.

The overall reasonableness of noise abatement is determined by the following three factors:

- The noise reduction design goal.
- The cost of noise abatement.
- The viewpoints of benefited receptors (including property owners and residents of the benefited receptors).

The Caltrans' acoustical design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one benefited receptor. This design goal applies to any receptor and is not limited to impacted receptors.

The Protocol defines the procedure for assessing reasonableness of noise barriers from a cost perspective. Based on 2019 construction costs, an allowance of $107,000 is provided for each benefited receptor (i.e., receptors that receive at least 5 dB of noise reduction from a noise barrier). The total allowance for each barrier is calculated by multiplying the number of benefited receptors by $107,000. If the estimated construction cost of a barrier is less than the total calculated allowance for the barrier, the barrier is considered reasonable from a cost perspective. The viewpoints of benefits receptors are determined by a survey that is typically conducted after completion of the NSR. The process for conducting the survey is described in detail in the Protocol.

This NSR assesses potential traffic noise impacts. If necessary, the feasibility and reasonableness of noise abatement will be reported in the Noise Abatement Decision Report.

Chapter 6. Existing Noise Environment

6.1. Existing and Permitted Land Uses

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project alignment. The following land uses were identified in the project area:

- Places of worship: Activity Categories C and D
- Commercial and light industrial land uses: Activity Category F

Although all developed land uses are evaluated in this analysis, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas.

Figure 5 shows the project overview map delineating Areas A-D and the location of the Calvary Chapel of Temecula Valley (Chapel). Land uses in the project area have been grouped into a series of lettered analysis areas that are identified in Figure 6 though Figure 9. Each of these analysis areas is considered to be acoustically equivalent.

Area A: Area A is located on the northwest side of Overland Drive, east of Murrieta Creek, and north of the proposed project alignment. The Chapel (Activity Categories C and D), is located approximately 215 feet from the proposed bridge. This area is generally flat. There are no manmade or topographical features that shield the use from the local roadways in this area. In addition, based on the site evaluation there were no identifiable exterior areas of frequent human use. All other land uses in Area A are service commercial businesses or light industrial land uses (Activity Category F) and does not have areas of frequent human use.

Area B: Area B is located on the southeast side of Overland Drive, east of Murrieta Creek, and east of the proposed bridge. The area includes service commercial businesses or light industrial land uses (Activity Category F) and does not have areas of frequent human use.

Figure 5 Project Overview Map

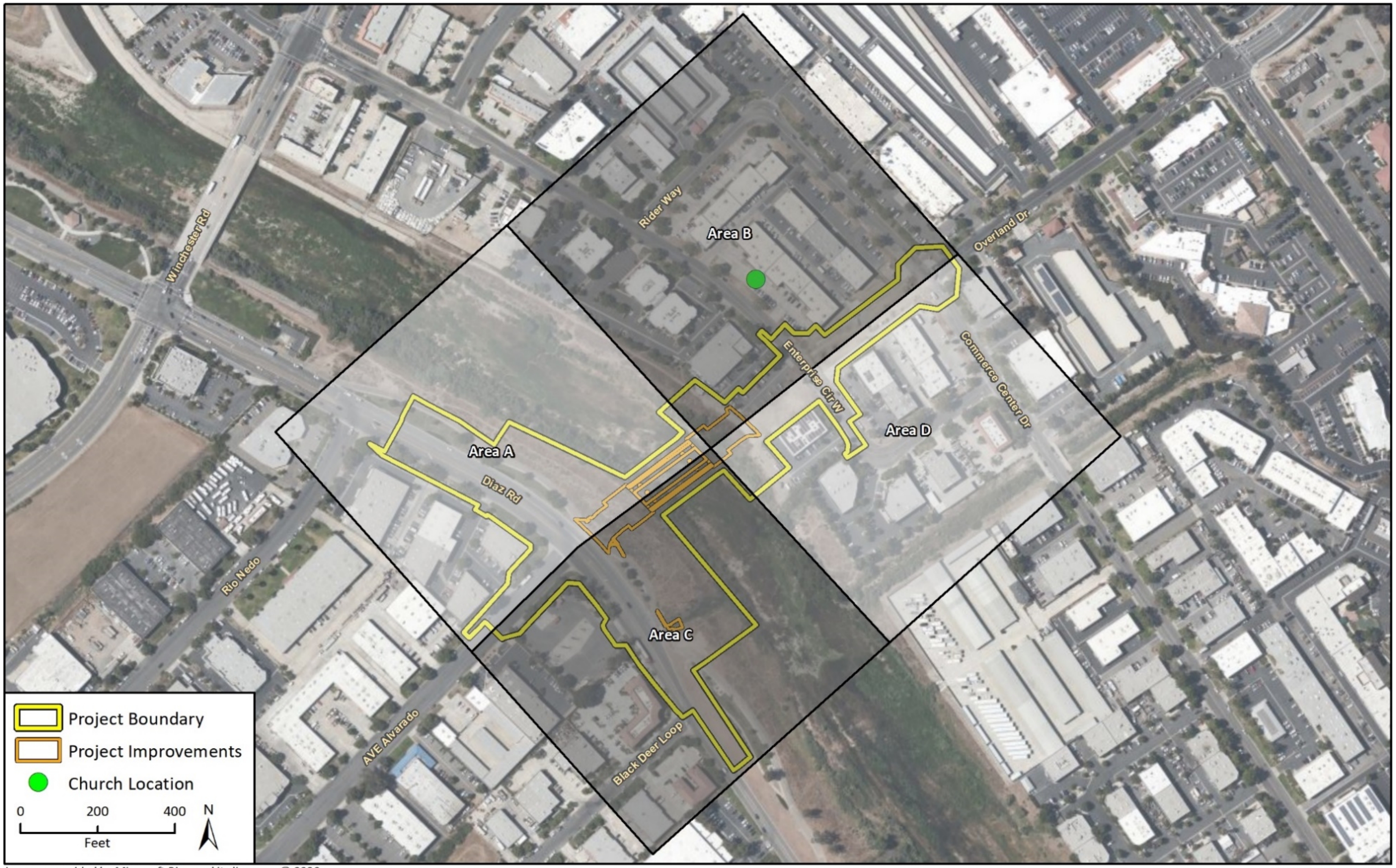

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Fig 5 Project Overview Map

Figure 6 Impact Area A Receivers

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Figure 7 Impact Area B Receivers

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Figure 8 Impact Area C Receivers

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Fig 7 Noise Receiver Locations - Area C

Figure 9 Impact Area D Receivers

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Fig 8 Noise Receiver Locations - Area D

Area C: Area C is located on the northwest side of Avenida Alvarado, west of Murrieta Creek, and west of the proposed bridge. The area includes agricultural lands (Activity Category F). The area includes light industrial land uses (Activity Category F) and does not have areas of frequent human use.

Area D: Area D is located on the southeast side of Avenida Alvarado, west of Murrieta Creek, and south of the proposed bridge. The area includes light industrial land uses (Activity Category F) and does not have areas of frequent human use.

6.2. Ambient Noise Environment

The project site is surrounded by existing service commercial and light industrial development with a place of worship. Noise sources associated with adjacent land uses include heating, ventilation, and air conditioning units, landscape maintenance machinery, pumps, and heavy equipment. Additional traffic noise is associated with existing roads such as I-15 and Winchester Road.

6.3. Ambient Noise Measurements

The existing noise environment in the project area is characterized below based on short-term noise monitoring that was conducted.

6.3.1. Short-term Monitoring

As discussed in Section 5.2.2, short-term monitoring was conducted at four locations on Wednesday, June 17, 2020. Table 3 summarizes the results of the short-term noise monitoring conducted in the project area. Table 5 summarizes traffic counts taken during short-term noise measurements, which were used to validate the noise model at existing land uses.

Table 5 Traffic Counts during Noise Measurements

Measurement	Roadway	Automobiles	Medium Trucks	Heavy Trucks
1	Enterprise Circle West	10	2	0
2	Enterprise Circle West	25	1	0
3	Diaz Road	115	4	2
4	Avenida Alvarado	15	2	1

6.4. Noise Model Validation/Calibration

Noise measurements near highways or other transportation corridors are routinely used to validate and, if necessary, calibrate the project-specific TNM model by comparing calculated noise levels with actual (measured) noise levels. Model validation is performed by modeling traffic volumes observed during each noise measurement and comparing the measured and modeled noise levels. Model calibration is performed when an environmental condition that cannot be accounted for in the model is identified (e.g., a wooden fence with gaps or thick vegetation). The TNM has only been validated at distances within 500 feet of the highway. Project-specific TNM model validation and calibration may only be performed based on actual (measured) noise levels within 500 feet of the highway. Additionally, model calibrations are generally only recommended if the site conditions (i.e. highway alignment and profile) are not expected to change significantly. As the project is a new bridge, model calibration/validation would not be appropriate and is not applied in this analysis.

Chapter 7. Future Noise Environment, Impacts, and Considered Abatement

Table 6 summarizes the traffic noise modeling results for existing conditions and design-year conditions with and without the project. Predicted design-year traffic noise levels with the project are compared to existing conditions and to design-year no-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts as defined under 23 CFR 772. The comparison to no-project conditions indicates the direct effect of the project.

Figures 5 through 8 show modeled receiver locations. As shown in Table 6, traffic noise levels at modeled receivers range from 46 to 71 dBA L_{eq} for existing conditions and range from 48 to 72 dBA L_{eq} for design-year conditions.

Table 6 shows estimated ambient noise levels for existing conditions and design-year conditions. As stated in the TeNS, modeling results are rounded to the nearest decibel before comparisons are made. In some cases, this can result in relative changes that may not appear intuitive. An example would be a comparison between calculated sound levels of 64.4 and 64.5 dBA. The difference between these two values is 0.1 dB. However, after rounding, the difference is reported as 1 dB.

7.1. Future Noise Environment and Impacts

Table 6 summarizes the traffic noise modeling results for existing conditions and design-year conditions with and without the project. Detailed traffic tables are provided in Appendix A. Predicted design-year traffic noise levels with the project are compared to existing conditions and to design-year no-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts as defined under 23 CFR 772. The comparison to no-project conditions indicates the direct effect of the project.

Table 6 Summary of Noise Modeling

						Loudest Hour Noise Level dB(A) L_{eq}					
Receiver Number	Area	Land Use	Activity Category (NAC)	Units	Address	Existing	Without Project	With Project	Increase Over Existing	Direct Project Increase	Potential Impact Type
1	A	SC	F	1	27479 Enterprise Circle W.	54	56	61	7	5	None
2		PoW	C	1	27452 Enterprise Circle W.	58	59	60	2	1	None
3		SC	F	1	27495 Commerce Center Dr.	58	59	63	5	4	None
4		SC	F	1	27496 Commerce Center Dr.	59	60	62	3	2	None
5	B	SC	F	1	27531 Commerce Center Dr.	56	57	63	7	6	None
6		SC	F	1	27515 Commerce Center Dr.	58	58	60	2	2	None
7		SC	F	1	27511 Commerce Center Dr.	61	62	65	4	3	None
8		SC	F	1	27516 Commerce Center Dr.	54	55	57	3	2	None
9	C	Ind	F	1	42030 Avenida Alvarado	46	47	48	2	1	None
10		Ind	F	1	41976 Avenida Alvarado	68	69	69	1	0	None
11		Ind	F	1	27461 Diaz Rd.	68	69	70	2	1	None
12	D	Ind	F	1	42011 Avenida Alvarado	59	60	60	1	0	None
13		Ind	F	1	43015 Black Deer Loop	71	72	72	1	0	None
14		Ind	F	1	43020 Black Deer Loop	71	72	72	1	0	None

NAC = noise abatement criteria; dB(A) = A-weighted decibels; Leq(1) = equivalent sound level at one hour; Ind = Industrial; SC = Service Commercial; PoW = Places of Worship

7.1.1. Area A

The traffic noise modeling results in Table 6 indicate that traffic noise levels at residences in Area A are predicted to be in the range of 60 to 63 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is predicted to be up to 7 dB. Because the predicted noise levels in the design-year are not predicted to approach or exceed the noise abatement criterion at the Calvary Church (Categories C and D) or result in a substantial increase in noise, no traffic noise impacts are predicted in Area A.

7.1.2. Area B

The traffic noise modeling results in Table 6 indicate traffic noise levels at residences in Area B are predicted to be in the range of 57 to 65 dBA L_{eq} in the design-year, and that the increase in noise will be up to 7 dB in the design-year. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in Area B.

7.1.3. Area C

The traffic noise modeling results in Table 6 indicate traffic noise levels at commercial uses in Area C will be 48 to 70 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is 2 dB. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in this area.

7.1.4. Area D

The traffic noise modeling results in Table 6 indicate traffic noise levels at commercial uses in Area C will be 60 to 72 dBA L_{eq} in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is 0 dB. Because there is no noise abatement criterion for Category F uses in this area and because the project would not result in a substantial increase in noise, no traffic noise impacts are predicted to occur in this area and noise abatement does not need to be considered in this area.

Because the church has an interior noise abatement criterion in addition to the exterior criterion, interior noise must be considered at the church as well. From Table 6 in the FHWA Highway Traffic Noise Analysis and Abatement Guidance document, the building noise reduction factor for standard construction with ordinary windows closed is 20 dB. The interior noise level in the church in the design-year is therefore predicted to be 40 dBA L_{eq}(h). Because this predicted design-year noise level does not exceed the interior NAC of 52 dBA Leq(h), no interior traffic noise impacts are predicted at the church.

7.2. Preliminary Noise Abatement Analysis

Noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. According to 23 CFR 772(13)(c) and 772(15)(c), federal funding may be used for the following abatement measures:

- Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way.
- Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
- Alteration of horizontal and vertical alignments.
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
- Noise insulation of certain Activity Categories C and D land use facilities. Post-installation maintenance and operational costs for noise insulation are not eligible for Federal-aid funding.

No traffic noise impacts are predicted for Areas A, B, C, or D. Accordingly, noise abatement is not considered further.

Chapter 8. Construction Noise

Construction noise would be associated with the use of heavy-duty construction equipment used for clearing and grading, trenching and installing underground utilities, spreading and compacting materials, and paving. In addition, drilled piles would be required in Murrieta Creek for the installation of piles.

Construction equipment with heavy-duty diesel engines typically generate maximum noise levels from 80 to 90 dB(A) at a distance of 50 feet (FHWA 2006). Table 7 summarizes typical construction equipment noise levels. Equipment goes through varying load cycles, and there are breaks for the operators and for non-equipment tasks, such as measurement. Thus, average hourly noise levels would be less than maximum noise levels. Typical noise levels from earthworks activities reach 82 dB(A) $L_{eq(1)}$ at 50 feet from the center of construction activity when assessing the loudest pieces of equipment working simultaneously.

Maximum noise levels would occur when the loudest construction equipment is nearest to a noise sensitive receiver. Due to the linear nature of roadway construction, noise levels would be intermittent and the intensity of construction activities in a given area varies substantially.

Based on previous experience, construction activities would progress at a rate of approximately 100 feet per day and would include an active work area of approximately 300 feet. Due to the length of the active work area, 300 feet, when the active work area is directly adjacent to a given receiver, construction activities throughout the day would be an average distance of 150 feet along an active portion of the alignment from the receiver. For example, the average distance from construction equipment to a receiver that is 50 feet from the centerline of alignment would be 158 feet.

Construction along the proposed alignment would be characterized by hard site attenuation rate of 6 dB(A) per doubling of distance. This analysis conservatively assumes no attenuation from barriers and topography. The nearest receivers are approximately 50 feet from the road (e.g., Overland Drive). Thus, when assessing the loudest pieces of equipment working simultaneously on the proposed alignment, noise levels would attenuate to roughly 72 dB(A) $L_{eq(1)}$ at the nearest receivers.

Table 7 Typical Construction Equipment Noise Levels

Equipment	Noise Level at 50 Feet dB(A) L_{max}	Typical Duty Cycle
Auger Drill Rig	85	20%
Backhoe	80	40%
Blasting	94	1%
Chain Saw	85	20%
Clam Shovel	93	20%
Compactor (ground)	80	20%
Compressor (air)	80	40%
Concrete Mixer Truck	85	40%
Concrete Pump	82	20%
Concrete Saw	90	20%
Crane (mobile or stationary)	85	20%
Dozer	85	40%
Dump Truck	84	40%
Excavator	85	40%
Front End Loader	80	40%
Generator (25 kilovolt amps or less)	70	50%
Generator (more than 25 kilovolt amps)	82	50%
Grader	85	40%
Hydra Break Ram	90	10%
Impact Pile Driver (diesel or drop)	95	20%
In situ Soil Sampling Rig	84	20%
Jackhammer	85	20%
Mounted Impact Hammer (hoe ram)	90	20%
Paver	85	50%
Pneumatic Tools	85	50%
Pumps	77	50%
Rock Drill	85	20%
Roller	74	40%
Scraper	85	40%
Tractor	84	40%
Vacuum Excavator (vac-truck)	85	40%
Vibratory Concrete Mixer	80	20%
Vibratory Pile Driver	95	20%

dB(A) = A-weighted decibels; L_{max} = maximum sound level

Source: Federal Highway Administration 2006

Although construction equipment may temporarily be located at the point on the alignment nearest to a receiver, over time equipment would move along the alignment. Therefore, the distance from a receiver to the centerline of the alignment is not the same as the average distance during a given day from the receiver to construction equipment. Thus, average noise levels correlate to the area of active construction.

Caltrans Standard Specifications Section 14-8.02 includes noise control requirements that restrict construction noise (Caltrans 2018):

- Construction noise levels shall not exceed 86 dB(A) L_{max} at 50 feet from the job site activities between the hours of 9:00 p.m. to 6:00 a.m.

No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans Standard Specifications Section 14.8-02. Construction noise would be short-term and intermittent.

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Chapter 9. References

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Appendix A

Traffic Data

Table A-1 Traffic Data for Existing Conditions

Road	Segment	Lanes	Total Daily Volume	Peak Hour Traffic Volume	Auto		Medium Trucks		Heavy Trucks		Speed
					%	Volume	%	Volume	%	Volume	
Avenida Alvarado	West of Diaz Rd.	2,001	180	93.09	168	2.58	5	4.33	8	35	2,001
Overland Drive	Jefferson Ave. to Commerce Center Dr.	2,977	268	93.09	249	2.58	7	4.33	12	35	2,977
	Commerce Center Dr. to Enterprise Circle W.	6,959	626	93.09	583	2.58	16	4.33	27	35	6,959
	Enterprise Circle W. to Diaz Rd.	DNE	DNE	DNE	DNE	DNE	DNE	DNE	DNE	DNE	DNE
Diaz Road	Winchester Rd. to Overland Dr.	14,335	1,290	93.09	1,201	2.58	33	4.33	56	50	14,335
	Overland Dr. to Via Montezuma	12,665	1,140	93.09	1,061	2.58	29	4.33	49	50	12,665
Enterprise Circle West	Rider Way to Overland Dr.	4,066	365.94	93.09	341	2.58	9	4.33	16	25	4,066
	Overland Dr. to Commerce Center Dr.	1,154	104	93.09	97	2.58	3	4.33	4	25	1,154

Table A-2 Traffic Data for Design Year No-Project Conditions

Road	Segment	Lanes	Total Daily Volume	Peak Hour Traffic Volume	Auto		Medium Trucks		Heavy Trucks		Speed
					%	Volume	%	Volume	%	Volume	
Avenida Alvarado	West of Diaz Rd.	2	2,521	227	93.09	211	2.58	6	4.33	10	35
Overland Drive	Jefferson Ave. to Commerce Center Dr.	2	3,751	338	93.09	314	2.58	9	4.33	15	35
	Commerce Center Dr. to Enterprise Circle W.	2	8,768	789	93.09	735	2.58	20	4.33	34	35
	Enterprise Circle W. to Diaz Rd.	DNE	DNE	DNE	DNE	DNE	DNE	DNE	DNE	DNE	DNE
Diaz Road	Winchester Rd. to Overland Dr.	4	18,062	1,626	93.09	1,513	2.58	42	4.33	70	50
	Overland Dr. to Via Montezuma	4	15,945	1,435	93.09	1,336	2.58	37	4.33	62	50
Enterprise Circle West	Rider Way to Overland Dr.	2	5,165	464.85	93.09	433	2.58	12	4.33	20	25
	Overland Dr. to Commerce Center Dr.	2	1,516	136	93.09	127	2.58	4	4.33	6	25

Table A-3 Traffic Data for Design Year with Project Conditions

Road	Segment	Lanes	Total Daily Volume	Peak Hour Traffic Volume	Auto		Medium Trucks		Heavy Trucks		Speed
					%	Volume	%	Volume	%	Volume	
Avenida Alvarado	West of Diaz Rd.	2	2,521	227	93.09	211	2.58	6	4.33	10	35
Overland Drive	Jefferson Ave. to Commerce Center Dr.	2	9,636	867	93.09	807	2.58	22	4.33	38	35
	Commerce Center Dr. to Enterprise Circle W.	2	14,653	1,319	93.09	1,228	2.58	34	4.33	57	35
	Enterprise Circle W. to Diaz Rd.	DNE	7,600	684	93.09	637	2.58	18	4.33	30	35
Diaz Road	Winchester Rd. to Overland Dr.	4	21,221	1,910	93.09	1,778	2.58	49	4.33	83	50
	Overland Dr. to Via Montezuma	4	15,945	1,435	93.09	1,336	2.58	37	4.33	62	50
Enterprise Circle West	Rider Way to Overland Dr.	2	5,275	474.75	93.09	442	2.58	12	4.33	21	25
	Overland Dr. to Commerce Center Dr.	2	1,538	138	93.09	129	2.58	4	4.33	6	25

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Appendix H

Hydrology and Hydraulics Report (Engineering Resources of Southern California, Inc., May 2020)

HYDROLOGY & HYDRAULICS REPORT

For the

Murrieta Creek Bridge at Overland Drive

(Avenida Alvarado over Murrieta Creek)
Federal Aid Project No. BR-NBIL(543)
City Project No. PW-16-05

Submitted to:
Caltrans District 8
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May 2020

Project File No. 19009001

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Project Description

The site is situated in the City of Temecula, and adjacent to Interstate Highway 15. The project includes construction of a bridge that runs over Murrieta Creek and continues Avenida Alvarado to intersect with the extension of Overland Drive. There is an existing bridge upstream of the site across Murrieta Creek along Winchester Road, and a low-water crossing downstream of the site along Via Montezuma. The current status of the Via Montezuma low-water crossing includes routine flooding that limits its usage. This prompts the establishment of a bridge along Avendia Alvarado that ties into an extension of Overland Drive to accommodate regular traffic over the creek, which includes bike and pedestrian crossings. A hydraulic analysis of the creek will be performed. The intent of the analysis is to determine any impacts of construction of the proposed bridge crossing along Avenida Alvarado. The analysis will include modeling the creek geometry from upstream of Winchester Road and beyond the existing low-water crossing along Via Montezuma. This totals to be an approximate 1.2 mile segment of Murrieta Creek under evaluation of design impacts from the proposed bridge crossing. Figure 1 below presents the project location map and the key features under evaluation for impacts as a result of this project.

Existing Conditions:

The project is located in the northwest area in the City of Temecula, within and adjacent to Murrieta Creek. The project would extend from the terminus of Overland Drive near the Enterprise Circle West intersection, over Murrieta Creek, along Diaz Road, approximately 600 feet on either side of Avenida Alvarado, and about 500 feet along Avenida Alvarado.

Roadways at the location of the proposed bridge consist of the intersection of Diaz Road and Avenida Alvarado on the west side of the Creek. Diaz Road parallels the Creek and has a width of 76 feet and consists of two northbound and two southbound through lanes, and Avenida Alvarado has a width of 64 feet with one eastbound and one westbound travel lane. To the east of the Creek, Overland Drive terminates at Commerce Center Drive. Overland Drive was recently extended to Enterprise Circle West under a separate Overland Drive Extension Project (City Project PW 16-06). The project involved the demolition of two buildings, roadway improvements including construction of curbs and gutters, sidewalks, storm drains, utility facilities, traffic signage, and intersection improvements at Overland Drive/Commerce Center Drive and Overland Drive/Enterprise Circle West. Enterprise Circle West is 44 feet in width with one northbound and one southbound lane and Overland Drive between Enterprise Circle West and Commerce Center Drive is 68 feet in width with two westbound and two eastbound lanes.

An existing pedestrian and bike trail parallels the west side of the Creek to the east of Diaz Road. Nearby Creek crossings include the Winchester Road Bridge, approximately 0.3 miles north, and the Via Montezuma low-water crossing, approximately 0.5 miles south.

Proposed Conditions:

The project proposes to construct a bridge over the Murrieta Creek to connect Avenida Alvarado with Overland Drive in the City of Temecula, Riverside County. The Murrieta Creek Bridge at Overland Drive is anticipated to be a concrete girder structure spanning approximately 348 linear feet over Murrieta Creek. The bridge would accommodate four through travel lanes (two lanes in each direction), left-turn lane(s), and two 6-foot-wide shoulders served as Class II bike lanes, for a curb-to-curb width of 68 feet. In addition, a 6-foot-wide sidewalk would be included on the southern side of the bridge for pedestrians to cross the creek. The existing bike trail on the west side of the creek will intersect with the extended Overland Drive by a signal-controlled at-grade crossing.

Upon completion of the Murrieta Creek Bridge project, the proposed street configuration would be consistent with the four-lane roadway segment on Overland Drive to the east. In addition to the construction of the bridge, various roadway and utility improvements would occur at the western and eastern bridge approaches. In order to match the roadway section on Avenida Alvarado on the west side of the bridge, the project would transition the lane configuration in the eastern portion of Avenida Alvarado to be consistent with the four-lane configuration of the bridge. Intersection improvements to Overland Drive/Enterprise Circle West and Diaz Road/Avenida Alvarado would include the installation of traffic signals and associated signing, striping, street lights, and utilities. Traffic signals and street lights will be installed at the Overland Drive/ Commerce Centre Drive intersection as well. Reconstruction and roadway improvements along Diaz Road and Avenida Alvarado would include undergrounding electrical utilities, construction of curbs, gutters, and sidewalks, relocating sewer and water facilities, and adding traffic signage and striping.

As a part of the bridge construction, one abutment would be constructed on each end of the bridge, along with two piers within the Murrieta Creek. Earth embankments with concrete slope protection and cutoff walls buried underground for scour protection would also be installed on the east and west side of the Creek. The foundation of the bridge piers involving large-diameter cast-in-drilled-hole concrete piles will be installed below the channel bottom, which is deep enough for protection from scour. The channel bottom will remain earthen without any concrete or rip rap lining. The bridge girder would provide cell openings to accommodate future utilities and electrical conduits for street lights and traffic signal communication.

Project Location Map

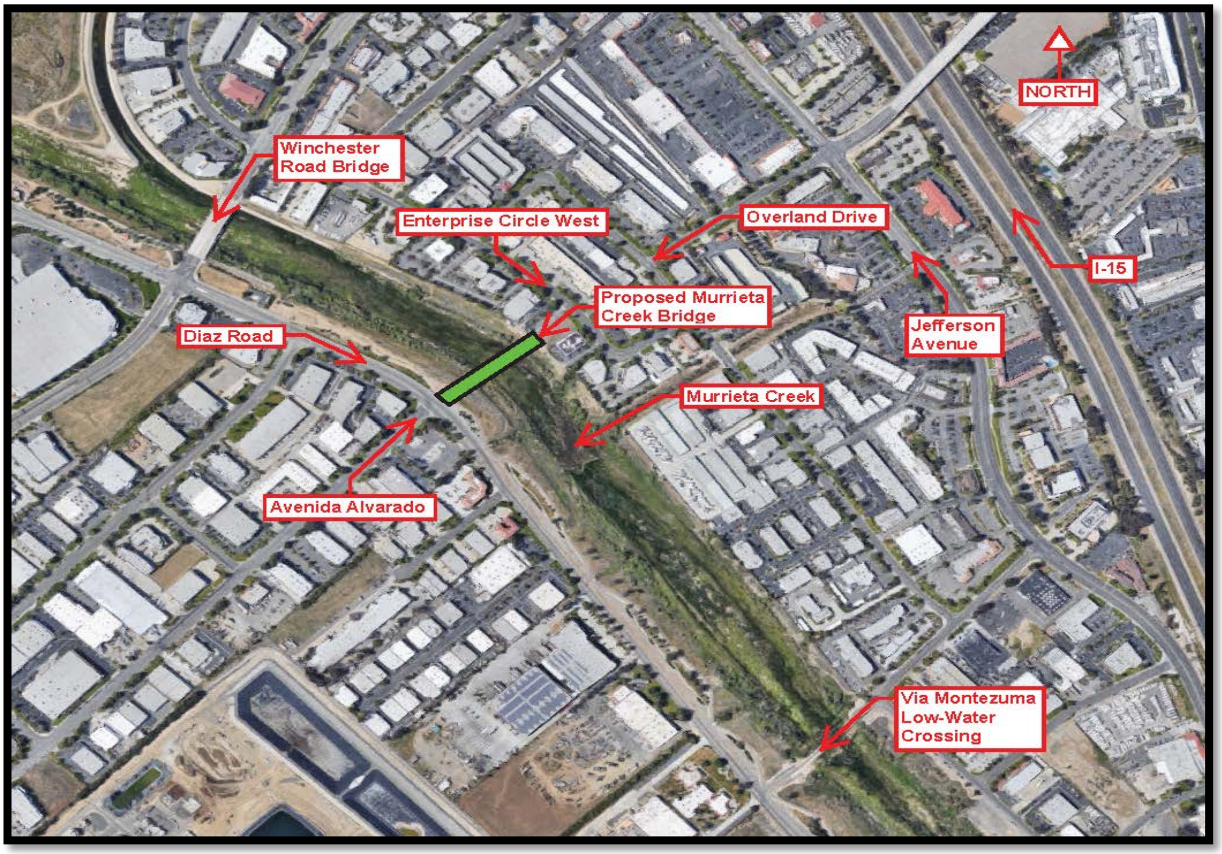

Figure 1: Project Location Map

Objective

The objective of ERSC Inc., is to perform a hydraulic analysis of the proposed bridge and identify the impacts of the upstream existing bridge along Winchester Road. Due to the construction of bridge piers that will be installed as structural supports to the bridge, ERSC considers the reduction of area of flow through the channel cross-section. This reduced area will result in an increased velocity through the channel and could drive the water surface elevation up for the upstream bridge. There is a low-water crossing that was constructed downstream of the proposed water crossing that will not be removed as a part of this project but the removal of this crossing will also be considered in calculations as the intention is removal of this system in the future. As part of a project in the works by the United States Army Corps of Engineers (USACE), the intention is to also increase the cross-sectional area of Murrieta Creek and this will also be considered as a part of the study. The design analyses will focus on improvements that will be considered as the "Interim Condition" being constructed before the future improvements proposed by the USACE. The improvements proposed by the USACE will be considered as the "Ultimate Condition" of our design. This will be implemented so that the design will suffice in both the short-term and with the long-term improvements anticipated by the USACE.

Hydrologic Analysis

Summary Of USACE Hydrology Report:

The Hydrology Report known as "Murrieta Creek Phase II Flood Control, Environmental Restoration, and Recreation Project", dated February 2014, used for the analysis of the Santa Margarita River watershed was prepared by the United States Army Corps of Engineers. Murrieta Creek is a major tributary to the Santa Margarita River, and the USACE is proposing to improve the Creek's capacity with added freeboard by lowering the channel invert. The channel functions as a primary flood control method for the generation of storm water from seasonal flood events. The region of the Santa Margarita Watershed that is discharging to this portion of the creek includes approximately a 222 square mile area. The flow discharge of the 100-year flood event and the 200-year check flood of the reach were determined to be 22,300 cfs, and 27,200 cfs, respectively. The values found in this report for the discharge of the various flood events will be considered in our comprehensive design. Our design will depend on the accuracy of the results determined in this study. Refer to Appendix B or below "Table 1: Discharge Frequency Values" for a full summary of the flowrates used in the USACE Hydrology and Hydraulics Analysis report.

% AEP Event	Discharge
0.50 (2-yr)	5,390
0.20 (5-yr)	8,860
0.10 (10-yr)	11,700
0.04 (25-yr)	15,700
0.02 (50-yr)	19,300
0.01 (100-yr)	22,300*
0.005 (200-yr)	27,200
0.002 (500-yr)	37,100
AEP = annual exceedance probability *100-yr discharge reduced to 22,300 ft^3/s to avoid increasing the size of the channel in Phase 2. Maximum outflow of the basin will be 22,300 ft^3/s.	

Table 1: Discharge Frequency Values.

Hydraulic Analyses

Analyses Modeling Scenarios:

ERSC modeled the geometry of Murrieta Creek with the following sequence to best analyze the addition of a bridge that extends Overland Drive to meet Avenida Alvarado. The first modeling scenario "S-1" considers the existing conditions of the creek with the low-water crossing at Via Montezuma and the existing upstream bridge at Winchester Road. The next modeling scenario "S-2" considers the addition of the proposed bridge along Overland Drive. S-2 will be investigated to demonstrate the potential impacts of backwater to existing structures due to the introduction of our proposed bridge. The following modeling scenario "S-3" will consider the proposed bridge, and the removal of the low-water crossing at Via Montezuma, this will be used as our "Interim Condition" before USACE constructs their Ultimate Improvements of the channel. Finally, the last modeling scenario "S-4" will consider the proposed bridge, the removal of the low-water crossing at Via Montezuma, and the "Ultimate Condition" of the channel with the improvements proposed by the USACE. The scenarios are summarized below, and the subsequent figures are the tabular results from the analysis for each scenario, data tables for S-4 can be referenced in "Murrieta Creek Phase II Flood Control, Environmental Restoration, and Recreation Project" prepared by USACE, dated February of 2014.

- S-1: Existing Conditions.
- S-2: Proposed Bridge at Avenida Alvarado. (Modeled for Evaluation of Backwater Impacts).
- S-3: Interim Condition - Proposed Bridge at Avenida Alvarado and the removal of Via Montezuma. The Channel will remain in this condition until the Ultimate Improvements are constructed by the USACE.
- S-4: Ultimate Condition - Channel Improvements proposed by the Army Corps of Engineers. (Included in "Murrieta Creek Phase II Flood Control, Environmental Restoration, and Recreation Project" dated February 2014). The timeframe for these Improvements are TBD.

HEC-RAS Plan: Ex Conditions River: Murrieta Creek Reach: Main - EC Profile: Q100

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Area (sq ft)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Mann Wtd Chnl
Main - EC	3430	Q100	22300.00	1027.71	0.003944	10.71	2210.05	2081.55	357.94	0.66	0.035
Main - EC	3069	Q100	22300.00	1025.35	0.005624	12.44	1812.40	1792.90	273.26	0.77	0.035
Main - EC	2700	Q100	22300.00	1025.32	0.001845	7.46	2988.92	2988.92	353.32	0.45	0.035
Main - EC	2540	Q100	22300.00	1024.66	0.002491	8.62	2586.92	2586.92	307.27	0.52	0.035
Main - EC	2399	Q100	22300.00	1024.41	0.002112	8.25	2704.36	2704.36	297.28	0.48	0.035
Main - EC	2343 Winchester Road		Bridge								
Main - EC	2295	Q100	22300.00	1023.63	0.002512	8.76	2545.52	2545.52	293.27	0.52	0.035
Main - EC	2022	Q100	22300.00	1022.64	0.003219	9.47	2489.63	2355.81	401.55	0.59	0.035
Main - EC	1737	Q100	22300.00	1021.98	0.002573	8.67	2731.69	2571.28	432.09	0.52	0.035
Main - EC	1265	Q100	22300.00	1020.90	0.002323	8.25	2702.30	2702.30	330.40	0.51	0.035
Main - EC	1130	Q100	22300.00	1020.52	0.002391	8.44	2643.54	2643.54	319.97	0.52	0.035
Main - EC	1000	Q100	22300.00	1020.04	0.002671	8.92	2498.60	2498.60	300.43	0.55	0.035
Main - EC	954 Bridge Location	Q100	22300.00	1019.71	0.003265	9.44	2362.04	2362.04	305.07	0.60	0.035
Main - EC	912	Q100	22300.00	1019.50	0.003238	9.68	2303.09	2303.09	282.98	0.60	0.035
Main - EC	642	Q100	22300.00	1019.01	0.002497	7.67	2907.17	2907.17	417.14	0.51	0.035
Main - EC	343	Q100	22300.00	1017.57	0.004126	9.39	2399.69	2374.83	443.08	0.65	0.035
Main - EC	-16	Q100	22300.00	1016.52	0.003071	8.23	2709.90	2709.90	409.65	0.56	0.035
Main - EC	-417	Q100	22300.00	1015.54	0.002493	7.51	2967.81	2967.81	441.66	0.51	0.035
Main - EC	-966	Q100	22300.00	1013.00	0.005106	9.69	2301.96	2301.96	398.86	0.71	0.035
Main - EC	-1415 Via Montezuma	Q100	22300.00	1012.05	0.000973	9.98	2233.97	2233.97	345.75	0.69	0.016
Main - EC	-1451 Via Montezuma	Q100	22300.00	1012.46	0.000603	7.71	2899.33	2894.41	476.51	0.54	0.016
Main - EC	-2068	Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66	530.11	0.45	0.035
Main - EC	-2437	Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54	511.52	1.00	0.035

Figure 2: HEC-RAS Summary Output for S-1.

HEC-RAS Plan: P-Bridge River: Murrieta Creek Reach: Main - EC Profile: Q100

Reach	River Sta	Profile	Q Total	W.S. Elev	E.G. Slope	Vel Chnl	Area	Flow Area	Top Width	Froude # Chl	Mann Wtd Chnl
			(cfs)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(sq ft)	(ft)		
Main - EC	3430	Q100	22300.00	1027.72	0.003943	10.71	2210.31	2081.73	357.95	0.66	0.035
Main - EC	3069	Q100	22300.00	1025.36	0.005586	12.41	1817.02	1796.66	275.76	0.77	0.035
Main - EC	2700	Q100	22300.00	1025.34	0.001830	7.44	2996.38	2996.38	353.43	0.45	0.035
Main - EC	2540	Q100	22300.00	1024.69	0.002465	8.59	2595.48	2595.48	307.36	0.52	0.035
Main - EC	2399	Q100	22300.00	1024.44	0.002089	8.22	2713.58	2713.58	297.38	0.48	0.035
Main - EC	2343 Winchester Road		Bridge								
Main - EC	2295	Q100	22300.00	1023.67	0.002476	8.72	2556.83	2556.83	293.33	0.52	0.035
Main - EC	2022	Q100	22300.00	1022.71	0.003132	9.39	2517.39	2376.03	406.33	0.58	0.035
Main - EC	1737	Q100	22300.00	1022.07	0.002488	8.58	2772.86	2600.01	434.63	0.52	0.035
Main - EC	1265	Q100	22300.00	1021.05	0.002199	8.10	2753.63	2753.63	332.29	0.50	0.035
Main - EC	1130	Q100	22300.00	1020.70	0.002237	8.25	2701.45	2701.45	321.27	0.50	0.035
Main - EC	1000	Q100	22300.00	1020.20	0.002738	8.82	2527.24	2527.24	315.13	0.55	0.035
Main - EC	954 Overland Drive		Bridge								
Main - EC	912	Q100	22300.00	1019.50	0.003246	9.69	2301.13	2301.13	282.96	0.60	0.035
Main - EC	642	Q100	22300.00	1019.01	0.002497	7.67	2907.17	2907.17	417.14	0.51	0.035
Main - EC	343	Q100	22300.00	1017.57	0.004126	9.39	2399.69	2374.83	443.08	0.65	0.035
Main - EC	-16	Q100	22300.00	1016.52	0.003071	8.23	2709.90	2709.90	409.65	0.56	0.035
Main - EC	-417	Q100	22300.00	1015.54	0.002493	7.51	2967.81	2967.81	441.66	0.51	0.035
Main - EC	-966	Q100	22300.00	1013.00	0.005106	9.69	2301.96	2301.96	398.86	0.71	0.035
Main - EC	-1415 Via Montezuma	Q100	22300.00	1012.05	0.000973	9.98	2233.97	2233.97	345.75	0.69	0.016
Main - EC	-1451 Via Montezuma	Q100	22300.00	1012.46	0.000603	7.71	2899.33	2894.41	476.51	0.54	0.016
Main - EC	-2068	Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66	530.11	0.45	0.035
Main - EC	-2437	Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54	511.52	1.00	0.035

Figure 3: HEC-RAS Summary Output for S-2.

HEC-RAS Plan: P-Bridge w/o VM River: Murrieta Creek Reach: Main - EC Profile: Q100

Reach	River Sta	Profile	Q Total	W.S. Elev	E.G. Slope	Vel Chnl	Area	Flow Area	Top Width	Froude # Chl	Mann Wtd Chnl
			(cfs)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(sq ft)	(ft)		
Main - EC	3430	Q100	22300.00	1027.72	0.003943	10.71	2210.31	2081.73	357.95	0.66	0.035
Main - EC	3069	Q100	22300.00	1025.37	0.005583	12.41	1817.43	1796.99	275.97	0.77	0.035
Main - EC	2700	Q100	22300.00	1025.35	0.001829	7.44	2996.99	2996.99	353.43	0.45	0.035
Main - EC	2540	Q100	22300.00	1024.69	0.002463	8.59	2596.15	2596.15	307.37	0.52	0.035
Main - EC	2399	Q100	22300.00	1024.44	0.002087	8.22	2714.31	2714.31	297.39	0.48	0.035
Main - EC	2343 Winchester Road		Bridge								
Main - EC	2295	Q100	22300.00	1023.67	0.002473	8.72	2557.80	2557.80	293.33	0.52	0.035
Main - EC	2022	Q100	22300.00	1022.71	0.003124	9.38	2519.70	2377.71	406.73	0.58	0.035
Main - EC	1737	Q100	22300.00	1022.08	0.002480	8.57	2776.29	2602.40	434.67	0.52	0.035
Main - EC	1265	Q100	22300.00	1021.07	0.002189	8.09	2757.91	2757.91	332.44	0.49	0.035
Main - EC	1130	Q100	22300.00	1020.71	0.002224	8.24	2706.25	2706.25	321.38	0.50	0.035
Main - EC	1000	Q100	22300.00	1020.22	0.002738	8.80	2532.80	2532.80	316.84	0.55	0.035
Main - EC	954 Overland Drive		Bridge								
Main - EC	912	Q100	22300.00	1019.52	0.003214	9.66	2308.49	2308.49	283.06	0.60	0.035
Main - EC	642	Q100	22300.00	1019.05	0.002459	7.63	2922.07	2922.07	418.02	0.51	0.035
Main - EC	343	Q100	22300.00	1017.66	0.003948	9.25	2441.85	2409.52	448.18	0.64	0.035
Main - EC	-16	Q100	22300.00	1016.72	0.002792	7.99	2790.71	2790.71	410.37	0.54	0.035
Main - EC	-417	Q100	22300.00	1015.88	0.002131	7.14	3121.81	3121.81	445.39	0.48	0.035
Main - EC	-966	Q100	22300.00	1014.50	0.002451	7.65	2916.19	2916.19	414.88	0.51	0.035
Main - EC	-1415 VM Removed	Q100	22300.00	1012.99	0.003051	8.71	2561.54	2561.54	352.07	0.57	0.035
Main - EC	-1451 VM Removed	Q100	22300.00	1013.19	0.001987	6.89	3250.55	3238.12	476.51	0.46	0.035
Main - EC	-2068	Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66	530.11	0.45	0.035
Main - EC	-2437	Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54	511.52	1.00	0.035

Figure 4: HEC-RAS Summary Output for S-3.

The comparison of the existing conditions S-1 and the proposed conditions S-2 & S-3 are used to identify the potential for backwater impacts to the upstream bridge. This will be modeled to determine and establishment the low chord elevation of the proposed bridge. For consistency with S-4, the creek parameters selected for S-2 and S-3 are to remain consistent. S-4 will provide additional freeboard due to the increase in creek capacity, however our design will focus on interim conditions to allow for a more conservative design approach for the bridge hydraulics. For example, the manning's coefficients selected for existing channel were increased to reflect values used in the USACE design. The coefficient used assumes existing vegetation along the embankments and channel bottom. This was done to model a more accurate version of the existing channel conditions and to remain consistent with USACE design approach. The selection of a higher manning coefficient resulted in an overall higher water surface elevation and therefore a more conservative approach. To analyze the removal of Via Montezuma the manning coefficients were established as an asphalt surface for S-1 & S-2 at the roadway cross sections. These values were adjusted in S-3 to represent a vegetative surface. The adjusted values in S-3 conform to the natural surface coverage used for the channel. In other words, the "n" values (or manning's coefficients) were adjusted from 0.016 (an asphalt surface) to 0.035 (a vegetative surface). The values used in S-3 assimilate to the existing channel surface with the roadway removed. This was our process used to model the removal of Via Montezuma and is demonstrated above in Figures 2, 3 & 4.

Establishment of Bridge Elevation:

With the geometry of the creek modeled and the hydrologic data analyzed the next step in the design process was to determine the proposed bridge's low chord elevation. The flowrate for the 100-year flood event and the corresponding normal depth in Murrieta Creek was used for determining water surface elevation at the proposed bridge location. Riverside County Flood Control and Water Conservation District (RCFC&WCD) has bridge design guidelines similar to Los Angeles County Flood Control District (LACFCD). Per LACFCD guidelines the low chord elevation of the bridge must be set 2 feet above the water surface elevation for the 100-year flood event. Additionally, at least 2 feet of freeboard is to be provided in the over banks of the channel. Our design follows guidelines of both LACFCD and Caltrans Memo to Designers 16-1: Hydraulic Design for Structures over Waterways (MTD 16-1). Per Caltrans MTD 16-1 the bridge soffit elevation must be set to either the WSE of the 50-year storm event plus freeboard or the 100-year flood WSE elevation, for our design the RCFC&WCD guidelines will govern. The WSE of the 100-year flood in S-3 was determined to be an elevation 1020.22. To achieve the design requirements the low chord elevation of the proposed bridge was set at an elevation above 1022.22'. The removal of Via Montezuma will cause the downstream roughness coefficient to be increased. Scenario S-3 considers this change and the analysis determined that this will be the governing scenario for a conservative design. The water surface elevation of the creek in the ultimate condition proposed by the USACE is 1014.22'. The Bridge will have adequate freeboard prior to and after the USACE improvements. In theory the improvements made by the USACE will provide more flow capacity within the creek and therefore the design will be more conservative. Refer to Figure 5 and 6 below for a graphical representation of the proposed bridge modeled in HEC-RAS.

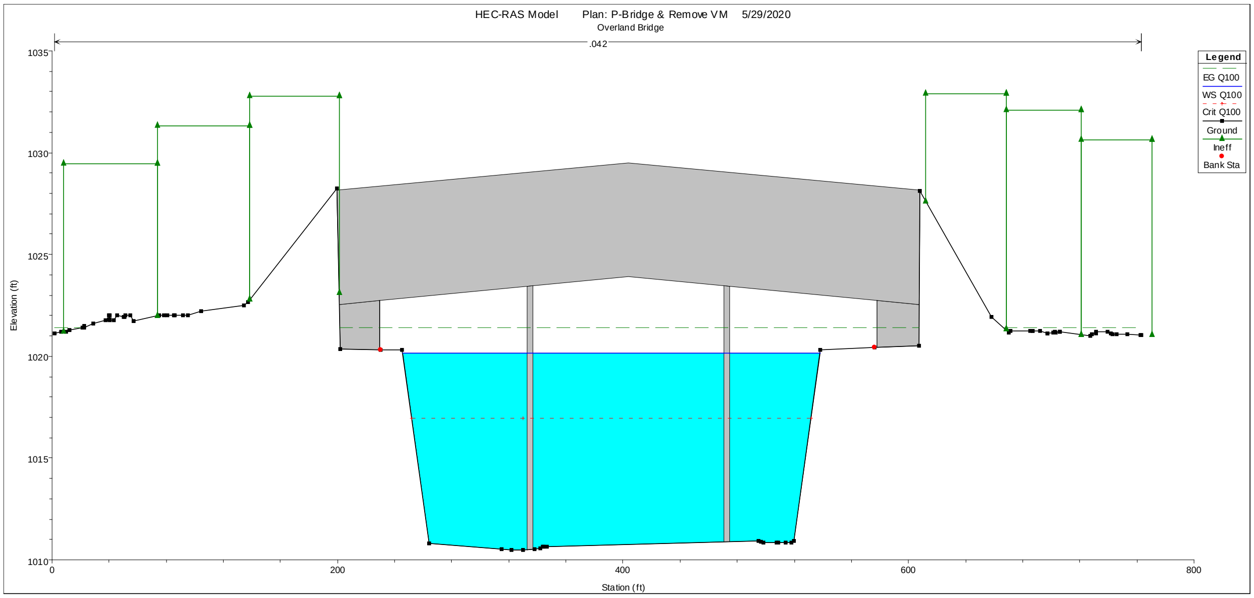

Figure 5: Water Surface Elevation at the upstream Bridge Cross Section for Model S-3.

Backwater Analysis:

As a result of the introduction of bridge piers within the creek bed, backwater impacts to local structures may be of concern. Backwater is the increase in the water surface elevations upstream of the proposed bridge due to the additional obstruction caused by the proposed structure. The design works to minimize the constriction of the channel flow by alignment of the piers with the direction of flow in the creek. The bridge at Winchester Road is approximately 1200 feet upstream of the proposed bridge. Backwater effects of the proposed bridge is anticipated to occur upstream but have no major impact on the existing bridge at Winchester Road. S-3 resulted in having the greatest increase in water surface elevation at the existing bridge for the 100-year flood event. This is identified to be an overall increase of 0.03 feet which will not have any adverse impacts. The water surface elevation at the existing bridge will increase from 1024.41’ to 1024.44’. The low chord elevation of the existing bridge currently sits at 1028.20’. This will still provide adequate freeboard for the 100-year flood event of 2 feet or more required by the bridge design guidelines. With the creek improvements proposed by USACE the potential for backwater impacts are further mitigated. Refer to the figure below generated by the HEC-RAS model that compares the 3 scenarios described above in the report.

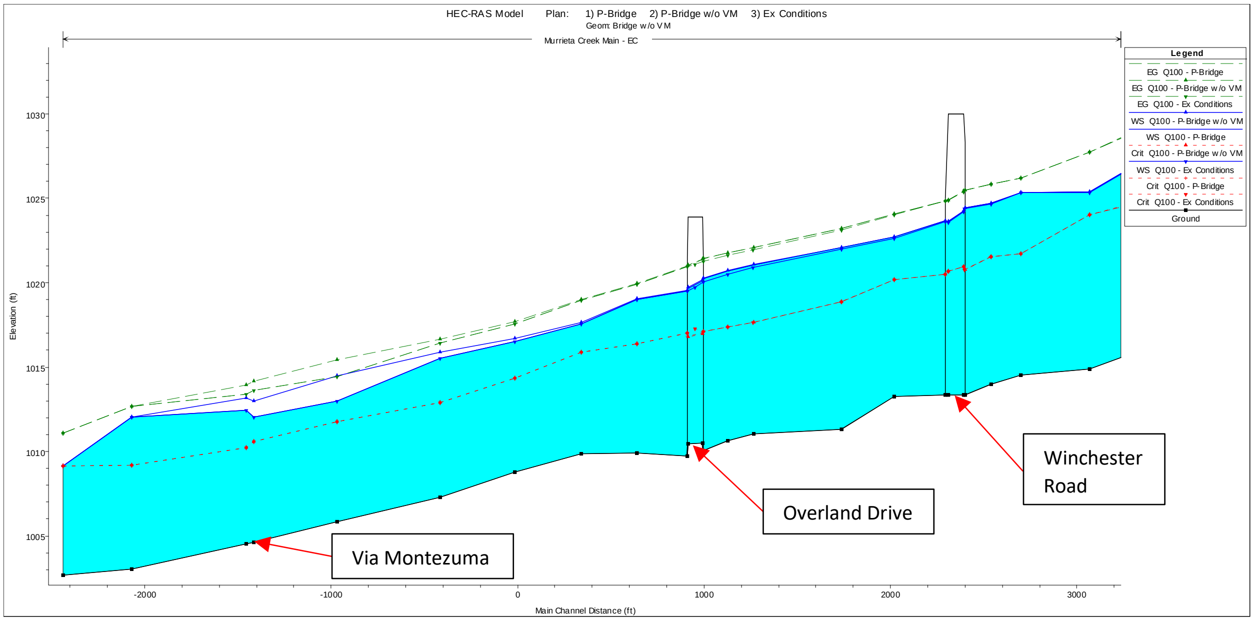

Figure 6: Model Comparison of the Water Surface Elevation for the 100-year flood event.

Additional Design Considerations:

The design accommodates the effects of flood waters within the channel using design considerations as outlined in the FHWA HEC-18 and HEC-20 Guidelines. The considerations are implemented into the design as a good practice strategy. The bridge design crosses the creek and flow pattern with a skew of approximately 7.71 degrees. This skew allows for the bridge piers to align perpendicular to the creek flow. The length of the bridge is designed to maximize the channel cross-sectional area available for the flood waters. The circular pier selection for the bridge are aligned and streamlined in the direction of the flow. Alignment of the piers will help to mitigate concerns for bridge backwater, contraction scour between the piers, debris collection and local scour. Circular piers will help to streamline any passing flows and minimize the accumulation of debris and local scour. Piers are designed with the same foundation depth for consistency to mitigate the concerns of lateral migration.

Hydraulic Design Summary:

The design includes a symmetrical layout with the use of two 4-foot diameter column piers spread out 138 feet apart and approximately 105 feet from the bridge ends. The channel cross-sectional area is reduced due to the introduction of a bridge, the design mitigates this concern by placing abutments beyond the channel embankments on both ends of the superstructure. The superstructure is supported by abutments. Abutments for the bridge will be considered a seat-type abutment with wing walls. The bridge design uses only two lines of piers over the bridge span of approximately 348 feet, thus the reduction of the cross-sectional area is minimized. However, the creek widening considered by the USACE design provides additional cross-sectional area in the ultimate condition. The improvements proposed by the USACE are to lower the channel invert, adjust the embankment side slopes to a 2:1 slope and protect the side slopes of the channel with slope protection. The slope protection proposed in the Ultimate condition will be constructed and buried as part of our Interim Improvements. The slope protection in the Interim Condition will be installed along the USACE proposed embankment. The toe of the slope protection is set below the long-term scour depth of the channel determined in USACE's study. The slope protection will protect the abutments. The slope protection will be designed as reinforced concrete levees per LACFCD Guidelines. The slope protection will follow the future slope grading and extend the toe of the USACE proposed Ultimate Improvements to meet LACFCD Levee Design Criteria. The intent is to establish these as permanent improvements to mitigate potential scour at the abutments in both the Interim and Ultimate conditions. As a result of matching the future slopes proposed by the USACE on the east side regrading of the west side of the channel will be necessary to gain back some of the capacity of the channel at the bridge location. Temporary slope protection may be required to protect the earthen slope on the west side of the channel. The east side of the channel will utilize the slope protection proposed for the ultimate condition. See the Channel Improvement Plan in Appendix E.

To remain consistent with plans proposed by the USACE, field survey data used in our report is based on North American Vertical Datum 88 (NAVD88) for elevations and North American Datum 83 (NAD83) for horizontal distances developed within California Zone 6 for Riverside County in US feet.

The Hydraulic Model used to determine the Analysis is based on the one-dimensional hydraulic analysis software developed by the USACE known as HEC-RAS. Design procedures were followed as outlined in the FHWA HEC-18 & HEC-20, Caltrans Memorandum to Designers 16-1: Hydraulic Design for Structures over Waterways (MTD 16-1), and local regulations set forth by RCFC&WCD. The project will be submitted for review to ensure accordance with USACE, CALTRANS, and RCFC&WCD.

Hydrologic Summary for Bridge Federal Project No. BR-NBIL(543)			
Drainage Area: 222 mi ^{2}			
Frequency	**Design Flood**	**Base Flood**	**Flood of Record**
	50-year	100-year	200-year
Discharge	19,300 cfs	22,300 cfs	27,200 cfs
Water Surface Elevation at Bridge	1019.54'	1020.22'	1021.45'
Floodplain data are based upon information available when the plans were prepared and are shown to meet federal requirements. The accuracy of said information is not warranted by the state and interested or affected parties should make their own investigation.			

Table 2: Hydrologic Summary for Proposed Bridge (per S-3).

SCOUR ANALYSES

The evaluation of the bridge pile shaft foundation design and its potential for scour is the next step in the design process. Scour is the result of erosion of the stream bed due to the flow of water. Impacts of scour can occur with change in geometry or velocity of the flow within the creek. The bridge design must take into consideration the Total Scour potential and proceed with an appropriate selection of foundation depths and countermeasures. Total scour is the sum of three components of various scour types that bridge pile shaft foundations are susceptible to which includes General Scour (or Contraction Scour), Local Scour, and Long-Term Scour. Caltrans MTD 16-1 design requires that the analyses of Total Scour be based on the 100-year flood event for regular service. The 200-year check flood is also examined for the extreme condition and to prevent collapse. Long-term scour is analyzed for the seismic conditions. Scour impacts of the bridge piers were determined for the Interim Conditions of the channel and compared with the Ultimate condition proposed by USACE. Scenario S-3 considers the General and Local Scour potential at the proposed bridge location in the interim condition. Scenario S-4 considers the General, Local, and Long-Term Scour potential to be designed in accordance with the USACE Ultimate Improvements. The depth of the piers will consider the analysis of both scenarios to determine the most conservative design approach. The proposed Ultimate Improvements include lowering the channel invert, constructing slope protection at the embankments, and possibly providing Rip-Rap revetment around the bridge piers to mitigate potential scour. However, our design will introduce deep foundations below the total scour depth at the pier locations assuming no revetment around the bridge piers in the Ultimate condition to remain conservative. Our design will suffice for both the Interim channel conditions and the Ultimate channel conditions proposed by the USACE. The abutments will remain protected by constructing the ultimate improvements as a part of our design of the interim condition. An earthen embankment on the west side of the channel or additional countermeasures determined by the RCFC&WCD may be incorporated. In both the Interim and Ultimate condition of the channel the abutments will be buried within the embankments. The reach known as Murrieta Creek Channel curves at the bridge and to maintain the capacity of the creek the channel banks of reach will be modified. To ensure that the abutments remain within the embankment the channel will be regraded at the location of the bridge. In the interim condition the slope on the east side of the bridge will be constructed to match the slope of the ultimate condition of the channel. The slope of the west side of the bridge will be constructed to widen the channel section that is lost by matching the USACE ultimate slope to the east. Additional options for interim design will depend on the requirements of the RCFC&WCD. Temporary slope protection may be required in the interim condition at the proposed grade of the westside. The slope protection design to be constructed for the Ultimate Condition follows the Levee Design Criteria as outlined in the Hydraulic Design Manual for LAFCD and will be used to maintain the channel geometry that is used in the analysis. The design criteria set the cut-off depth of the slope protection to mitigate scour potential at the abutments. Slope protection for the Ultimate Condition may require further coordination with USACE to determine an appropriate design. See Appendix D for Levee Design Criteria.

Creek Geomorphology:

To accurately assess the scour potential of the creek, ERSC investigated creek data, soil information, geomorphic features and local existing bridge data. The geomorphology of the creek is considered an alluvial stream due to the nature of the soils examined, the natural trapezoidal channel shape and long winding irregular bends of the reach. Alluvial stream beds are highly susceptible to erosion, sediment deposits, and change in channel shape. At the embankments potential for erosion increases where velocities are higher, and soils are less stable against the shear forces of moving water. The design takes into consideration the nature of the creek and the appropriate parameters are used in the design for scour analysis. Alluvial streams typically have soil characteristics of fine silt and clay particles as well as larger sand and gravel particles. The shape of a creek tends to be driven by the forces of flowing water. Murrieta Creek is purposed mainly for flood control of larger water flow events when functioning at its full capacity. According to the Web Soil Survey as well as Borings B-3 and B-5 of the Kleinfelder soils report entitled “Report of Geotechnical Investigation Proposed Overland Drive Bridge Over Murrieta Creek” the surface and subsurface soils in the region of the piers are defined as silty sand which is typical for alluvial stream beds. Refer to the soil mapping data in Appendix C.

General Scour:

When adding bridge piers to a creek bed the impacts of General Scour must be considered in the analyses. General scour is also known as contraction scour of the stream bed. Contraction scour occurs generally with an increase in the flow velocity through the channel due to the reduction in overall area of the creek. The bridge pile shaft foundation design consists of circular piers spaced evenly within the channel bottom. The design works to minimize the impacts of channel area reduction with the introduction of only two piers spaced farther apart. The piers being spaced farther allow for less constriction in the flow, this works to mitigate the impacts of contraction scour. After evaluating proposed conditions any additional scour caused by the piers is minimal due to the relatively low velocity. The contraction scour in the channel at the bridge location for the Interim Condition was determined to be 0.46 feet, and for 0.74 feet the 100-year & 200-year events, respectively. The contraction scour in the channel at the bridge location for the Ultimate Condition was determined to be 0.53 feet, and 0.61 feet for the 100-year & 200-year events, respectively. Although the overall area of the section will be reduced the overall contraction scour as seen in the HEC-RAS figure below for the proposed bridge piers is minimal and will not have any major impacts on the embankment slopes or structural elements. Refer to Figures 7-10 below for delineation of the scour.

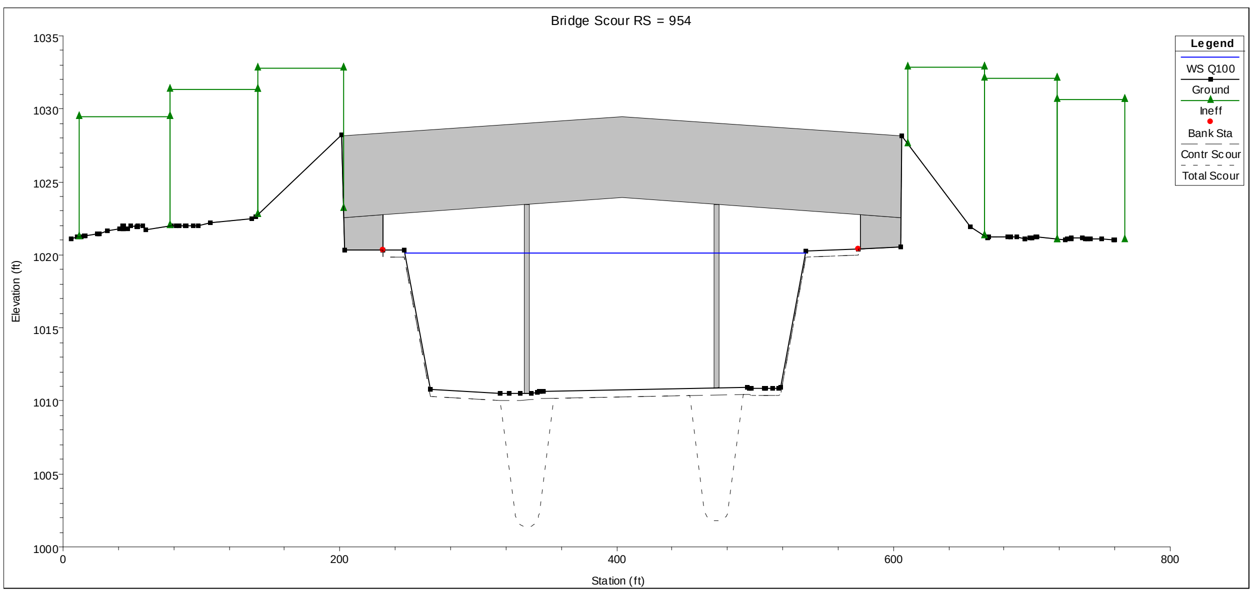

Figure 7: Scour of Proposed Bridge Piers in Interim Condition for Q100.

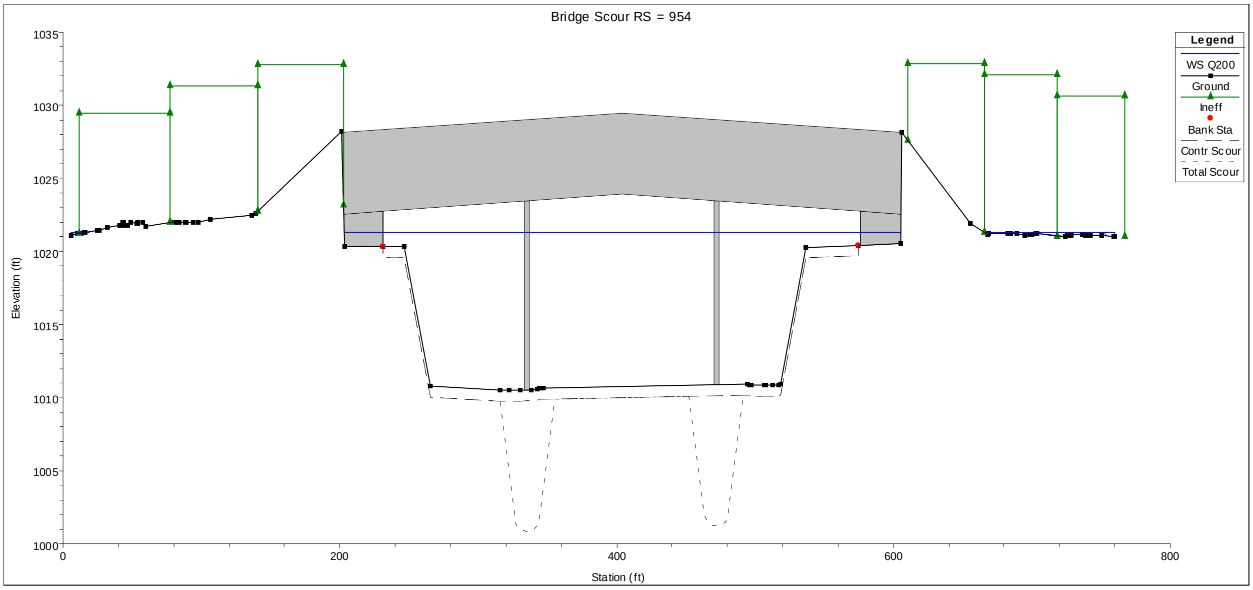

Figure 8: Scour of Proposed Bridge Piers in Interim Condition for Q200.

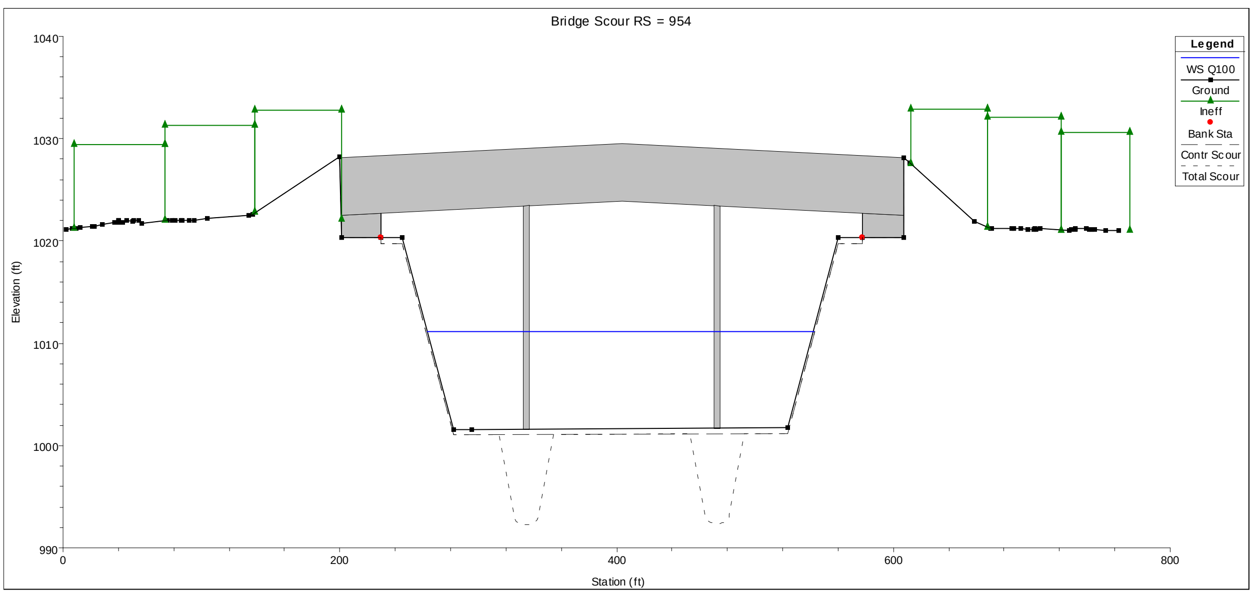

Figure 9: Scour of Proposed Bridge Piers in Ultimate Condition for Q100.

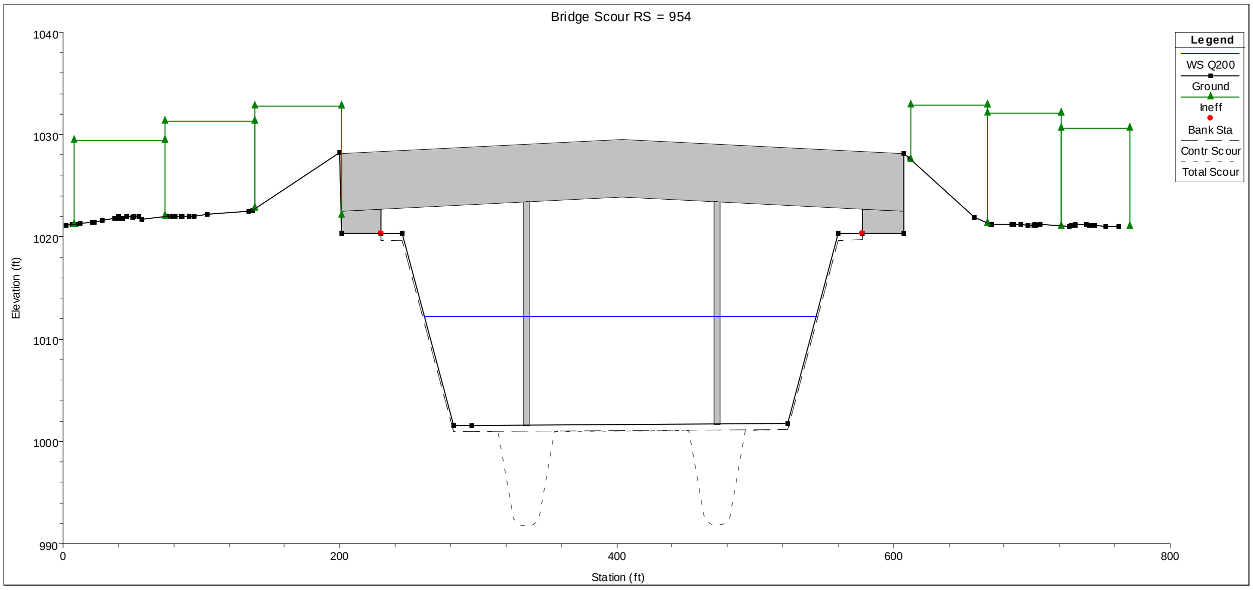

Figure 10: Scour of Proposed Bridge Piers in Ultimate Condition for Q200.

Local Scour:

With the addition of structural elements of a bridge to the stream bed, Local Scour must be considered in analyses. Local scour is the removal of material around abutments, piers, and embankments. It is responsible as one of the main causes of bridge failure. The addition of structures in the creek results in increasing flow velocities. The streamline of the flows is disrupted by the obstruction of those structural elements. This results in mild turbulence and drag that excavates and removes the sediment that surrounds the base of the structural elements. Over time equilibrium is reached when enough material is displaced to alleviate these forces resulting from the addition of structures. This result is known as local scour. The results in local scour in the interim condition were determined to be a depth of 8.66 feet, and 8.92 feet for the 100-year and 200-year events, respectively. The combined scour (Local + Contraction) was determined to be 9.12 and 9.66 feet below the channel invert to an elevation of approximately 1001.39' and 1000.86' for S-3. Refer to the HEC-RAS plot Figure 7 & 8 above for delineation of the scour at the bridge cross section. The results in local scour in the Ultimate condition were determined to be a depth of 8.80 feet, and 9.23 feet for the 100-year and 200-year events, respectively. The combined scour (Local + Contraction) was determined to be 9.33 feet, and 9.84 feet to an elevation of approximately 992.26' and 991.75' for S-4. Refer to the HEC-RAS plot Figure 9 & 10 above for delineation of the scour at the bridge cross section. Surveyed soils of the site were found to be a D_{50} grain size of 0.03 mm, and a D_{95} grain size of 0.3 mm.

Long Term Scour:

Long-term scour of the creek bed is a result of the long-term degradation or aggradation of the cross-sectional area of the channel. To remain consistent with the future improvements proposed by the USACE, design of the foundation and slope protection will consider their study to ensure the lowest potential for scour. Based on the data identified in the report created by the USACE for their Improvements, the ultimate channel depth is to be lowered to an invert elevation of 1001.50'. The USACE has determined to set the toe of their slope protection for the embankment to a depth of approximately 4.5 feet at our bridge location. The report determines that long-term scour anticipated will not exceed 4.5 feet and the toe of slope is set at an invert elevation of 995.72' per Murrieta Creek – Phase 2 Plan &

Profile. This allows for a conservative approach in our design as the long-term scour in the Ultimate Condition supersedes our Interim design due to the lowering of the channel invert of 8+ feet. Refer to Table 3 below for a tabular representation of anticipated long-term scour results in the creek with the USACE improvements. Our design recommendations are dependent on the accuracy of the information presented in the report titled "Murrieta Creek Phase II Flood Control, Environmental Restoration, and Recreation Project" created by the USACE, any future alterations to this design would amend our design and require additional coordination.

		Long Term after 209 events, assuming no O&M for scour areas				Ave Annual since 1974, assuming routine O&M	Design Q, with-project	
XS	initial invert elevation	After 209 events, after 1974	diff	grade stabilizer, -2.72 ft	diff	Ave Annual (37 yrs)	0.6348 days (end of hydrograph)	0.5934 days (peak of hydrograph)
18900	1007.46	998.33	-9.13	1004.74	-6.41	-0.17	2.09	2.09
18800	1007.46	998.45	-9.01	1004.74	-6.29	-0.17	2.73	2.73
18698	1007.10	998.87	-8.23	1004.38	-5.51	-0.15	2.74	2.73
18600	1006.86	998.46	-8.40	1004.14	-5.68	-0.15	1.58	1.57
18300	1006.26	997.88	-8.38	1003.54	-5.66	-0.15	2.31	2.31
18000	1006.86	997.55	-9.31	1004.14	-6.59	-0.18	0.90	0.89
17900	1005.46	997.85	-7.61	1002.74	-4.89	-0.13	2.72	2.69
17500	1004.66	997.29	-7.37	1001.94	-4.65	-0.13	2.73	2.69
17000	1003.66	996.72	-6.94	1000.94	-4.22	-0.11	2.00	2.15

Table 3: Scour with USACE improvements.

Scour Summary:

The line of total scour is used to determine the depth of the foundation for our design. For our design, the resulting total scour is the result of the contraction scour, local scour, and long-term scour around the bridge piers. The foundation of the bridge is placed as shown below in the Figure 11. Tabularized below are the anticipated Short-Term scour results based on our study for the Interim and Ultimate Condition. Long-Term scour results are based on the Ultimate Condition proposed by the USACE to remain conservative. These results are based on the 100-year and 200-year flood events and Tables 4-7 below will be included on the foundation as well as the as-built plans per CALTRANS Memo to Designers 16 (MTD 16-1). Impacts of scour at the abutments will be mitigated in our design as the abutments are protected by a reinforced concrete levee extending below the potential scour depth for our reach conditions. Long-Term scour at the abutments is accounted for in the USACE study and appropriate countermeasures have been designed. The proposed countermeasure design for the Ultimate Condition will be installed as a part of our project to mitigate any scour potential along the embankment. The degradation is determined not to exceed 4.5 feet based on USACE analysis of the channel at the bridge location (Murrieta Creek – Phase 2 at Station 173+06.11). In Table 3 above, the USACE determined the long-term scour depth of the channel based on the initial invert elevation and record storm events. The resultant long-term scour elevation was determined to be 996.47'. The Total Scour Line for our design occurs in the Ultimate Condition where the channel invert is lowered by approximately 8.83 feet and this will govern for setting the foundation depths. This depth of Total Scour was determined to be approximately 13.83' at the lowest invert and shown as "L" on the Channel Improvement Plans in Appendix E. Our analysis is based on the accuracy of the data recorded in the report titled "Murrieta Creek Phase II Flood Control, Environmental Restoration, and Recreation Project" created by the USACE.

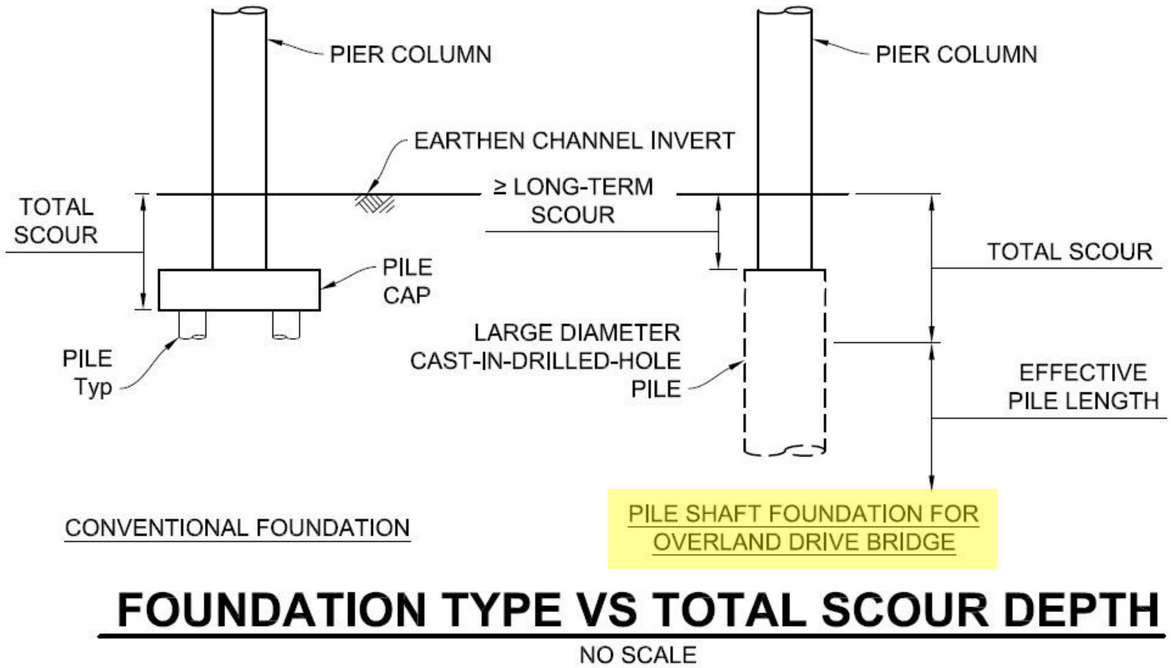

Figure 11: Pile Shaft Foundation Design with Respect to Scour

Interim Condition Scour Tables per MTD 16-1:

Long Term & Short Term Scour Depths Bridge Federal Project No. BR-NBIL(543)			
Support No.	**Degradation Scour Depth (ft)**	**Contraction Scour Depth (ft)**	**Short Term (Local) Scour Depth (ft)**
Abutment 1	4.5	0.46	None
Pier 2	4.5	0.46	8.66
Pier 3	4.5	0.46	8.66
Abutment 4	4.5	0.46	None

Table 4: Scour Summary Table for 100-year Design Flood.

Support No.	Long Term (Degradation and Contraction) Scour Elevation (ft)	Short Term (Local) Scour Depth (ft)
Abutment 1	▶ 1005.52	None
Pier 2	▶ 1005.52	1001.39
Pier 3	▶ 1005.52	1001.39
Abutment 4	▶ 1005.52	None

Table 5: Scour Data Table for 100-year Design Flood.

Long Term & Short Term Scour Depths Bridge Federal Project No. BR-NBIL(543)			
Support No.	**Degradation Scour Depth (ft)**	**Contraction Scour Depth (ft)**	**Short Term (Local) Scour Depth (ft)**
Abutment 1	4.5	0.74	None
Pier 2	4.5	0.74	8.92
Pier 3	4.5	0.74	8.92
Abutment 4	4.5	0.74	None

Table 6: Scour Summary Table for 200-year Check Flood.

Support No.	Long Term (Degradation and Contraction) Scour Elevation (ft)	Short Term (Local) Scour Depth (ft)
Abutment 1	► 1005.24	None
Pier 2	► 1005.24	1000.86
Pier 3	► 1005.24	1000.86
Abutment 4	► 1005.24	None

Table 7: Scour Data Table for 200-year Check Flood.

► = To remain conservative in our design, Long Term Scour effects of the channel consider the study prepared by the USACE.

Ultimate Condition Scour Tables per MTD 16-1:

Long Term & Short Term Scour Depths Bridge Federal Project No. BR-NBIL(543)			
Support No.	**Degradation Scour Depth (ft)**	**Contraction Scour Depth (ft)**	**Short Term (Local) Scour Depth (ft)**
Abutment 1	4.5	0.53	None
Pier 2	4.5	0.53	8.80
Pier 3	4.5	0.53	8.80
Abutment 4	4.5	0.53	None

Table 8: Scour Summary Table for 100-year Design Flood.

Support No.	Long Term (Degradation and Contraction) Scour Elevation (ft)	Short Term (Local) Scour Depth (ft)
Abutment 1	996.47	None
Pier 2	996.47	992.26
Pier 3	996.47	992.26
Abutment 4	996.47	None

Table 9: Scour Data Table for 100-year Design Flood.

Long Term & Short Term Scour Depths Bridge Federal Project No. BR-NBIL(543)			
Support No.	**Degradation Scour Depth (ft)**	**Contraction Scour Depth (ft)**	**Short Term (Local) Scour Depth (ft)**
Abutment 1	4.5	0.61	None
Pier 2	4.5	0.61	9.23
Pier 3	4.5	0.61	9.23
Abutment 4	4.5	0.61	None

Table 10: Scour Summary Table for 200-year Check Flood.

Support No.	Long Term (Degradation and Contraction) Scour Elevation (ft)	Short Term (Local) Scour Depth (ft)
Abutment 1	996.39	None
Pier 2	996.39	991.75
Pier 3	996.39	991.75
Abutment 4	996.39	None

Table 11: Scour Data Table for 200-year Check Flood.

APPENDIX A

```
                         HEC-RAS HEC-RAS 5.0.7 March 2019
                           U.S. Army Corps of Engineers
                          Hydrologic Engineering Center
                                609 Second Street
                                Davis, California


            X     X  XXXXXX   XXXX        XXXX       XX      XXXX
            X     X  X       X    X       X   X     X  X    X
            X     X  X       X            X   X    X    X   X
            XXXXXXX  XXXX    X      XXX   XXXX     XXXXXX    XXXX
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PROJECT DATA
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Project in English units

Project Description:


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Geometry Title: Ex-Cond
Geometry File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.g03

Flow Title : Flood Design
Flow File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.f01

Plan Description:
Murrieta Creek in Proposed water crossing at Overland Drive

```
Plan Summary Information:
Number of:  Cross Sections =   22    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    1    Lateral Structures =    0

Computational Information
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    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.33
    Flow tolerance factor                =  0.001
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Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Flood Design
Flow File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.f01

Flow Data (cfs)

River	Reach	RS	Q100	Q200	Q50
Murrieta Creek	Main - EC	3430	22300	27200	19300

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Murrieta Creek	Main - EC	Q100	Critical	Critical
Murrieta Creek	Main - EC	Q200	Critical	Critical
Murrieta Creek	Main - EC	Q50	Critical	Critical

GEOMETRY DATA

Geometry Title: Ex-Cond
Geometry File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.g03

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: 3430

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14.68	1029	18.56	1029.83	20.8	1029.83	26.61	1029.92	27.71	1029.93
36.93	1029.96	38.2	1029.57	39.13	1029.43	40.72	1029	42.22	1028.13
46.23	1028.13	48.06	1028.09	48.83	1028	55.72	1026.94	56.1	1027
56.63	1027	57.94	1026.83	59.81	1026.58	63.23	1026.59	64	1026.6
74.7	1026.18	75.19	1026.18	76.06	1026.16	76.46	1026.01	87.28	1026
89.31	1024.19	89.55	1024	90.95	1023.15	91.29	1022.6	93.62	1021.69
95.06	1020.92	96.28	1020.73	97.3	1020.45	98.26	1019.58	99.65	1018.97
99.73	1019.03	100.35	1019.02	104.88	1018.17	109.54	1018	109.85	1018
110.71	1017.77	113.34	1017.7	114.42	1017.65	115.28	1016.68	118.05	1016.44
120.32	1016.44	125.04	1016.44	125.81	1016.44	126.71	1016.32	130.38	1016.64
131.88	1016.89	133.48	1017.05	133.89	1017.27	135.82	1017.19	139.2	1017.07
140.19	1017.06	140.62	1017.34	140.98	1017.06	141.19	1017.38	142.14	1017.42
143.09	1017.27	147.15	1017.27	148.34	1017.48	149.37	1017.48	149.99	1017.48
152.8	1017.45	153.45	1017.35	155.02	1017.07	155.32	1017.02	155.53	1017
155.82	1016.88	156.64	1016.85	157.09	1016.85	163.03	1016.92	163.19	1016.85
164.28	1016.85	164.69	1017	165.57	1017.04	165.8	1017.03	166.07	1017.03
166.99	1017.07	169.28	1017.08	171.39	1017.07	172.51	1017.05	173.67	1017.05
175.26	1017	176.84	1016.85	177.56	1016.89	178.21	1016.98	179.16	1017.06
180.88	1017.16	182.1	1017.13	184.18	1017.2	186.47	1017.33	191.53	1017.14
191.63	1017.14	195.47	1017.15	196.24	1017.17	197.38	1017.24	200.1	1017.23
201.19	1017.26	202.12	1017.27	203.33	1017.56	204.22	1017.55	205.58	1017.48
205.74	1017.48	208.17	1017.48	211.62	1017.54	213.01	1017.56	215.44	1017.67
216.52	1017.83	217.46	1018.16	217.79	1018.17	218.06	1018.11	218.79	1018.11
219.01	1018	221.57	1017.48	223.57	1017.53	224.8	1017.63	230.13	1017.64
238.26	1017.48	240.81	1017.54	244.58	1017.63	246.16	1017.66	246.48	1017.66
249.23	1017.48	252.05	1017.48	252.69	1016.69	256.03	1016.54	256.59	1016.51
257.15	1016.45	270.66	1016.97	270.76	1017.02	277.56	1019.21	280.09	1019.48

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  284.59 1021.42  284.98 1021.75   286.1 1021.87  286.89 1022.31  288.74 1023.71
  291.13    1024  293.75 1024.61  295.06 1025.32  296.12 1025.31  296.65 1025.18
  297.61 1025.18  298.39    1026  301.37    1027  301.67    1027  302.26    1028
  305.15    1028  305.58 1028.18  305.93 1028.18  324.08  1029.4  324.94 1029.46
  326.85 1029.52  327.88 1028.55  329.27 1028.58  331.95 1028.52  333.39    1028
  335.76 1027.67  337.03 1027.59  353.43 1026.57  384.91 1026.67  409.21  1026.2
  415.29 1026.08   421.3 1026.11  441.98 1026.11

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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
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Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
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  330.56  441.98 1034.68       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 3069

INPUT
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    33.1 1025.96   35.79 1025.96    46.4 1025.53   51.43 1025.42   57.01 1025.32
    66.4 1025.51   75.04 1025.71   75.49 1025.74   79.87  1025.8   88.64 1025.98
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  124.67  1023.7  124.73 1023.03  125.31    1023  126.21    1023  126.59 1021.54
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  182.85 1017.06  187.36 1017.26  188.07 1017.27  193.64 1017.27   193.8 1017.07
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  220.67 1017.01  220.72    1017  221.73    1017  222.26 1016.85  229.23 1016.85
   229.7 1016.85  233.45    1017  233.59 1017.08  235.02 1017.06  237.31 1017.06
  242.56  1017.2  246.23 1017.12  247.19 1017.09  248.98 1016.85  249.73 1016.85
  250.57 1016.84  259.96 1016.65  260.27 1016.64  262.95  1016.3  265.06 1016.03
  265.28    1016   268.5  1016.1  269.11 1016.11  271.78 1015.76  274.76 1016.02
  276.61 1016.12  277.57 1016.34  291.41 1016.43  291.98 1016.43  302.38 1016.43
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  322.44 1017.66  325.82 1019.11  328.06 1019.25  328.44 1019.93  328.58 1019.93
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  373.06 1028.03  373.23 1028.01  379.76    1028  379.93 1027.58  380.39 1027.48
  381.18 1027.47  398.61 1027.18  398.83 1027.46  399.72 1027.46  401.04 1027.24
  409.33 1027.01  409.43    1027  409.77    1027  409.97    1027  410.27 1026.87
   417.2 1026.78  419.15 1026.75  431.52    1026  432.69    1026  461.64  1025.5
  477.14 1025.11  479.07 1025.08  488.98 1024.79  508.53 1024.81  515.06 1024.94
  515.09 1024.94

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042  112.49    .035  362.15    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        112.49  362.15           368.55  368.55  368.55             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
```

```
       0  104.79 1030.75       F
  366.55  515.09 1031.44       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 2700

INPUT
Description:
Station Elevation Data    num=     237
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.13     .14 1029.13    4.23 1029.07       5 1029.01   10.32 1028.86
   11.83 1028.81   12.69 1028.78   18.51 1028.71   19.17 1028.12   19.32    1028
   20.19 1028.17   20.61 1028.18   22.13 1025.83   23.25 1024.11   24.92 1024.04
   25.12 1024.12   25.26    1024   26.92    1023    27.7 1022.57   28.72 1021.48
   29.69 1021.05   30.42 1021.04   31.76    1020   32.14 1019.14   33.62 1019.09
   33.77    1019   33.96    1019   35.44    1018   35.73 1017.82   37.08 1016.86
   37.84 1016.87    38.1 1016.55   40.08 1016.39   42.59 1016.43   44.76 1016.87
   45.39 1017.16   45.66 1017.16   46.95 1017.18   51.88  1017.2   57.88 1017.27
   66.75 1017.18    75.9 1017.01   76.25  1017.3   84.95  1017.3   88.66  1017.3
   88.74  1017.3   88.83  1017.3   94.98 1017.08    95.2 1017.06   95.42 1017.01
   95.56 1017.08   98.54 1016.84  101.41  1016.4  102.21  1016.4  105.16  1016.4
  105.41  1016.4  106.03 1016.44  107.64 1016.54  108.83 1016.57  109.25 1016.62
  110.41 1016.85  115.25 1016.96  117.16 1016.99  118.51    1017  122.34 1017.06
  126.95 1017.06  131.55 1017.04  131.89 1017.06  131.94 1017.06  132.23 1017.06
  134.02 1017.03  136.51 1016.85  139.01    1017  141.51    1017   141.9    1017
  143.02 1017.06  143.11  1017.1   143.4 1017.09  144.47    1017  147.78    1017
  151.77 1017.01  153.37 1017.01  159.53 1017.03  163.51 1017.06  163.76 1017.06
  164.07 1017.03  165.32 1016.87  166.73 1016.64  167.37 1016.64  167.56 1016.68
  167.65 1016.71  168.21 1016.99  169.33 1016.99  169.67 1016.98  170.77 1016.97
  173.24 1016.85  174.73 1016.85  176.11 1016.64  177.85 1016.76  178.84 1016.98
  180.93 1017.01  182.25 1016.96  183.07 1016.97  183.65 1016.85  184.94 1016.85
  188.61 1016.85  192.34 1016.82  193.81  1016.8  196.69 1016.67  199.92 1016.54
  202.35 1016.43  207.39 1016.43  214.26 1016.43  215.27 1016.01  215.77 1016.01
  219.24 1016.31  220.57 1016.05  221.16    1016  221.41 1015.97  224.07 1015.67
  224.36 1015.61  224.55 1016.08  224.74 1016.08  225.07 1016.09  225.45 1015.65
  225.64 1015.63  230.59 1015.77  231.28 1015.85  233.56 1015.89  238.41 1015.99
  238.78    1016  238.97 1016.01  239.06 1016.01  239.22 1016.01   240.6 1016.01
  240.64    1016     241    1016  250.37    1016  251.13    1016  251.52    1016
  252.97    1016  254.16    1016  259.98 1015.99  261.48 1015.99   263.2    1016
  267.88    1016   269.9    1016  270.13    1016  270.68 1016.01  271.96 1016.01
  275.58 1015.97  295.22 1015.58  299.17 1015.39  299.25 1015.38  302.89 1015.45
  313.41 1015.64  314.56 1015.69  321.28 1015.58  323.93 1015.06  325.77    1015
  328.14    1015  331.75 1014.69  336.51 1014.54  343.17 1014.83  347.19 1015.58
  348.69 1016.52  350.57    1017   352.3    1017  352.87 1017.33  353.51 1017.71
  358.67    1019  361.04 1019.06  362.12    1020   362.4    1020  364.14    1021
  366.01    1021  367.59    1021  369.55 1022.13  370.01 1022.14  370.04 1022.53
  370.79    1023   371.7    1023  373.21 1023.78  375.06  1024.3  375.44 1025.24
  377.07 1025.63  377.24 1025.63  378.57    1026  379.06    1027   380.5 1027.79
  380.88    1028  381.28 1028.93  382.87 1028.93  382.96 1028.95  383.19    1029
  384.08    1029  384.41 1029.19  385.06 1029.26   398.9 1029.24  399.84 1029.24
  401.26 1029.23  403.45  1029.5  404.26 1029.51  407.47 1029.68  407.71 1029.52
  413.47 1029.09  413.56 1029.18  413.73 1029.17  415.56 1029.01  415.59    1029
  416.02    1029  419.62 1028.91  435.31 1028.22  441.66 1027.98  446.23 1027.86
  446.78 1027.83  446.91 1027.83  447.07 1027.83  447.31 1027.83  447.91  1027.7
  448.84 1027.69  467.31 1027.41  471.93 1027.28  475.22 1027.31  476.71 1027.25
  480.48  1027.1  481.05 1026.99  481.16 1027.01  485.66 1026.93  487.11 1026.81
  487.85 1026.79  488.29 1026.77  498.29    1026  498.48    1026   509.2 1026.24
  512.25 1026.31  512.86 1026.31

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   11.83    .035  399.84    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         11.83  399.84           161.15  161.15  161.15             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    9.83 1036.11       F
  404.34  512.86 1037.18       F

CROSS SECTION


RIVER: Murrieta Creek
```

REACH: Main - EC RS: 2540

INPUT
Description:
Station Elevation Data num= 177

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1027.4	64.26	1027.45	72.65	1028	75.81	1028.85	75.96	1028.85
78.08	1028.86	79.61	1028.82	88.99	1028.62	96.92	1028	98.21	1027.39
98.69	1027.39	98.94	1027.6	101.81	1027.6	107.28	1021	107.69	1021
107.75	1021	108.96	1020.02	111.31	1018.99	112.47	1018.24	112.86	1018
113.48	1017	114.58	1016	115.45	1016	117.38	1015.63	127.91	1016
131.17	1016.01	136.33	1016.04	141.88	1016.04	142.88	1015.99	143.1	1015.98
144.69	1015.98	146.93	1016.01	148.73	1016.01	155.85	1016.17	156.24	1016.22
156.32	1016.22	157.87	1016	159.76	1015.83	160.78	1016.03	162.33	1016.03
163.12	1016.21	165.07	1016.22	165.13	1016.22	165.31	1016.22	168.26	1016.09
174.03	1015.68	185.91	1015.86	192.96	1016	194.46	1016.01	199.31	1016.32
205.07	1016.43	205.79	1016.43	210.28	1016.43	217.07	1016.39	217.93	1016.45
221.08	1016.42	225.97	1016.52	226.26	1016.53	226.79	1016.43	227.06	1016.41
228.26	1016.43	239.03	1016.43	240.58	1016.43	242.2	1016.43	244.61	1016.04
245.01	1016	245.47	1016	246.06	1016	247.28	1016.31	250.77	1016.41
252.77	1016.41	254.32	1016.41	255.68	1016.46	258.17	1016.36	260.31	1016.4
262.05	1016.47	264.66	1016.34	265.87	1016.22	267.39	1016.38	267.45	1016.39
267.49	1016	268.26	1015.8	268.54	1015.8	269.01	1015.86	270.99	1015.77
271.82	1015.77	273.72	1015.9	276.35	1015.79	281.52	1015.75	301.04	1015.5
304.31	1015.77	305.37	1015.73	310.97	1015.38	314.26	1015.38	315.47	1015.13
315.76	1015.05	316.04	1015	317.21	1015	335.18	1014.97	335.37	1015
336.13	1015.17	336.42	1015.03	336.51	1015.17	337.04	1015.17	345.18	1015.18
347.16	1015	347.89	1015	349.16	1015	353.22	1015.05	353.7	1015.06
356.29	1014.67	358.13	1014.12	361.89	1014.12	367.26	1014.22	367.62	1014.29
368.3	1014.27	369.25	1014.2	372.67	1014.05	373.47	1014.02	374.54	1014.01
375.2	1014	377.02	1014.14	382.29	1014.92	384.58	1015.33	386.88	1016.2
387.56	1016.55	389.98	1016.73	391.96	1017.74	392.66	1018.41	393.82	1018.43
395.22	1019.01	395.55	1019.54	397.34	1019.14	397.54	1020	398.09	1021
400.02	1021	401.13	1022	402.54	1022	402.91	1022	405.27	1022.55
406.08	1023	407.2	1023.69	408.15	1024.2	408.78	1024.34	411.18	1024.51
412.29	1025	413.2	1025.53	414.78	1026.82	415.13	1027.81	416.92	1027.93
419.23	1029	419.45	1029	419.59	1029.28	421.84	1029.22	422.71	1029.22
433.37	1029.29	438.19	1029.32	439.01	1029.31	439.87	1029.29	440.37	1029.27
444.75	1029.13	448.13	1029.05	448.72	1028.98	450.92	1028.9	451.75	1028.76
455.08	1028.74	463.87	1028.45	465.47	1028.44	470	1028.33	477.86	1028.28
483	1028.27	507.17	1027.56	532.89	1027.28	532.92	1027	541.46	1026.77
553.24	1026.95	555.53	1026.99						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	88.99	.035	422.71	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88.99	422.71	141.07	141.07	141.07	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	80.45	1038.47	F
426.35	555.53	1039.09	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 2399

INPUT
Description:
Station Elevation Data num= 261

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1029.02	.23	1028.98	22.55	1029.59	23.49	1029.5	29.83	1029.6
33.36	1029.58	33.69	1029.59	33.73	1029.58	33.77	1029.58	33.91	1029.57
41.61	1029.17	41.98	1029.29	42.25	1029.26	43.21	1029.26	49.37	1029.6
61.96	1029.33	67.52	1029.59	75.64	1029.59	77.95	1029.5	78.56	1029.59
78.95	1029.59	80.71	1029.57	101.89	1029.93	102.08	1029.93	102.59	1029.93
104.77	1029.9	115.26	1030.79	116.8	1030.25	119.69	1029.24	120.83	1029.24
122.96	1029.24	123.62	1029.24	125.75	1029.48	131.99	1029.18	134.02	1029.03
134.12	1029.36	134.22	1029.36	134.97	1029.19	136.87	1029.18	137.5	1027.61
138.31	1027	139.14	1027	139.63	1026.37	140.72	1025.17	140.93	1025.04
142.25	1024.17	142.51	1024	143.94	1023.76	144.07	1023.76	144.97	1022
145.6	1022	146	1022.41	147.06	1022.4	147.86	1020.45	151.62	1018.31
152.19	1017.66	153.31	1018.1	153.87	1018.08	155.01	1016	155.51	1015.7
156.52	1015	156.7	1015	157.89	1014.55	160.65	1014.3	163.52	1014.3

```
  166.77 1014.99  166.91    1015  168.47    1015  169.73 1015.04  174.96 1015.24
  175.49 1015.26  175.61 1015.29  176.63 1015.35  177.29 1015.35  187.57 1015.35
  197.06 1015.35  197.74 1015.35  198.81    1015  199.84    1015  202.28 1015.05
  204.27 1015.14     206 1015.01   207.5 1015.52  216.13 1015.39  218.13 1015.35
  218.67 1015.35  218.89 1015.35  219.07 1015.35  219.55 1015.35  223.49 1015.19
  228.85    1015   228.9    1015  228.92    1015   229.7 1015.71  233.05  1015.7
  237.76 1015.79  241.62 1015.89  244.67 1015.89   244.7 1015.77   247.2 1015.32
  249.06 1014.98  249.27 1014.62  250.97 1014.62  253.39 1014.62  254.25 1014.62
  255.42 1014.53  257.59 1014.61  258.02  1014.6  259.06 1015.71  259.56 1015.71
  260.91 1015.28  262.15 1015.71  273.22 1015.95   279.3 1015.93   280.1 1015.93
  283.81 1015.57  286.47 1015.56  289.48 1015.25  296.41 1015.17  296.49 1015.17
  296.58 1015.17  299.33 1015.29  300.84    1015  303.68    1015  305.77 1014.84
  306.25 1014.84  310.77 1014.76  310.94 1014.54  318.89 1014.44  320.47 1014.44
  320.83 1014.04     321 1014.07  321.12 1014.06  321.59 1013.96  322.47 1013.81
  322.87 1013.86  323.17 1014.57  323.53 1013.81  324.05 1013.83  325.26 1013.87
  326.29 1014.12  327.45 1014.26  329.05 1014.26  332.89 1014.22  335.16 1014.18
   336.4 1014.19  339.61 1014.08  340.84 1014.34  341.17 1014.26  341.57 1014.26
  343.27 1014.43  344.09 1014.43   344.2  1014.3  346.26 1014.52  346.72 1015.18
  347.19 1015.35  351.46 1015.35  352.76 1015.36   356.6 1015.14  359.12 1015.09
  360.97 1014.88  361.06 1014.87  361.13 1014.88  361.24 1014.66  363.03  1014.4
  363.29    1014  365.04    1014  365.89 1014.02   366.1 1014.06  366.93 1013.98
  370.65 1013.68  374.41  1013.9  374.54  1013.9  374.82    1014  375.76    1014
  375.92    1014  376.04 1013.81  379.33 1013.53  380.89 1013.37   383.7 1013.37
  387.15 1013.37  389.22 1013.45  389.96 1013.48  393.61 1013.89  396.28 1013.89
  406.93 1013.89  412.86 1013.98  414.09 1013.98  414.81 1014.01  418.93 1014.02
  421.31 1014.08  421.99    1015  423.69 1015.51  424.89 1015.85  425.76 1016.29
  426.38 1016.29   427.7 1017.96  428.17 1017.96  429.18 1017.31  429.37  1017.8
  429.53 1018.07  429.84    1018  430.81 1018.63  431.36 1019.35  432.31 1019.41
  432.88 1019.63  433.78    1020  435.91 1021.58  436.87    1022  437.43 1023.41
  439.86  1024.8  440.12  1024.8  440.35 1025.83  441.23 1025.85  442.61    1027
  442.78 1027.68  444.57 1027.55  445.42 1027.81  445.98    1028  447.93 1028.64
  449.04    1029  453.28 1029.26  454.22 1029.45  459.09 1029.67  461.93 1029.67
  468.98 1029.67  474.81 1029.65  483.23  1029.2  493.97    1029  497.21    1029
  498.15 1028.98  498.65 1028.98  499.98 1028.97  502.45 1028.97  507.32 1029.13
  511.95  1029.1   521.3 1028.72  522.22 1028.48  529.56 1028.43  537.05 1028.04
  539.33 1028.03  540.17 1028.04  540.36    1028  540.72    1028  540.97    1028
  543.29    1028  544.09 1027.92  544.36 1027.91  552.82  1027.6  559.36  1027.6
  559.55  1027.6  567.27 1027.21  570.03 1027.23  571.43 1027.26  571.66 1027.46
  576.73 1027.46  579.79 1027.46  584.15 1027.51   593.7 1027.44  595.27 1027.44
  596.93 1027.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   116.8    .035  461.93    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         116.8  461.93           103.93  103.93  103.93             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  110.61  1047.8       F
  467.29  596.93  1049.8       F

BRIDGE


RIVER: Murrieta Creek
REACH: Main - EC          RS: 2343

INPUT
Description: Winchester Road
Distance from Upstream XS =       5
Deck/Roadway Width        =      84
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   117.5    1030  1028.2     135    1031    1029     280    1033    1030
     280    1033    1030     446    1031    1029   452.5    1030  1028.2

Upstream Bridge Cross Section Data
Station Elevation Data    num=     261
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.02     .23 1028.98   22.55 1029.59   23.49  1029.5   29.83  1029.6
   33.36 1029.58   33.69 1029.59   33.73 1029.58   33.77 1029.58   33.91 1029.57
   41.61 1029.17   41.98 1029.29   42.25 1029.26   43.21 1029.26   49.37  1029.6
   61.96 1029.33   67.52 1029.59   75.64 1029.59   77.95  1029.5   78.56 1029.59
   78.95 1029.59   80.71 1029.57  101.89 1029.93  102.08 1029.93  102.59 1029.93
```

104.77	1029.9	115.26	1030.79	116.8	1030.25	119.69	1029.24	120.83	1029.24
122.96	1029.24	123.62	1029.24	125.75	1029.48	131.99	1029.18	134.02	1029.03
134.12	1029.36	134.22	1029.36	134.97	1029.19	136.87	1029.18	137.5	1027.61
138.31	1027	139.14	1027	139.63	1026.37	140.72	1025.17	140.93	1025.04
142.25	1024.17	142.51	1024	143.94	1023.76	144.07	1023.76	144.97	1022
145.6	1022	146	1022.41	147.06	1022.4	147.86	1020.45	151.62	1018.31
152.19	1017.66	153.31	1018.1	153.87	1018.08	155.01	1016	155.51	1015.7
156.52	1015	156.7	1015	157.89	1014.55	160.65	1014.3	163.52	1014.3
166.77	1014.99	166.91	1015	168.47	1015	169.73	1015.04	174.96	1015.24
175.49	1015.26	175.61	1015.29	176.63	1015.35	177.29	1015.35	187.57	1015.35
197.06	1015.35	197.74	1015.35	198.81	1015	199.84	1015	202.28	1015.05
204.27	1015.14	206	1015.01	207.5	1015.52	216.13	1015.39	218.13	1015.35
218.67	1015.35	218.89	1015.35	219.07	1015.35	219.55	1015.35	223.49	1015.19
228.85	1015	228.9	1015	228.92	1015	229.7	1015.71	233.05	1015.7
237.76	1015.79	241.62	1015.89	244.67	1015.89	244.7	1015.77	247.2	1015.32
249.06	1014.98	249.27	1014.62	250.97	1014.62	253.39	1014.62	254.25	1014.62
255.42	1014.53	257.59	1014.61	258.02	1014.6	259.06	1015.71	259.56	1015.71
260.91	1015.28	262.15	1015.71	273.22	1015.95	279.3	1015.93	280.1	1015.93
283.81	1015.57	286.47	1015.56	289.48	1015.25	296.41	1015.17	296.49	1015.17
296.58	1015.17	299.33	1015.29	300.84	1015	303.68	1015	305.77	1014.84
306.25	1014.84	310.77	1014.76	310.94	1014.54	318.89	1014.44	320.47	1014.44
320.83	1014.04	321	1014.07	321.12	1014.06	321.59	1013.96	322.47	1013.81
322.87	1013.86	323.17	1014.57	323.53	1013.81	324.05	1013.83	325.26	1013.87
326.29	1014.12	327.45	1014.26	329.05	1014.26	332.89	1014.22	335.16	1014.18
336.4	1014.19	339.61	1014.08	340.84	1014.34	341.17	1014.26	341.57	1014.26
343.27	1014.43	344.09	1014.43	344.2	1014.3	346.26	1014.52	346.72	1015.18
347.19	1015.35	351.46	1015.35	352.76	1015.36	356.6	1015.14	359.12	1015.09
360.97	1014.88	361.06	1014.87	361.13	1014.88	361.24	1014.66	363.03	1014.4
363.29	1014	365.04	1014	365.89	1014.02	366.1	1014.06	366.93	1013.98
370.65	1013.68	374.41	1013.9	374.54	1013.9	374.82	1014	375.76	1014
375.92	1014	376.04	1013.81	379.33	1013.53	380.89	1013.37	383.7	1013.37
387.15	1013.37	389.22	1013.45	389.96	1013.48	393.61	1013.89	396.28	1013.89
406.93	1013.89	412.86	1013.98	414.09	1013.98	414.81	1014.01	418.93	1014.02
421.31	1014.08	421.99	1015	423.69	1015.51	424.89	1015.85	425.76	1016.29
426.38	1016.29	427.7	1017.96	428.17	1017.96	429.18	1017.31	429.37	1017.8
429.53	1018.07	429.84	1018	430.81	1018.63	431.36	1019.35	432.31	1019.41
432.88	1019.63	433.78	1020	435.91	1021.58	436.87	1022	437.43	1023.41
439.86	1024.8	440.12	1024.8	440.35	1025.83	441.23	1025.85	442.61	1027
442.78	1027.68	444.57	1027.55	445.42	1027.81	445.98	1028	447.93	1028.64
449.04	1029	453.28	1029.26	454.22	1029.45	459.09	1029.67	461.93	1029.67
468.98	1029.67	474.81	1029.65	483.23	1029.2	493.97	1029	497.21	1029
498.15	1028.98	498.65	1028.98	499.98	1028.97	502.45	1028.97	507.32	1029.13
511.95	1029.1	521.3	1028.72	522.22	1028.48	529.56	1028.43	537.05	1028.04
539.33	1028.03	540.17	1028.04	540.36	1028	540.72	1028	540.97	1028
543.29	1028	544.09	1027.92	544.36	1027.91	552.82	1027.6	559.36	1027.6
559.55	1027.6	567.27	1027.21	570.03	1027.23	571.43	1027.26	571.66	1027.46
576.73	1027.46	579.79	1027.46	584.15	1027.51	593.7	1027.44	595.27	1027.44
596.93	1027.46								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	116.8	.035	461.93	.042

Bank Sta: Left	Right	Coeff Contr.	Expan.
116.8	461.93	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	110.61	1047.8	F
467.29	596.93	1049.8	F

Downstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
110	1030	1028.2	115	1031	1029	270	1033	1030
270	1033	1030	427	1031	1029	434	1030	1028.2

Downstream Bridge Cross Section Data
Station Elevation Data num= 265

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1029.69	.27	1029.69	3.98	1029.77	9.71	1029.77	12.09	1029.77
18.45	1030	19.68	1030.12	23.19	1030.12	26.48	1030.07	30	1030.12
31.88	1030.12	33.85	1030.26	41.44	1030.27	45.05	1030.29	55.06	1030.29
58.32	1030.29	65.21	1030.29	67.57	1030.29	69.59	1030.38	71.02	1030.38
72.13	1030.39	73.33	1030.41	75.79	1030.29	76.38	1030	76.62	1029.98
77.61	1030.07	86.22	1029.73	87.53	1029.65	90.23	1029.65	91.49	1029.79
92.3	1029.79	95.36	1029.51	98.27	1029.43	107.35	1029.18	110.91	1029
111.16	1029	119.42	1026	120.71	1025.12	122.34	1023.99	122.46	1024.03

```
   123.84 1024.01  124.24 1022.73  125.35 1022.73     126 1021.57  126.85    1021
   127.66    1020  128.36 1019.88  128.54 1019.75  128.74 1019.75  129.57    1019
   129.99    1019  130.92 1018.45  131.67 1017.28  132.97 1017.23  133.35 1016.39
   134.32  1016.3  135.04    1016  135.15    1016  136.73    1015  138.68 1014.99
   140.04 1014.99  140.32 1014.99  140.63 1015.01  140.72 1015.11  141.06 1015.02
   141.74 1014.76  141.85 1015.17  143.02 1015.19  153.55 1014.87  158.02 1014.85
   161.64 1015.02  163.12 1014.72  165.38 1014.65  167.91  1014.4  168.84 1014.19
   172.28 1014.08  174.96  1014.2  176.63 1014.81  180.46 1014.82  186.54 1014.79
   188.64  1014.8  189.42 1014.81  191.22 1014.81   193.3 1014.81  194.56 1014.81
   197.18 1014.71  198.54 1014.44  202.49 1014.44  203.17 1014.43   204.6 1014.43
   204.67 1014.43  204.79 1014.43  205.87 1014.55  206.58 1014.57  208.59 1014.66
   209.94 1014.91  210.98 1015.14  212.96 1015.17  215.12 1015.17  216.17 1015.17
   217.36 1015.17  220.33 1015.21  222.65 1015.11  222.89  1015.1   223.2 1015.12
    226.1 1015.05  226.42 1014.99  226.47  1014.8  226.72  1014.8  227.16 1014.89
   227.76 1014.94  230.56 1014.52  233.15 1015.08  233.25 1015.08  235.36    1015
   235.81    1015  238.31 1014.78  239.32 1014.48  242.42 1015.01   243.2 1015.13
   243.37 1015.23  246.07 1015.23   249.8 1015.35  252.11 1015.53  252.84 1015.53
   254.59 1015.53  260.82 1015.42   264.7 1015.35  267.76 1015.32  270.64  1015.3
   272.83 1015.22  275.23  1015.1  278.69 1014.92   280.7    1015  281.51    1015
   283.59 1015.21     285 1015.18  285.44 1015.01  290.77 1015.01  291.68 1015.09
   295.54 1015.11  296.53 1015.44  299.65 1015.44  304.54 1015.37  305.42 1015.01
   307.77 1015.01  308.93    1015  308.98    1015  311.26 1014.08  313.79 1014.77
   318.61 1014.08  321.21 1014.19  322.35 1014.22   324.6  1014.2  326.13 1014.26
   329.14 1014.26  339.84 1014.17  346.93 1014.08     351 1014.08  351.81 1014.08
   352.25  1014.2  352.58 1014.18  355.23    1014   363.3    1014  363.37 1013.37
   363.51 1013.37  363.96 1013.37  368.71 1013.37  374.34 1013.65  376.21 1013.77
   377.77 1013.75   379.6  1013.9   380.6 1013.88  385.29 1013.37  385.57 1013.37
   387.14 1013.85  387.24 1013.98  387.84 1013.92  389.78 1013.61  390.47 1013.54
   391.01 1013.55  392.55 1013.43  392.63 1013.42  392.77 1013.41  393.45 1013.37
   396.28 1013.37  397.62 1013.37  398.99 1013.37  399.99 1013.37  400.17 1013.37
   400.29 1013.43  401.29 1013.65  402.72 1014.06  403.65 1014.21  403.85 1014.23
   405.12 1014.34  405.37 1014.86  406.81    1016  407.25    1016  407.94    1016
   409.08    1017  410.31 1017.78  410.85    1018  411.99    1018  412.42    1019
   412.82    1020  414.03    1020     415 1020.61  415.63 1022.91  416.31 1022.91
    419.4 1025.34  420.34 1025.39  424.93    1027  425.16    1027  426.05 1028.42
   426.35 1028.43   427.6    1028  428.01    1028  428.55 1028.92  431.38 1028.78
   431.75 1028.81  432.17    1029  438.34    1029   439.4 1028.96  440.26 1029.02
   440.41 1029.03  447.75 1029.39  448.07 1029.41  448.39 1029.41  449.13 1029.32
   450.19  1029.3  453.08 1029.26   459.7 1029.12  460.57 1029.01  461.25    1029
    463.6    1029  465.55    1029  465.96 1028.99  466.13 1028.99  467.13 1028.84
    469.7 1028.84  483.25 1028.95  485.32 1028.18  485.52    1028  487.24    1028
   494.17 1028.04  495.72    1028  497.44 1027.97  497.93 1027.97  499.87 1027.84
    502.1 1028.09  503.26 1028.08  506.45 1027.71  514.39 1027.39  517.03 1027.18
   519.41 1027.12  521.02 1027.12  523.23  1027.1  525.66 1027.05  527.97 1026.88
    531.7 1027.02  532.69 1027.03  559.93 1026.51  568.43  1026.5  577.23  1026.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   98.27    .035  440.26    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
         98.27  440.26             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   92.45 1052.63       F
  446.22  577.23 1054.89       F

Upstream Embankment side slope             =       3 horiz. to 1.0 vertical
Downstream Embankment side slope           =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Piers =  4

Pier Data
Pier Station     Upstream=     190    Downstream=     175
Upstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035
Downstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035

Pier Data
```

```
Pier Station     Upstream=     255    Downstream=     240
Upstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035
Downstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035

Pier Data
Pier Station     Upstream=     320    Downstream=     305
Upstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035
Downstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035

Pier Data
Pier Station     Upstream=     385    Downstream=     370
Upstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035
Downstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
       Yarnell                KVal =    1.05
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 2295

INPUT
Description:
Station Elevation Data    num=     265
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.69     .27 1029.69    3.98 1029.77    9.71 1029.77   12.09 1029.77
   18.45    1030   19.68 1030.12   23.19 1030.12   26.48 1030.07      30 1030.12
   31.88 1030.12   33.85 1030.26   41.44 1030.27   45.05 1030.29   55.06 1030.29
   58.32 1030.29   65.21 1030.29   67.57 1030.29   69.59 1030.38   71.02 1030.38
   72.13 1030.39   73.33 1030.41   75.79 1030.29   76.38    1030   76.62 1029.98
   77.61 1030.07   86.22 1029.73   87.53 1029.65   90.23 1029.65   91.49 1029.79
    92.3 1029.79   95.36 1029.51   98.27 1029.43  107.35 1029.18  110.91    1029
  111.16    1029  119.42    1026  120.71 1025.12  122.34 1023.99  122.46 1024.03
  123.84 1024.01  124.24 1022.73  125.35 1022.73     126 1021.57  126.85    1021
  127.66    1020  128.36 1019.88  128.54 1019.75  128.74 1019.75  129.57    1019
  129.99    1019  130.92 1018.45  131.67 1017.28  132.97 1017.23  133.35 1016.39
  134.32  1016.3  135.04    1016  135.15    1016  136.73    1015  138.68 1014.99
  140.04 1014.99  140.32 1014.99  140.63 1015.01  140.72 1015.11  141.06 1015.02
  141.74 1014.76  141.85 1015.17  143.02 1015.19  153.55 1014.87  158.02 1014.85
  161.64 1015.02  163.12 1014.72  165.38 1014.65  167.91  1014.4  168.84 1014.19
  172.28 1014.08  174.96  1014.2  176.63 1014.81  180.46 1014.82  186.54 1014.79
  188.64  1014.8  189.42 1014.81  191.22 1014.81   193.3 1014.81  194.56 1014.81
  197.18 1014.71  198.54 1014.44  202.49 1014.44  203.17 1014.43   204.6 1014.43
  204.67 1014.43  204.79 1014.43  205.87 1014.55  206.58 1014.57  208.59 1014.66
  209.94 1014.91  210.98 1015.14  212.96 1015.17  215.12 1015.17  216.17 1015.17
  217.36 1015.17  220.33 1015.21  222.65 1015.11  222.89  1015.1   223.2 1015.12
   226.1 1015.05  226.42 1014.99  226.47  1014.8  226.72  1014.8  227.16 1014.89
  227.76 1014.94  230.56 1014.52  233.15 1015.08  233.25 1015.08  235.36    1015
```

235.81	1015	238.31	1014.78	239.32	1014.48	242.42	1015.01	243.2	1015.13
243.37	1015.23	246.07	1015.23	249.8	1015.35	252.11	1015.53	252.84	1015.53
254.59	1015.53	260.82	1015.42	264.7	1015.35	267.76	1015.32	270.64	1015.3
272.83	1015.22	275.23	1015.1	278.69	1014.92	280.7	1015	281.51	1015
283.59	1015.21	285	1015.18	285.44	1015.01	290.77	1015.01	291.68	1015.09
295.54	1015.11	296.53	1015.44	299.65	1015.44	304.54	1015.37	305.42	1015.01
307.77	1015.01	308.93	1015	308.98	1015	311.26	1014.08	313.79	1014.77
318.61	1014.08	321.21	1014.19	322.35	1014.22	324.6	1014.2	326.13	1014.26
329.14	1014.26	339.84	1014.17	346.93	1014.08	351	1014.08	351.81	1014.08
352.25	1014.2	352.58	1014.18	355.23	1014	363.3	1014	363.37	1013.37
363.51	1013.37	363.96	1013.37	368.71	1013.37	374.34	1013.65	376.21	1013.77
377.77	1013.75	379.6	1013.9	380.6	1013.88	385.29	1013.37	385.57	1013.37
387.14	1013.85	387.24	1013.98	387.84	1013.92	389.78	1013.61	390.47	1013.54
391.01	1013.55	392.55	1013.43	392.63	1013.42	392.77	1013.41	393.45	1013.37
396.28	1013.37	397.62	1013.37	398.99	1013.37	399.99	1013.37	400.17	1013.37
400.29	1013.43	401.29	1013.65	402.72	1014.06	403.65	1014.21	403.85	1014.23
405.12	1014.34	405.37	1014.86	406.81	1016	407.25	1016	407.94	1016
409.08	1017	410.31	1017.78	410.85	1018	411.99	1018	412.42	1019
412.82	1020	414.03	1020	415	1020.61	415.63	1022.91	416.31	1022.91
419.4	1025.34	420.34	1025.39	424.93	1027	425.16	1027	426.05	1028.42
426.35	1028.43	427.6	1028	428.01	1028	428.55	1028.92	431.38	1028.78
431.75	1028.81	432.17	1029	438.34	1029	439.4	1028.96	440.26	1029.02
440.41	1029.03	447.75	1029.39	448.07	1029.41	448.39	1029.41	449.13	1029.32
450.19	1029.3	453.08	1029.26	459.7	1029.12	460.57	1029.01	461.25	1029
463.6	1029	465.55	1029	465.96	1028.99	466.13	1028.99	467.13	1028.84
469.7	1028.84	483.25	1028.95	485.32	1028.18	485.52	1028	487.24	1028
494.17	1028.04	495.72	1028	497.44	1027.97	497.93	1027.97	499.87	1027.84
502.1	1028.09	503.26	1028.08	506.45	1027.71	514.39	1027.39	517.03	1027.18
519.41	1027.12	521.02	1027.12	523.23	1027.1	525.66	1027.05	527.97	1026.88
531.7	1027.02	532.69	1027.03	559.93	1026.51	568.43	1026.5	577.23	1026.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	98.27	.035	440.26	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
98.27	440.26	272.93	272.93	272.93	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	92.45	1052.63	F
446.22	577.23	1054.89	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 2022

INPUT
Description:
Station Elevation Data num= 204

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1026.88	4.38	1026.88	20.26	1026.88	26.3	1026.98	36.49	1026.9
43.12	1027.03	43.52	1027.03	44.18	1026.95	46.88	1026.95	49.17	1026.56
50.83	1025.16	50.88	1025	52.45	1024.97	53.43	1024.97	62.6	1024.35
68.31	1024.28	68.5	1024.27	71.04	1024	74.19	1022	76.31	1021.1
77.77	1020	78.63	1019	78.82	1019	79.61	1019	80.06	1018.15
80.35	1017	81.69	1017	82.25	1017	83.28	1016	85.69	1014.48
86.45	1014	92.23	1013.46	93.58	1013.35	96.18	1013.53	100.4	1013.61
101.99	1013.8	103.51	1013.85	105.79	1013.71	107.53	1013.28	108.94	1013.42
111.62	1013.83	113.99	1013.83	116.7	1013.65	120.04	1013.71	124.79	1014
128.54	1014	130.05	1013.57	132.64	1013.6	133.71	1013.92	134.5	1014.01
134.58	1014.08	135.23	1014.12	135.83	1014.11	142.37	1014.08	144.7	1014.26
144.85	1014.26	145.03	1014.12	148.05	1014.65	171.06	1014.97	171.89	1014.81
172.35	1014.81	177.64	1014.82	179.73	1014.62	180.73	1014.74	184.42	1014.78
184.72	1015.07	185.28	1015.06	185.85	1014.79	186.51	1014.78	200.69	1014.69
202.48	1014.62	203.7	1014.26	205.48	1014.26	209.04	1014.26	210.4	1014.26
213.44	1014.41	214.2	1014.41	216.03	1014.37	219.67	1014.27	220.13	1014.27
220.92	1014.98	225.16	1014.98	226.05	1014.99	234.47	1014.68	241.77	1014.68
244.47	1014.5	245.3	1014.5	247.9	1014.68	248.38	1014.62	250.29	1014.62
251.11	1014.63	266.47	1014.29	267.83	1014.24	271.35	1014.21	273.65	1014.05
274.48	1014	276.44	1013.97	279.73	1014	283.98	1014	284.6	1014
295.13	1014	297.39	1014.09	297.94	1014.08	299.9	1013.94	302.35	1013.74
309.17	1014	309.24	1014	309.38	1014.01	311.8	1014.17	313.44	1014.36
316.11	1014.33	316.29	1014.33	316.37	1014.33	316.48	1014.33	320.41	1014.36
320.54	1014.34	321.04	1014.24	322.09	1013.92	322.69	1014	323.09	1014
323.27	1014	325.47	1014	326.13	1014.15	327.22	1014.25	328.46	1014.23

329.12	1013.86	332.54	1013.72	334.84	1013.75	338.16	1013.76	342.5	1013.68
346.63	1013.77	349.24	1013.83	352.15	1013.84	352.46	1013.84	353.26	1014.41
354.16	1014.9	354.36	1015	354.73	1015	356.41	1016.33	357.08	1016.92
358.03	1016.92	358.35	1016.98	358.39	1016.98	360.03	1017.93	360.15	1017.93
360.59	1019	363.48	1020	363.62	1020.09	364.71	1020.09	364.98	1021
365.32	1021.22	366.48	1022	366.54	1022.04	367.91	1023	368.29	1023.82
369.34	1023.85	369.96	1024.43	379.77	1025.8	386.04	1026.02	386.54	1026.02
391.57	1026.03	393.69	1026.03	396.11	1026.07	401.02	1026.25	401.61	1026.25
401.8	1026.06	403.59	1026	404.38	1025.17	404.9	1025.07	405.72	1025.06
407.2	1024.73	407.63	1024.08	407.74	1024.08	407.83	1024.04	408.47	1023.75
408.95	1023.56	410.38	1022.87	410.71	1022.35	412.02	1022.35	419.45	1022.39
434.61	1022.39	439.16	1022.53	452.21	1022.81	467.89	1022	468.72	1022
469.79	1022.25	469.88	1022.25	471.76	1022	477.33	1021	481.26	1020.99
489.79	1021.05	496.18	1020.07	498.33	1020.01	500.76	1020.01	501.72	1020.03
506.13	1020	506.41	1020	506.75	1019.96	508.11	1019.98	510.07	1020.09
520.71	1020.37	524.25	1020.43	527.69	1020.53	529.36	1020.53		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	49.17	.035	391.57	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
49.17	391.57	284.86	284.86	284.86	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.18	1033.2	F
398.13	529.36	1034.15	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1737

INPUT
Description:
Station Elevation Data num= 234

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1026.17	3.76	1026.28	5.88	1026.51	9.22	1026.87	13.05	1027.24
15.71	1027.52	22.07	1027.94	27.52	1028.38	29.52	1028.53	32.24	1028.53
33.06	1028.52	37.36	1028.3	43.05	1028	47.87	1028	47.94	1028.09
49.25	1028	53.8	1028	56.65	1027.72	56.76	1027.72	57.51	1027.76
66.6	1027.15	68.62	1026.98	69.2	1026.42	70.38	1026.42	75.35	1026.35
77.92	1025	78.12	1025	78.78	1025	79.6	1024	80.15	1024
81.17	1022.83	81.76	1022.2	82.48	1022.67	82.61	1022.59	82.67	1022.06
83.3	1022	83.55	1021	83.69	1021	84.34	1020.64	84.68	1020.77
85.12	1020.81	85.22	1018.94	85.37	1018.22	85.84	1018.05	86	1020.19
86.06	1020.18	87.12	1018	87.27	1017.08	88.04	1017.05	88.67	1016.71
88.75	1016.01	89.53	1015.82	92.47	1015.51	92.65	1015.5	92.75	1014.81
93.18	1014.75	93.91	1014.73	94.69	1014	95.52	1013.56	95.93	1014.57
96.06	1014.57	96.1	1013.25	96.7	1013.2	98.29	1013.04	98.62	1013
99.49	1012.91	99.73	1012.91	99.89	1012.89	101.61	1012.87	105.95	1012.74
106.5	1012.67	109.75	1012.57	110.39	1012.11	110.69	1012.11	111.6	1011.65
112.83	1011.6	115.33	1011.32	116.3	1011.32	117.02	1011.44	120.52	1012.15
121.5	1012.36	122.66	1012.36	125.01	1012.36	130.46	1012.39	136.82	1012.68
138.39	1012.95	139.67	1012.99	140.28	1013.07	141.54	1013.16	142.05	1013.01
142.36	1013.01	142.54	1013.24	142.84	1013.24	165.1	1013.46	171.49	1013.54
172.15	1013.35	174.25	1013.42	174.95	1013.42	176.21	1013.45	177.25	1013.6
178.54	1013.6	179.33	1013.62	190.55	1013.51	195.09	1013.44	196.67	1013.44
198.76	1013.4	201.39	1013.28	202.82	1013.28	220.37	1013.37	235.48	1013.44
239.23	1013.44	240.55	1013.44	243.87	1013.45	244.63	1013.45	244.76	1013.45
246.89	1013.45	248.32	1013.45	248.47	1013.27	249.08	1013.27	253.14	1013.27
259.56	1013.27	263.72	1013.27	265.7	1013.27	265.83	1013.02	265.94	1013.02
266.37	1013.04	267.85	1013.27	268.52	1013.27	268.93	1013.27	270.55	1013.27
272.87	1013.27	275.12	1013.27	276.99	1013.27	278.69	1013.27	279.34	1013.27
279.91	1013.27	282.67	1013.15	283.02	1012.92	283.65	1012.92	283.89	1012.92
296.95	1012.47	298.63	1012.42	298.81	1012.42	299.36	1012.39	302.65	1013
303.18	1013	304.6	1013	304.89	1013.22	311.29	1013.27	313.2	1013.4
314.03	1013.4	314.33	1013.25	316.51	1013.27	317.08	1013.27	317.59	1013.3
319.04	1013.32	331.68	1013	331.92	1012.97	332.39	1012.92	338.79	1012.87
365.44	1012.87	366.92	1013.31	369.24	1013.44	370.51	1014.38	372.08	1014.85
372.63	1015.15	373.23	1015	373.67	1015	373.71	1015.41	373.84	1015.49
374.95	1015.63	375.67	1016.57	376.84	1016.59	377.82	1018	378.73	1018
378.91	1018	379.01	1018.15	382.26	1019.6	383.16	1020	383.79	1020.44
384.46	1021	384.79	1021	385.26	1021	385.93	1023.01	387.32	1023.06
387.37	1023.24	388.53	1023.91	388.61	1024.13	388.77	1024.13	388.81	1024.16
390.36	1024.15	393.32	1024.13	397.98	1024.06	404.45	1024.05	404.59	1024

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  405.02 1023.94  406.89 1023.62   410.5    1023  410.96  1022.9  411.06  1022.9
  413.08 1022.62  416.54 1021.85  418.09 1021.85   418.1 1022.01  418.67 1022.03
  423.28 1021.74  445.92 1020.96  449.72 1020.93  459.49 1020.75  459.62 1020.58
  464.27 1020.58  470.84 1020.62  471.62 1020.62  476.15  1020.6  488.81 1020.45
  493.76 1020.27  493.93 1020.25  506.16 1020.11  511.94 1020.45  516.77 1020.41
  517.06 1020.44   517.1 1020.58  517.25 1020.38  518.95  1020.4  526.98  1020.6
  528.14 1020.71  528.28 1020.62  533.04 1020.53  535.64 1020.68  538.27 1020.71
  538.59 1020.67  538.79 1020.67  539.49 1020.73  547.23 1020.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   37.36    .035  388.77    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         37.36  388.77           471.89  471.89  471.89             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   31.88 1034.12       F
  415.39  547.23 1033.98       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 1265

INPUT
Description:
Station Elevation Data    num=     220
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -166.1  1024.7   90.27  1024.7  129.68  1024.7  131.38    1025  132.11 1025.13
  132.27 1025.16  133.08 1025.19  142.71 1025.62  149.53  1025.1  150.71    1025
   152.1 1024.95  156.46 1024.77  157.79 1024.51  161.24    1024  161.34 1023.99
   167.1    1023   167.9 1022.86  169.88 1022.52  171.43 1022.22  172.62    1022
  177.15 1021.31   179.2    1021  179.63 1020.94  179.72 1020.93  181.49 1020.52
  183.99    1020  185.93 1019.59  188.79    1019  192.32 1018.23  193.48    1018
  194.28 1017.83  198.89 1017.08  199.35    1017  201.51 1016.63  205.56    1016
  210.98  1015.4  214.33    1015  216.08 1014.79   217.7  1014.6  222.35 1014.11
  223.48    1014  223.65 1013.98  227.96 1013.58  229.25 1013.37  231.44    1013
  232.91 1012.73  234.92 1012.42  237.33 1012.02  237.44    1012  238.53 1011.83
  238.69 1011.79  239.18 1011.82  242.83 1011.99  246.29 1011.91  250.75  1011.8
  252.67 1011.68  257.01 1011.42  269.93 1011.27  273.96 1011.28  287.44 1011.32
  292.78 1011.29  295.25 1011.28   301.9 1011.22  304.99 1011.22  305.74 1011.22
  311.56 1011.22  319.32 1011.22  323.53 1011.22  330.01 1011.31  332.74 1011.42
   333.9 1011.46  334.18 1011.47  343.54 1011.73  348.38 1011.65  349.56  1011.8
  350.99  1011.8  356.53 1011.96  359.44  1011.9  361.84 1011.94  363.52 1011.89
  366.29 1011.44  366.48 1011.42  366.53 1011.42  368.55  1011.8  371.78 1011.66
  374.28 1011.63  377.03 1011.55   381.1 1011.42  381.95 1011.49  383.96 1011.61
  385.03 1011.63  391.56  1011.8  392.07 1011.73  394.34 1011.42  396.02 1011.42
  396.88 1011.42  398.79 1011.64  400.14  1011.8  401.58 1011.75  403.74 1011.67
  405.08 1011.65  405.37 1011.67  405.39 1011.69  406.51 1011.61   408.9 1011.55
  409.87 1011.61     411 1011.61  412.21 1011.64  417.49  1011.8  419.31 1011.53
  423.62 1011.03  424.24 1011.09  424.76 1011.13  428.12 1011.55  432.76 1011.52
   436.6 1011.58  438.29 1011.58  440.54 1011.54  447.14 1011.51  452.53 1011.51
  462.15 1011.33  462.21 1011.33  462.23 1011.33  462.25 1011.33  462.49 1011.33
  477.01 1011.33  477.69 1011.46  479.12  1011.7  480.81    1012  481.44  1012.1
  485.39 1012.78  485.95 1012.93  486.22    1013  489.15 1013.76  490.09    1014
  492.02 1014.51  493.89    1015  494.18 1015.08  495.52 1015.42  495.52 1015.43
  496.51    1016  497.23 1016.42  498.24    1017  499.94 1019.39  499.94 1019.42
  503.85 1019.98  505.83 1020.27  506.67 1020.39  507.43  1020.5  508.89 1020.71
  510.06 1020.87  510.19 1020.89  510.66 1020.96  514.94 1021.82  521.55    1023
  521.86 1023.15  523.57    1024  523.87 1024.15   525.6    1025  526.32 1025.17
  530.94 1025.44   534.9  1025.5  536.91 1025.58  541.14 1025.66  547.19 1025.67
  549.32 1025.65  551.72 1025.67  571.41  1025.4  587.48 1025.35  590.27 1025.33
  609.43 1025.17  611.29 1025.15  612.17 1025.14  612.63 1025.13  621.09 1025.04
  635.01 1025.08  647.29 1025.05  652.65 1025.04  654.69 1025.04  655.17    1025
  656.72 1024.81  660.55 1024.72  666.37 1024.58   669.1 1024.51  675.43 1024.38
  687.11  1024.1  691.54    1024  691.57    1024  691.69    1024  691.71    1024
  691.72    1024  692.76    1024  699.12 1024.01  701.98    1024  706.53    1024
   707.4 1023.98  707.86 1023.98  709.37 1023.95  710.91 1023.78  711.16 1023.76
  711.21 1023.76   711.7 1023.72  713.56 1023.58  714.92 1023.13  716.96    1023
  729.99 1022.72  732.72 1022.67  736.02 1022.61  736.04 1022.61  736.06 1022.61
  736.08 1022.61   736.1 1022.61  736.13 1022.61  736.15 1022.61  736.16 1022.62
  736.18 1022.62  736.19 1022.62  736.21 1022.62   736.5 1022.58   833.9 1022.58

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

-166.1	.042	142.71	.035	534.9	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
142.71	534.9	137.3	137.3	137.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-166.1	132.3	1028.56	F
535.53	833.9	1027.76	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1130

INPUT
Description:
Station Elevation Data num= 226

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-145.41	1024.8	-.53	1024.8	160.6	1024.8	168.58	1024.6	175.21	1024.58
180.44	1024.45	187.62	1024.23	192.66	1024	194.08	1023.9	196.19	1023.75
197.73	1023.44	200.05	1023	203.53	1022.36	203.66	1022.34	203.93	1022.29
205.46	1022	208.62	1021.39	210.67	1021	211.29	1020.88	211.88	1020.79
213.77	1020.4	214.4	1020.25	215.44	1020	217.93	1019.42	219.64	1019
223.7	1018.06	223.97	1018	224.72	1017.83	227.34	1017.26	227.66	1017.19
228.96	1017	228.98	1017	229.06	1016.99	234.16	1016.2	234.18	1016.2
235.96	1016	240.92	1015.45	241.35	1015.41	244.28	1015	244.44	1014.98
244.66	1014.95	248.08	1014.48	249.94	1014.22	250.01	1014.21	251.22	1014
252.55	1013.78	256.3	1013	256.96	1012.95	257	1012.94	259.06	1012.54
260.94	1012.25	262.3	1012	263.2	1011.85	266.11	1011.33	267.8	1011.22
270.45	1011.03	270.64	1011.02	270.93	1011	273.1	1010.87	273.47	1010.82
274.06	1010.84	274.55	1010.87	274.77	1010.88	279.65	1011	279.7	1011
280.51	1011.01	280.95	1011.02	281	1010.96	281.72	1011.01	282.35	1011
286.16	1010.92	290.01	1010.84	291.08	1010.86	298.48	1010.95	301.23	1010.99
302.84	1011	303.6	1011	303.77	1011	306.64	1011.01	312.29	1011.02
315.67	1011.03	316.51	1011	316.57	1011	316.88	1010.99	320.26	1010.79
321.49	1010.79	322.71	1010.79	323.31	1010.78	324.13	1010.77	324.8	1010.76
326.37	1010.75	329.04	1010.71	332.82	1010.65	333.02	1010.71	333.91	1011
333.97	1011.02	334.59	1011.22	334.63	1011.22	339.77	1011.2	341.47	1011.19
343.46	1011.03	348.82	1011.16	350	1011.22	351.06	1011.19	352.35	1011.16
354.59	1011.1	354.76	1011.1	357.31	1011.03	360.55	1011.03	361.67	1011.03
362.12	1011.03	363.55	1011.03	363.85	1011.03	365.66	1011.03	366.06	1011.03
366.49	1011.03	369.36	1011.03	370.86	1011.03	376.23	1011.03	377.23	1011.03
378.49	1011.26	380.22	1011.42	385.75	1011.43	387.27	1011.43	408.84	1011.42
412.98	1011.42	413.54	1011.38	414.7	1011.22	418.64	1011.18	419.41	1011.15
423.58	1011.05	424.2	1011.03	424.35	1011.05	427.28	1011.53	429.66	1011.62
432.16	1011.77	432.33	1011.79	432.38	1011.79	432.58	1011.79	432.69	1011.78
436.4	1011.03	444.16	1011.2	445	1011.22	457.5	1011.19	462.01	1011.17
466.65	1011.16	471.39	1011.21	475.64	1011.11	483.49	1011.03	490.25	1011.13
492.02	1011.15	498.63	1011.6	499.32	1011.65	499.47	1011.67	499.65	1011.69
500.91	1011.73	506.58	1011.92	509.09	1012	513.09	1012.85	513.77	1013
516.88	1013.89	517.22	1014	517.48	1014.11	519.86	1015	521.48	1015.76
522.18	1016	523.87	1016.59	524.97	1017	525.52	1017.23	525.91	1017.42
526.33	1017.62	534.94	1021.26	536.52	1021.78	537.89	1022	550.49	1022.37
572.89	1023	574.71	1023.89	574.93	1024	576.74	1024.89	576.96	1025
579.99	1025.98	580.08	1026	582.07	1026.98	582.12	1027	582.52	1027
583.49	1027.01	585.57	1027.02	588.16	1027.03	614.18	1027.19	623.78	1027.14
646.51	1027	647.35	1027	647.44	1027	647.52	1027	647.71	1027
647.74	1027	675.03	1026.45	690.16	1026.15	690.55	1026.14	690.76	1026.14
697.58	1026	713.24	1025.49	719.65	1025.34	731.17	1025.08	732.51	1025.04
733.85	1025	733.89	1024.98	734.6	1024.81	736.77	1024.13	737.67	1024
738.21	1023.99	740.74	1023.97	741.95	1023.96	742.06	1023.96	746.04	1024
746.14	1024	746.75	1024	746.89	1024	747.19	1024	752.28	1024
754.02	1024	754.56	1023.79	760.13	1023.68	762.61	1023.68	763.19	1023.68
854.59	1023.68								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-145.41	.042	168.58	.035	582.07	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
168.58	582.07	131.85	131.85	131.85	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-145.41	151.57	1032.9	F
605.3	854.59	1033.36	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: 1000

INPUT
Description:
Station Elevation Data   num=   294

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-98.46	1022.62	-97.16	1022.62	-92.58	1022.62	-72.16	1022.61	-65.13	1022.61
-64.87	1022.61	-63.21	1022.6	-60.18	1022.55	-58.44	1022.53	-56.07	1022.49
-52.97	1022.42	-49.36	1022.33	-42.76	1022.13	-40.39	1022.06	-38.9	1022
-35.82	1022	-34.4	1022	-31.02	1022	-30.33	1022	-24.93	1022
-20.46	1022.08	-19	1022.1	.41	1022.27	14.97	1022.3	15.6	1022.3
17.97	1022.33	20.13	1022.48	26.53	1022.98	26.77	1023	27.74	1023
28.23	1023.01	29	1023.01	29.71	1023.01	40.79	1023.07	42.03	1023.08
42.58	1023.07	45.11	1023.07	46.86	1023.06	50.73	1023.01	50.9	1023.01
50.98	1023.01	51.07	1023.01	52.48	1023	53.29	1023	53.5	1023
53.55	1023	53.68	1023	55.18	1023	55.41	1023	57.56	1023
57.58	1023	58.1	1023	58.12	1023	60.89	1023	117.29	1023.67
119.14	1023.75	121.6	1023.89	126.23	1024	129.04	1024.07	130.44	1024.1
142.91	1024.4	149.1	1024.54	164.94	1024.89	166.09	1024.92	170.18	1025
176.24	1025.13	177.83	1025.16	184.45	1025.34	187.75	1025.41	188.06	1025.39
188.18	1025.38	188.51	1025.37	188.61	1025.37	191.84	1025.44	207.88	1025.73
212.46	1025.81	213.86	1025.84	215.34	1025.86	224.05	1026	235.62	1026.19
236.98	1026.21	238.95	1026.24	244.04	1026.33	244.51	1026.3	247.22	1026
247.65	1025.95	248.06	1025.89	250.55	1025.13	250.83	1025	253.13	1024.23
253.57	1024	254.27	1023.74	260.34	1023	260.74	1022.8	262.34	1022
263.69	1021.33	264.35	1021	267.39	1020.9	296.42	1020	297.27	1019.53
298.31	1019	299.37	1018.49	300.39	1018	301.42	1017.49	302.4	1017
303.41	1016.5	304.36	1016	305.59	1015.41	306.56	1015	308.27	1014.11
308.52	1014	308.69	1013.91	310.55	1013	311.06	1012.7	312.49	1012
313.5	1011.5	314.5	1011	314.9	1011.09	315.38	1011.13	315.75	1011
318.65	1010.12	318.69	1010.1	318.81	1010.1	318.83	1010.1	318.85	1010.1
318.88	1010.1	320.55	1010.1	320.91	1010.1	328.11	1010.1	334.22	1010.1
334.77	1010.17	337.92	1010.45	341.26	1010.29	341.94	1010.26	346.7	1010.1
348.32	1010.07	349.05	1010.21	349.64	1010.31	352.23	1010.65	352.29	1010.65
362.11	1010.82	369.81	1010.96	371.9	1011	373.43	1011	379.6	1011.03
401.54	1011.13	403.69	1011.14	403.95	1011.14	404.15	1011.14	405.19	1011.15
405.41	1011.15	405.43	1011.15	405.57	1011.15	405.65	1011.15	409.57	1011.11
411.44	1011.08	412.74	1011.15	439.26	1011.15	451.64	1011.28	452.43	1011.4
454.01	1011.5	454.17	1011.51	457.97	1011.51	458.54	1011.51	459.96	1011.51
479.05	1011.64	479.85	1011.64	484.37	1011.66	485.18	1011.5	486.66	1011.15
487.69	1011.31	489.27	1011.43	493.5	1011.23	494.53	1011.16	495.36	1011.13
498.33	1011.02	498.65	1011.01	498.76	1011.01	499.13	1011	499.69	1010.98
501.25	1010.93	501.9	1010.89	502.64	1010.86	503.6	1010.84	514.76	1010.84
514.97	1010.84	520.13	1010.84	523.57	1010.84	528.05	1010.82	529.06	1010.82
539.64	1010.95	540.61	1010.98	540.82	1011	540.94	1011	540.96	1011
550.58	1011.34	553.72	1011.45	572.84	1012	575.27	1012.53	577.32	1013
579.31	1013.64	580.26	1014	581.08	1014.35	582.71	1015	584.23	1015.72
584.81	1016	586.39	1016.78	586.84	1017	588.49	1017.79	588.94	1018
590.68	1018.84	591.02	1019	592.83	1019.88	593.09	1020	601.38	1020.12
602.63	1020.13	608.23	1020.21	635.92	1020.64	657.07	1021	658.12	1021.51
659.12	1022	660.12	1022.49	661.18	1023	662.13	1023.47	663.23	1024
664.15	1024.45	665.29	1025	666.17	1025.43	667.35	1026	668.19	1026.41
669.4	1027	671.04	1027.8	671.46	1028	679.32	1027.93	680.08	1027.92
685.79	1027.97	687.39	1027.99	688.02	1028	689.06	1027.99	689.32	1027.98
689.97	1027.97	694.56	1027.86	722.88	1027.2	731.57	1027	752.36	1026.46
770.26	1026	772.33	1025.93	798.84	1025	800.41	1024.99	801.52	1024.98
803.03	1024.99	803.52	1024.99	805.29	1025	805.44	1025	805.69	1025
805.88	1025	807.33	1025	808.54	1025	816.14	1025	819.97	1025
821.57	1025	824.29	1025	824.58	1025	825.36	1025	826.02	1025
827.98	1024.6	830.28	1024	831.62	1024	833.95	1023.72	835.32	1023.55
836.13	1023.58	836.87	1023.53	837.77	1023.58	839.45	1023.6	840.88	1023.68
845.84	1023.9	846.75	1023.95	846.93	1023.96	847.47	1023.97	849.5	1024
849.85	1024	851.5	1024	861.32	1024	861.32	1024.07	863.13	1024.33
866.39	1024.4	868.27	1024.48	884.3	1024.42	885.48	1024.4	888.55	1024.06
894.49	1024	895.73	1023.94	901.23	1023.68	901.54	1023.67		

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
-98.46	.042	244.04	.035	679.32	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
244.04	679.32	45.27	45.27	45.27	.3	.5

Ineffective Flow   num=   6

Sta L	Sta R	Elev	Permanent
8.34	74.01	1029.44	F
74.01	138.6	1031.31	F
138.6	201.03	1032.79	F
612.25	668.23	1032.89	F
668.23	720.98	1032.1	F
720.98	770.49	1030.62	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: 954

INPUT
Description: Future Bridge Location
Station Elevation Data   num=   408

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-94	1021.63	-91.97	1021.58	-83.74	1021.39	-70.15	1021.1	-63.01	1020.97
-58.76	1021	-56.08	1020.95	-45.79	1020.76	-38.61	1020.7	-34.96	1020.65
-33.59	1020.64	-33.58	1020.64	-33.48	1020.57	-33.29	1020.57	-28.61	1020.47
-28.57	1020.48	-28.56	1020.48	-28.17	1020.42	-28.16	1020.42	-28.06	1020.43
-23.53	1020.59	-23.29	1020.64	-23.28	1020.64	-23.27	1020.64	-23.07	1020.65
-15.7	1020.82	-12.19	1020.93	-10.63	1021	-5.42	1021.1	-3.11	1021.15
-2.96	1021.33	-2.81	1021.22	8.08	1021.01	8.36	1021.01	8.5	1021
11.97	1020.87	17.48	1020.6	18.2	1020.54	18.86	1020.49	18.92	1020.7
19.01	1020.95	19.14	1020.73	19.2	1020.6	19.35	1020.97	19.36	1021
19.39	1021.08	19.4	1021.1	19.48	1020.98	19.53	1021	22.13	1021.61
24.72	1022	25.44	1022.11	25.81	1022.16	27.24	1022.26	44.94	1022.84
45.97	1022.85	46.52	1022.89	46.81	1022.89	47.37	1022.9	47.64	1022.91
50.22	1022.9	50.45	1022.9	50.84	1022.86	55.09	1022.84	60.63	1022.81
74.43	1022.69	74.69	1022.69	93.11	1022.73	94.65	1022.75	99.7	1022.63
99.75	1022.63	99.94	1022.13	99.99	1022.13	102.17	1022.16	140.78	1022.63
141.07	1022.56	141.21	1022.91	141.25	1023	141.27	1023.06	142.35	1023.04
142.97	1023.04	142.99	1023.04	144.27	1023.05	144.73	1023	144.76	1022.94
144.91	1022.56	145.3	1022.75	156.67	1022.68	163.04	1022.76	163.24	1022.65
163.28	1022.75	163.38	1023	163.44	1023.15	164.39	1023.14	165.5	1023.12
166.79	1023.09	166.83	1023	166.87	1022.91	166.99	1022.59	167.25	1022.66
178.91	1022.67	194.32	1022.69	195.37	1022.68	195.51	1022.99	195.51	1023
195.55	1023.11	195.57	1023.18	196.97	1023.12	199.91	1023.1	205.65	1023.04
208.71	1023.06	212.33	1023.04	213.22	1023	213.24	1023	213.26	1023
213.3	1023	213.35	1023.01	213.67	1023.03	218.08	1023.43	221.89	1023.75
224.38	1023.75	226.75	1023.7	237.56	1023.57	241.52	1023.26	244.87	1023
249.43	1022.64	250.14	1022.6	250.49	1022.58	251.59	1022.49	253.87	1022
253.9	1022	254.27	1021.95	260.92	1021	261.31	1020.95	261.42	1020.93
263.12	1020.52	264.16	1020.26	265.57	1020	266.4	1019.84	269.1	1019.34
272.12	1019	272.13	1019	272.16	1019	272.89	1018.82	276.37	1018
277.14	1017.81	280.59	1017	280.83	1016.94	281.82	1016.71	283.05	1016.54
286.91	1016	288.75	1015.76	292	1015.3	293.29	1015.12	294.22	1015
296.55	1014.68	297.47	1014.56	297.9	1014.5	298.22	1014.44	299.65	1014.18
300.56	1014	301.62	1013.79	305.6	1013.01	306.14	1012.9	306.16	1012.89
308.39	1012.12	308.72	1012	311.25	1011.12	311.47	1011.05	311.53	1011.03
311.6	1011.03	312.12	1011	316.39	1010.7	329.64	1010.45	330.74	1010.45
331.05	1010.41	331.6	1010.37	335.25	1010.01	335.27	1010.03	336.11	1010.04
338.58	1010.15	343.11	1010.26	345.6	1010.27	345.63	1010.27	345.79	1010.27
347.2	1010.26	347.64	1010.26	349.55	1010.22	355.59	1010.17	356.94	1010.17
357.92	1010.17	358.84	1010.35	359.75	1010.45	365.58	1010.62	367.37	1010.67
370.57	1010.76	373	1010.82	379.53	1011	386.89	1011.01	395.03	1011.02
397.26	1011.02	399.07	1011.02	402.39	1011.07	406	1011.11	406.8	1011.11
410.39	1011.13	411.01	1011.13	413.47	1011.14	416.08	1011.15	416.46	1011.15
418.69	1011.15	418.97	1011.15	430.49	1011.15	451.41	1011.15	455.38	1011.15
456.27	1011.1	457.92	1011	458.23	1010.98	458.53	1010.98	458.56	1010.97
458.57	1010.98	458.64	1011	459.28	1011.2	459.43	1011.23	459.7	1011.31
459.99	1011.26	460.08	1011.25	462.01	1011	462.13	1010.99	462.28	1010.97
462.38	1010.99	462.47	1011	463.59	1011.21	464.37	1011.33	467.74	1011.33
467.92	1011.33	468.04	1011.32	470.79	1011.15	473.77	1011.3	474.13	1011.33
474.52	1011.33	476.63	1011.52	478.32	1011.67	481.47	1011.37	483.39	1011.15
485.53	1011.15	487.48	1011.15	488.08	1011.11	489.66	1011.01	489.88	1011
491.36	1010.9	492.24	1010.84	499.65	1010.84	501.81	1010.84	506.53	1010.81
511.02	1010.79	516.1	1010.71	522.22	1010.55	527.38	1010.68	534.29	1010.79
534.35	1010.78	540.21	1010.64	541.92	1010.95	542.23	1011	543.18	1011.17
543.75	1011.33	544.54	1011.46	547.41	1012	548.3	1012.28	550.56	1013
553.11	1013.81	553.95	1014	554.07	1014.03	554.58	1014.14	557.17	1014.88
557.61	1015	557.76	1015.04	561.24	1015.95	561.28	1015.97	561.38	1016
562.22	1016.27	564.54	1017	566.21	1017.52	568.36	1018	568.92	1018.12
570.16	1018.67	570.23	1018.71	570.62	1018.91	570.79	1019	572.43	1019.85
572.71	1020	573.69	1020.51	574.63	1021	575.37	1021.39	575.92	1021.72

576.07	1021.78	576.57	1022	577.73	1022.51	578.91	1023	580.68	1023.77
581.22	1024	581.53	1024.13	583.58	1025	583.96	1025.16	585.49	1025.81
585.98	1025.88	586.77	1026	605.14	1026	610.47	1026	614.31	1026
615.28	1026	616.45	1025.96	621.86	1025.71	624.35	1025.33	627.08	1025
634.13	1024.16	635.51	1024	637.81	1023.73	639.41	1023.52	639.67	1023.48
642.7	1023	644.15	1022.78	649.13	1022	651.15	1021.68	652.44	1021.48
659.43	1021.15	664.88	1021.03	667.17	1021	674.63	1020.86	676.75	1020.81
679.55	1020.97	679.74	1021	680.34	1021.08	682.35	1021.36	685.9	1021.25
689.43	1021.06	690.3	1021.02	690.75	1021	691.23	1020.98	692.82	1020.91
693.46	1020.89	693.59	1020.88	695.7	1020.99	695.95	1021	697.8	1021.08
700.04	1021.19	702.82	1021.16	710.11	1021.06	710.18	1021.1	713.61	1021
713.66	1021	713.84	1021	714.06	1021	714.93	1020.96	716.63	1020.76
717.41	1020.66	717.55	1020.3	717.61	1020.16	717.66	1020.23	717.88	1020.57
717.89	1020.3	717.96	1020.1	718.03	1020.09	718.53	1020.16	719.45	1020.23
728.47	1020.35	729.98	1020.37	732.19	1020.53	738.63	1021	739.51	1021.06
740.93	1021.16	741.07	1020.96	746.11	1020.92	751.36	1021.17	754.67	1020.96
758.55	1020.94	759.51	1021.01	760.03	1021	762.76	1020.92	763.9	1020.88
766.09	1020.88	775.27	1020.84	782.25	1020.65	793.14	1020.42	793.15	1020.56
793.24	1020.35	795.05	1020.36	796.16	1020.25	796.26	1020.24	796.42	1020.21
799.14	1020.42	799.21	1020.42	799.23	1020.43	799.24	1020.31	799.31	1020.43
799.62	1020.45	811.52	1020.98	812.37	1021	823.5	1021.3	828.66	1021.42
829.44	1021.38	840.08	1021.42	843.66	1021.61	850.62	1021.4	871.55	1021.56
883.65	1021.64	898.75	1021.9	906	1021.88				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-94	.042	224.38	.035	585.98	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
224.38	585.98	39.88	39.88	39.88	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-94	172.27	1028.74	F
625.99	906	1028.9	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 912

INPUT
Description:
Station Elevation Data num= 384

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-97.14	1022	-95.45	1022.01	-94.28	1022.01	-86.03	1022.01	-84.14	1022.01
-75.8	1022.01	-59.49	1022	-55.39	1022	-54.39	1022	-53.3	1022
-52.92	1021.73	-52.28	1021.86	-52.01	1021.89	-51.59	1021.95	-51.44	1021.93
-50.86	1021.9	-47.08	1021.74	-41.07	1021.76	-39.91	1021.81	-39.75	1021.83
-39.63	1021.83	-38.97	1021.87	-38.45	1022	-38.27	1022	-37.46	1022
-37.05	1022	-36.71	1022	-35.57	1021.99	-24.32	1021.84	-13.86	1021.82
-10.57	1021.89	-6.17	1022	-1.94	1022.01	.3	1022.01	5.8	1022
7.04	1022.01	8.25	1022	8.58	1022	9.39	1022	10.56	1022
10.59	1022	12.4	1022	15.09	1022	16.79	1022.01	16.8	1022.01
19.96	1022.03	20.44	1022.04	21.1	1022.06	31.06	1022.55	39.36	1022.84
40.55	1023	41.32	1023.01	41.86	1023.01	45.01	1023.05	47.39	1023.06
47.71	1023.06	48.07	1023.07	48.65	1023.07	49.15	1023.08	50.2	1023.09
50.79	1023.09	51.07	1023.09	51.21	1023.09	51.73	1023.1	52.07	1023.1
52.22	1023.1	54.12	1023.12	54.62	1023.12	56.37	1023.12	60.5	1023.51
63.39	1023.51	64.14	1023.56	64.5	1023.56	71.34	1024	74.66	1024.03
77.6	1024.04	81.14	1024.07	82.08	1024.08	82.6	1024.08	88.82	1024.11
90.43	1024.11	95.2	1024.13	98.32	1024.14	99.5	1024.14	104.8	1024.51
105.15	1024.54	105.19	1024.54	112.56	1025	113.33	1025.02	116.78	1025.03
120.57	1025.07	121.81	1025.09	122.36	1025.09	126.65	1025.11	127.71	1025.11
133.75	1025.13	134.59	1025.14	134.91	1025.14	137.4	1025.15	138.34	1025.15
141.93	1025.51	143.09	1025.59	150.17	1026	154.94	1026.03	156.62	1026.04
156.77	1026.04	156.89	1026.04	161.77	1026.05	168.51	1026.07	170.04	1026.07
174.81	1026.08	175.33	1026.08	175.5	1026.08	175.77	1026.08	175.86	1026.08
176.73	1026.08	177.01	1026.08	180.76	1026.52	190.24	1027	194.41	1027
194.61	1027	197.31	1027	197.52	1027	197.66	1027	202.68	1027
209.59	1027	210.76	1027	218.3	1027	220.01	1027	220.48	1027
220.77	1027	220.85	1027	220.88	1027	220.89	1027	224.92	1027.52
224.93	1027.52	230.94	1027.76	237.03	1028	243.18	1027.81	244.62	1027.77
245.39	1027.79	246.47	1027.83	248.36	1027.94	248.54	1027.96	249.09	1028
249.66	1027.72	250.3	1027.41	251.12	1027	252.19	1026.47	253.14	1026
254.1	1025.53	255.2	1025	256.3	1024.46	257.24	1024	259.05	1023.32
259.75	1023	261.67	1022.08	261.83	1022	262.68	1021.59	263.76	1021

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  275.08  1020.7  302.55    1020  304.54 1019.01  304.55    1019  304.56 1018.99
  306.58    1018  306.59    1018  308.59    1017  309.15 1016.72  310.64    1016
  310.86 1015.87  312.73    1015     313 1014.86  314.88    1014  316.28 1013.25
  316.79    1013  318.59 1012.03  318.67    1012  319.36 1011.64  320.62    1011
  321.93 1010.94  324.45 1010.84   331.5 1010.54  331.55 1010.45  334.02 1010.45
  335.53  1010.2  336.93    1010  337.81 1009.87  339.09 1009.72  341.12 1009.82
   345.5 1009.99  345.78    1010  347.84 1010.19  348.56 1010.26  349.43 1010.17
  351.24    1010   351.6 1009.96  352.52 1009.88  357.47 1009.88  360.55 1009.88
  361.06 1009.95  361.42    1010  362.59 1010.16   364.4 1010.45  365.98 1010.56
   366.9  1010.6  367.77 1010.65  370.35 1010.64  372.36 1010.68  375.11 1010.71
  376.46 1010.72  378.71 1010.74  384.88 1010.83  386.06 1010.83  387.64 1010.85
  392.67 1010.93  393.34 1010.94  393.88 1010.95  397.65    1011  397.81    1011
  402.86    1011  403.25    1011  406.44 1011.01   406.5 1011.01  409.27 1011.01
  420.65 1011.08  437.55 1011.15  438.55 1011.07  439.34    1011  440.66 1010.89
  441.67 1010.79   444.2 1010.99   444.3    1011  444.45 1011.01   446.1 1011.15
  452.68 1011.15  456.57 1011.15  459.76 1011.15  464.36 1011.15  465.21 1011.07
  465.63 1011.04  465.98    1011  466.01    1011  466.31 1010.97  466.34 1010.97
  466.47    1011  466.82 1011.06  468.12 1011.33   470.4 1011.33  471.12 1011.33
   471.4 1011.31  472.95 1011.15  473.09 1011.16  477.13 1011.33  481.09 1011.19
  482.16 1011.15   482.5 1011.11  483.73    1011  484.68 1010.91  487.59 1010.65
  491.23 1010.97  491.56    1011  491.58    1011  491.95 1011.03  492.74    1011
  492.76    1011  492.96 1010.99  494.07 1010.95  504.36  1010.6  510.26 1010.46
  520.03 1010.24   522.1 1010.24  534.08 1010.24   536.3 1010.29  541.61 1010.42
  542.25 1010.59  543.46    1011  555.61 1011.52  560.58 1011.73  561.46 1011.77
  561.78 1011.79  562.31 1011.81   567.9    1012  569.37 1012.33   572.4    1013
  574.36 1013.74  574.95    1014  576.68 1014.75  577.22    1015  578.84 1015.78
  579.28    1016  580.91 1016.82  581.28    1017  583.03 1017.83   583.4    1018
  585.32 1018.92  585.49    1019  587.52 1019.98  587.56    1020  591.01 1020.06
  655.49    1021  655.73 1021.11   657.5    1022  657.74 1022.11  659.52    1023
  659.75 1023.11  661.54    1024  661.77 1024.11  663.41    1025  663.64 1025.11
  665.57    1026   665.8 1026.11  667.72    1027  670.62 1027.24  671.51 1027.72
  672.03    1028  675.72 1027.96  677.62 1027.94  679.73 1027.95  685.83 1027.99
  685.86 1027.99  686.41    1028  689.56 1027.85   708.7    1027   709.4    1027
  709.83    1027  712.91 1027.01  715.84 1027.01  716.19 1027.01  717.07 1027.01
  719.83    1027  726.44 1026.84  739.79 1026.53  741.37 1026.49  743.36 1026.44
  760.39    1026  760.94 1025.98  772.21 1025.62  793.33    1025  800.96 1024.48
  806.93 1024.24   811.9 1024.02  812.29    1024  814.49    1024  817.27    1024
  822.37    1024  823.16    1024  824.61    1024   827.3    1024  827.97    1024
  829.93    1024  831.54    1024  837.36    1024  840.72 1023.08  840.99    1023
  842.71 1022.62  843.88  1022.4  844.31 1022.33  844.48    1022  844.96 1022.21
  845.03 1022.21  845.96 1022.27  846.31 1022.83  847.54 1022.04  847.69 1022.06
  847.96 1022.09  849.18 1022.26  854.63    1023  855.32 1022.99  856.08    1023
  856.63    1023  856.83 1023.02  857.65    1023  858.13    1023  858.38    1023
   858.6 1023.03  860.75 1023.31   863.2 1023.33  868.97 1023.35  879.08 1023.19
   891.6 1023.18  892.32 1023.17  892.51 1023.16  902.86 1023.64

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
  -97.14    .042  249.66    .035  671.51    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        249.66  671.51           269.51  269.51  269.51              .3       .5
Ineffective Flow     num=        6
   Sta L   Sta R    Elev  Permanent
    9.15    43.6 1027.65       F
    43.6  111.42 1031.16       F
  111.42  197.54  1032.7       F
  607.68  672.27  1032.7       F
  672.27  723.94 1031.71       F
  723.94     767 1030.39       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 642

INPUT
Description:
Station Elevation Data    num=      290
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -214.59    1022  -47.94    1022  170.16    1022  173.79 1021.71     175 1021.59
  175.81 1021.51  180.19 1021.04  180.61    1021  180.78 1020.98   182.1  1020.7
  184.25  1020.6  184.48 1020.58  186.47 1020.37  186.79 1020.35  191.33    1020
  191.56 1019.98   192.2 1019.93  193.03 1019.89  198.23 1019.41  199.17 1019.33
  200.07 1019.23  200.71 1019.17  201.45  1019.1  202.16 1019.03  202.26 1019.02
  202.41    1019  202.45 1018.99  203.74 1018.81  205.83  1018.4  207.89    1018
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   209.26 1017.73  212.33    1017  215.43 1016.25  216.44 1016.01  216.86 1015.91
    218.7 1015.48  220.26    1015  222.58 1014.29  223.53    1014  226.63 1013.05
    226.8    1013  228.29 1012.54  228.31 1012.54  228.35 1012.53  228.67 1012.46
   230.78    1012   232.6  1011.6  235.32    1011  236.84 1010.66  237.79 1010.45
   239.72 1010.14  240.59    1010  240.75 1009.98  241.22 1009.91  241.38 1009.91
    241.8 1009.91  242.18 1009.91  242.52 1009.91  244.22 1009.91  245.97 1009.91
   247.39 1009.91  247.67 1009.91  253.49 1009.91  277.22 1009.91  285.41 1009.91
   293.29 1009.91  293.35 1009.91  293.53 1009.91  293.86 1009.91  293.98 1009.91
   294.19 1009.91  295.17 1009.91  295.29 1009.91  295.77 1009.91  295.85 1009.91
   296.05 1009.93  296.68    1010     297 1010.03   297.3 1010.07  298.46 1010.07
   299.15 1010.07  300.22 1010.07   300.6 1010.07  301.35 1010.07  302.05 1010.07
   302.82 1010.07   310.4 1010.09  313.46  1010.1  314.39  1010.1  317.49 1010.11
   317.98 1010.11   318.6 1010.11  319.31 1010.11  320.33 1010.15  323.27 1010.16
   326.05 1010.17  328.63 1010.19  331.45  1010.2  334.06 1010.18  350.14 1010.27
   352.42 1010.27  380.61 1010.62  382.73 1010.61  383.12  1010.5  384.18 1010.01
    384.2    1010  384.43 1009.94  385.63 1009.94  386.26 1009.94  386.73 1009.94
   387.18 1009.94   389.5 1009.94  389.92 1009.94  390.24 1009.98  390.39    1010
   390.62    1010  392.24 1010.21  394.65 1010.51  395.78 1010.64  400.17 1010.99
   400.23    1011  401.45 1011.08  402.89  1011.3  406.23 1011.33  409.05 1011.27
   409.51 1011.18  410.39    1011  412.05 1010.68  413.14 1010.45  415.69 1010.43
   416.94 1010.46  423.19 1010.79  424.97 1010.79  429.87 1010.97  431.42    1011
   431.61    1011  432.17 1011.06  436.72 1011.55  439.35 1011.78     441 1011.91
   441.08 1011.95  441.19    1012   442.9 1012.81  443.29    1013  443.73 1013.21
   445.03    1014  445.13 1014.06  445.35 1014.19   447.2 1014.12  447.53 1014.12
   452.06 1014.29  453.73 1014.35  455.74 1014.33  457.01 1014.36  457.85 1014.37
   458.55 1014.38  460.08  1014.4  460.21  1014.4  462.19 1014.44  465.31  1014.7
   468.46 1014.67  472.52 1014.34  473.27 1014.17  474.09 1014.13  476.22 1014.29
   479.64 1014.55  483.46 1014.84  487.64 1014.66  494.61 1014.37  496.08 1014.42
   498.39 1014.51  503.21 1014.47  513.66 1014.38  517.61 1014.35  520.81 1014.33
   522.37 1014.25   527.4    1014  530.89 1013.83  536.42 1013.55  541.35 1013.34
    543.4 1013.24  547.78 1013.01   547.9 1013.01  548.12    1013  558.57 1012.62
   559.26 1012.64  561.43 1012.43  561.44 1012.43  561.47 1012.43  561.49 1012.44
   564.07 1012.32  565.54 1012.24  566.38 1012.16  567.74    1012  570.91  1011.6
   571.38 1011.44  572.67 1011.14  573.71    1011   589.9    1011  607.89    1011
   608.02 1011.53  608.27 1012.97  608.73    1014  609.27    1014  610.78 1014.73
   611.33    1015  612.85 1015.75  613.35    1016  614.91 1016.77  615.38    1017
   616.98 1017.79   617.4    1018  619.04 1018.81  619.42    1019  622.85 1019.85
   623.46    1020  625.23 1020.87  625.49    1021  626.02 1021.27  627.51    1022
   629.93 1022.02  633.13 1022.03  636.92 1022.01  638.13 1022.01   638.8    1022
   639.13    1022  639.16    1022  639.18    1022  639.41    1022  641.19    1022
   645.24 1021.99  647.06    1022  647.59 1021.99  648.03 1021.99  648.72 1021.99
   649.35    1022  649.99    1022  654.14    1022  665.15    1022  665.37    1022
   668.01 1021.97  675.28    1022  675.92    1022  676.25    1022  676.37    1022
   676.87    1022  676.96    1022  678.76 1021.97  679.58 1021.95  683.35 1021.85
   686.85 1021.77  702.71 1021.34  714.87    1021  715.28    1021  715.34    1021
   715.55 1021.02  723.38 1021.31  728.01 1021.42  728.03 1021.42  729.09    1021
   730.21 1020.56  731.07 1020.53  731.97 1020.47  731.98 1020.47  738.32 1020.03
   738.94    1020  739.48    1020  740.05 1019.98  741.12 1019.97  741.65 1019.96
   743.16 1019.94  744.27 1019.96  744.73 1019.97  745.35 1019.96  747.09 1019.95
    747.4 1019.94  748.87 1019.92  752.42 1019.83  752.67 1019.82  753.14 1019.44
    753.7 1019.28  753.71  1019.3  753.72 1019.35  753.93 1019.35  759.16 1019.12
   761.03 1019.04  761.94 1019.07  767.54  1019.2  779.09 1019.25  785.41 1019.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -214.59    .042  170.16    .035  629.93    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        170.16  629.93           298.19  298.19  298.19             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 -214.59  126.31 1027.05       F
   654.9  785.41 1026.09       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 343

INPUT
Description:
Station Elevation Data    num=     236
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1017   72.95 1017.46   78.66 1017.61   82.22 1017.75   84.24 1017.64
   84.73 1017.62   85.38    1018   87.81    1018  116.51    1019  125.91  1019.1
  126.43 1019.11  131.93 1019.47   133.9 1019.32  135.41 1019.35   142.1 1019.91
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   143.46    1020  144.26    1020  153.86  1020.4  154.18 1020.41  154.44 1020.42
   171.05    1021  171.28    1021  175.17 1021.43  179.27 1021.27  181.79 1021.73
   222.54 1021.73  225.06 1021.87  234.86 1022.01  237.33 1022.01   241.5    1022
   241.88    1022  247.97    1022  249.43 1022.01  258.11 1022.01  259.41 1022.01
   261.23    1022  268.23    1022   268.8    1022  269.83    1022  271.02 1021.97
   272.17 1021.96  272.39 1021.73  274.58 1021.73  277.67 1021.73  278.79 1021.87
   280.41  1021.7   280.9 1021.57  283.99 1020.75   285.6 1020.06   286.3 1020.06
   297.16 1020.24  298.98    1020   299.3    1020   300.6 1020.04  306.32 1019.59
   308.13    1019  309.13    1019  311.74    1019  312.41  1018.2  314.23    1018
   317.45 1017.65  318.55 1017.53  318.82 1017.58  320.79 1017.15  323.97 1016.23
   324.93 1015.35  329.63 1014.86  330.86 1014.16  333.02 1014.28  333.94 1014.09
   334.62 1013.91  335.19    1013  339.16    1013  340.76 1012.88  344.11 1012.33
   346.66 1012.33   348.3 1012.35  349.49 1012.35   351.7 1012.21  353.81 1011.94
   360.96    1012  361.32    1012  362.65    1012  371.42 1011.94  371.54 1011.51
   375.76 1011.41  375.81 1011.41  381.52 1011.16  383.05 1010.93  383.75 1010.93
   384.29  1010.8  386.24 1010.79  386.85  1010.8  387.76  1010.8  388.27 1010.85
   388.71 1010.87  391.49    1011  393.48    1011  395.85    1011  396.13    1011
   400.19 1011.01  400.63 1011.01  401.46 1011.03  404.92 1010.77  405.51 1010.79
   406.76 1010.97  407.99 1010.94  408.52 1010.95  432.39  1010.6  437.75 1010.52
   438.92 1010.46  440.09  1010.4  448.27 1010.35   451.1 1010.21  454.11 1010.28
   455.12 1010.28  455.97 1010.27  456.05 1010.25  456.78 1010.19  457.98 1010.12
   458.31 1010.07  458.61 1010.06  458.73 1009.91  459.06 1009.91  462.13 1009.91
   462.54 1009.91     463 1009.91  549.44 1009.91  555.44 1009.91  560.45 1009.91
   565.73 1009.91  565.84 1009.91  566.12 1009.91  566.58 1009.91   568.6    1010
   573.28 1010.17  574.19 1010.19  575.41 1010.28  577.65 1010.25  578.32 1010.27
   581.59 1010.18  581.83  1010.2  584.91 1010.16  585.71 1010.15  586.13 1009.94
   587.46 1009.94   588.2 1009.94  590.28 1009.94  591.46 1009.89  591.63 1009.94
   591.79 1010.37  594.46 1010.72  595.97 1010.69  597.17 1010.97   597.4 1010.97
   602.71    1011  604.58 1010.96  605.58 1010.77  606.66 1011.14  607.81 1011.12
   608.74 1011.05  609.78 1011.13  609.89 1011.13  621.18 1011.29  621.61 1011.27
   622.43 1011.14  623.63 1011.14  626.04 1011.22   626.8 1011.12  632.08 1011.02
   633.43 1011.02   649.2 1011.07  653.14 1011.11  660.66 1011.15  662.35 1011.14
   662.55    1011  663.42    1011  668.44 1011.88  668.96  1012.5  669.36  1012.5
   671.22 1013.21  672.41 1013.21   672.7    1013  675.66 1015.73  675.68 1015.73
    677.7 1014.71  678.53 1015.18  679.16    1016  681.39    1016  681.52    1016
   681.76 1016.92  683.63 1017.21  684.67 1017.72  685.25    1018  686.48    1018
   687.06 1019.02  688.67 1019.02  689.37 1019.26  690.06 1019.26   690.7 1019.18
   692.77  1019.3  695.36  1019.3   707.2 1019.29   711.8 1019.29  717.21 1020.88
   717.74 1020.88  725.17    1021  725.56 1021.15  726.46 1021.28  731.55 1021.31
   737.04 1021.44  741.13 1021.36  742.15 1021.36  742.32 1021.35  742.51 1021.35
   742.75 1021.35  744.54 1021.23   747.6    1021  749.23    1021  766.87    1021
   766.92 1020.85   767.4 1021.07  772.54 1021.07  772.98 1021.11  773.18  1021.1
    773.5  1021.1  775.11 1021.08  789.26 1020.59   810.4 1020.37  820.06 1020.09
   825.82 1020.09  838.78 1020.08  842.45 1020.08  851.91 1019.81   860.9 1019.52
   861.44 1019.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   280.9    .035  717.21    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         280.9  717.21           358.82  358.82  358.82             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  243.81 1023.12       F
   723.66  861.44 1022.63       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -16

INPUT
Description:
Station Elevation Data    num=     199
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1021.2    23.3  1021.2   23.98  1021.2   24.99  1021.2   28.09 1021.23
    28.83 1021.23    29.6 1020.82   29.87 1020.82   32.01 1020.81    34.9 1020.76
    38.77 1020.69      43 1020.66   48.22 1020.27   49.32 1020.27   49.72    1020
    52.19  1019.5   54.64 1018.77   56.58 1018.64   56.94  1018.6   57.87 1018.47
     58.5 1018.18   58.78    1018   60.33    1018   61.36    1017   63.23 1016.34
    64.21 1015.41   65.95 1015.08   66.82 1015.08    67.2 1015.08   67.34 1015.02
    73.07  1014.1   73.71 1013.66   76.52 1013.42   79.71 1013.35   79.89    1013
    82.04    1012   84.71    1012    89.2 1011.06   89.53    1011   89.58 1010.99
    93.65    1009   96.28    1009   99.24 1008.82  103.84 1008.87  104.47 1008.87
   105.84 1009.17  107.77 1009.18  109.29 1009.28  119.66 1009.28  126.45 1009.28
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   127.77 1009.45  130.56 1009.29  142.95 1009.11  146.43  1009.5  150.02 1009.53
   156.47 1009.35  160.06 1009.18  166.98    1009  168.14 1008.94  169.18 1008.94
   169.85 1008.97  170.56 1008.97  176.24    1009  178.42 1009.01  179.98 1009.01
   184.16 1009.01  193.74    1009  194.48 1008.99  194.76 1008.99  195.03    1009
   201.75    1009  203.73    1009   211.1 1008.99  211.67 1008.99  212.12    1009
   218.68    1009  221.15    1009  224.25    1009  230.67 1009.01  236.68 1009.01
   238.71 1009.01  239.69 1009.01   249.8 1009.02  254.22 1009.11  266.04 1009.11
   268.61 1009.02  268.85 1009.02  269.32 1009.03  272.91 1008.94  273.73 1008.84
   274.55 1009.29  275.62 1009.32  275.84 1009.21  275.97 1009.23  276.34 1009.24
   277.39 1009.26  278.14 1009.25  286.34 1009.11  289.64 1009.11   303.2 1009.03
   310.17  1009.1  310.31 1009.11  311.37 1009.08  312.29 1008.91  313.48 1008.87
   316.15 1008.79  322.07 1008.78  325.47 1008.98   325.8 1009.02  327.69 1009.13
   329.07 1009.29  337.32 1009.14  345.01 1009.32  353.24 1009.79  353.91 1009.82
   355.13 1010.13  355.47 1010.13  355.96  1010.5  362.95  1010.5  368.03 1010.41
   370.98 1010.44  377.09 1010.22  379.66 1010.11  379.78 1010.07  382.51  1010.3
   383.65  1010.3  385.65    1010  397.12    1010  401.12 1009.45  403.87    1009
   416.28 1008.95  417.27 1008.94  417.72 1008.94  417.99 1008.94  418.28    1009
   420.34 1009.41  423.14    1010  424.67    1010  425.42 1010.48   428.6 1010.69
    432.8  1011.2  436.98 1011.67  442.78 1011.74   447.1 1011.75  452.85 1011.76
    453.5    1012  454.36 1012.08     457 1012.33     458 1012.42   460.1 1012.98
   461.24 1013.01  461.71 1013.54  462.26 1013.61  465.35 1013.88  465.51    1014
   465.79 1014.68  469.25 1014.87  471.75    1015  471.84    1015  472.08 1016.18
   472.77    1017   473.1 1017.06  475.41 1017.52  475.71 1017.53   475.8 1017.16
   478.21 1017.47  482.86 1017.47  484.16 1017.47  484.33 1017.47  485.73 1017.47
   486.06 1017.47  491.09 1017.48     500 1017.85  500.31 1017.86  503.38 1017.91
   504.51 1017.94  506.38 1017.99  506.57    1018  507.79 1018.15  513.95 1018.24
   521.65 1018.32  522.95 1018.34  524.02  1018.2  527.83 1018.22  529.54 1018.47
   530.81 1018.53  536.12 1018.76   541.7 1018.82  546.69 1018.87  547.98 1018.97
   548.65    1019  549.34    1019  551.54  1019.1  553.95    1019  555.27    1019
   555.95    1019  566.72    1019   578.1    1019  585.94    1019

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042    29.6    .035  513.95    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          29.6  513.95           401.42  401.42  401.42             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    23.5 1024.74       F
  519.22  585.94 1023.72       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -417

INPUT
Description:
Station Elevation Data    num=     201
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1021   15.84    1021   17.56 1021.13    23.5 1021.05   26.83    1021
    31.44 1019.94   32.32 1019.69   35.45 1019.25   36.33 1019.23   38.71    1019
     39.8    1018   41.66  1017.3   42.01  1017.3   42.74 1017.22   43.79 1017.21
    46.55 1016.43   48.66 1015.81   49.56 1015.75    50.2 1015.71   50.57 1015.67
    51.08 1015.59   52.01 1015.47   57.75    1015   58.57    1015   58.83 1014.65
    60.46 1014.62   63.77 1014.09   64.13 1014.08   65.12  1013.9   66.97 1013.73
    67.27 1013.38   68.89 1013.38      69 1013.02   69.82 1012.86   74.69    1012
    76.45 1011.66   77.72 1011.64   78.71 1011.23   79.56 1010.72   81.76    1010
       83 1009.28   83.95 1009.11   87.41 1008.51   89.77 1007.65   91.53  1007.6
    92.41 1007.41  100.58 1007.28  103.89 1007.27  113.12 1008.21  149.55  1007.9
   151.83 1007.52  159.86 1007.39     171 1007.28  177.21 1007.77  178.66    1008
    180.9 1008.01  183.17 1008.06  185.78    1008  188.19    1008  189.49    1008
    197.7 1007.92  200.83 1007.92  202.12 1007.94  202.56 1007.94  205.29 1007.97
   207.18 1008.01  210.09 1008.04  212.76 1008.06   213.8 1008.04  214.11 1008.04
    214.3 1007.89   215.3 1007.78  215.63 1007.77  216.44 1007.58  220.04 1007.85
   222.33 1007.75  224.14 1007.74  225.02 1007.78  228.72 1007.72  228.78 1007.72
   229.13 1007.74  231.45  1007.9  232.83 1008.01  233.04 1008.08  234.18 1008.08
   234.39 1008.08  235.48 1008.11  244.83 1008.26  252.88 1008.26  256.46 1008.26
   257.41 1008.03  257.56 1008.04  258.38  1007.8  258.89 1007.72  259.15 1007.72
   259.47 1007.72  260.82 1007.72  262.37 1007.72  263.35 1007.72  266.29 1007.72
   267.76 1007.72  268.14 1007.72  268.56 1007.92  271.48 1007.96   273.5 1007.99
   274.41 1008.11  274.96 1008.11  277.31 1008.09  280.81 1008.41  283.06 1008.43
   285.58 1008.43  288.28 1008.48  288.89 1008.34  291.07 1008.33  291.77 1008.02
   292.35 1007.76  292.58 1007.75  294.07 1007.78   303.5 1007.94  313.76 1007.94
   323.07 1007.57  329.68 1007.35  331.49 1007.32  332.99 1007.32  335.01 1007.32
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  335.24 1007.32  336.72 1007.32  340.85 1007.76  346.27 1007.76   347.2 1007.96
  348.85 1008.09  350.52 1008.23  352.87 1008.51  353.97 1008.52  364.38 1008.32
  370.68 1008.25  373.25 1008.19  375.39 1008.17  377.99 1008.06  390.48 1007.57
  391.54  1007.6  391.88 1007.59   400.6 1007.92  421.47 1008.35  423.48 1008.43
  430.94    1009  438.43 1009.63  441.36 1009.75  444.92 1009.84  447.59 1010.11
  450.91  1010.2   454.9 1010.47  461.39    1011  464.35  1011.5  466.77 1011.84
  471.68 1011.94  472.36    1012  474.82 1012.69  479.56 1013.02  480.74 1013.05
  481.45 1012.92   483.9  1013.4  487.33 1014.11  487.96 1014.74  488.32 1014.74
  491.19 1014.74  491.53 1014.68  491.87 1014.84  494.01 1015.99  495.93 1016.62
  498.81 1016.62  499.35  1016.7     500 1016.65  500.15 1016.64  500.69 1016.62
  503.61 1016.62  505.06 1017.99  505.69 1018.01  507.86 1017.82  512.45 1017.97
  517.59    1018  517.84 1017.92  521.37 1017.97   521.7 1017.99  522.29    1018
  522.35    1018  522.94 1018.01  526.77  1018.3  528.04  1018.3  533.28 1018.02
     544 1018.89  550.39 1018.89  551.91 1018.89  555.23 1018.89  557.34  1018.8
  558.08 1018.74  566.13 1018.53  566.87  1018.5  574.74 1017.54  596.49 1017.83
  600.65 1017.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   26.83    .035  517.59    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         26.83  517.59           549.14  549.14  549.14             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   22.41 1023.71       F
  523.03  600.65 1024.02       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -966

INPUT
Description:
Station Elevation Data    num=     198
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1018.4    6.98  1018.4   18.72 1018.32   24.16 1018.33    29.6 1018.26
   31.59 1018.21   32.34    1018   35.17 1017.36   37.46    1017   40.89 1016.18
    41.6 1015.58   43.64 1015.46   43.84 1015.09   45.35 1015.04   46.24 1015.13
   47.11 1014.86   50.74 1014.17   52.05    1014   52.25    1014   55.59 1013.34
    56.1 1013.36   57.77 1013.36   59.02    1013   61.04    1013    62.5    1013
   62.65 1012.55   62.87 1012.48   63.93 1012.38   64.38 1012.45   66.68 1012.44
   68.62 1011.72   68.96 1011.68   69.75 1011.68   71.07 1011.38   71.66 1011.31
   74.69 1010.99   77.36 1010.74   77.62 1010.67   77.92 1010.67   78.15 1010.63
   78.43 1010.59   82.05 1009.85   83.38 1009.56   84.83 1009.42   86.78 1009.44
   91.71 1009.24   92.08 1009.11   92.25 1009.11   97.43 1008.03   97.54 1007.99
   101.2 1007.82  101.64 1007.83  106.27 1006.79  106.38    1006  106.46    1006
  110.74 1006.07  112.86 1006.06  114.67 1006.06  115.76 1006.09  121.63 1006.21
  121.71 1006.11  121.95  1006.1  122.01 1005.98   122.2 1005.89  122.29 1005.85
  122.43 1005.85  122.64 1005.85  125.16 1005.85  129.22    1006  129.73    1006
   129.9 1006.08  130.35 1006.13  130.44 1006.13  130.68 1006.64  132.98 1006.64
  134.65 1006.56  237.75 1006.62  254.78 1006.62   254.8  1006.6  256.24 1006.61
   258.9 1006.63  322.09 1006.44  335.58 1006.22  337.47 1006.19  339.25 1006.08
  342.01 1005.99  351.55    1006  352.17 1006.01     357 1006.03  357.66 1006.03
  358.51 1005.99  359.05 1006.12  360.71 1006.19  362.21 1006.21  363.24 1006.68
  364.17    1007  366.98 1007.45     367 1007.45  367.08 1007.46  373.62 1007.68
  376.71 1007.52  380.64 1007.45  381.73 1007.45  382.38 1006.99  385.64 1006.99
  389.08 1006.99  390.07    1007  390.42 1007.25  398.88 1007.37  402.69 1007.37
  407.38 1007.26  408.39 1007.14  409.22 1007.14  410.66 1007.14  417.27 1007.35
   422.8 1007.71  423.45 1007.72  424.82 1007.75  427.93    1008  428.63 1008.06
  429.26 1008.49  431.25  1008.5  436.58 1008.29  443.15 1008.73  444.63 1008.77
  445.22 1009.04  445.97  1009.1  447.51 1009.12  451.44 1009.26  451.75 1010.68
  452.13 1010.69  455.59  1010.9  455.85 1010.97  456.08 1011.01  458.37  1012.4
  459.22 1012.41   460.8 1012.52  461.94  1013.5  462.27 1013.66  462.32 1014.06
  463.03 1014.13  463.57 1014.27  465.09 1015.42  465.95 1015.43  466.54 1015.84
  471.82 1015.87  480.56    1016  480.62 1016.01  492.12 1016.25     500 1016.37
  502.55 1016.41  506.55 1016.48  511.11  1016.7  514.35  1016.7  515.76 1016.66
  530.01    1017  536.98    1017  539.09 1017.01   539.4 1017.01  539.62 1017.06
  541.85 1016.97  543.34  1016.9  544.11  1016.9   544.6 1016.95  544.62 1016.95
  544.77 1016.95  545.06 1016.96   547.6    1017  547.68 1017.05  552.63 1017.24
  559.12 1017.24  559.17 1017.24  565.01 1017.28  566.21 1017.27  568.52 1017.21
  572.75  1017.4  577.63 1017.42  578.21 1017.42  581.16 1017.38  582.22  1017.4
  586.94 1017.62   592.3 1017.67  594.29 1017.67   594.5 1017.67   594.6 1017.77
  604.65 1017.58  604.87 1017.58  605.44 1017.58  608.61 1017.51  633.18 1017.07
  636.55    1017  640.39 1016.82  641.26  1016.8  641.77 1016.79  641.98 1016.78
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642.14	1016.79	643.36	1016.76	645.28	1016.76

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	32.34	.035	536.98	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
32.34	536.98	446.71	446.71	446.71	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	28.58	1020.48	F
543.87	645.28	1020.94	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: -1415

INPUT
Description: Via Montezuma
Station Elevation Data num= 277

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1015.16	3.54	1015.18	5.68	1015.16	11.07	1015.12	15.77	1015.08
16.48	1015.08	16.7	1015.06	16.93	1015.06	20.58	1014.74	26.64	1014.74
29.29	1014.76	37.06	1014.82	42.55	1014.66	45.37	1014.62	53.1	1014.53
54.63	1014.23	57.08	1014.08	58.59	1014.14	60.33	1014.14	63.33	1013.87
64.6	1013.81	66.46	1013.54	72.48	1013.59	74.53	1013.51	74.63	1013.5
75.41	1013.49	76.07	1013.46	81.84	1013.08	86.1	1013	86.29	1012.97
86.38	1012.96	86.54	1012.94	86.61	1012	87.22	1012.84	88.26	1012.07
88.76	1012.07	89.06	1012.35	89.2	1012.29	89.45	1012.1	89.89	1012.06
90.07	1012.19	90.26	1012.2	90.82	1011.65	91.83	1011	93.59	1010.81
94.47	1010.66	95.37	1010.66	96.24	1010.3	97.37	1010.68	98.27	1010.57
99.17	1009.75	99.72	1009.45	100.05	1009.45	101.32	1009.19	102.68	1009
103.4	1008.59	104.88	1008.32	108.06	1008.16	109.36	1008	109.83	1007.85
110.2	1007.89	111.02	1007.82	116.57	1007.31	121.42	1006.94	125.51	1006.61
126.8	1006.44	129.43	1006.32	129.53	1006.01	129.64	1005.99	130.75	1006.03
131.71	1005.77	132.68	1005.7	133.61	1005.64	134.5	1005.64	134.63	1005.63
143.05	1005.09	144.26	1004.64	146.61	1004.64	146.94	1004.64	147.83	1004.64
148.33	1004.64	150.4	1004.64	150.74	1004.64	151.25	1004.64	152.92	1004.64
154.05	1004.64	154.25	1004.64	155.22	1004.64	155.28	1004.64	156.55	1004.64
156.65	1004.64	156.79	1004.64	163.09	1004.64	165.16	1004.64	165.65	1004.64
169.18	1004.64	172.04	1004.64	175.02	1004.64	175.76	1004.64	176.81	1004.64
177.76	1004.64	178.82	1004.64	183.51	1004.64	184.8	1004.64	185.78	1004.64
189.45	1004.64	192.2	1004.64	194.24	1004.64	195.93	1004.64	197.1	1004.64
197.58	1004.64	200.75	1004.64	201.79	1004.64	210.7	1004.64	215.95	1004.64
228.33	1004.64	228.5	1004.64	228.68	1004.64	238.32	1004.66	238.69	1004.64
239.01	1004.64	254.52	1004.64	263.01	1004.64	270.71	1004.64	274.94	1004.64
277.45	1004.64	277.93	1004.64	278.71	1004.64	279.12	1004.64	280.23	1004.64
281.24	1004.64	282.44	1004.64	282.84	1004.64	284.07	1004.64	285.47	1004.64
285.9	1005	286.23	1005.15	286.56	1005.15	291.62	1005.32	296.03	1005.32
297.27	1005.32	297.47	1005.28	297.63	1005.27	297.83	1005.27	301.02	1005.23
304.9	1005.18	308.39	1005.17	308.51	1005	308.7	1005	308.97	1004.69
309.21	1004.69	309.65	1004.69	309.88	1004.69	311.12	1004.69	312.81	1004.69
313.35	1004.69	314.35	1004.69	315.02	1005.09	315.58	1005.03	315.64	1005.04
322.02	1005.12	324.08	1005.2	327.29	1005.22	334.15	1005.28	336.45	1005.37
340.7	1005.4	342	1005.37	342.18	1005.39	342.41	1005.39	344.34	1004.62
344.37	1004.62	346.89	1004.62	347.17	1004.62	348.45	1004.62	354.22	1004.62
360.19	1004.62	360.67	1004.62	362.21	1004.62	363.35	1004.62	367.59	1004.62
371.48	1004.62	372.54	1004.62	373.86	1004.62	380.22	1004.62	382.12	1004.62
382.98	1004.62	384.43	1004.62	385.81	1004.62	387.42	1004.62	387.79	1004.62
388.81	1004.62	389.09	1004.62	389.28	1004.62	389.44	1004.62	389.76	1004.62
393.1	1005.27	396.45	1005.57	397.84	1005.82	400.06	1005.97	400.78	1006
402.41	1006.3	402.81	1006.34	404.12	1006.51	405.98	1006.74	408.71	1006.76
412.69	1007.39	413.97	1007.5	416.41	1008	418.75	1008	418.8	1008.01
423.03	1008.59	423.24	1008.62	423.42	1009.04	424	1009	424.95	1008.94
425.9	1009.22	426.03	1009.25	427.64	1009.62	429.23	1010	430.53	1010.49
431.27	1011.04	432.79	1011	432.8	1011	434.99	1011.7	435.96	1012
436.8	1012.26	436.95	1012.31	437.1	1012.35	437.24	1012.39	437.41	1012.44
437.53	1012.48	437.6	1012.5	437.66	1012.51	437.73	1012.53	437.8	1012.55
437.9	1012.58	438.13	1013	438.22	1012.67	438.26	1013	439.45	1013
439.56	1013.11	439.85	1013.1	439.9	1013.11	441.16	1013.38	443.38	1013.31
443.49	1013.32	443.56	1013.87	444.22	1014	444.75	1014.26	445.4	1014.31
446.21	1014.66	446.61	1014.64	448.21	1014.58	448.57	1014.7	450.27	1015
450.78	1015.15	450.94	1015.18	451.5	1015.2	451.57	1015.21	452.04	1015.26
452.24	1015.14	455.38	1015.16	456.25	1015.75	457.37	1015.78	459.42	1015.98
459.77	1016.03	461.34	1016.14	461.57	1016.13	462.57	1016.1	463.35	1016.09

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     464 1016.06  465.88    1016  466.29 1015.99  466.46    1016   467.9 1015.98
  468.31 1015.99  468.97 1015.99

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   11.07    .016  459.42    .016

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         11.07  459.42            42.27   42.27   42.27             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    9.64 1019.22       F
  462.05  468.97 1018.55       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -1451

INPUT
Description: Via Montezuma
Station Elevation Data    num=     120
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1012.44    7.89 1012.44    9.52 1011.97    9.58 1011.97   11.91 1011.87
    20.7 1011.51   23.65  1011.3   23.72  1011.3   33.71 1010.66   36.94 1010.32
   47.65 1009.59   47.86 1009.44   54.55 1009.03   55.08 1008.87   62.21 1008.58
   63.57 1008.48   68.18 1008.25   72.62    1008   86.63 1007.28   90.61 1007.26
   91.39 1007.02   95.47 1006.74   98.56  1006.6  106.46 1006.31  116.59    1006
  117.08 1006.06  118.72 1005.93  125.01  1005.7  127.27 1005.46  134.78 1005.34
  142.65 1005.25  147.59 1005.03  148.12 1004.92  150.74 1004.78  153.68 1004.74
  154.47 1004.64  155.55 1004.64   157.3 1004.64  157.59 1004.64   157.8 1004.64
  158.68 1004.64  158.73 1004.64  162.51 1004.64  164.38 1004.64  164.82 1004.64
  165.06 1004.64  167.56 1004.64  174.29 1004.64  176.38 1004.64  180.38 1004.64
  187.87 1004.64  191.53 1004.64  193.14 1004.64  209.69 1004.61  209.95 1004.61
  225.33 1004.61  238.67 1004.64  240.36 1004.64  243.98 1004.54  247.84 1004.54
  248.81  1004.6  250.78  1004.6  251.14  1004.6   266.4 1004.64  283.07 1004.64
  298.49 1004.61  308.65 1004.63  309.27 1004.64  311.32 1004.64  311.56 1004.64
  311.83 1004.64  312.08 1004.64  312.36 1004.64   314.5 1004.64  314.87 1004.64
  315.28 1004.64  320.72 1004.64  322.57 1004.64   326.2 1004.64  330.78 1004.64
  332.01 1004.64  336.07 1004.64  337.13 1004.64  338.48 1004.64  345.25 1004.64
  346.01 1004.64  347.07 1004.64  348.39 1004.73  352.44 1004.64  355.16 1004.64
   356.3 1004.92  357.81 1004.64  357.91 1004.64  358.99 1005.02  365.12 1005.23
  365.13 1005.17  375.68 1005.36  387.28 1005.94  393.71 1005.94  394.12 1005.99
   403.2 1006.31  408.27  1006.4  417.45 1006.52  424.81 1007.23  424.98 1007.24
  425.54 1007.75  426.54 1007.75  435.24 1007.75   439.6 1007.61  442.79 1007.79
   444.9 1007.99  445.13 1008.27  451.68 1008.55  456.24 1008.75  456.51 1008.88
  459.56 1008.88  461.91  1008.8   463.1 1009.19  473.85 1009.68  476.51 1009.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016    9.52    .016  473.85    .016

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9.52  473.85           612.44  612.44  612.44             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    8.47 1013.32       F
   474.8  476.51 1013.78       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -2068

INPUT
Description:
Station Elevation Data    num=     218
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1013.09    7.16 1013.16   11.22 1013.04   12.39    1013   14.78 1012.86
   19.59 1013.01   24.92 1012.85    31.1 1012.94   34.95 1012.95   39.38 1012.92
   41.28 1012.86   41.87 1012.82    42.8 1012.58   47.23 1012.56   47.41 1012.56
   47.42    1012   48.31  1012.4   49.58 1011.06   49.76 1011.06   49.99 1011.05
      50  1010.9   50.02  1010.9   50.25  1010.8   51.97 1010.08   52.15    1010
   52.18 1009.84    52.9 1009.21   53.58 1010.18   53.79 1010.14      54 1008.91
   54.06 1008.78   54.34    1009   54.91    1009   57.16 1008.33   57.31 1008.29
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57.4	1009	57.82	1008.69	58.3	1008.69	58.92	1008.65	59.25	1008.76
59.56	1008.85	59.77	1009	60.4	1009	60.47	1009	61	1008.86
66.09	1008.53	67.22	1008	74.88	1007.89	76.07	1007.93	85.39	1007.37
91.27	1007.37	95.01	1007.41	95.33	1007.04	96.16	1007.07	96.72	1007.05
96.87	1007.05	97.26	1007	97.87	1007	102.77	1007	116.05	1006.2
119.67	1005.88	134.14	1005.46	135.58	1005.5	150.41	1005.3	168.03	1004.77
170.48	1004.77	176.56	1004.47	182.44	1004.33	195.18	1004.6	205.17	1004.54
208.09	1004.35	211.17	1004.38	217.79	1004.45	227.52	1004.37	228.51	1004.01
228.57	1004	228.64	1003.99	230.93	1003.26	231.82	1003.15	232.83	1003.08
233.29	1003.06	234.42	1003.07	234.8	1003.07	238.88	1003.05	243.37	1003.05
244.91	1003.05	245.55	1003.39	246.44	1003.39	248.77	1003.26	251.67	1003.39
253.12	1003.77	253.61	1003.9	254.25	1004.2	254.61	1004.28	259.46	1004.28
259.99	1004.19	261.06	1004.19	261.78	1004.3	262.24	1004.3	289.29	1004.27
314.81	1004.17	314.91	1004.17	315.26	1004	315.48	1004	315.62	1003.89
315.96	1003.86	316.07	1003.73	316.34	1003.62	318.74	1003.62	320.55	1003.61
323.93	1003.59	324.1	1003.59	324.26	1003.59	324.37	1003.59	324.7	1003.59
324.88	1004	325	1004	326.41	1003.84	326.6	1003.59	326.85	1003.59
327.27	1003.61	329.35	1003.59	330.27	1003.59	331.41	1003.59	332.2	1004.19
332.3	1004.21	332.41	1004.08	333.52	1004.11	338.12	1004.19	345	1004.09
345.62	1004.08	345.72	1004.11	346.18	1004.11	353.02	1004.1	355.67	1004.11
357.91	1004.11	358.04	1004.08	358.09	1003.73	358.63	1003.71	359.02	1003.59
359.4	1003.59	363.35	1003.59	365.65	1003.59	365.93	1003.81	366.26	1003.81
366.42	1004	366.63	1004.27	381.95	1004.27	453.52	1004.27	455.5	1004.42
464.75	1004.83	467.1	1005	468.09	1005	469.88	1005.31	472.51	1005.9
481.15	1006	481.2	1006.15	485.93	1006.15	488.37	1006.24	498.64	1006.17
499.29	1006.17	500	1006.38	500.1	1006.41	507.92	1007	512.95	1007
516.85	1007	517.71	1007.06	518.09	1007.49	525.65	1007.87	528.4	1008.08
531	1008.23	538.59	1008.73	540.13	1009.19	540.53	1009.19	544.63	1009.5
545.71	1009.58	551.24	1009.71	551.95	1009.71	552.37	1010	554.78	1010
555.09	1010	560.23	1010.43	568.28	1011.04	578.64	1011.94	579.38	1012.56
586.17	1012.94	587.2	1013.03	587.38	1013.02	594.48	1014	594.92	1014
599.83	1014.26	600.86	1014.31	601.1	1014.85	603.17	1015	607.19	1015.54
610.42	1015.54	610.95	1015.77	644.07	1015.84	652.26	1015.89	656.71	1015.92
660.31	1015.95	661.85	1015.96	664.63	1016.01	667.14	1016.01	668.98	1015.9
672.02	1015.94	675.45	1015.97	681.81	1015.84	684.68	1015.84	687.61	1015.87
701.14	1015.75	712.04	1015.79	723.42	1015.75	724.07	1015.58	724.61	1015.58
737.3	1015.51	743.15	1015.54	744.37	1015.54				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	41.28	.035	610.95	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
41.28	610.95	368.66	368.66	368.66	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	36.09	1018.9	F
618.04	744.37	1019.43	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: -2437

INPUT
Description:
Station Elevation Data num= 202

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1012.11	1.07	1012.11	1.22	1012.11	5.71	1012.18	12.82	1012.37
24.09	1012.39	25.08	1012.39	25.99	1012.08	36.81	1012	36.88	1012.06
39.37	1012.06	40.97	1012.16	50.1	1012.14	52.82	1012.14	58.02	1012.13
58.56	1012.13	58.81	1011.89	59.65	1010.62	60.04	1010.53	60.61	1010
60.89	1009.45	61.26	1009.33	61.34	1009.28	61.97	1008.99	62.08	1008.97
62.3	1008.96	62.54	1008.94	63.28	1008.35	63.61	1008.45	64.26	1008.04
64.38	1007.95	64.83	1007.77	64.95	1007.57	65.7	1007.52	67.49	1007.97
69.96	1007.31	73.37	1006.87	74.66	1007.15	74.91	1007.16	85.59	1007
87.4	1006.88	87.83	1006.89	88.92	1006.41	90.3	1006.37	94.52	1006.34
99.8	1006.53	107.15	1006.37	120.12	1006	120.15	1005.87	123.34	1005.94
126.53	1005.95	127.33	1005.82	141.84	1005.64	144.41	1005.64	149.41	1005.64
154.35	1005.66	156.2	1005.7	163.99	1005.66	169.66	1005.64	176.35	1005.62
182.78	1005.53	189.06	1005.49	195.17	1005.32	200.85	1005.32	208.14	1005.31
212.02	1005.24	221.28	1005.22	224.02	1005.08	225.13	1005.05	228.82	1005.18
233.29	1005.32	235.71	1005.42	237.29	1005.36	240.34	1005.34	242.81	1005.34
244.15	1005	244.23	1005	244.6	1005	244.71	1005	244.93	1005.02
245.75	1005.02	248.44	1004.9	294.01	1004.31	298.6	1004.25	298.81	1004.25
298.95	1004.25	299.26	1004.17	300.08	1004.1	301.14	1003.97	301.34	1004

301.73	1003.95	302.6	1003.9	304.24	1003.71	306.28	1003.62	309.71	1003.62
313.19	1003.59	313.66	1003.78	314.19	1004	315.62	1004.35	316.16	1004.39
342.03	1005.03	355.02	1004.41	360.97	1004.13	363.39	1004	364.72	1004
463.89	1004.04	470.42	1003.33	475.19	1003.01	475.68	1003	476.25	1003.19
477.76	1002.67	478.03	1002.92	478.14	1003.06	478.22	1003.06	478.3	1003.15
480.56	1003.11	481.71	1003.1	481.81	1003.1	481.95	1003.05	482.36	1002.8
482.61	1002.68	484.11	1002.67	485.7	1002.96	485.9	1003	485.94	1003.02
487.97	1003.09	488.17	1004	489.02	1004.17	490.13	1004.99	490.46	1005
490.48	1005	491.94	1005	502.04	1005.65	512.66	1006.1	514.3	1006.13
519.39	1005.75	520.13	1005.99	526.62	1006.19	527.21	1006.19	529.43	1006.72
533.88	1006.78	534.79	1006.82	538.12	1007.3	539.24	1007.3	540.14	1007.4
541.6	1008	549.33	1008	549.45	1008.01	550.36	1008.06	559.19	1008.4
563.13	1008.4	565.32	1008.6	571.14	1008.77	571.82	1009.05	573.93	1009.2
578.28	1009.87	584.52	1010.13	585.69	1009.95	585.99	1011.02	595.51	1011.16
595.62	1011.16	598.28	1011.16	603.63	1011.71	607.24	1011.88	608.13	1012.11
609.77	1012.48	612.55	1012.48	615.08	1012.63	619.2	1013	623.46	1013.47
626.63	1014.07	627.44	1014.15	631.02	1014.77	633.16	1014.84	636.65	1015
636.84	1015.01	639.13	1015.25	640.03	1015.25	642.33	1015	644.41	1015
658.11	1015	663.52	1015	667.14	1014.82	669.08	1014.17	694.63	1014.09
700.6	1014.09	706.55	1014.07	707.26	1014.07	707.35	1014.07	707.54	1014.07
707.55	1014.07	708.86	1014.08	712.78	1014.12	718.9	1014.18	719.11	1014.18
719.66	1014.06	728.09	1014.29	728.22	1014.21	728.39	1013.93	730.41	1013.88
732.03	1014	736.85	1014						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	50.1	.035	636.65	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
50.1	636.65	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	46.01	1018.27	F
641.63	736.85	1020.6	F

SUMMARY OF MANNING'S N VALUES

River:Murrieta Creek

Reach	River Sta.	n1	n2	n3
Main - EC	3430	.042	.035	.042
Main - EC	3069	.042	.035	.042
Main - EC	2700	.042	.035	.042
Main - EC	2540	.042	.035	.042
Main - EC	2399	.042	.035	.042
Main - EC	2343	Bridge		
Main - EC	2295	.042	.035	.042
Main - EC	2022	.042	.035	.042
Main - EC	1737	.042	.035	.042
Main - EC	1265	.042	.035	.042
Main - EC	1130	.042	.035	.042
Main - EC	1000	.042	.035	.042
Main - EC	954	.042	.035	.042
Main - EC	912	.042	.035	.042
Main - EC	642	.042	.035	.042
Main - EC	343	.042	.035	.042
Main - EC	-16	.042	.035	.042
Main - EC	-417	.042	.035	.042
Main - EC	-966	.042	.035	.042
Main - EC	-1415	.016	.016	.016
Main - EC	-1451	.016	.016	.016
Main - EC	-2068	.042	.035	.042
Main - EC	-2437	.042	.035	.042

SUMMARY OF REACH LENGTHS

River: Murrieta Creek

Reach	River Sta.	Left	Channel	Right
Main - EC	3430	360.57	360.57	360.57

Main - EC	3069	368.55	368.55	368.55
Main - EC	2700	161.15	161.15	161.15
Main - EC	2540	141.07	141.07	141.07
Main - EC	2399	103.93	103.93	103.93
Main - EC	2343	Bridge		
Main - EC	2295	272.93	272.93	272.93
Main - EC	2022	284.86	284.86	284.86
Main - EC	1737	471.89	471.89	471.89
Main - EC	1265	137.3	137.3	137.3
Main - EC	1130	131.85	131.85	131.85
Main - EC	1000	45.27	45.27	45.27
Main - EC	954	39.88	39.88	39.88
Main - EC	912	269.51	269.51	269.51
Main - EC	642	298.19	298.19	298.19
Main - EC	343	358.82	358.82	358.82
Main - EC	-16	401.42	401.42	401.42
Main - EC	-417	549.14	549.14	549.14
Main - EC	-966	446.71	446.71	446.71
Main - EC	-1415	42.27	42.27	42.27
Main - EC	-1451	612.44	612.44	612.44
Main - EC	-2068	368.66	368.66	368.66
Main - EC	-2437	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Murrieta Creek

Reach	River Sta.	Contr.	Expan.
Main - EC	3430	.1	.3
Main - EC	3069	.1	.3
Main - EC	2700	.1	.3
Main - EC	2540	.1	.3
Main - EC	2399	.1	.3
Main - EC	2343	Bridge	
Main - EC	2295	.1	.3
Main - EC	2022	.1	.3
Main - EC	1737	.1	.3
Main - EC	1265	.3	.5
Main - EC	1130	.1	.3
Main - EC	1000	.3	.5
Main - EC	954	.1	.3
Main - EC	912	.3	.5
Main - EC	642	.1	.3
Main - EC	343	.1	.3
Main - EC	-16	.1	.3
Main - EC	-417	.1	.3
Main - EC	-966	.1	.3
Main - EC	-1415	.1	.3
Main - EC	-1451	.1	.3
Main - EC	-2068	.1	.3
Main - EC	-2437	.1	.3

Profile Output Table - ERSC

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Area (sq ft)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Mann Wtd Chnl
Main - EC	3430	Q100	22300.00	1027.71	0.003944	10.71	2210.05	2081.55	357.94	0.66	0.035
Main - EC	3430	Q200	27200.00	1029.04	0.003985	11.18	2716.79	2434.56	407.62	0.67	0.035
Main - EC	3430	Q50	19300.00	1026.91	0.003968	10.26	1928.23	1880.87	337.69	0.65	0.035
Main - EC	3069	Q100	22300.00	1025.35	0.005624	12.44	1812.40	1792.90	273.26	0.77	0.035
Main - EC	3069	Q200	27200.00	1026.33	0.005882	13.50	2160.41	2015.48			

414.32 0.80 0.035
Main - EC 3069 Q50 19300.00 1024.71 0.005435 11.69 1650.95 1650.95
220.08 0.75 0.035

Main - EC 2700 Q100 22300.00 1025.32 0.001845 7.46 2988.92 2988.92
353.32 0.45 0.035
Main - EC 2700 Q200 27200.00 1026.53 0.001784 7.95 3426.86 3419.57
378.64 0.45 0.035
Main - EC 2700 Q50 19300.00 1024.54 0.001898 7.12 2711.20 2711.20
352.18 0.45 0.035

Main - EC 2540 Q100 22300.00 1024.66 0.002491 8.62 2586.92 2586.92
307.27 0.52 0.035
Main - EC 2540 Q200 27200.00 1025.82 0.002443 9.23 2945.97 2945.97
310.27 0.53 0.035
Main - EC 2540 Q50 19300.00 1023.91 0.002490 8.19 2357.40 2357.40
302.73 0.52 0.035

Main - EC 2399 Q100 22300.00 1024.41 0.002112 8.25 2704.36 2704.36
297.28 0.48 0.035
Main - EC 2399 Q200 27200.00 1025.56 0.002137 8.92 3050.35 3050.35
299.93 0.49 0.035
Main - EC 2399 Q50 19300.00 1023.66 0.002065 7.77 2483.72 2483.72
293.74 0.47 0.035

Main - EC 2343 Winchester Road Bridge

Main - EC 2295 Q100 22300.00 1023.63 0.002512 8.76 2545.52 2545.52
293.27 0.52 0.035
Main - EC 2295 Q200 27200.00 1024.74 0.002548 9.46 2874.32 2874.32
297.38 0.54 0.035
Main - EC 2295 Q50 19300.00 1022.92 0.002483 8.26 2336.50 2336.50
292.13 0.51 0.035

Main - EC 2022 Q100 22300.00 1022.64 0.003219 9.47 2489.63 2355.81
401.55 0.59 0.035
Main - EC 2022 Q200 27200.00 1023.75 0.003148 10.13 2949.75 2684.04
417.70 0.59 0.035
Main - EC 2022 Q50 19300.00 1021.93 0.003233 8.98 2230.19 2149.96
349.27 0.58 0.035

Main - EC 1737 Q100 22300.00 1021.98 0.002573 8.67 2731.69 2571.28
432.09 0.52 0.035
Main - EC 1737 Q200 27200.00 1023.11 0.002582 9.33 3227.23 2917.76
443.75 0.53 0.035
Main - EC 1737 Q50 19300.00 1021.26 0.002563 8.19 2431.08 2356.27
411.98 0.52 0.035

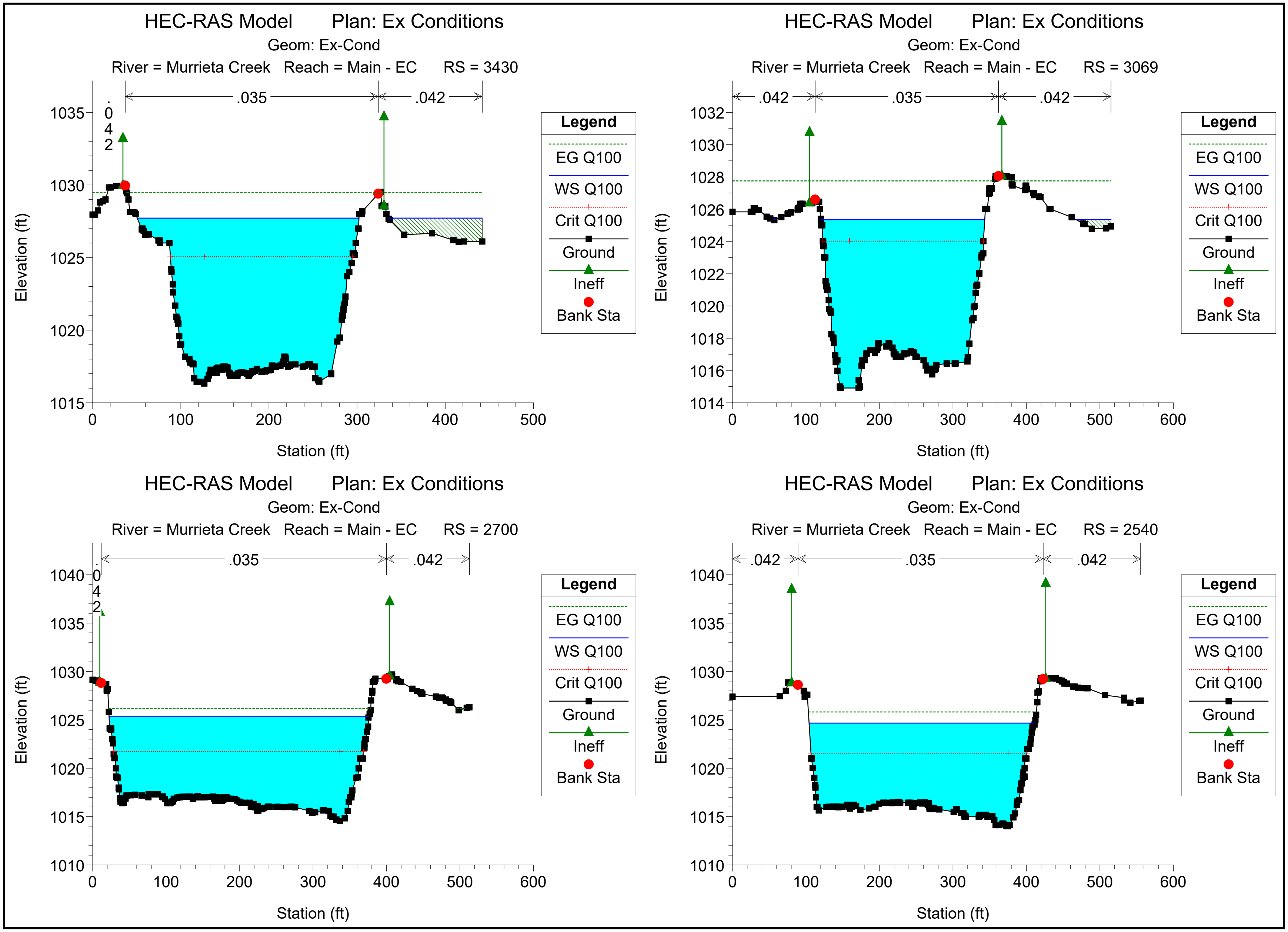
Main - EC 1265 Q100 22300.00 1020.90 0.002323 8.25 2702.30 2702.30
330.40 0.51 0.035
Main - EC 1265 Q200 27200.00 1022.06 0.002328 8.80 3091.99 3091.99
343.94 0.52 0.035
Main - EC 1265 Q50 19300.00 1020.20 0.002264 7.81 2472.39 2472.39
322.27 0.50 0.035

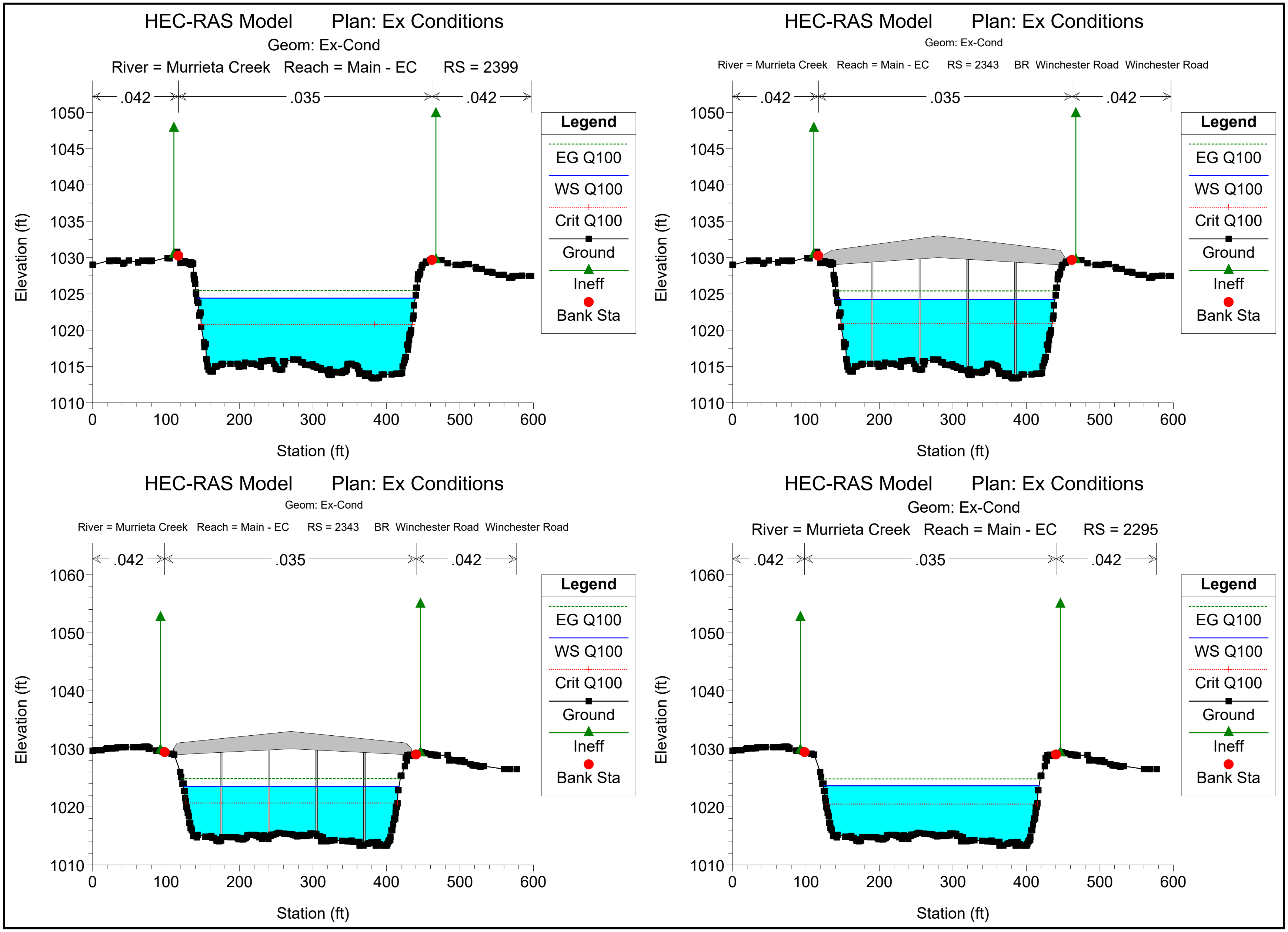
Main - EC 1130 Q100 22300.00 1020.52 0.002391 8.44 2643.54 2643.54
319.97 0.52 0.035
Main - EC 1130 Q200 27200.00 1021.64 0.002396 9.04 3009.64 3009.64
328.80 0.53 0.035
Main - EC 1130 Q50 19300.00 1019.83 0.002338 7.96 2425.86 2425.86
315.39 0.51 0.035

Main - EC 1000 Q100 22300.00 1020.04 0.002671 8.92 2498.60 2498.60
300.43 0.55 0.035
Main - EC 1000 Q200 27200.00 1021.15 0.003045 9.48 2892.01 2868.64
393.32 0.58 0.035

Main - EC	1000		Q50	19300.00	1019.40	0.002527	8.36	2309.60	2309.60	294.31	0.53	0.035
Main - EC	954	Bridge Location	Q100	22300.00	1019.71	0.003265	9.44	2362.04	2362.04	305.07	0.60	0.035
Main - EC	954	Bridge Location	Q200	27200.00	1020.74	0.003297	10.16	2693.64	2677.87	384.84	0.61	0.035
Main - EC	954	Bridge Location	Q50	19300.00	1019.09	0.003151	8.88	2172.82	2172.82	299.61	0.58	0.035
Main - EC	912		Q100	22300.00	1019.50	0.003238	9.68	2303.09	2303.09	282.98	0.60	0.035
Main - EC	912		Q200	27200.00	1020.46	0.003902	10.52	2587.27	2586.39	334.26	0.66	0.035
Main - EC	912		Q50	19300.00	1018.92	0.003068	9.03	2138.35	2138.35	280.61	0.58	0.035
Main - EC	642		Q100	22300.00	1019.01	0.002497	7.67	2907.17	2907.17	417.14	0.51	0.035
Main - EC	642		Q200	27200.00	1019.96	0.002521	8.22	3335.16	3310.17	474.51	0.52	0.035
Main - EC	642		Q50	19300.00	1018.40	0.002502	7.28	2651.74	2651.74	412.35	0.51	0.035
Main - EC	343		Q100	22300.00	1017.57	0.004126	9.39	2399.69	2374.83	443.08	0.65	0.035
Main - EC	343		Q200	27200.00	1018.41	0.004192	10.12	2787.50	2688.04	474.11	0.67	0.035
Main - EC	343		Q50	19300.00	1017.02	0.004070	8.88	2174.62	2174.60	363.83	0.64	0.035
Main - EC	-16		Q100	22300.00	1016.52	0.003071	8.23	2709.90	2709.90	409.65	0.56	0.035
Main - EC	-16		Q200	27200.00	1017.39	0.003092	8.87	3066.00	3066.00	415.57	0.58	0.035
Main - EC	-16		Q50	19300.00	1015.95	0.003095	7.80	2474.63	2474.63	408.39	0.56	0.035
Main - EC	-417		Q100	22300.00	1015.54	0.002493	7.51	2967.81	2967.81	441.66	0.51	0.035
Main - EC	-417		Q200	27200.00	1016.41	0.002509	8.10	3359.19	3359.19	448.69	0.52	0.035
Main - EC	-417		Q50	19300.00	1014.95	0.002456	7.11	2712.95	2712.95	433.47	0.50	0.035
Main - EC	-966		Q100	22300.00	1013.00	0.005106	9.69	2301.96	2301.96	398.86	0.71	0.035
Main - EC	-966		Q200	27200.00	1013.88	0.004854	10.22	2661.92	2661.92	409.46	0.71	0.035
Main - EC	-966		Q50	19300.00	1012.44	0.005271	9.28	2080.32	2080.32	394.34	0.71	0.035
Main - EC	-1415	Via Montezuma	Q100	22300.00	1012.05	0.000973	9.98	2233.97	2233.97	345.75	0.69	0.016
Main - EC	-1415	Via Montezuma	Q200	27200.00	1012.65	0.001103	11.14	2442.42	2442.42	350.98	0.74	0.016
Main - EC	-1415	Via Montezuma	Q50	19300.00	1011.65	0.000895	9.21	2095.68	2095.68	344.01	0.66	0.016
Main - EC	-1451	Via Montezuma	Q100	22300.00	1012.46	0.000603	7.71	2899.33	2894.41	476.51	0.54	0.016
Main - EC	-1451	Via Montezuma	Q200	27200.00	1013.20	0.000617	8.40	3252.41	3239.95	476.51	0.56	0.016
Main - EC	-1451	Via Montezuma	Q50	19300.00	1011.97	0.000591	7.23	2673.43	2669.51	467.00	0.53	0.016
Main - EC	-2068		Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66			

530.11	0.45	0.035							
Main - EC	-2068		Q200	27200.00	1012.77	0.002127	7.13	3814.61	3814.61
541.10	0.47	0.035							
Main - EC	-2068		Q50	19300.00	1011.54	0.001926	6.11	3157.72	3157.72
524.85	0.44	0.035							
Main - EC	-2437		Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54
511.52	1.00	0.035							
Main - EC	-2437		Q200	27200.00	1009.71	0.010932	11.91	2284.27	2284.27
516.46	1.00	0.035							
Main - EC	-2437		Q50	19300.00	1008.76	0.011961	10.74	1797.13	1797.13
507.88	1.01	0.035							


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 3430
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 3069
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 2700
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 2540
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta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Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 2399
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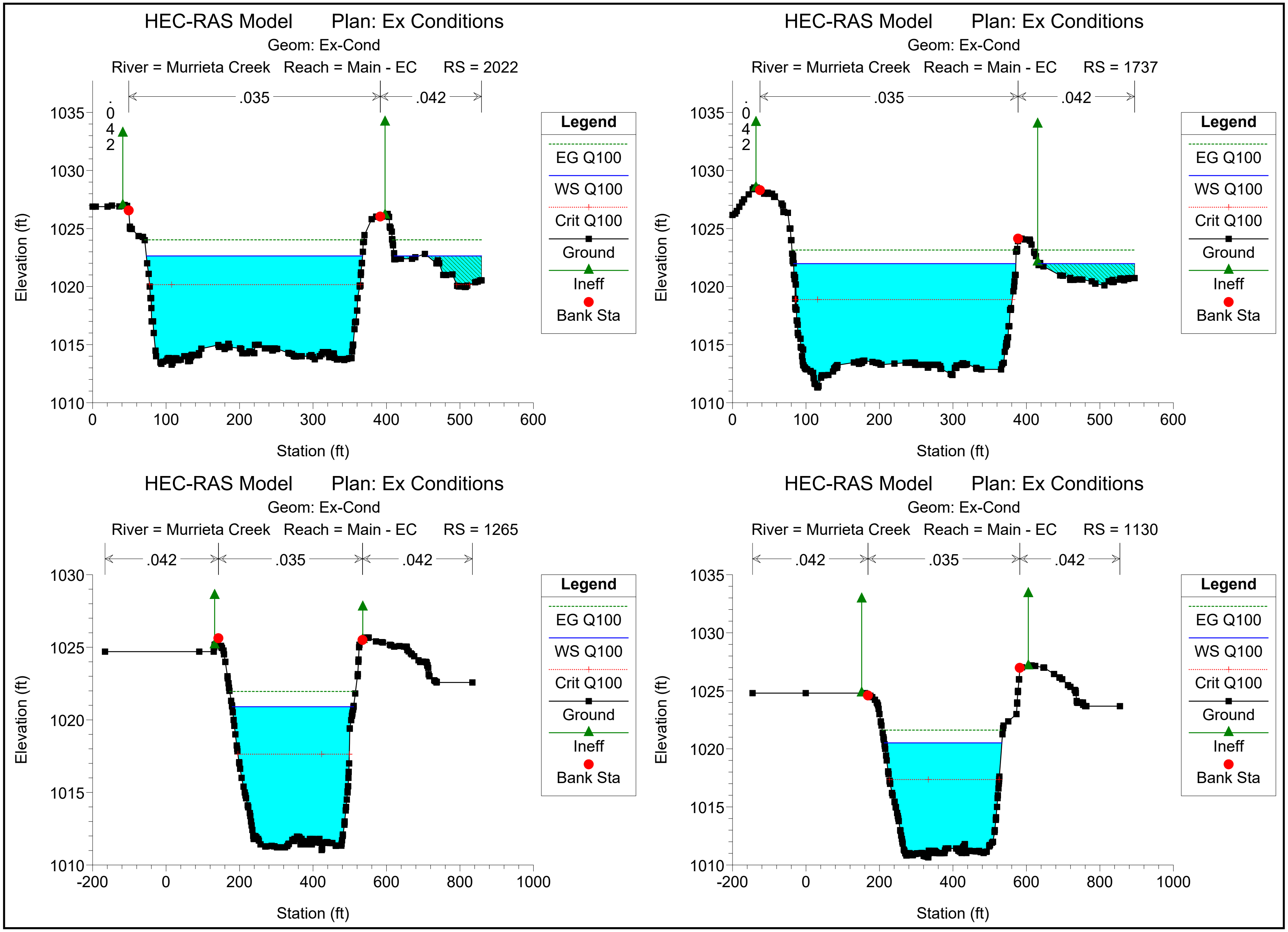
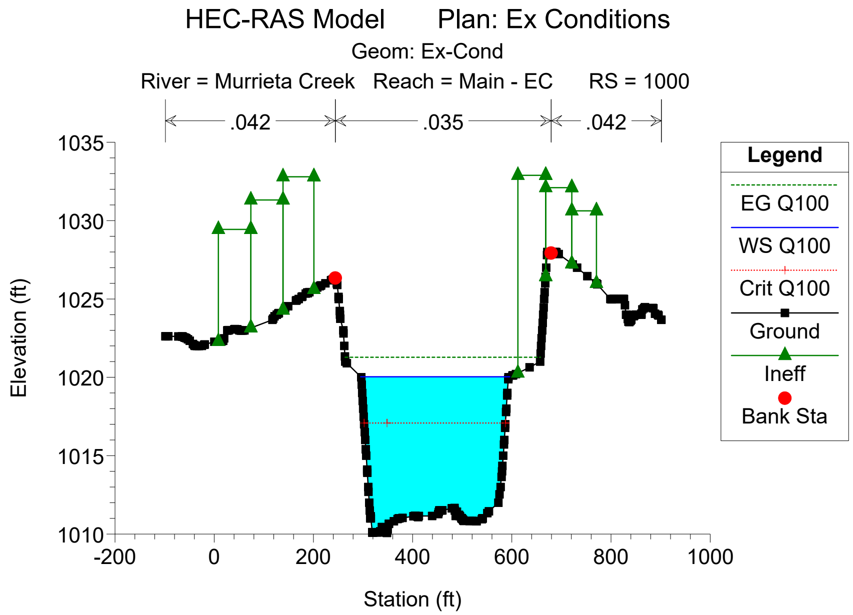
.035
.042
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 2343 BR Winchester Road Winchester Road
.042
.035
.042
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 2343 BR Winchester Road Winchester Road
.042
.035
.042
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 2295
.042
.035
.042
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)



HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 2022
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 1737
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 1265
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 1130
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta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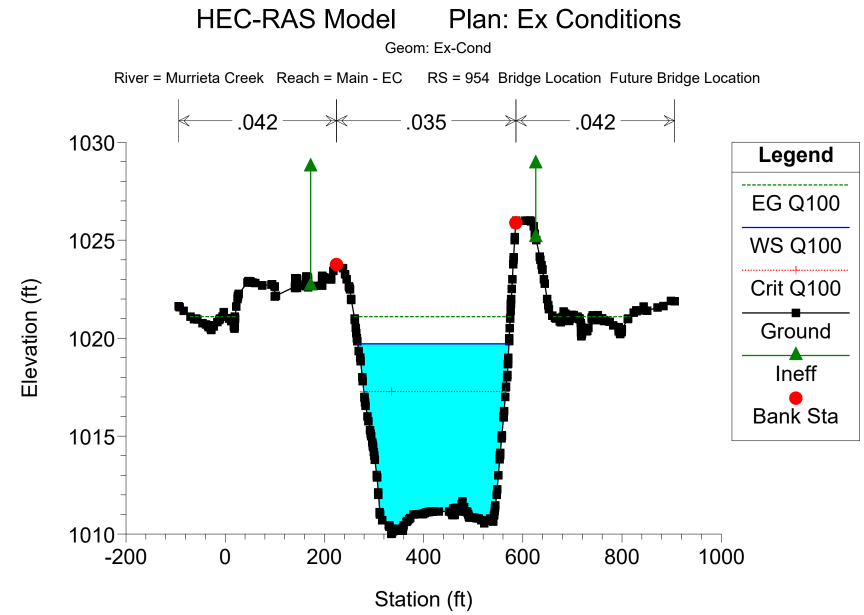
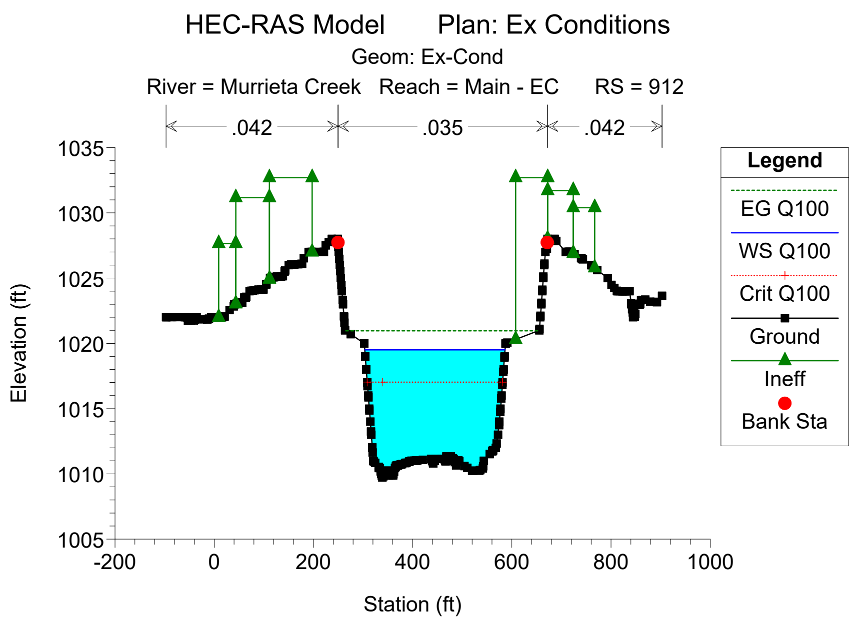
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 1000
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 954 Bridge Location Future Bridge Location
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 912
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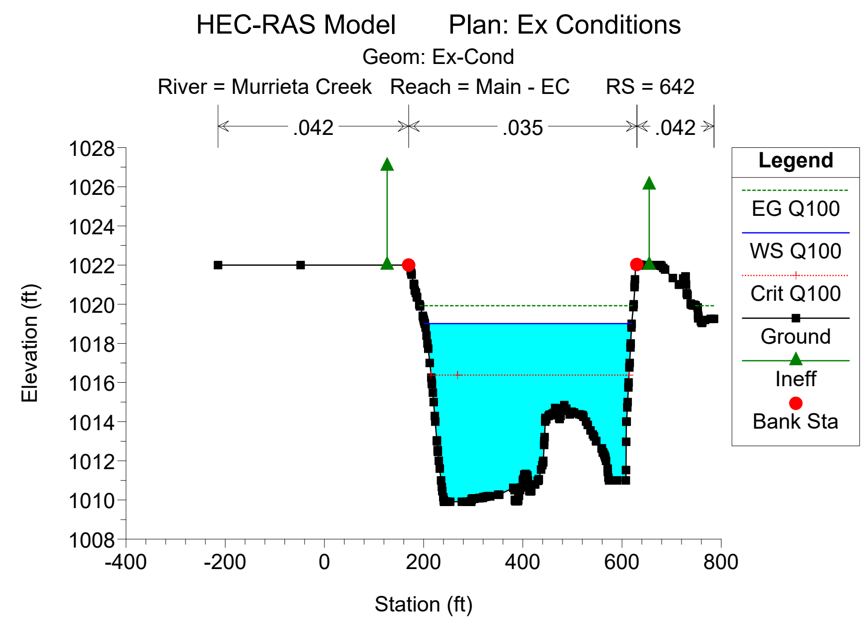
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 642
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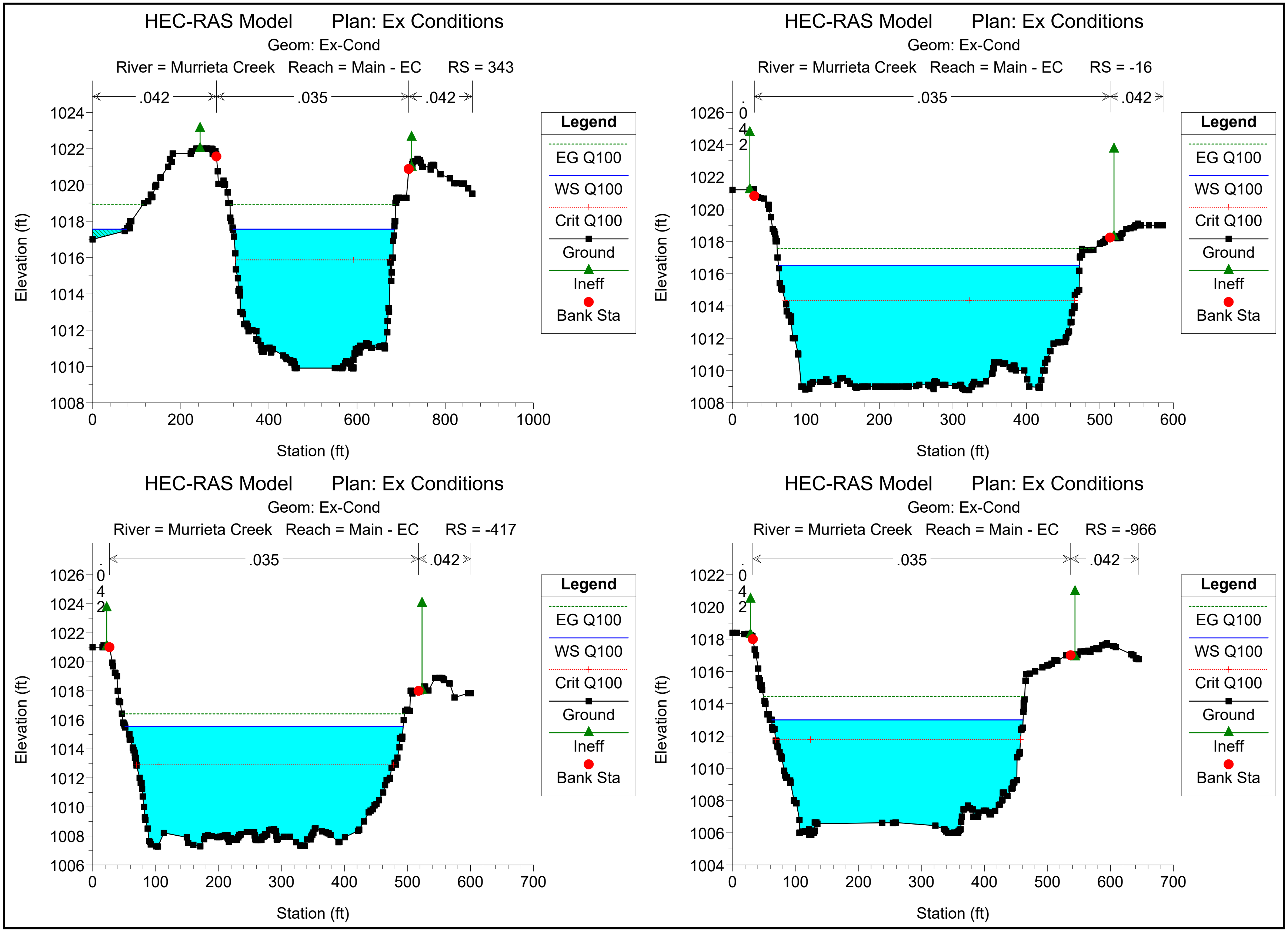
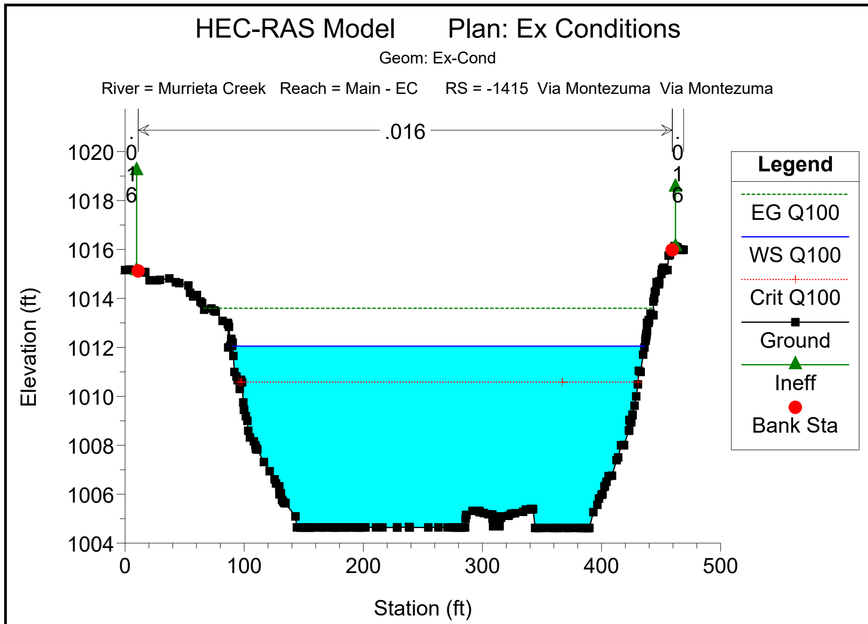
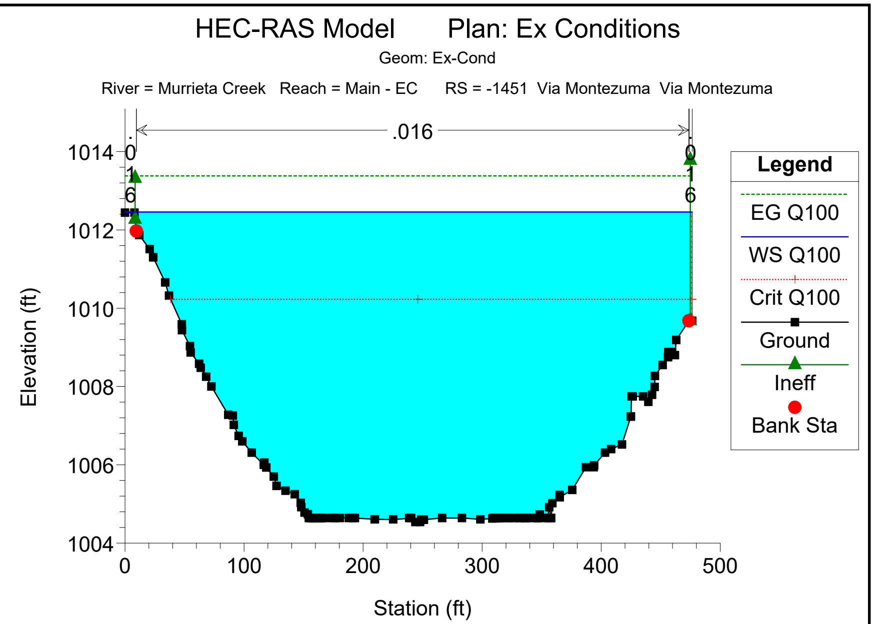
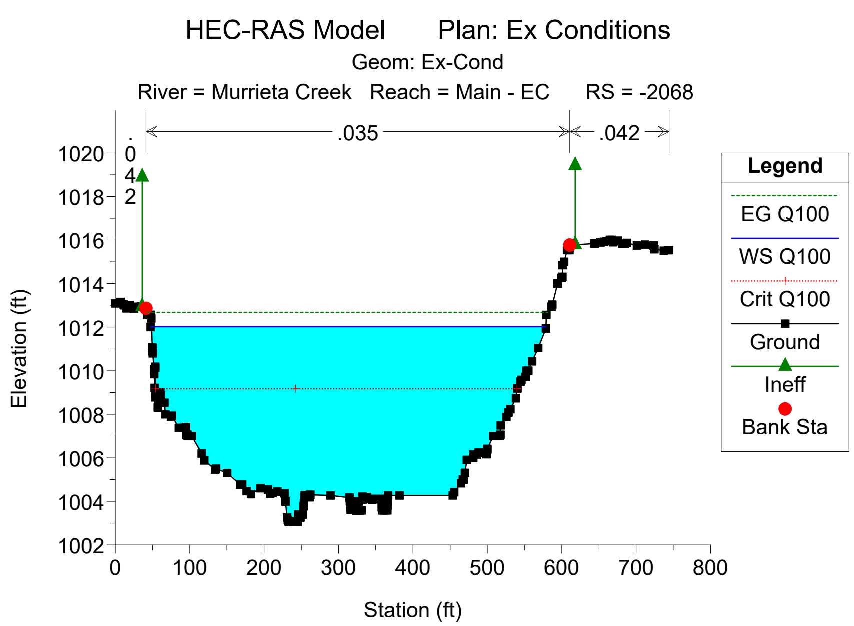
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta

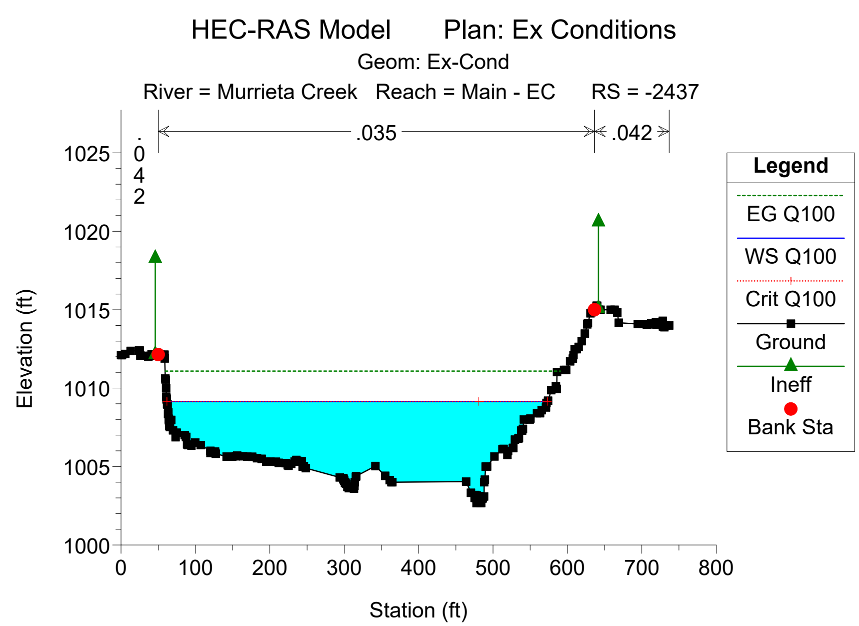


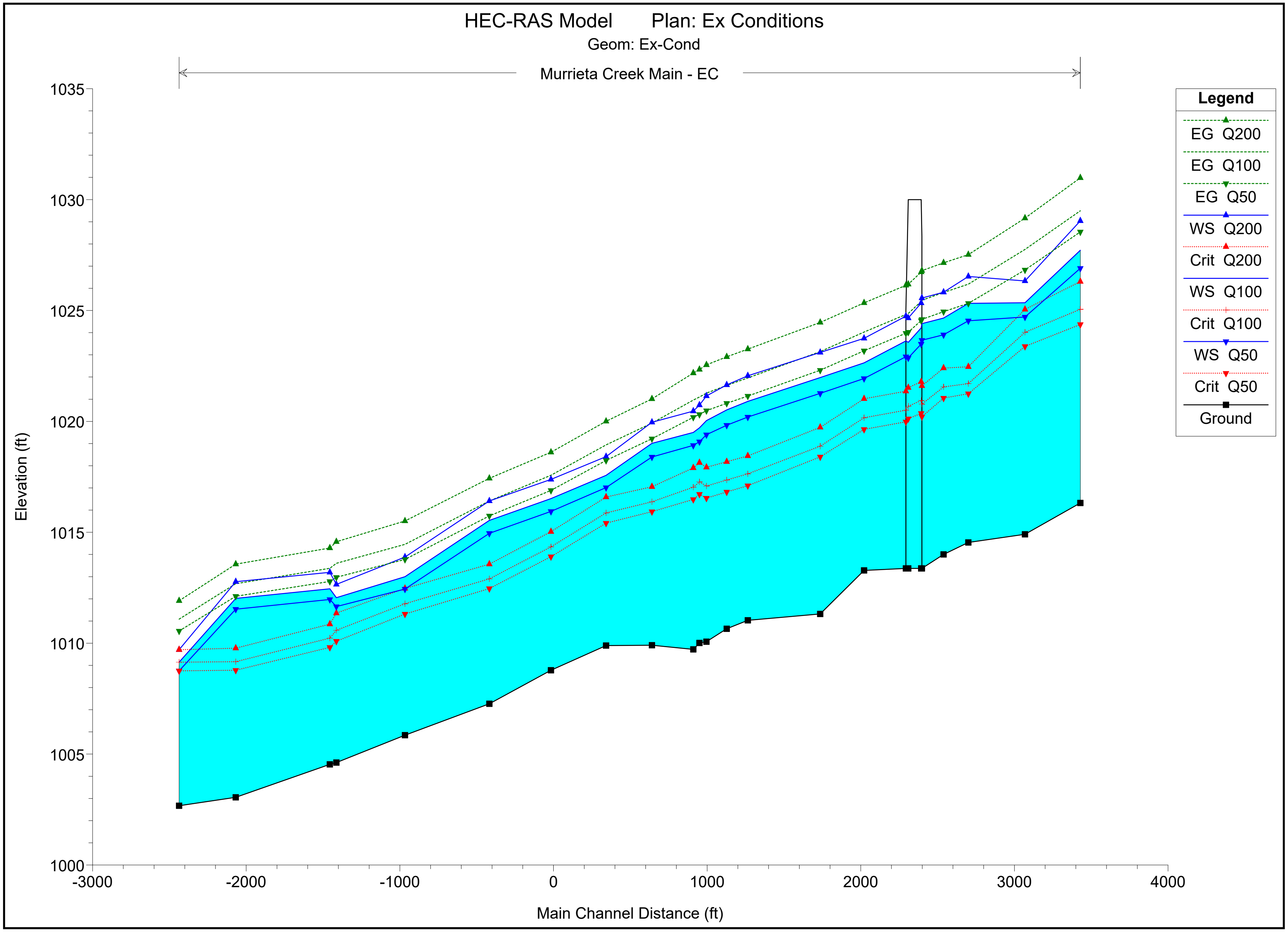
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = 343
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = -16
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = -417
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = -966
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta

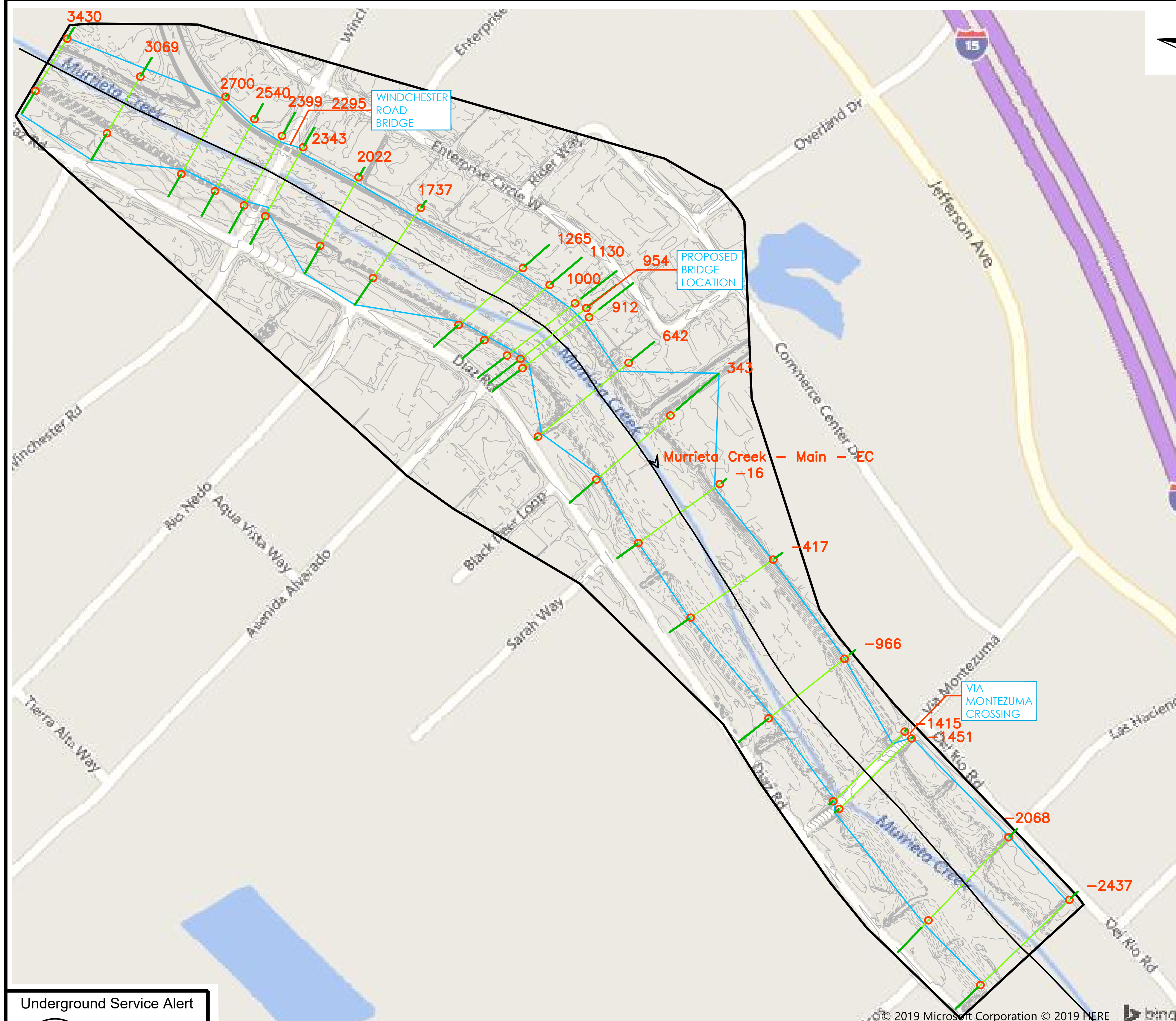

HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = -1415 Via Montezuma Via Montezuma
.016
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = -1451 Via Montezuma Via Montezuma
.016
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = -2068
.035
.042
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
River = Murrieta Creek Reach = Main - EC RS = -2437
.035
.042
Legend
EG Q100
WS Q100
Crit Q100
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Ex Conditions
Geom: Ex-Cond
Murrieta Creek Main - EC
Legend
EG Q200
EG Q100
EG Q50
WS Q200
Crit Q200
WS Q100
Crit Q100
WS Q50
Crit Q50
Ground
Elevation (ft)
Main Channel Distance (ft)
1035
1030
1025
1020
1015
1010
1005
1000
-3000
-2000
-1000
0
1000
2000
3000
4000



N

LEGEND

○	BANK STATION
light green line	HEC-RAS CROSS SECTIONS
dark green line	INEFFECTIVE FLOW AREA
grey line	HEC-RAS RIVER REACH
blue line	100 YEAR INUNDATION BOUNDARY
black line	BOUNDARY OF SURVEY

SUMMARY TABLE FOR EXISTING CONDITIONS

HEC-RAS Plan: Ex Conditions River: Murrieta Creek Reach: Main - EC Profile: Q100

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Area (sq ft)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Mann Wtd Chnl
Main - EC	3430	Q100	22300.00	1027.71	0.003944	10.71	2210.05	2081.55	357.94	0.66	0.035
Main - EC	3069	Q100	22300.00	1025.35	0.005624	12.44	1812.40	1792.90	273.26	0.77	0.035
Main - EC	2700	Q100	22300.00	1025.32	0.001845	7.46	2988.92	2988.92	353.32	0.45	0.035
Main - EC	2540	Q100	22300.00	1024.66	0.002491	8.62	2586.92	2586.92	307.27	0.52	0.035
Main - EC	2399	Q100	22300.00	1024.41	0.002112	8.25	2704.36	2704.36	297.28	0.48	0.035
Main - EC	2343 Winchester Road		Bridge								
Main - EC	2295	Q100	22300.00	1023.63	0.002512	8.76	2545.52	2545.52	293.27	0.52	0.035
Main - EC	2022	Q100	22300.00	1022.64	0.003219	9.47	2489.63	2355.81	401.55	0.59	0.035
Main - EC	1737	Q100	22300.00	1021.98	0.002573	8.67	2731.69	2571.28	432.09	0.52	0.035
Main - EC	1265	Q100	22300.00	1020.90	0.002323	8.25	2702.30	2702.30	330.40	0.51	0.035
Main - EC	1130	Q100	22300.00	1020.52	0.002391	8.44	2643.54	2643.54	319.97	0.52	0.035
Main - EC	1000	Q100	22300.00	1020.04	0.002671	8.92	2498.60	2498.60	300.43	0.55	0.035
Main - EC	954 Bridge Location	Q100	22300.00	1019.71	0.003265	9.44	2362.04	2362.04	305.07	0.60	0.035
Main - EC	912	Q100	22300.00	1019.50	0.003238	9.68	2303.09	2303.09	282.98	0.60	0.035
Main - EC	642	Q100	22300.00	1019.01	0.002497	7.67	2907.17	2907.17	417.14	0.51	0.035
Main - EC	343	Q100	22300.00	1017.57	0.004126	9.39	2399.69	2374.83	443.08	0.65	0.035
Main - EC	-16	Q100	22300.00	1016.52	0.003071	8.23	2709.90	2709.90	409.65	0.56	0.035
Main - EC	-417	Q100	22300.00	1015.54	0.002493	7.51	2967.81	2967.81	441.66	0.51	0.035
Main - EC	-966	Q100	22300.00	1013.00	0.005106	9.69	2301.96	2301.96	398.86	0.71	0.035
Main - EC	-1415 Via Montezuma	Q100	22300.00	1012.05	0.000973	9.98	2233.97	2233.97	345.75	0.69	0.016
Main - EC	-1451 Via Montezuma	Q100	22300.00	1012.46	0.000603	7.71	2899.33	2894.41	476.51	0.54	0.016
Main - EC	-2068	Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66	530.11	0.45	0.035
Main - EC	-2437	Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54	511.52	1.00	0.035

0 500 1000
Feet

Underground Service Alert

Call: TOLL FREE
1-800
422-4133

TWO WORKING DAYS BEFORE YOU DIG

ERSC INC.COM
Engineering Resources of Southern California
1861 West Redlands Blvd.
Redlands, CA 92373
P: 909.890.1255
F: 909.890.0995

CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE
Contractor ______					
Inspector ______					
Date Completed ______					

BENCH MARK

RIVERSIDE COUNTY FLOOD CONTROL BENCH MARK No. Z10320 AN 1/2" IP, WITH RCFC TRI STAR CAP. 173; ± EAST OF DIAZ RD CL AND 34' ± NORTH BLOCK WALL, FLUSH ELEVATION: 1028.38 (NAVD88)

SCALE
Horizontal
Vertical

SEAL:

Designed By	Drawn By	Checked By

Plans Prepared Under Supervision Of

STEVEN LATINO, PE Date ______
R.C.E. No. XXXXX Expires XX-XX-XX

RECOMMENDED BY: ______ DATE: ______
NINO ABAD, ASSOCIATE ENGINEER

ACCEPTED BY: ______ DATE: ______
PATRICK A. THOMAS
DIRECTOR OF PUBLIC WORKS/CITY ENGINEER
R.C.E. No. 44223 Expires: 06-30-2019

CITY OF TEMECULA DEPARTMENT OF PUBLIC WORKS

MURRIETA CREEK BRIDGE
AT OVERLAND DRIVE
PROJECT NO. PW 16-05
EXISTING CONDITION WORK MAP

Drawing No.
WM - 1
Sheet 1 of 2

June 2, 2020

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                        HEC-RAS HEC-RAS 5.0.7 March 2019
                            U.S. Army Corps of Engineers
                          Hydrologic Engineering Center
                               609 Second Street
                               Davis, California


            X     X  XXXXXX    XXXX        XXXX       XX      XXXX
            X     X  X        X    X       X   X     X  X    X
            X     X  X        X            X   X    X    X   X
            XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
            X     X  X        X            X  X     X    X        X
            X     X  X        X    X       X   X    X    X        X
            X     X  XXXXXX    XXXX        X    X   X    X   XXXXX




PROJECT DATA
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Project File : 19009001_Murrieta Creek.prj
Run Date and Time: 6/2/2020 8:04:17 AM

Project in English units

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STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.p01

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           Flow Title    : Flood Design
           Flow File     : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS &
STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.f01

Plan Description:
Murrieta Creek in Proposed water crossing at Overland Drive


Plan Summary Information:
Number of:  Cross Sections =   21    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    2    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.33
    Flow tolerance factor                =  0.001
```

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Flood Design
Flow File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.f01

Flow Data (cfs)

River	Reach	RS	Q100	Q200	Q50
Murrieta Creek	Main - EC	3430	22300	27200	19300

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Murrieta Creek	Main - EC	Q100	Critical	Critical
Murrieta Creek	Main - EC	Q200	Critical	Critical
Murrieta Creek	Main - EC	Q50	Critical	Critical

GEOMETRY DATA

Geometry Title: Pr Bridge
Geometry File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.g04

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: 3430

INPUT
Description:
Station Elevation Data   num=   178

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1027.96	2.84	1027.96	6.07	1028.25	8.57	1028.8	11.66	1028.88
14.68	1029	18.56	1029.83	20.8	1029.83	26.61	1029.92	27.71	1029.93
36.93	1029.96	38.2	1029.57	39.13	1029.43	40.72	1029	42.22	1028.13
46.23	1028.13	48.06	1028.09	48.83	1028	55.72	1026.94	56.1	1027
56.63	1027	57.94	1026.83	59.81	1026.58	63.23	1026.59	64	1026.6
74.7	1026.18	75.19	1026.18	76.06	1026.16	76.46	1026.01	87.28	1026
89.31	1024.19	89.55	1024	90.95	1023.15	91.29	1022.6	93.62	1021.69
95.06	1020.92	96.28	1020.73	97.3	1020.45	98.26	1019.58	99.65	1018.97
99.73	1019.03	100.35	1019.02	104.88	1018.17	109.54	1018	109.85	1018
110.71	1017.77	113.34	1017.7	114.42	1017.65	115.28	1016.68	118.05	1016.44
120.32	1016.44	125.04	1016.44	125.81	1016.44	126.71	1016.32	130.38	1016.64
131.88	1016.89	133.48	1017.05	133.89	1017.27	135.82	1017.19	139.2	1017.07
140.19	1017.06	140.62	1017.34	140.98	1017.06	141.19	1017.38	142.14	1017.42
143.09	1017.27	147.15	1017.27	148.34	1017.48	149.37	1017.48	149.99	1017.48
152.8	1017.45	153.45	1017.35	155.02	1017.07	155.32	1017.02	155.53	1017
155.82	1016.88	156.64	1016.85	157.09	1016.85	163.03	1016.92	163.19	1016.85
164.28	1016.85	164.69	1017	165.57	1017.04	165.8	1017.03	166.07	1017.03
166.99	1017.07	169.28	1017.08	171.39	1017.07	172.51	1017.05	173.67	1017.05
175.26	1017	176.84	1016.85	177.56	1016.89	178.21	1016.98	179.16	1017.06
180.88	1017.16	182.1	1017.13	184.18	1017.2	186.47	1017.33	191.53	1017.14
191.63	1017.14	195.47	1017.15	196.24	1017.17	197.38	1017.24	200.1	1017.23
201.19	1017.26	202.12	1017.27	203.33	1017.56	204.22	1017.55	205.58	1017.48
205.74	1017.48	208.17	1017.48	211.62	1017.54	213.01	1017.56	215.44	1017.67
216.52	1017.83	217.46	1018.16	217.79	1018.17	218.06	1018.11	218.79	1018.11
219.01	1018	221.57	1017.48	223.57	1017.53	224.8	1017.63	230.13	1017.64
238.26	1017.48	240.81	1017.54	244.58	1017.63	246.16	1017.66	246.48	1017.66
249.23	1017.48	252.05	1017.48	252.69	1016.69	256.03	1016.54	256.59	1016.51
257.15	1016.45	270.66	1016.97	270.76	1017.02	277.56	1019.21	280.09	1019.48

```
  280.64 1019.48  282.64 1020.71  283.38    1021  284.04    1021  284.15 1021.27
  284.59 1021.42  284.98 1021.75   286.1 1021.87  286.89 1022.31  288.74 1023.71
  291.13    1024  293.75 1024.61  295.06 1025.32  296.12 1025.31  296.65 1025.18
  297.61 1025.18  298.39    1026  301.37    1027  301.67    1027  302.26    1028
  305.15    1028  305.58 1028.18  305.93 1028.18  324.08  1029.4  324.94 1029.46
  326.85 1029.52  327.88 1028.55  329.27 1028.58  331.95 1028.52  333.39    1028
  335.76 1027.67  337.03 1027.59  353.43 1026.57  384.91 1026.67  409.21  1026.2
  415.29 1026.08   421.3 1026.11  441.98 1026.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   36.93    .035  324.08    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.93  324.08           360.57  360.57  360.57             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   34.39  1033.2       F
  330.56  441.98 1034.68       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 3069

INPUT
Description:
Station Elevation Data    num=     186
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1025.83   24.86 1025.83   27.17 1025.83   28.86 1026.07   30.65 1026.07
    33.1 1025.96   35.79 1025.96    46.4 1025.53   51.43 1025.42   57.01 1025.32
    66.4 1025.51   75.04 1025.71   75.49 1025.74   79.87  1025.8   88.64 1025.98
   89.08    1026   89.22 1026.01   89.52 1026.05    90.3 1026.09   91.71    1026
    91.8    1026   91.87 1026.09   92.18 1026.33   94.86 1026.33   95.38 1026.33
  108.66  1026.4  112.49  1026.6  117.97 1026.46  118.89    1026  120.11  1025.4
  120.88    1025  122.16    1025  122.84    1024  123.33    1024   123.4 1023.73
  124.67  1023.7  124.73 1023.03  125.31    1023  126.21    1023  126.59 1021.54
   127.7 1021.22  128.02 1021.23  128.51 1021.15  128.56 1021.02   129.1    1021
   129.3    1021   129.4    1021  130.96 1020.36  131.44 1019.81   133.4 1019.67
  134.14 1019.57  134.54 1018.25  136.64 1018.04   137.4    1018  137.91  1017.7
  139.91 1016.94  140.44 1016.53  141.16 1016.51  141.28 1016.64  142.69 1016.64
  142.77 1015.98  146.05    1015   146.3    1015  146.81 1014.91  147.65 1014.91
  171.68 1014.91  171.82 1015.39  172.01 1015.39  173.31    1015  175.66 1016.29
  176.78 1016.64  178.01 1016.64  180.08 1016.64  182.13 1017.03  182.48 1017.06
  182.85 1017.06  187.36 1017.26  188.07 1017.27  193.64 1017.27   193.8 1017.07
  196.44 1017.27  198.22  1017.4  198.43 1017.69   198.7 1017.68  209.17 1017.49
  209.54  1017.5   212.5 1017.69  213.41 1017.64   217.7 1017.41   219.4 1017.12
  220.67 1017.01  220.72    1017  221.73    1017  222.26 1016.85  229.23 1016.85
   229.7 1016.85  233.45    1017  233.59 1017.08  235.02 1017.06  237.31 1017.06
  242.56  1017.2  246.23 1017.12  247.19 1017.09  248.98 1016.85  249.73 1016.85
  250.57 1016.84  259.96 1016.65  260.27 1016.64  262.95  1016.3  265.06 1016.03
  265.28    1016   268.5  1016.1  269.11 1016.11  271.78 1015.76  274.76 1016.02
  276.61 1016.12  277.57 1016.34  291.41 1016.43  291.98 1016.43  302.38 1016.43
  303.08 1016.43  303.48 1016.43  319.74 1016.56  320.24 1016.83  320.69 1016.83
  322.44 1017.66  325.82 1019.11  328.06 1019.25  328.44 1019.93  328.58 1019.93
  329.47    1020  330.92  1020.8  331.73 1021.23  333.01 1021.31  335.85    1022
  335.95 1022.03  338.69    1023  339.12 1023.16  341.24 1023.26  341.51 1024.02
  344.19    1026  344.27    1026  346.62 1026.02  349.17 1026.96  349.21    1027
  349.31    1027  349.62 1027.28  349.92 1027.28  350.08    1027  350.26    1027
  350.89 1027.28  351.35 1027.28  352.54 1027.28  352.73 1027.28  352.92 1027.28
  357.77 1027.86  358.01    1028  358.28 1028.07  362.15 1028.05  372.74 1028.05
  373.06 1028.03  373.23 1028.01  379.76    1028  379.93 1027.58  380.39 1027.48
  381.18 1027.47  398.61 1027.18  398.83 1027.46  399.72 1027.46  401.04 1027.24
  409.33 1027.01  409.43    1027  409.77    1027  409.97    1027  410.27 1026.87
   417.2 1026.78  419.15 1026.75  431.52    1026  432.69    1026  461.64  1025.5
  477.14 1025.11  479.07 1025.08  488.98 1024.79  508.53 1024.81  515.06 1024.94
  515.09 1024.94

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042  112.49    .035  362.15    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        112.49  362.15           368.55  368.55  368.55             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
```

Sta L	Sta R	Elev	Permanent
0	104.79	1030.75	F
366.55	515.09	1031.44	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: 2700

INPUT
Description:
Station Elevation Data   num=   237

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1029.13	.14	1029.13	4.23	1029.07	5	1029.01	10.32	1028.86
11.83	1028.81	12.69	1028.78	18.51	1028.71	19.17	1028.12	19.32	1028
20.19	1028.17	20.61	1028.18	22.13	1025.83	23.25	1024.11	24.92	1024.04
25.12	1024.12	25.26	1024	26.92	1023	27.7	1022.57	28.72	1021.48
29.69	1021.05	30.42	1021.04	31.76	1020	32.14	1019.14	33.62	1019.09
33.77	1019	33.96	1019	35.44	1018	35.73	1017.82	37.08	1016.86
37.84	1016.87	38.1	1016.55	40.08	1016.39	42.59	1016.43	44.76	1016.87
45.39	1017.16	45.66	1017.16	46.95	1017.18	51.88	1017.2	57.88	1017.27
66.75	1017.18	75.9	1017.01	76.25	1017.3	84.95	1017.3	88.66	1017.3
88.74	1017.3	88.83	1017.3	94.98	1017.08	95.2	1017.06	95.42	1017.01
95.56	1017.08	98.54	1016.84	101.41	1016.4	102.21	1016.4	105.16	1016.4
105.41	1016.4	106.03	1016.44	107.64	1016.54	108.83	1016.57	109.25	1016.62
110.41	1016.85	115.25	1016.96	117.16	1016.99	118.51	1017	122.34	1017.06
126.95	1017.06	131.55	1017.04	131.89	1017.06	131.94	1017.06	132.23	1017.06
134.02	1017.03	136.51	1016.85	139.01	1017	141.51	1017	141.9	1017
143.02	1017.06	143.11	1017.1	143.4	1017.09	144.47	1017	147.78	1017
151.77	1017.01	153.37	1017.01	159.53	1017.03	163.51	1017.06	163.76	1017.06
164.07	1017.03	165.32	1016.87	166.73	1016.64	167.37	1016.64	167.56	1016.68
167.65	1016.71	168.21	1016.99	169.33	1016.99	169.67	1016.98	170.77	1016.97
173.24	1016.85	174.73	1016.85	176.11	1016.64	177.85	1016.76	178.84	1016.98
180.93	1017.01	182.25	1016.96	183.07	1016.97	183.65	1016.85	184.94	1016.85
188.61	1016.85	192.34	1016.82	193.81	1016.8	196.69	1016.67	199.92	1016.54
202.35	1016.43	207.39	1016.43	214.26	1016.43	215.27	1016.01	215.77	1016.01
219.24	1016.31	220.57	1016.05	221.16	1016	221.41	1015.97	224.07	1015.67
224.36	1015.61	224.55	1016.08	224.74	1016.08	225.07	1016.09	225.45	1015.65
225.64	1015.63	230.59	1015.77	231.28	1015.85	233.56	1015.89	238.41	1015.99
238.78	1016	238.97	1016.01	239.06	1016.01	239.22	1016.01	240.6	1016.01
240.64	1016	241	1016	250.37	1016	251.13	1016	251.52	1016
252.97	1016	254.16	1016	259.98	1015.99	261.48	1015.99	263.2	1016
267.88	1016	269.9	1016	270.13	1016	270.68	1016.01	271.96	1016.01
275.58	1015.97	295.22	1015.58	299.17	1015.39	299.25	1015.38	302.89	1015.45
313.41	1015.64	314.56	1015.69	321.28	1015.58	323.93	1015.06	325.77	1015
328.14	1015	331.75	1014.69	336.51	1014.54	343.17	1014.83	347.19	1015.58
348.69	1016.52	350.57	1017	352.3	1017	352.87	1017.33	353.51	1017.71
358.67	1019	361.04	1019.06	362.12	1020	362.4	1020	364.14	1021
366.01	1021	367.59	1021	369.55	1022.13	370.01	1022.14	370.04	1022.53
370.79	1023	371.7	1023	373.21	1023.78	375.06	1024.3	375.44	1025.24
377.07	1025.63	377.24	1025.63	378.57	1026	379.06	1027	380.5	1027.79
380.88	1028	381.28	1028.93	382.87	1028.93	382.96	1028.95	383.19	1029
384.08	1029	384.41	1029.19	385.06	1029.26	398.9	1029.24	399.84	1029.24
401.26	1029.23	403.45	1029.5	404.26	1029.51	407.47	1029.68	407.71	1029.52
413.47	1029.09	413.56	1029.18	413.73	1029.17	415.56	1029.01	415.59	1029
416.02	1029	419.62	1028.91	435.31	1028.22	441.66	1027.98	446.23	1027.86
446.78	1027.83	446.91	1027.83	447.07	1027.83	447.31	1027.83	447.91	1027.7
448.84	1027.69	467.31	1027.41	471.93	1027.28	475.22	1027.31	476.71	1027.25
480.48	1027.1	481.05	1026.99	481.16	1027.01	485.66	1026.93	487.11	1026.81
487.85	1026.79	488.29	1026.77	498.29	1026	498.48	1026	509.2	1026.24
512.25	1026.31	512.86	1026.31						

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	11.83	.035	399.84	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
11.83	399.84	161.15	161.15	161.15	.1	.3

Ineffective Flow   num=   2

Sta L	Sta R	Elev	Permanent
0	9.83	1036.11	F
404.34	512.86	1037.18	F

CROSS SECTION

RIVER: Murrieta Creek

REACH: Main - EC RS: 2540

INPUT
Description:
Station Elevation Data num= 177

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1027.4	64.26	1027.45	72.65	1028	75.81	1028.85	75.96	1028.85
78.08	1028.86	79.61	1028.82	88.99	1028.62	96.92	1028	98.21	1027.39
98.69	1027.39	98.94	1027.6	101.81	1027.6	107.28	1021	107.69	1021
107.75	1021	108.96	1020.02	111.31	1018.99	112.47	1018.24	112.86	1018
113.48	1017	114.58	1016	115.45	1016	117.38	1015.63	127.91	1016
131.17	1016.01	136.33	1016.04	141.88	1016.04	142.88	1015.99	143.1	1015.98
144.69	1015.98	146.93	1016.01	148.73	1016.01	155.85	1016.17	156.24	1016.22
156.32	1016.22	157.87	1016	159.76	1015.83	160.78	1016.03	162.33	1016.03
163.12	1016.21	165.07	1016.22	165.13	1016.22	165.31	1016.22	168.26	1016.09
174.03	1015.68	185.91	1015.86	192.96	1016	194.46	1016.01	199.31	1016.32
205.07	1016.43	205.79	1016.43	210.28	1016.43	217.07	1016.39	217.93	1016.45
221.08	1016.42	225.97	1016.52	226.26	1016.53	226.79	1016.43	227.06	1016.41
228.26	1016.43	239.03	1016.43	240.58	1016.43	242.2	1016.43	244.61	1016.04
245.01	1016	245.47	1016	246.06	1016	247.28	1016.31	250.77	1016.41
252.77	1016.41	254.32	1016.41	255.68	1016.46	258.17	1016.36	260.31	1016.4
262.05	1016.47	264.66	1016.34	265.87	1016.22	267.39	1016.38	267.45	1016.39
267.49	1016	268.26	1015.8	268.54	1015.8	269.01	1015.86	270.99	1015.77
271.82	1015.77	273.72	1015.9	276.35	1015.79	281.52	1015.75	301.04	1015.5
304.31	1015.77	305.37	1015.73	310.97	1015.38	314.26	1015.38	315.47	1015.13
315.76	1015.05	316.04	1015	317.21	1015	335.18	1014.97	335.37	1015
336.13	1015.17	336.42	1015.03	336.51	1015.17	337.04	1015.17	345.18	1015.18
347.16	1015	347.89	1015	349.16	1015	353.22	1015.05	353.7	1015.06
356.29	1014.67	358.13	1014.12	361.89	1014.12	367.26	1014.22	367.62	1014.29
368.3	1014.27	369.25	1014.2	372.67	1014.05	373.47	1014.02	374.54	1014.01
375.2	1014	377.02	1014.14	382.29	1014.92	384.58	1015.33	386.88	1016.2
387.56	1016.55	389.98	1016.73	391.96	1017.74	392.66	1018.41	393.82	1018.43
395.22	1019.01	395.55	1019.54	397.34	1019.14	397.54	1020	398.09	1021
400.02	1021	401.13	1022	402.54	1022	402.91	1022	405.27	1022.55
406.08	1023	407.2	1023.69	408.15	1024.2	408.78	1024.34	411.18	1024.51
412.29	1025	413.2	1025.53	414.78	1026.82	415.13	1027.81	416.92	1027.93
419.23	1029	419.45	1029	419.59	1029.28	421.84	1029.22	422.71	1029.22
433.37	1029.29	438.19	1029.32	439.01	1029.31	439.87	1029.29	440.37	1029.27
444.75	1029.13	448.13	1029.05	448.72	1028.98	450.92	1028.9	451.75	1028.76
455.08	1028.74	463.87	1028.45	465.47	1028.44	470	1028.33	477.86	1028.28
483	1028.27	507.17	1027.56	532.89	1027.28	532.92	1027	541.46	1026.77
553.24	1026.95	555.53	1026.99						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	88.99	.035	422.71	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88.99	422.71	141.07	141.07	141.07	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	80.45	1038.47	F
426.35	555.53	1039.09	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 2399

INPUT
Description:
Station Elevation Data num= 261

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1029.02	.23	1028.98	22.55	1029.59	23.49	1029.5	29.83	1029.6
33.36	1029.58	33.69	1029.59	33.73	1029.58	33.77	1029.58	33.91	1029.57
41.61	1029.17	41.98	1029.29	42.25	1029.26	43.21	1029.26	49.37	1029.6
61.96	1029.33	67.52	1029.59	75.64	1029.59	77.95	1029.5	78.56	1029.59
78.95	1029.59	80.71	1029.57	101.89	1029.93	102.08	1029.93	102.59	1029.93
104.77	1029.9	115.26	1030.79	116.8	1030.25	119.69	1029.24	120.83	1029.24
122.96	1029.24	123.62	1029.24	125.75	1029.48	131.99	1029.18	134.02	1029.03
134.12	1029.36	134.22	1029.36	134.97	1029.19	136.87	1029.18	137.5	1027.61
138.31	1027	139.14	1027	139.63	1026.37	140.72	1025.17	140.93	1025.04
142.25	1024.17	142.51	1024	143.94	1023.76	144.07	1023.76	144.97	1022
145.6	1022	146	1022.41	147.06	1022.4	147.86	1020.45	151.62	1018.31
152.19	1017.66	153.31	1018.1	153.87	1018.08	155.01	1016	155.51	1015.7
156.52	1015	156.7	1015	157.89	1014.55	160.65	1014.3	163.52	1014.3

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  166.77 1014.99  166.91    1015  168.47    1015  169.73 1015.04  174.96 1015.24
  175.49 1015.26  175.61 1015.29  176.63 1015.35  177.29 1015.35  187.57 1015.35
  197.06 1015.35  197.74 1015.35  198.81    1015  199.84    1015  202.28 1015.05
  204.27 1015.14     206 1015.01   207.5 1015.52  216.13 1015.39  218.13 1015.35
  218.67 1015.35  218.89 1015.35  219.07 1015.35  219.55 1015.35  223.49 1015.19
  228.85    1015   228.9    1015  228.92    1015   229.7 1015.71  233.05  1015.7
  237.76 1015.79  241.62 1015.89  244.67 1015.89   244.7 1015.77   247.2 1015.32
  249.06 1014.98  249.27 1014.62  250.97 1014.62  253.39 1014.62  254.25 1014.62
  255.42 1014.53  257.59 1014.61  258.02  1014.6  259.06 1015.71  259.56 1015.71
  260.91 1015.28  262.15 1015.71  273.22 1015.95   279.3 1015.93   280.1 1015.93
  283.81 1015.57  286.47 1015.56  289.48 1015.25  296.41 1015.17  296.49 1015.17
  296.58 1015.17  299.33 1015.29  300.84    1015  303.68    1015  305.77 1014.84
  306.25 1014.84  310.77 1014.76  310.94 1014.54  318.89 1014.44  320.47 1014.44
  320.83 1014.04     321 1014.07  321.12 1014.06  321.59 1013.96  322.47 1013.81
  322.87 1013.86  323.17 1014.57  323.53 1013.81  324.05 1013.83  325.26 1013.87
  326.29 1014.12  327.45 1014.26  329.05 1014.26  332.89 1014.22  335.16 1014.18
   336.4 1014.19  339.61 1014.08  340.84 1014.34  341.17 1014.26  341.57 1014.26
  343.27 1014.43  344.09 1014.43   344.2  1014.3  346.26 1014.52  346.72 1015.18
  347.19 1015.35  351.46 1015.35  352.76 1015.36   356.6 1015.14  359.12 1015.09
  360.97 1014.88  361.06 1014.87  361.13 1014.88  361.24 1014.66  363.03  1014.4
  363.29    1014  365.04    1014  365.89 1014.02   366.1 1014.06  366.93 1013.98
  370.65 1013.68  374.41  1013.9  374.54  1013.9  374.82    1014  375.76    1014
  375.92    1014  376.04 1013.81  379.33 1013.53  380.89 1013.37   383.7 1013.37
  387.15 1013.37  389.22 1013.45  389.96 1013.48  393.61 1013.89  396.28 1013.89
  406.93 1013.89  412.86 1013.98  414.09 1013.98  414.81 1014.01  418.93 1014.02
  421.31 1014.08  421.99    1015  423.69 1015.51  424.89 1015.85  425.76 1016.29
  426.38 1016.29   427.7 1017.96  428.17 1017.96  429.18 1017.31  429.37  1017.8
  429.53 1018.07  429.84    1018  430.81 1018.63  431.36 1019.35  432.31 1019.41
  432.88 1019.63  433.78    1020  435.91 1021.58  436.87    1022  437.43 1023.41
  439.86  1024.8  440.12  1024.8  440.35 1025.83  441.23 1025.85  442.61    1027
  442.78 1027.68  444.57 1027.55  445.42 1027.81  445.98    1028  447.93 1028.64
  449.04    1029  453.28 1029.26  454.22 1029.45  459.09 1029.67  461.93 1029.67
  468.98 1029.67  474.81 1029.65  483.23  1029.2  493.97    1029  497.21    1029
  498.15 1028.98  498.65 1028.98  499.98 1028.97  502.45 1028.97  507.32 1029.13
  511.95  1029.1   521.3 1028.72  522.22 1028.48  529.56 1028.43  537.05 1028.04
  539.33 1028.03  540.17 1028.04  540.36    1028  540.72    1028  540.97    1028
  543.29    1028  544.09 1027.92  544.36 1027.91  552.82  1027.6  559.36  1027.6
  559.55  1027.6  567.27 1027.21  570.03 1027.23  571.43 1027.26  571.66 1027.46
  576.73 1027.46  579.79 1027.46  584.15 1027.51   593.7 1027.44  595.27 1027.44
  596.93 1027.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   116.8    .035  461.93    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         116.8  461.93           103.93  103.93  103.93             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  110.61  1047.8       F
  467.29  596.93  1049.8       F

BRIDGE


RIVER: Murrieta Creek
REACH: Main - EC          RS: 2343

INPUT
Description: Winchester Road
Distance from Upstream XS =       5
Deck/Roadway Width        =      84
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   117.5    1030  1028.2     135    1031    1029     280    1033    1030
     280    1033    1030     446    1031    1029   452.5    1030  1028.2

Upstream Bridge Cross Section Data
Station Elevation Data    num=     261
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.02     .23 1028.98   22.55 1029.59   23.49  1029.5   29.83  1029.6
   33.36 1029.58   33.69 1029.59   33.73 1029.58   33.77 1029.58   33.91 1029.57
   41.61 1029.17   41.98 1029.29   42.25 1029.26   43.21 1029.26   49.37  1029.6
   61.96 1029.33   67.52 1029.59   75.64 1029.59   77.95  1029.5   78.56 1029.59
   78.95 1029.59   80.71 1029.57  101.89 1029.93  102.08 1029.93  102.59 1029.93
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   104.77  1029.9  115.26 1030.79   116.8 1030.25  119.69 1029.24  120.83 1029.24
   122.96 1029.24  123.62 1029.24  125.75 1029.48  131.99 1029.18  134.02 1029.03
   134.12 1029.36  134.22 1029.36  134.97 1029.19  136.87 1029.18   137.5 1027.61
   138.31    1027  139.14    1027  139.63 1026.37  140.72 1025.17  140.93 1025.04
   142.25 1024.17  142.51    1024  143.94 1023.76  144.07 1023.76  144.97    1022
    145.6    1022     146 1022.41  147.06  1022.4  147.86 1020.45  151.62 1018.31
   152.19 1017.66  153.31  1018.1  153.87 1018.08  155.01    1016  155.51  1015.7
   156.52    1015   156.7    1015  157.89 1014.55  160.65  1014.3  163.52  1014.3
   166.77 1014.99  166.91    1015  168.47    1015  169.73 1015.04  174.96 1015.24
   175.49 1015.26  175.61 1015.29  176.63 1015.35  177.29 1015.35  187.57 1015.35
   197.06 1015.35  197.74 1015.35  198.81    1015  199.84    1015  202.28 1015.05
   204.27 1015.14     206 1015.01   207.5 1015.52  216.13 1015.39  218.13 1015.35
   218.67 1015.35  218.89 1015.35  219.07 1015.35  219.55 1015.35  223.49 1015.19
   228.85    1015   228.9    1015  228.92    1015   229.7 1015.71  233.05  1015.7
   237.76 1015.79  241.62 1015.89  244.67 1015.89   244.7 1015.77   247.2 1015.32
   249.06 1014.98  249.27 1014.62  250.97 1014.62  253.39 1014.62  254.25 1014.62
   255.42 1014.53  257.59 1014.61  258.02  1014.6  259.06 1015.71  259.56 1015.71
   260.91 1015.28  262.15 1015.71  273.22 1015.95   279.3 1015.93   280.1 1015.93
   283.81 1015.57  286.47 1015.56  289.48 1015.25  296.41 1015.17  296.49 1015.17
   296.58 1015.17  299.33 1015.29  300.84    1015  303.68    1015  305.77 1014.84
   306.25 1014.84  310.77 1014.76  310.94 1014.54  318.89 1014.44  320.47 1014.44
   320.83 1014.04     321 1014.07  321.12 1014.06  321.59 1013.96  322.47 1013.81
   322.87 1013.86  323.17 1014.57  323.53 1013.81  324.05 1013.83  325.26 1013.87
   326.29 1014.12  327.45 1014.26  329.05 1014.26  332.89 1014.22  335.16 1014.18
    336.4 1014.19  339.61 1014.08  340.84 1014.34  341.17 1014.26  341.57 1014.26
   343.27 1014.43  344.09 1014.43   344.2  1014.3  346.26 1014.52  346.72 1015.18
   347.19 1015.35  351.46 1015.35  352.76 1015.36   356.6 1015.14  359.12 1015.09
   360.97 1014.88  361.06 1014.87  361.13 1014.88  361.24 1014.66  363.03  1014.4
   363.29    1014  365.04    1014  365.89 1014.02   366.1 1014.06  366.93 1013.98
   370.65 1013.68  374.41  1013.9  374.54  1013.9  374.82    1014  375.76    1014
   375.92    1014  376.04 1013.81  379.33 1013.53  380.89 1013.37   383.7 1013.37
   387.15 1013.37  389.22 1013.45  389.96 1013.48  393.61 1013.89  396.28 1013.89
   406.93 1013.89  412.86 1013.98  414.09 1013.98  414.81 1014.01  418.93 1014.02
   421.31 1014.08  421.99    1015  423.69 1015.51  424.89 1015.85  425.76 1016.29
   426.38 1016.29   427.7 1017.96  428.17 1017.96  429.18 1017.31  429.37  1017.8
   429.53 1018.07  429.84    1018  430.81 1018.63  431.36 1019.35  432.31 1019.41
   432.88 1019.63  433.78    1020  435.91 1021.58  436.87    1022  437.43 1023.41
   439.86  1024.8  440.12  1024.8  440.35 1025.83  441.23 1025.85  442.61    1027
   442.78 1027.68  444.57 1027.55  445.42 1027.81  445.98    1028  447.93 1028.64
   449.04    1029  453.28 1029.26  454.22 1029.45  459.09 1029.67  461.93 1029.67
   468.98 1029.67  474.81 1029.65  483.23  1029.2  493.97    1029  497.21    1029
   498.15 1028.98  498.65 1028.98  499.98 1028.97  502.45 1028.97  507.32 1029.13
   511.95  1029.1   521.3 1028.72  522.22 1028.48  529.56 1028.43  537.05 1028.04
   539.33 1028.03  540.17 1028.04  540.36    1028  540.72    1028  540.97    1028
   543.29    1028  544.09 1027.92  544.36 1027.91  552.82  1027.6  559.36  1027.6
   559.55  1027.6  567.27 1027.21  570.03 1027.23  571.43 1027.26  571.66 1027.46
   576.73 1027.46  579.79 1027.46  584.15 1027.51   593.7 1027.44  595.27 1027.44
   596.93 1027.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   116.8    .035  461.93    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
         116.8  461.93             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  110.61  1047.8       F
  467.29  596.93  1049.8       F

Downstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     110    1030  1028.2     115    1031    1029     270    1033    1030
     270    1033    1030     427    1031    1029     434    1030  1028.2

Downstream Bridge Cross Section Data
Station Elevation Data    num=     265
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.69     .27 1029.69    3.98 1029.77    9.71 1029.77   12.09 1029.77
    18.45    1030   19.68 1030.12   23.19 1030.12   26.48 1030.07      30 1030.12
    31.88 1030.12   33.85 1030.26   41.44 1030.27   45.05 1030.29   55.06 1030.29
    58.32 1030.29   65.21 1030.29   67.57 1030.29   69.59 1030.38   71.02 1030.38
    72.13 1030.39   73.33 1030.41   75.79 1030.29   76.38    1030   76.62 1029.98
    77.61 1030.07   86.22 1029.73   87.53 1029.65   90.23 1029.65   91.49 1029.79
     92.3 1029.79   95.36 1029.51   98.27 1029.43  107.35 1029.18  110.91    1029
   111.16    1029  119.42    1026  120.71 1025.12  122.34 1023.99  122.46 1024.03
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  123.84 1024.01  124.24 1022.73  125.35 1022.73     126 1021.57  126.85    1021
  127.66    1020  128.36 1019.88  128.54 1019.75  128.74 1019.75  129.57    1019
  129.99    1019  130.92 1018.45  131.67 1017.28  132.97 1017.23  133.35 1016.39
  134.32  1016.3  135.04    1016  135.15    1016  136.73    1015  138.68 1014.99
  140.04 1014.99  140.32 1014.99  140.63 1015.01  140.72 1015.11  141.06 1015.02
  141.74 1014.76  141.85 1015.17  143.02 1015.19  153.55 1014.87  158.02 1014.85
  161.64 1015.02  163.12 1014.72  165.38 1014.65  167.91  1014.4  168.84 1014.19
  172.28 1014.08  174.96  1014.2  176.63 1014.81  180.46 1014.82  186.54 1014.79
  188.64  1014.8  189.42 1014.81  191.22 1014.81   193.3 1014.81  194.56 1014.81
  197.18 1014.71  198.54 1014.44  202.49 1014.44  203.17 1014.43   204.6 1014.43
  204.67 1014.43  204.79 1014.43  205.87 1014.55  206.58 1014.57  208.59 1014.66
  209.94 1014.91  210.98 1015.14  212.96 1015.17  215.12 1015.17  216.17 1015.17
  217.36 1015.17  220.33 1015.21  222.65 1015.11  222.89  1015.1   223.2 1015.12
   226.1 1015.05  226.42 1014.99  226.47  1014.8  226.72  1014.8  227.16 1014.89
  227.76 1014.94  230.56 1014.52  233.15 1015.08  233.25 1015.08  235.36    1015
  235.81    1015  238.31 1014.78  239.32 1014.48  242.42 1015.01   243.2 1015.13
  243.37 1015.23  246.07 1015.23   249.8 1015.35  252.11 1015.53  252.84 1015.53
  254.59 1015.53  260.82 1015.42   264.7 1015.35  267.76 1015.32  270.64  1015.3
  272.83 1015.22  275.23  1015.1  278.69 1014.92   280.7    1015  281.51    1015
  283.59 1015.21     285 1015.18  285.44 1015.01  290.77 1015.01  291.68 1015.09
  295.54 1015.11  296.53 1015.44  299.65 1015.44  304.54 1015.37  305.42 1015.01
  307.77 1015.01  308.93    1015  308.98    1015  311.26 1014.08  313.79 1014.77
  318.61 1014.08  321.21 1014.19  322.35 1014.22   324.6  1014.2  326.13 1014.26
  329.14 1014.26  339.84 1014.17  346.93 1014.08     351 1014.08  351.81 1014.08
  352.25  1014.2  352.58 1014.18  355.23    1014   363.3    1014  363.37 1013.37
  363.51 1013.37  363.96 1013.37  368.71 1013.37  374.34 1013.65  376.21 1013.77
  377.77 1013.75   379.6  1013.9   380.6 1013.88  385.29 1013.37  385.57 1013.37
  387.14 1013.85  387.24 1013.98  387.84 1013.92  389.78 1013.61  390.47 1013.54
  391.01 1013.55  392.55 1013.43  392.63 1013.42  392.77 1013.41  393.45 1013.37
  396.28 1013.37  397.62 1013.37  398.99 1013.37  399.99 1013.37  400.17 1013.37
  400.29 1013.43  401.29 1013.65  402.72 1014.06  403.65 1014.21  403.85 1014.23
  405.12 1014.34  405.37 1014.86  406.81    1016  407.25    1016  407.94    1016
  409.08    1017  410.31 1017.78  410.85    1018  411.99    1018  412.42    1019
  412.82    1020  414.03    1020     415 1020.61  415.63 1022.91  416.31 1022.91
   419.4 1025.34  420.34 1025.39  424.93    1027  425.16    1027  426.05 1028.42
  426.35 1028.43   427.6    1028  428.01    1028  428.55 1028.92  431.38 1028.78
  431.75 1028.81  432.17    1029  438.34    1029   439.4 1028.96  440.26 1029.02
  440.41 1029.03  447.75 1029.39  448.07 1029.41  448.39 1029.41  449.13 1029.32
  450.19  1029.3  453.08 1029.26   459.7 1029.12  460.57 1029.01  461.25    1029
   463.6    1029  465.55    1029  465.96 1028.99  466.13 1028.99  467.13 1028.84
   469.7 1028.84  483.25 1028.95  485.32 1028.18  485.52    1028  487.24    1028
  494.17 1028.04  495.72    1028  497.44 1027.97  497.93 1027.97  499.87 1027.84
   502.1 1028.09  503.26 1028.08  506.45 1027.71  514.39 1027.39  517.03 1027.18
  519.41 1027.12  521.02 1027.12  523.23  1027.1  525.66 1027.05  527.97 1026.88
   531.7 1027.02  532.69 1027.03  559.93 1026.51  568.43  1026.5  577.23  1026.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   98.27    .035  440.26    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
         98.27  440.26              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   92.45 1052.63       F
  446.22  577.23 1054.89       F

Upstream Embankment side slope             =       3 horiz. to 1.0 vertical
Downstream Embankment side slope           =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Piers =  4

Pier Data
Pier Station     Upstream=     190    Downstream=     175
Upstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035
Downstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035

Pier Data
```

Pier Station Upstream= 255 Downstream= 240
Upstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Downstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Pier Data
Pier Station Upstream= 320 Downstream= 305
Upstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Downstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Pier Data
Pier Station Upstream= 385 Downstream= 370
Upstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Downstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
    Energy
    Momentum Cd = 1.2
    Yarnell KVal = 1.05
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
    Energy Only

Additional Bridge Parameters
    Add Friction component to Momentum
    Do not add Weight component to Momentum
    Class B flow critical depth computations use critical depth
        inside the bridge at the upstream end
    Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 2295

INPUT
Description:
Station Elevation Data num= 265

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1029.69	.27	1029.69	3.98	1029.77	9.71	1029.77	12.09	1029.77
18.45	1030	19.68	1030.12	23.19	1030.12	26.48	1030.07	30	1030.12
31.88	1030.12	33.85	1030.26	41.44	1030.27	45.05	1030.29	55.06	1030.29
58.32	1030.29	65.21	1030.29	67.57	1030.29	69.59	1030.38	71.02	1030.38
72.13	1030.39	73.33	1030.41	75.79	1030.29	76.38	1030	76.62	1029.98
77.61	1030.07	86.22	1029.73	87.53	1029.65	90.23	1029.65	91.49	1029.79
92.3	1029.79	95.36	1029.51	98.27	1029.43	107.35	1029.18	110.91	1029
111.16	1029	119.42	1026	120.71	1025.12	122.34	1023.99	122.46	1024.03
123.84	1024.01	124.24	1022.73	125.35	1022.73	126	1021.57	126.85	1021
127.66	1020	128.36	1019.88	128.54	1019.75	128.74	1019.75	129.57	1019
129.99	1019	130.92	1018.45	131.67	1017.28	132.97	1017.23	133.35	1016.39
134.32	1016.3	135.04	1016	135.15	1016	136.73	1015	138.68	1014.99
140.04	1014.99	140.32	1014.99	140.63	1015.01	140.72	1015.11	141.06	1015.02
141.74	1014.76	141.85	1015.17	143.02	1015.19	153.55	1014.87	158.02	1014.85
161.64	1015.02	163.12	1014.72	165.38	1014.65	167.91	1014.4	168.84	1014.19
172.28	1014.08	174.96	1014.2	176.63	1014.81	180.46	1014.82	186.54	1014.79
188.64	1014.8	189.42	1014.81	191.22	1014.81	193.3	1014.81	194.56	1014.81
197.18	1014.71	198.54	1014.44	202.49	1014.44	203.17	1014.43	204.6	1014.43
204.67	1014.43	204.79	1014.43	205.87	1014.55	206.58	1014.57	208.59	1014.66
209.94	1014.91	210.98	1015.14	212.96	1015.17	215.12	1015.17	216.17	1015.17
217.36	1015.17	220.33	1015.21	222.65	1015.11	222.89	1015.1	223.2	1015.12
226.1	1015.05	226.42	1014.99	226.47	1014.8	226.72	1014.8	227.16	1014.89
227.76	1014.94	230.56	1014.52	233.15	1015.08	233.25	1015.08	235.36	1015

235.81	1015	238.31	1014.78	239.32	1014.48	242.42	1015.01	243.2	1015.13
243.37	1015.23	246.07	1015.23	249.8	1015.35	252.11	1015.53	252.84	1015.53
254.59	1015.53	260.82	1015.42	264.7	1015.35	267.76	1015.32	270.64	1015.3
272.83	1015.22	275.23	1015.1	278.69	1014.92	280.7	1015	281.51	1015
283.59	1015.21	285	1015.18	285.44	1015.01	290.77	1015.01	291.68	1015.09
295.54	1015.11	296.53	1015.44	299.65	1015.44	304.54	1015.37	305.42	1015.01
307.77	1015.01	308.93	1015	308.98	1015	311.26	1014.08	313.79	1014.77
318.61	1014.08	321.21	1014.19	322.35	1014.22	324.6	1014.2	326.13	1014.26
329.14	1014.26	339.84	1014.17	346.93	1014.08	351	1014.08	351.81	1014.08
352.25	1014.2	352.58	1014.18	355.23	1014	363.3	1014	363.37	1013.37
363.51	1013.37	363.96	1013.37	368.71	1013.37	374.34	1013.65	376.21	1013.77
377.77	1013.75	379.6	1013.9	380.6	1013.88	385.29	1013.37	385.57	1013.37
387.14	1013.85	387.24	1013.98	387.84	1013.92	389.78	1013.61	390.47	1013.54
391.01	1013.55	392.55	1013.43	392.63	1013.42	392.77	1013.41	393.45	1013.37
396.28	1013.37	397.62	1013.37	398.99	1013.37	399.99	1013.37	400.17	1013.37
400.29	1013.43	401.29	1013.65	402.72	1014.06	403.65	1014.21	403.85	1014.23
405.12	1014.34	405.37	1014.86	406.81	1016	407.25	1016	407.94	1016
409.08	1017	410.31	1017.78	410.85	1018	411.99	1018	412.42	1019
412.82	1020	414.03	1020	415	1020.61	415.63	1022.91	416.31	1022.91
419.4	1025.34	420.34	1025.39	424.93	1027	425.16	1027	426.05	1028.42
426.35	1028.43	427.6	1028	428.01	1028	428.55	1028.92	431.38	1028.78
431.75	1028.81	432.17	1029	438.34	1029	439.4	1028.96	440.26	1029.02
440.41	1029.03	447.75	1029.39	448.07	1029.41	448.39	1029.41	449.13	1029.32
450.19	1029.3	453.08	1029.26	459.7	1029.12	460.57	1029.01	461.25	1029
463.6	1029	465.55	1029	465.96	1028.99	466.13	1028.99	467.13	1028.84
469.7	1028.84	483.25	1028.95	485.32	1028.18	485.52	1028	487.24	1028
494.17	1028.04	495.72	1028	497.44	1027.97	497.93	1027.97	499.87	1027.84
502.1	1028.09	503.26	1028.08	506.45	1027.71	514.39	1027.39	517.03	1027.18
519.41	1027.12	521.02	1027.12	523.23	1027.1	525.66	1027.05	527.97	1026.88
531.7	1027.02	532.69	1027.03	559.93	1026.51	568.43	1026.5	577.23	1026.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	98.27	.035	440.26	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
98.27	440.26	272.93	272.93	272.93	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	92.45	1052.63	F
446.22	577.23	1054.89	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 2022

INPUT
Description:
Station Elevation Data num= 204

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1026.88	4.38	1026.88	20.26	1026.88	26.3	1026.98	36.49	1026.9
43.12	1027.03	43.52	1027.03	44.18	1026.95	46.88	1026.95	49.17	1026.56
50.83	1025.16	50.88	1025	52.45	1024.97	53.43	1024.97	62.6	1024.35
68.31	1024.28	68.5	1024.27	71.04	1024	74.19	1022	76.31	1021.1
77.77	1020	78.63	1019	78.82	1019	79.61	1019	80.06	1018.15
80.35	1017	81.69	1017	82.25	1017	83.28	1016	85.69	1014.48
86.45	1014	92.23	1013.46	93.58	1013.35	96.18	1013.53	100.4	1013.61
101.99	1013.8	103.51	1013.85	105.79	1013.71	107.53	1013.28	108.94	1013.42
111.62	1013.83	113.99	1013.83	116.7	1013.65	120.04	1013.71	124.79	1014
128.54	1014	130.05	1013.57	132.64	1013.6	133.71	1013.92	134.5	1014.01
134.58	1014.08	135.23	1014.12	135.83	1014.11	142.37	1014.08	144.7	1014.26
144.85	1014.26	145.03	1014.12	148.05	1014.65	171.06	1014.97	171.89	1014.81
172.35	1014.81	177.64	1014.82	179.73	1014.62	180.73	1014.74	184.42	1014.78
184.72	1015.07	185.28	1015.06	185.85	1014.79	186.51	1014.78	200.69	1014.69
202.48	1014.62	203.7	1014.26	205.48	1014.26	209.04	1014.26	210.4	1014.26
213.44	1014.41	214.2	1014.41	216.03	1014.37	219.67	1014.27	220.13	1014.27
220.92	1014.98	225.16	1014.98	226.05	1014.99	234.47	1014.68	241.77	1014.68
244.47	1014.5	245.3	1014.5	247.9	1014.68	248.38	1014.62	250.29	1014.62
251.11	1014.63	266.47	1014.29	267.83	1014.24	271.35	1014.21	273.65	1014.05
274.48	1014	276.44	1013.97	279.73	1014	283.98	1014	284.6	1014
295.13	1014	297.39	1014.09	297.94	1014.08	299.9	1013.94	302.35	1013.74
309.17	1014	309.24	1014	309.38	1014.01	311.8	1014.17	313.44	1014.36
316.11	1014.33	316.29	1014.33	316.37	1014.33	316.48	1014.33	320.41	1014.36
320.54	1014.34	321.04	1014.24	322.09	1013.92	322.69	1014	323.09	1014
323.27	1014	325.47	1014	326.13	1014.15	327.22	1014.25	328.46	1014.23

329.12	1013.86	332.54	1013.72	334.84	1013.75	338.16	1013.76	342.5	1013.68
346.63	1013.77	349.24	1013.83	352.15	1013.84	352.46	1013.84	353.26	1014.41
354.16	1014.9	354.36	1015	354.73	1015	356.41	1016.33	357.08	1016.92
358.03	1016.92	358.35	1016.98	358.39	1016.98	360.03	1017.93	360.15	1017.93
360.59	1019	363.48	1020	363.62	1020.09	364.71	1020.09	364.98	1021
365.32	1021.22	366.48	1022	366.54	1022.04	367.91	1023	368.29	1023.82
369.34	1023.85	369.96	1024.43	379.77	1025.8	386.04	1026.02	386.54	1026.02
391.57	1026.03	393.69	1026.03	396.11	1026.07	401.02	1026.25	401.61	1026.25
401.8	1026.06	403.59	1026	404.38	1025.17	404.9	1025.07	405.72	1025.06
407.2	1024.73	407.63	1024.08	407.74	1024.08	407.83	1024.04	408.47	1023.75
408.95	1023.56	410.38	1022.87	410.71	1022.35	412.02	1022.35	419.45	1022.39
434.61	1022.39	439.16	1022.53	452.21	1022.81	467.89	1022	468.72	1022
469.79	1022.25	469.88	1022.25	471.76	1022	477.33	1021	481.26	1020.99
489.79	1021.05	496.18	1020.07	498.33	1020.01	500.76	1020.01	501.72	1020.03
506.13	1020	506.41	1020	506.75	1019.96	508.11	1019.98	510.07	1020.09
520.71	1020.37	524.25	1020.43	527.69	1020.53	529.36	1020.53		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	49.17	.035	391.57	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
49.17	391.57	284.86	284.86	284.86	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.18	1033.2	F
398.13	529.36	1034.15	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1737

INPUT
Description:
Station Elevation Data num= 234

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1026.17	3.76	1026.28	5.88	1026.51	9.22	1026.87	13.05	1027.24
15.71	1027.52	22.07	1027.94	27.52	1028.38	29.52	1028.53	32.24	1028.53
33.06	1028.52	37.36	1028.3	43.05	1028	47.87	1028	47.94	1028.09
49.25	1028	53.8	1028	56.65	1027.72	56.76	1027.72	57.51	1027.76
66.6	1027.15	68.62	1026.98	69.2	1026.42	70.38	1026.42	75.35	1026.35
77.92	1025	78.12	1025	78.78	1025	79.6	1024	80.15	1024
81.17	1022.83	81.76	1022.2	82.48	1022.67	82.61	1022.59	82.67	1022.06
83.3	1022	83.55	1021	83.69	1021	84.34	1020.64	84.68	1020.77
85.12	1020.81	85.22	1018.94	85.37	1018.22	85.84	1018.05	86	1020.19
86.06	1020.18	87.12	1018	87.27	1017.08	88.04	1017.05	88.67	1016.71
88.75	1016.01	89.53	1015.82	92.47	1015.51	92.65	1015.5	92.75	1014.81
93.18	1014.75	93.91	1014.73	94.69	1014	95.52	1013.56	95.93	1014.57
96.06	1014.57	96.1	1013.25	96.7	1013.2	98.29	1013.04	98.62	1013
99.49	1012.91	99.73	1012.91	99.89	1012.89	101.61	1012.87	105.95	1012.74
106.5	1012.67	109.75	1012.57	110.39	1012.11	110.69	1012.11	111.6	1011.65
112.83	1011.6	115.33	1011.32	116.3	1011.32	117.02	1011.44	120.52	1012.15
121.5	1012.36	122.66	1012.36	125.01	1012.36	130.46	1012.39	136.82	1012.68
138.39	1012.95	139.67	1012.99	140.28	1013.07	141.54	1013.16	142.05	1013.01
142.36	1013.01	142.54	1013.24	142.84	1013.24	165.1	1013.46	171.49	1013.54
172.15	1013.35	174.25	1013.42	174.95	1013.42	176.21	1013.45	177.25	1013.6
178.54	1013.6	179.33	1013.62	190.55	1013.51	195.09	1013.44	196.67	1013.44
198.76	1013.4	201.39	1013.28	202.82	1013.28	220.37	1013.37	235.48	1013.44
239.23	1013.44	240.55	1013.44	243.87	1013.45	244.63	1013.45	244.76	1013.45
246.89	1013.45	248.32	1013.45	248.47	1013.27	249.08	1013.27	253.14	1013.27
259.56	1013.27	263.72	1013.27	265.7	1013.27	265.83	1013.02	265.94	1013.02
266.37	1013.04	267.85	1013.27	268.52	1013.27	268.93	1013.27	270.55	1013.27
272.87	1013.27	275.12	1013.27	276.99	1013.27	278.69	1013.27	279.34	1013.27
279.91	1013.27	282.67	1013.15	283.02	1012.92	283.65	1012.92	283.89	1012.92
296.95	1012.47	298.63	1012.42	298.81	1012.42	299.36	1012.39	302.65	1013
303.18	1013	304.6	1013	304.89	1013.22	311.29	1013.27	313.2	1013.4
314.03	1013.4	314.33	1013.25	316.51	1013.27	317.08	1013.27	317.59	1013.3
319.04	1013.32	331.68	1013	331.92	1012.97	332.39	1012.92	338.79	1012.87
365.44	1012.87	366.92	1013.31	369.24	1013.44	370.51	1014.38	372.08	1014.85
372.63	1015.15	373.23	1015	373.67	1015	373.71	1015.41	373.84	1015.49
374.95	1015.63	375.67	1016.57	376.84	1016.59	377.82	1018	378.73	1018
378.91	1018	379.01	1018.15	382.26	1019.6	383.16	1020	383.79	1020.44
384.46	1021	384.79	1021	385.26	1021	385.93	1023.01	387.32	1023.06
387.37	1023.24	388.53	1023.91	388.61	1024.13	388.77	1024.13	388.81	1024.16
390.36	1024.15	393.32	1024.13	397.98	1024.06	404.45	1024.05	404.59	1024

405.02	1023.94	406.89	1023.62	410.5	1023	410.96	1022.9	411.06	1022.9
413.08	1022.62	416.54	1021.85	418.09	1021.85	418.1	1022.01	418.67	1022.03
423.28	1021.74	445.92	1020.96	449.72	1020.93	459.49	1020.75	459.62	1020.58
464.27	1020.58	470.84	1020.62	471.62	1020.62	476.15	1020.6	488.81	1020.45
493.76	1020.27	493.93	1020.25	506.16	1020.11	511.94	1020.45	516.77	1020.41
517.06	1020.44	517.1	1020.58	517.25	1020.38	518.95	1020.4	526.98	1020.6
528.14	1020.71	528.28	1020.62	533.04	1020.53	535.64	1020.68	538.27	1020.71
538.59	1020.67	538.79	1020.67	539.49	1020.73	547.23	1020.73		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	37.36	.035	388.77	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
37.36	388.77	471.89	471.89	471.89	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	31.88	1034.12	F
415.39	547.23	1033.98	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1265

INPUT
Description:
Station Elevation Data num= 220

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-166.1	1024.7	90.27	1024.7	129.68	1024.7	131.38	1025	132.11	1025.13
132.27	1025.16	133.08	1025.19	142.71	1025.62	149.53	1025.1	150.71	1025
152.1	1024.95	156.46	1024.77	157.79	1024.51	161.24	1024	161.34	1023.99
167.1	1023	167.9	1022.86	169.88	1022.52	171.43	1022.22	172.62	1022
177.15	1021.31	179.2	1021	179.63	1020.94	179.72	1020.93	181.49	1020.52
183.99	1020	185.93	1019.59	188.79	1019	192.32	1018.23	193.48	1018
194.28	1017.83	198.89	1017.08	199.35	1017	201.51	1016.63	205.56	1016
210.98	1015.4	214.33	1015	216.08	1014.79	217.7	1014.6	222.35	1014.11
223.48	1014	223.65	1013.98	227.96	1013.58	229.25	1013.37	231.44	1013
232.91	1012.73	234.92	1012.42	237.33	1012.02	237.44	1012	238.53	1011.83
238.69	1011.79	239.18	1011.82	242.83	1011.99	246.29	1011.91	250.75	1011.8
252.67	1011.68	257.01	1011.42	269.93	1011.27	273.96	1011.28	287.44	1011.32
292.78	1011.29	295.25	1011.28	301.9	1011.22	304.99	1011.22	305.74	1011.22
311.56	1011.22	319.32	1011.22	323.53	1011.22	330.01	1011.31	332.74	1011.42
333.9	1011.46	334.18	1011.47	343.54	1011.73	348.38	1011.65	349.56	1011.8
350.99	1011.8	356.53	1011.96	359.44	1011.9	361.84	1011.94	363.52	1011.89
366.29	1011.44	366.48	1011.42	366.53	1011.42	368.55	1011.8	371.78	1011.66
374.28	1011.63	377.03	1011.55	381.1	1011.42	381.95	1011.49	383.96	1011.61
385.03	1011.63	391.56	1011.8	392.07	1011.73	394.34	1011.42	396.02	1011.42
396.88	1011.42	398.79	1011.64	400.14	1011.8	401.58	1011.75	403.74	1011.67
405.08	1011.65	405.37	1011.67	405.39	1011.69	406.51	1011.61	408.9	1011.55
409.87	1011.61	411	1011.61	412.21	1011.64	417.49	1011.8	419.31	1011.53
423.62	1011.03	424.24	1011.09	424.76	1011.13	428.12	1011.55	432.76	1011.52
436.6	1011.58	438.29	1011.58	440.54	1011.54	447.14	1011.51	452.53	1011.51
462.15	1011.33	462.21	1011.33	462.23	1011.33	462.25	1011.33	462.49	1011.33
477.01	1011.33	477.69	1011.46	479.12	1011.7	480.81	1012	481.44	1012.1
485.39	1012.78	485.95	1012.93	486.22	1013	489.15	1013.76	490.09	1014
492.02	1014.51	493.89	1015	494.18	1015.08	495.52	1015.42	495.52	1015.43
496.51	1016	497.23	1016.42	498.24	1017	499.94	1019.39	499.94	1019.42
503.85	1019.98	505.83	1020.27	506.67	1020.39	507.43	1020.5	508.89	1020.71
510.06	1020.87	510.19	1020.89	510.66	1020.96	514.94	1021.82	521.55	1023
521.86	1023.15	523.57	1024	523.87	1024.15	525.6	1025	526.32	1025.17
530.94	1025.44	534.9	1025.5	536.91	1025.58	541.14	1025.66	547.19	1025.67
549.32	1025.65	551.72	1025.67	571.41	1025.4	587.48	1025.35	590.27	1025.33
609.43	1025.17	611.29	1025.15	612.17	1025.14	612.63	1025.13	621.09	1025.04
635.01	1025.08	647.29	1025.05	652.65	1025.04	654.69	1025.04	655.17	1025
656.72	1024.81	660.55	1024.72	666.37	1024.58	669.1	1024.51	675.43	1024.38
687.11	1024.1	691.54	1024	691.57	1024	691.69	1024	691.71	1024
691.72	1024	692.76	1024	699.12	1024.01	701.98	1024	706.53	1024
707.4	1023.98	707.86	1023.98	709.37	1023.95	710.91	1023.78	711.16	1023.76
711.21	1023.76	711.7	1023.72	713.56	1023.58	714.92	1023.13	716.96	1023
729.99	1022.72	732.72	1022.67	736.02	1022.61	736.04	1022.61	736.06	1022.61
736.08	1022.61	736.1	1022.61	736.13	1022.61	736.15	1022.61	736.16	1022.62
736.18	1022.62	736.19	1022.62	736.21	1022.62	736.5	1022.58	833.9	1022.58

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

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  -166.1    .042  142.71    .035   534.9    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        142.71   534.9            137.3   137.3   137.3             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -166.1   132.3 1028.56       F
  535.53   833.9 1027.76       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 1130

INPUT
Description:
Station Elevation Data    num=     226
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -145.41  1024.8    -.53  1024.8   160.6  1024.8  168.58  1024.6  175.21 1024.58
  180.44 1024.45  187.62 1024.23  192.66    1024  194.08  1023.9  196.19 1023.75
  197.73 1023.44  200.05    1023  203.53 1022.36  203.66 1022.34  203.93 1022.29
  205.46    1022  208.62 1021.39  210.67    1021  211.29 1020.88  211.88 1020.79
  213.77  1020.4   214.4 1020.25  215.44    1020  217.93 1019.42  219.64    1019
   223.7 1018.06  223.97    1018  224.72 1017.83  227.34 1017.26  227.66 1017.19
  228.96    1017  228.98    1017  229.06 1016.99  234.16  1016.2  234.18  1016.2
  235.96    1016  240.92 1015.45  241.35 1015.41  244.28    1015  244.44 1014.98
  244.66 1014.95  248.08 1014.48  249.94 1014.22  250.01 1014.21  251.22    1014
  252.55 1013.78   256.3    1013  256.96 1012.95     257 1012.94  259.06 1012.54
  260.94 1012.25   262.3    1012   263.2 1011.85  266.11 1011.33   267.8 1011.22
  270.45 1011.03  270.64 1011.02  270.93    1011   273.1 1010.87  273.47 1010.82
  274.06 1010.84  274.55 1010.87  274.77 1010.88  279.65    1011   279.7    1011
  280.51 1011.01  280.95 1011.02     281 1010.96  281.72 1011.01  282.35    1011
  286.16 1010.92  290.01 1010.84  291.08 1010.86  298.48 1010.95  301.23 1010.99
  302.84    1011   303.6    1011  303.77    1011  306.64 1011.01  312.29 1011.02
  315.67 1011.03  316.51    1011  316.57    1011  316.88 1010.99  320.26 1010.79
  321.49 1010.79  322.71 1010.79  323.31 1010.78  324.13 1010.77   324.8 1010.76
  326.37 1010.75  329.04 1010.71  332.82 1010.65  333.02 1010.71  333.91    1011
  333.97 1011.02  334.59 1011.22  334.63 1011.22  339.77  1011.2  341.47 1011.19
  343.46 1011.03  348.82 1011.16     350 1011.22  351.06 1011.19  352.35 1011.16
  354.59  1011.1  354.76  1011.1  357.31 1011.03  360.55 1011.03  361.67 1011.03
  362.12 1011.03  363.55 1011.03  363.85 1011.03  365.66 1011.03  366.06 1011.03
  366.49 1011.03  369.36 1011.03  370.86 1011.03  376.23 1011.03  377.23 1011.03
  378.49 1011.26  380.22 1011.42  385.75 1011.43  387.27 1011.43  408.84 1011.42
  412.98 1011.42  413.54 1011.38   414.7 1011.22  418.64 1011.18  419.41 1011.15
  423.58 1011.05   424.2 1011.03  424.35 1011.05  427.28 1011.53  429.66 1011.62
  432.16 1011.77  432.33 1011.79  432.38 1011.79  432.58 1011.79  432.69 1011.78
   436.4 1011.03  444.16  1011.2     445 1011.22   457.5 1011.19  462.01 1011.17
  466.65 1011.16  471.39 1011.21  475.64 1011.11  483.49 1011.03  490.25 1011.13
  492.02 1011.15  498.63  1011.6  499.32 1011.65  499.47 1011.67  499.65 1011.69
  500.91 1011.73  506.58 1011.92  509.09    1012  513.09 1012.85  513.77    1013
  516.88 1013.89  517.22    1014  517.48 1014.11  519.86    1015  521.48 1015.76
  522.18    1016  523.87 1016.59  524.97    1017  525.52 1017.23  525.91 1017.42
  526.33 1017.62  534.94 1021.26  536.52 1021.78  537.89    1022  550.49 1022.37
  572.89    1023  574.71 1023.89  574.93    1024  576.74 1024.89  576.96    1025
  579.99 1025.98  580.08    1026  582.07 1026.98  582.12    1027  582.52    1027
  583.49 1027.01  585.57 1027.02  588.16 1027.03  614.18 1027.19  623.78 1027.14
  646.51    1027  647.35    1027  647.44    1027  647.52    1027  647.71    1027
  647.74    1027  675.03 1026.45  690.16 1026.15  690.55 1026.14  690.76 1026.14
  697.58    1026  713.24 1025.49  719.65 1025.34  731.17 1025.08  732.51 1025.04
  733.85    1025  733.89 1024.98   734.6 1024.81  736.77 1024.13  737.67    1024
  738.21 1023.99  740.74 1023.97  741.95 1023.96  742.06 1023.96  746.04    1024
  746.14    1024  746.75    1024  746.89    1024  747.19    1024  752.28    1024
  754.02    1024  754.56 1023.79  760.13 1023.68  762.61 1023.68  763.19 1023.68
  854.59 1023.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -145.41    .042  168.58    .035  582.07    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        168.58  582.07           131.85  131.85  131.85             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 -145.41  151.57  1032.9       F
   605.3  854.59 1033.36       F
```

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1000

INPUT
Description:
Station Elevation Data num= 294

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-93.92	1022.62	-92.63	1022.62	-88.09	1022.62	-67.86	1022.61	-60.89	1022.61
-60.63	1022.61	-58.99	1022.6	-55.98	1022.55	-54.26	1022.53	-51.91	1022.49
-48.84	1022.42	-45.26	1022.33	-38.72	1022.13	-36.37	1022.06	-34.9	1022
-31.84	1022	-30.44	1022	-27.09	1022	-26.4	1022	-21.05	1022
-16.62	1022.08	-15.18	1022.1	4.06	1022.27	18.49	1022.3	19.11	1022.3
21.46	1022.33	23.6	1022.48	29.94	1022.98	30.18	1023	31.14	1023
31.63	1023.01	32.39	1023.01	33.09	1023.01	44.07	1023.07	45.3	1023.08
45.85	1023.07	48.35	1023.07	50.09	1023.06	53.92	1023.01	54.09	1023.01
54.17	1023.01	54.26	1023.01	55.66	1023	56.46	1023	56.67	1023
56.72	1023	56.85	1023	58.33	1023	58.56	1023	60.69	1023
60.71	1023	61.23	1023	61.25	1023	63.99	1023	119.88	1023.67
121.72	1023.75	124.15	1023.89	128.74	1024	131.53	1024.07	132.91	1024.1
145.27	1024.4	151.4	1024.54	167.1	1024.89	168.24	1024.92	172.29	1025
178.3	1025.13	179.87	1025.16	186.43	1025.34	189.7	1025.41	190.01	1025.39
190.13	1025.38	190.46	1025.37	190.56	1025.37	193.76	1025.44	209.65	1025.73
214.19	1025.81	215.58	1025.84	217.05	1025.86	225.68	1026	237.14	1026.19
238.49	1026.21	240.44	1026.24	245.49	1026.33	245.95	1026.3	248.64	1026
249.06	1025.95	249.47	1025.89	251.94	1025.13	252.21	1025	254.49	1024.23
254.93	1024	255.62	1023.74	261.64	1023	262.04	1022.8	263.62	1022
264.96	1021.33	265.61	1021	268.62	1020.9	297.39	1020	298.23	1019.53
299.27	1019	300.32	1018.49	301.33	1018	302.35	1017.49	303.32	1017
304.32	1016.5	305.26	1016	306.48	1015.41	307.44	1015	309.14	1014.11
309.38	1014	309.55	1013.91	311.39	1013	311.9	1012.7	313.32	1012
314.32	1011.5	315.31	1011	315.71	1011.09	316.18	1011.13	316.55	1011
319.42	1010.12	319.46	1010.1	319.58	1010.1	319.6	1010.1	319.62	1010.1
319.65	1010.1	321.3	1010.1	321.66	1010.1	328.8	1010.1	334.85	1010.1
335.4	1010.17	338.52	1010.45	341.83	1010.29	342.5	1010.26	347.22	1010.1
348.82	1010.07	349.55	1010.21	350.13	1010.31	352.7	1010.65	352.76	1010.65
362.49	1010.82	370.12	1010.96	372.19	1011	373.71	1011	379.82	1011.03
401.56	1011.13	403.69	1011.14	403.95	1011.14	404.15	1011.14	405.18	1011.15
405.4	1011.15	405.42	1011.15	405.56	1011.15	405.64	1011.15	409.52	1011.11
411.37	1011.08	412.66	1011.15	438.94	1011.15	451.21	1011.28	451.99	1011.4
453.56	1011.5	453.72	1011.51	457.48	1011.51	458.05	1011.51	459.45	1011.51
478.37	1011.64	479.16	1011.64	483.64	1011.66	484.45	1011.5	485.91	1011.15
486.93	1011.31	488.5	1011.43	492.69	1011.23	493.71	1011.16	494.53	1011.13
497.48	1011.02	497.79	1011.01	497.9	1011.01	498.27	1011	498.82	1010.98
500.37	1010.93	501.01	1010.89	501.75	1010.86	502.7	1010.84	513.76	1010.84
513.97	1010.84	519.08	1010.84	522.49	1010.84	526.93	1010.82	527.93	1010.82
538.41	1010.95	539.38	1010.98	539.58	1011	539.7	1011	539.72	1011
549.25	1011.34	552.37	1011.45	571.31	1012	573.72	1012.53	575.75	1013
577.73	1013.64	578.67	1014	579.48	1014.35	581.09	1015	582.6	1015.72
583.18	1016	584.74	1016.78	585.19	1017	586.82	1017.79	587.27	1018
588.99	1018.84	589.33	1019	591.12	1019.88	591.38	1020	599.6	1020.12
600.83	1020.13	606.38	1020.21	633.82	1020.64	654.78	1021	655.82	1021.51
656.81	1022	657.8	1022.49	658.86	1023	659.8	1023.47	660.89	1024
661.8	1024.45	662.93	1025	663.8	1025.43	664.97	1026	665.8	1026.41
667	1027	668.63	1027.8	669.04	1028	676.83	1027.93	677.58	1027.92
683.24	1027.97	684.83	1027.99	685.45	1028	686.48	1027.99	686.74	1027.98
687.38	1027.97	691.93	1027.86	720	1027.2	728.61	1027	749.21	1026.46
766.95	1026	769	1025.93	795.27	1025	796.83	1024.99	797.93	1024.98
799.42	1024.99	799.91	1024.99	801.66	1025	801.81	1025	802.06	1025
802.25	1025	803.68	1025	804.88	1025	812.41	1025	816.21	1025
817.8	1025	820.49	1025	820.78	1025	821.55	1025	822.2	1025
824.15	1024.6	826.43	1024	827.75	1024	830.06	1023.72	831.42	1023.55
832.22	1023.58	832.96	1023.53	833.85	1023.58	835.51	1023.6	836.93	1023.68
841.85	1023.9	842.75	1023.95	842.93	1023.96	843.46	1023.97	845.47	1024
845.82	1024	847.45	1024	857.19	1024	857.19	1024.07	858.98	1024.33
862.21	1024.4	864.07	1024.48	879.96	1024.42	881.13	1024.4	884.17	1024.06
890.06	1024	891.28	1023.94	896.73	1023.68	897.04	1023.67		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-93.92	.042	245.49	.035	676.83	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
245.49	676.83	85.15	85.15	85.15	.3	.5

Ineffective Flow num= 6

```
   Sta L   Sta R    Elev  Permanent
   11.92   76.99 1029.44       F
   76.99     141 1031.31       F
     141  202.86 1032.79       F
  610.37  665.84 1032.89       F
  665.84  718.11  1032.1       F
  718.11  767.18 1030.62       F
Skew Angle = 7.71

BRIDGE


RIVER: Murrieta Creek
REACH: Main - EC          RS: 954

INPUT
Description: Overland Bridge
Distance from Upstream XS =       5
Deck/Roadway Width        =   75.92
Weir Coefficient          =     2.6
Bridge Deck/Roadway Skew  =    7.71
Upstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   201.5 1028.17 1022.55  403.65 1029.48  1023.9  605.81 1028.17 1022.55

Upstream Bridge Cross Section Data
Station Elevation Data    num=      82
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
5.519999 1021.129.889999 1021.22   13.26 1021.22   15.58 1021.28   15.91 1021.28
    24.7 1021.42   25.85 1021.47   26.21 1021.42   31.95 1021.63   40.76 1021.77
   43.08 1021.81    43.3    1022   43.53    1022   43.75 1021.82   43.92 1021.77
   46.33 1021.79   49.05 1022.03   53.48 1021.93   53.69 1021.93   54.27    1022
   57.73    1022      60 1021.74   78.21    1022   81.37    1022   83.51 1022.01
   88.31    1022   88.73    1022   94.31 1022.01    97.9    1022  106.83  1022.2
  136.73 1022.49  139.56 1022.65  201.34 1028.23  203.19 1020.34  231.22 1020.32
  246.79  1020.3  265.41  1010.8  315.63 1010.52  322.54 1010.49  330.67 1010.48
  338.58 1010.54  342.62 1010.58  344.47 1010.65  344.78 1010.65  347.39 1010.65
   494.2 1010.94  495.65 1010.88  497.51 1010.84  506.91 1010.84  507.74 1010.84
  512.66 1010.84  516.89 1010.84  518.49 1010.94  537.08  1020.3  576.02 1020.33
  605.29 1020.34  605.94 1028.13  655.96 1021.94  667.84 1021.18  668.78 1021.23
  682.69 1021.23  684.47 1021.23   684.5 1021.24  689.47 1021.24  694.76 1021.11
  694.82 1021.13   698.8 1021.17  699.74 1021.19  700.41 1021.15   703.2 1021.22
  703.47 1021.21  724.19    1021   725.5 1021.09  728.51 1021.12  728.57 1021.19
  736.65 1021.19  738.73 1021.13  739.86  1021.1  742.44 1021.08  750.23 1021.07
  759.32 1021.05  759.59 1021.05

Manning's n Values        num=       1
     Sta   n Val
5.519999    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
        231.22  576.02             .3       .5
Ineffective Flow     num=       6
   Sta L   Sta R    Elev  Permanent
   11.92   76.99 1029.44       F
   76.99     141 1031.31       F
     141  202.86 1032.79       F
  610.37  665.84 1032.89       F
  665.84  718.11  1032.1       F
  718.11  767.18 1030.62       F
Skew Angle = 7.71

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  201.53 1028.17 1022.55  403.69 1029.48  1023.9  605.85 1028.17 1022.55

Downstream Bridge Cross Section Data
Station Elevation Data    num=      77
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    9.22    1021    12.2    1021   12.59 1020.95   13.09    1021   36.65 1021.34
   37.71 1021.15   41.88 1021.67   57.12 1022.42   57.35 1022.42   59.66 1022.44
   63.88 1022.41   66.95 1022.42   71.15 1022.93  119.53  1023.5   134.8 1024.03
  201.71 1028.24  204.28 1020.33  231.29 1020.31  250.48  1020.3  269.13 1010.76
  323.75 1010.45  331.52 1010.45  335.22 1010.49  337.66 1010.45  357.58 1010.52
  504.93 1010.58  510.72 1010.47  521.51  1010.5  540.65  1020.3  576.13 1020.31
```

```
  604.77 1020.32  605.54 1028.22  647.46    1022  648.84 1021.81  648.95 1021.81
  649.02 1021.81  658.73 1021.08  663.83 1021.08  666.86    1021  666.92 1020.88
  680.24 1020.88  682.65 1020.86  684.36 1020.98  684.76 1020.99  688.98 1020.88
  690.09 1020.99  694.39 1021.09  695.54 1021.13  695.97 1021.13  696.09 1021.13
  698.27 1021.14  706.54 1021.14  706.64  1021.1  706.75 1021.06  706.93    1021
  707.13    1021  708.97    1021  709.61 1020.98  709.93 1021.04  710.26 1021.04
  711.77 1020.95  711.83 1020.88  712.13 1021.17  712.96 1021.14  717.79 1020.82
  742.96    1021  744.15    1021  749.33 1021.04  751.09 1021.04  751.61 1021.21
  752.38 1021.19   756.9 1020.97  762.62 1020.68  765.04 1020.61  765.34 1020.63
  765.86 1020.63  773.33 1020.63

Manning's n Values        num=       1
     Sta   n Val
    9.22    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
        231.29  576.13             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -90.86   224.7 1032.69       F
   680.4  916.97 1033.17       F
Skew Angle = 7.71

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
   201.5 1022.55  231.23 1022.75  231.23    1013
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  201.53 1022.55  231.26 1022.75  231.26    1013

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  576.08    1013  576.08 1022.75  605.81 1022.55
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  576.12    1013  576.12 1022.75  605.85 1022.55

Number of Piers =  2

Pier Data
Pier Station     Upstream=  335.28    Downstream=  335.31
Upstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024
Downstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024

Pier Data
Pier Station     Upstream=  472.03    Downstream=  472.07
Upstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024
Downstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only
```

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 912

INPUT
Description:
Station Elevation Data num= 393

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-90.56	1022.01	-84.59	1022.01	-82.7	1022.01	-74.36	1022.01	-58.05	1022
-53.95	1022	-52.95	1022	-51.87	1022	-51.48	1021.73	-50.84	1021.86
-50.57	1021.89	-50.15	1021.95	-50	1021.93	-49.42	1021.9	-45.64	1021.74
-39.63	1021.76	-38.47	1021.81	-38.31	1021.83	-38.19	1021.83	-37.53	1021.87
-37.01	1022	-36.83	1022	-36.02	1022	-35.61	1022	-35.27	1022
-34.13	1021.99	-22.88	1021.84	-12.42	1021.82	-9.13	1021.89	-4.73	1022
-.5	1022.01	1.73	1022.01	7.24	1022	8.48	1022.01	9.69	1022
10.02	1022	10.83	1022	12	1022	12.03	1022	13.84	1022
16.53	1022	18.23	1022.01	18.24	1022.01	21.4	1022.03	21.88	1022.04
22.54	1022.06	32.5	1022.55	40.8	1022.84	41.99	1023	42.76	1023.01
43.3	1023.01	46.45	1023.05	48.83	1023.06	49.15	1023.06	49.51	1023.07
50.09	1023.07	50.58	1023.08	51.64	1023.09	52.23	1023.09	52.51	1023.09
52.65	1023.09	53.17	1023.1	53.51	1023.1	53.66	1023.1	55.56	1023.12
56.06	1023.12	57.81	1023.12	61.94	1023.51	64.83	1023.51	65.58	1023.56
65.94	1023.56	72.78	1024	76.1	1024.03	79.04	1024.04	82.58	1024.07
83.52	1024.08	84.04	1024.08	90.26	1024.11	91.87	1024.11	96.64	1024.13
99.76	1024.14	100.94	1024.14	106.24	1024.51	106.59	1024.54	106.63	1024.54
114	1025	114.76	1025.02	118.22	1025.03	122.01	1025.07	123.25	1025.09
123.8	1025.09	128.09	1025.11	129.15	1025.11	135.19	1025.13	136.03	1025.14
136.35	1025.14	138.84	1025.15	139.78	1025.15	143.37	1025.51	144.53	1025.59
151.61	1026	156.38	1026.03	158.06	1026.04	158.21	1026.04	158.33	1026.04
163.21	1026.05	169.95	1026.07	171.48	1026.07	176.25	1026.08	176.77	1026.08
176.94	1026.08	177.21	1026.08	177.3	1026.08	178.17	1026.08	178.45	1026.08
182.2	1026.52	191.68	1027	195.85	1027	196.05	1027	198.75	1027
198.96	1027	199.1	1027	204.12	1027	211.03	1027	212.2	1027
219.74	1027	221.45	1027	221.92	1027	222.21	1027	222.29	1027
222.32	1027	222.33	1027	226.36	1027.52	226.37	1027.52	232.38	1027.76
238.47	1028	244.62	1027.81	246.06	1027.77	246.83	1027.79	247.9	1027.83
249.8	1027.94	249.98	1027.96	250.53	1028	251.1	1027.72	251.74	1027.41
252.56	1027	253.63	1026.47	254.58	1026	255.54	1025.53	256.64	1025
257.73	1024.46	258.68	1024	260.49	1023.32	261.19	1023	263.11	1022.08
263.27	1022	264.12	1021.59	265.2	1021	276.52	1020.7	303.99	1020
305.98	1019.01	305.99	1019	306	1018.99	308.02	1018	308.03	1018
310.03	1017	310.59	1016.72	312.08	1016	312.3	1015.87	314.17	1015
314.44	1014.86	316.32	1014	317.72	1013.25	318.23	1013	320.03	1012.03
320.11	1012	320.8	1011.64	322.06	1011	323.37	1010.94	325.89	1010.84
332.94	1010.54	332.99	1010.45	335.46	1010.45	336.97	1010.2	338.37	1010
339.25	1009.87	340.53	1009.72	342.56	1009.82	346.94	1009.99	347.22	1010
349.28	1010.19	350	1010.26	350.87	1010.17	352.68	1010	353.04	1009.96
353.96	1009.88	358.91	1009.88	361.99	1009.88	362.5	1009.95	362.86	1010
364.03	1010.16	365.84	1010.45	367.42	1010.56	368.34	1010.6	369.21	1010.65
371.79	1010.64	373.8	1010.68	376.55	1010.71	377.9	1010.72	380.15	1010.74
386.32	1010.83	387.5	1010.83	389.08	1010.85	394.11	1010.93	394.78	1010.94
395.32	1010.95	399.09	1011	399.25	1011	404.69	1011	407.88	1011.01
407.94	1011.01	409.44	1011.01	410.71	1011.01	422.09	1011.08	438.99	1011.15
439.99	1011.07	440.78	1011	442.09	1010.89	443.11	1010.79	445.64	1010.99
445.74	1011	445.89	1011.01	447.54	1011.15	454.12	1011.15	458.01	1011.15
461.2	1011.15	465.8	1011.15	466.65	1011.07	467.07	1011.04	467.42	1011
467.45	1011	467.75	1010.97	467.78	1010.97	467.91	1011	468.26	1011.06
469.56	1011.33	471.84	1011.33	472.56	1011.33	472.84	1011.31	474.39	1011.15
474.53	1011.16	478.57	1011.33	482.53	1011.19	483.6	1011.15	483.94	1011.11
485.17	1011	486.12	1010.91	489.03	1010.65	492.67	1010.97	493	1011
493.02	1011	493.39	1011.03	494.18	1011	494.2	1011	494.4	1010.99
495.51	1010.95	505.8	1010.6	511.7	1010.46	521.47	1010.24	523.54	1010.24
535.52	1010.24	537.74	1010.29	543.05	1010.42	543.69	1010.59	544.9	1011
557.05	1011.52	562.01	1011.73	562.9	1011.77	563.22	1011.79	563.75	1011.81
569.34	1012	570.81	1012.33	573.84	1013	575.8	1013.74	576.39	1014
578.12	1014.75	578.66	1015	580.28	1015.78	580.71	1016	582.35	1016.82
582.72	1017	584.47	1017.83	584.84	1018	586.76	1018.92	586.93	1019

```
  588.96 1019.98     589    1020  592.44 1020.06  656.93    1021  657.17 1021.11
  658.94    1022  659.17 1022.11  660.96    1023  661.19 1023.11  662.98    1024
  663.21 1024.11  664.85    1025  665.08 1025.11  667.01    1026  667.24 1026.11
  669.16    1027  672.06 1027.24  672.95 1027.72  673.47    1028  677.16 1027.96
  679.06 1027.94  681.17 1027.95  687.27 1027.99   687.3 1027.99  687.85    1028
     691 1027.85  710.14    1027  710.83    1027  711.27    1027  714.35 1027.01
  717.27 1027.01  717.63 1027.01  718.51 1027.01  721.27    1027  727.88 1026.84
  741.23 1026.53  742.81 1026.49   744.8 1026.44  761.83    1026  762.38 1025.98
  773.65 1025.62  794.77    1025   802.4 1024.48  808.37 1024.24  813.34 1024.02
  813.73    1024  815.93    1024  818.71    1024  823.81    1024   824.6    1024
  826.05    1024  828.74    1024  829.41    1024  831.37    1024  832.98    1024
  838.79    1024  842.16 1023.08  842.43    1023  844.15 1022.62  845.32  1022.4
  845.75 1022.33  845.92    1022   846.4 1022.21  846.47 1022.21   847.4 1022.27
  847.75 1022.83  848.98 1022.04  849.13 1022.06   849.4 1022.09  850.62 1022.26
  856.07    1023  856.76 1022.99  857.52    1023  858.07    1023  858.27 1023.02
  859.09    1023  859.57    1023  859.82    1023  860.04 1023.03  862.19 1023.31
  864.64 1023.33  870.41 1023.35  880.52 1023.19  893.04 1023.18  893.76 1023.17
  893.95 1023.16     905 1023.68  905.01 1023.68  905.19 1023.67  905.36 1023.67
  905.54 1023.67  905.72 1023.67  905.91 1023.67   906.1 1023.67  906.31 1023.67
  906.52 1023.67  906.92 1023.67  909.44 1023.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -90.56    .042   251.1    .035  672.95    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         251.1  672.95            267.2   267.2   267.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -90.86   224.7 1032.69       F
   680.4  916.97 1033.17       F
Skew Angle = 7.71

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 642

INPUT
Description:
Station Elevation Data    num=     290
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -214.59    1022  -47.94    1022  170.16    1022  173.79 1021.71     175 1021.59
  175.81 1021.51  180.19 1021.04  180.61    1021  180.78 1020.98   182.1  1020.7
  184.25  1020.6  184.48 1020.58  186.47 1020.37  186.79 1020.35  191.33    1020
  191.56 1019.98   192.2 1019.93  193.03 1019.89  198.23 1019.41  199.17 1019.33
  200.07 1019.23  200.71 1019.17  201.45  1019.1  202.16 1019.03  202.26 1019.02
  202.41    1019  202.45 1018.99  203.74 1018.81  205.83  1018.4  207.89    1018
  209.26 1017.73  212.33    1017  215.43 1016.25  216.44 1016.01  216.86 1015.91
   218.7 1015.48  220.26    1015  222.58 1014.29  223.53    1014  226.63 1013.05
   226.8    1013  228.29 1012.54  228.31 1012.54  228.35 1012.53  228.67 1012.46
  230.78    1012   232.6  1011.6  235.32    1011  236.84 1010.66  237.79 1010.45
  239.72 1010.14  240.59    1010  240.75 1009.98  241.22 1009.91  241.38 1009.91
   241.8 1009.91  242.18 1009.91  242.52 1009.91  244.22 1009.91  245.97 1009.91
  247.39 1009.91  247.67 1009.91  253.49 1009.91  277.22 1009.91  285.41 1009.91
  293.29 1009.91  293.35 1009.91  293.53 1009.91  293.86 1009.91  293.98 1009.91
  294.19 1009.91  295.17 1009.91  295.29 1009.91  295.77 1009.91  295.85 1009.91
  296.05 1009.93  296.68    1010     297 1010.03   297.3 1010.07  298.46 1010.07
  299.15 1010.07  300.22 1010.07   300.6 1010.07  301.35 1010.07  302.05 1010.07
  302.82 1010.07   310.4 1010.09  313.46  1010.1  314.39  1010.1  317.49 1010.11
  317.98 1010.11   318.6 1010.11  319.31 1010.11  320.33 1010.15  323.27 1010.16
  326.05 1010.17  328.63 1010.19  331.45  1010.2  334.06 1010.18  350.14 1010.27
  352.42 1010.27  380.61 1010.62  382.73 1010.61  383.12  1010.5  384.18 1010.01
   384.2    1010  384.43 1009.94  385.63 1009.94  386.26 1009.94  386.73 1009.94
  387.18 1009.94   389.5 1009.94  389.92 1009.94  390.24 1009.98  390.39    1010
  390.62    1010  392.24 1010.21  394.65 1010.51  395.78 1010.64  400.17 1010.99
  400.23    1011  401.45 1011.08  402.89  1011.3  406.23 1011.33  409.05 1011.27
  409.51 1011.18  410.39    1011  412.05 1010.68  413.14 1010.45  415.69 1010.43
  416.94 1010.46  423.19 1010.79  424.97 1010.79  429.87 1010.97  431.42    1011
  431.61    1011  432.17 1011.06  436.72 1011.55  439.35 1011.78     441 1011.91
  441.08 1011.95  441.19    1012   442.9 1012.81  443.29    1013  443.73 1013.21
  445.03    1014  445.13 1014.06  445.35 1014.19   447.2 1014.12  447.53 1014.12
  452.06 1014.29  453.73 1014.35  455.74 1014.33  457.01 1014.36  457.85 1014.37
  458.55 1014.38  460.08  1014.4  460.21  1014.4  462.19 1014.44  465.31  1014.7
  468.46 1014.67  472.52 1014.34  473.27 1014.17  474.09 1014.13  476.22 1014.29
  479.64 1014.55  483.46 1014.84  487.64 1014.66  494.61 1014.37  496.08 1014.42
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498.39	1014.51	503.21	1014.47	513.66	1014.38	517.61	1014.35	520.81	1014.33
522.37	1014.25	527.4	1014	530.89	1013.83	536.42	1013.55	541.35	1013.34
543.4	1013.24	547.78	1013.01	547.9	1013.01	548.12	1013	558.57	1012.62
559.26	1012.64	561.43	1012.43	561.44	1012.43	561.47	1012.43	561.49	1012.44
564.07	1012.32	565.54	1012.24	566.38	1012.16	567.74	1012	570.91	1011.6
571.38	1011.44	572.67	1011.14	573.71	1011	589.9	1011	607.89	1011
608.02	1011.53	608.27	1012.97	608.73	1014	609.27	1014	610.78	1014.73
611.33	1015	612.85	1015.75	613.35	1016	614.91	1016.77	615.38	1017
616.98	1017.79	617.4	1018	619.04	1018.81	619.42	1019	622.85	1019.85
623.46	1020	625.23	1020.87	625.49	1021	626.02	1021.27	627.51	1022
629.93	1022.02	633.13	1022.03	636.92	1022.01	638.13	1022.01	638.8	1022
639.13	1022	639.16	1022	639.18	1022	639.41	1022	641.19	1022
645.24	1021.99	647.06	1022	647.59	1021.99	648.03	1021.99	648.72	1021.99
649.35	1022	649.99	1022	654.14	1022	665.15	1022	665.37	1022
668.01	1021.97	675.28	1022	675.92	1022	676.25	1022	676.37	1022
676.87	1022	676.96	1022	678.76	1021.97	679.58	1021.95	683.35	1021.85
686.85	1021.77	702.71	1021.34	714.87	1021	715.28	1021	715.34	1021
715.55	1021.02	723.38	1021.31	728.01	1021.42	728.03	1021.42	729.09	1021
730.21	1020.56	731.07	1020.53	731.97	1020.47	731.98	1020.47	738.32	1020.03
738.94	1020	739.48	1020	740.05	1019.98	741.12	1019.97	741.65	1019.96
743.16	1019.94	744.27	1019.96	744.73	1019.97	745.35	1019.96	747.09	1019.95
747.4	1019.94	748.87	1019.92	752.42	1019.83	752.67	1019.82	753.14	1019.44
753.7	1019.28	753.71	1019.3	753.72	1019.35	753.93	1019.35	759.16	1019.12
761.03	1019.04	761.94	1019.07	767.54	1019.2	779.09	1019.25	785.41	1019.25

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-214.59	.042	170.16	.035	629.93	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
170.16	629.93	298.19	298.19	298.19	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214.59	126.31	1027.05	F
654.9	785.41	1026.09	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 343

INPUT
Description:
Station Elevation Data num= 236

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1017	72.95	1017.46	78.66	1017.61	82.22	1017.75	84.24	1017.64
84.73	1017.62	85.38	1018	87.81	1018	116.51	1019	125.91	1019.1
126.43	1019.11	131.93	1019.47	133.9	1019.32	135.41	1019.35	142.1	1019.91
143.46	1020	144.26	1020	153.86	1020.4	154.18	1020.41	154.44	1020.42
171.05	1021	171.28	1021	175.17	1021.43	179.27	1021.27	181.79	1021.73
222.54	1021.73	225.06	1021.87	234.86	1022.01	237.33	1022.01	241.5	1022
241.88	1022	247.97	1022	249.43	1022.01	258.11	1022.01	259.41	1022.01
261.23	1022	268.23	1022	268.8	1022	269.83	1022	271.02	1021.97
272.17	1021.96	272.39	1021.73	274.58	1021.73	277.67	1021.73	278.79	1021.87
280.41	1021.7	280.9	1021.57	283.99	1020.75	285.6	1020.06	286.3	1020.06
297.16	1020.24	298.98	1020	299.3	1020	300.6	1020.04	306.32	1019.59
308.13	1019	309.13	1019	311.74	1019	312.41	1018.2	314.23	1018
317.45	1017.65	318.55	1017.53	318.82	1017.58	320.79	1017.15	323.97	1016.23
324.93	1015.35	329.63	1014.86	330.86	1014.16	333.02	1014.28	333.94	1014.09
334.62	1013.91	335.19	1013	339.16	1013	340.76	1012.88	344.11	1012.33
346.66	1012.33	348.3	1012.35	349.49	1012.35	351.7	1012.21	353.81	1011.94
360.96	1012	361.32	1012	362.65	1012	371.42	1011.94	371.54	1011.51
375.76	1011.41	375.81	1011.41	381.52	1011.16	383.05	1010.93	383.75	1010.93
384.29	1010.8	386.24	1010.79	386.85	1010.8	387.76	1010.8	388.27	1010.85
388.71	1010.87	391.49	1011	393.48	1011	395.85	1011	396.13	1011
400.19	1011.01	400.63	1011.01	401.46	1011.03	404.92	1010.77	405.51	1010.79
406.76	1010.97	407.99	1010.94	408.52	1010.95	432.39	1010.6	437.75	1010.52
438.92	1010.46	440.09	1010.4	448.27	1010.35	451.1	1010.21	454.11	1010.28
455.12	1010.28	455.97	1010.27	456.05	1010.25	456.78	1010.19	457.98	1010.12
458.31	1010.07	458.61	1010.06	458.73	1009.91	459.06	1009.91	462.13	1009.91
462.54	1009.91	463	1009.91	549.44	1009.91	555.44	1009.91	560.45	1009.91
565.73	1009.91	565.84	1009.91	566.12	1009.91	566.58	1009.91	568.6	1010
573.28	1010.17	574.19	1010.19	575.41	1010.28	577.65	1010.25	578.32	1010.27
581.59	1010.18	581.83	1010.2	584.91	1010.16	585.71	1010.15	586.13	1009.94
587.46	1009.94	588.2	1009.94	590.28	1009.94	591.46	1009.89	591.63	1009.94
591.79	1010.37	594.46	1010.72	595.97	1010.69	597.17	1010.97	597.4	1010.97

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  602.71    1011  604.58 1010.96  605.58 1010.77  606.66 1011.14  607.81 1011.12
  608.74 1011.05  609.78 1011.13  609.89 1011.13  621.18 1011.29  621.61 1011.27
  622.43 1011.14  623.63 1011.14  626.04 1011.22   626.8 1011.12  632.08 1011.02
  633.43 1011.02   649.2 1011.07  653.14 1011.11  660.66 1011.15  662.35 1011.14
  662.55    1011  663.42    1011  668.44 1011.88  668.96  1012.5  669.36  1012.5
  671.22 1013.21  672.41 1013.21   672.7    1013  675.66 1015.73  675.68 1015.73
   677.7 1014.71  678.53 1015.18  679.16    1016  681.39    1016  681.52    1016
  681.76 1016.92  683.63 1017.21  684.67 1017.72  685.25    1018  686.48    1018
  687.06 1019.02  688.67 1019.02  689.37 1019.26  690.06 1019.26   690.7 1019.18
  692.77  1019.3  695.36  1019.3   707.2 1019.29   711.8 1019.29  717.21 1020.88
  717.74 1020.88  725.17    1021  725.56 1021.15  726.46 1021.28  731.55 1021.31
  737.04 1021.44  741.13 1021.36  742.15 1021.36  742.32 1021.35  742.51 1021.35
  742.75 1021.35  744.54 1021.23   747.6    1021  749.23    1021  766.87    1021
  766.92 1020.85   767.4 1021.07  772.54 1021.07  772.98 1021.11  773.18  1021.1
   773.5  1021.1  775.11 1021.08  789.26 1020.59   810.4 1020.37  820.06 1020.09
  825.82 1020.09  838.78 1020.08  842.45 1020.08  851.91 1019.81   860.9 1019.52
  861.44 1019.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   280.9    .035  717.21    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         280.9  717.21           358.82  358.82  358.82             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  243.81 1023.12       F
  723.66  861.44 1022.63       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -16

INPUT
Description:
Station Elevation Data    num=     199
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1021.2    23.3  1021.2   23.98  1021.2   24.99  1021.2   28.09 1021.23
   28.83 1021.23    29.6 1020.82   29.87 1020.82   32.01 1020.81    34.9 1020.76
   38.77 1020.69      43 1020.66   48.22 1020.27   49.32 1020.27   49.72    1020
   52.19  1019.5   54.64 1018.77   56.58 1018.64   56.94  1018.6   57.87 1018.47
    58.5 1018.18   58.78    1018   60.33    1018   61.36    1017   63.23 1016.34
   64.21 1015.41   65.95 1015.08   66.82 1015.08    67.2 1015.08   67.34 1015.02
   73.07  1014.1   73.71 1013.66   76.52 1013.42   79.71 1013.35   79.89    1013
   82.04    1012   84.71    1012    89.2 1011.06   89.53    1011   89.58 1010.99
   93.65    1009   96.28    1009   99.24 1008.82  103.84 1008.87  104.47 1008.87
  105.84 1009.17  107.77 1009.18  109.29 1009.28  119.66 1009.28  126.45 1009.28
  127.77 1009.45  130.56 1009.29  142.95 1009.11  146.43  1009.5  150.02 1009.53
  156.47 1009.35  160.06 1009.18  166.98    1009  168.14 1008.94  169.18 1008.94
  169.85 1008.97  170.56 1008.97  176.24    1009  178.42 1009.01  179.98 1009.01
  184.16 1009.01  193.74    1009  194.48 1008.99  194.76 1008.99  195.03    1009
  201.75    1009  203.73    1009   211.1 1008.99  211.67 1008.99  212.12    1009
  218.68    1009  221.15    1009  224.25    1009  230.67 1009.01  236.68 1009.01
  238.71 1009.01  239.69 1009.01   249.8 1009.02  254.22 1009.11  266.04 1009.11
  268.61 1009.02  268.85 1009.02  269.32 1009.03  272.91 1008.94  273.73 1008.84
  274.55 1009.29  275.62 1009.32  275.84 1009.21  275.97 1009.23  276.34 1009.24
  277.39 1009.26  278.14 1009.25  286.34 1009.11  289.64 1009.11   303.2 1009.03
  310.17  1009.1  310.31 1009.11  311.37 1009.08  312.29 1008.91  313.48 1008.87
  316.15 1008.79  322.07 1008.78  325.47 1008.98   325.8 1009.02  327.69 1009.13
  329.07 1009.29  337.32 1009.14  345.01 1009.32  353.24 1009.79  353.91 1009.82
  355.13 1010.13  355.47 1010.13  355.96  1010.5  362.95  1010.5  368.03 1010.41
  370.98 1010.44  377.09 1010.22  379.66 1010.11  379.78 1010.07  382.51  1010.3
  383.65  1010.3  385.65    1010  397.12    1010  401.12 1009.45  403.87    1009
  416.28 1008.95  417.27 1008.94  417.72 1008.94  417.99 1008.94  418.28    1009
  420.34 1009.41  423.14    1010  424.67    1010  425.42 1010.48   428.6 1010.69
   432.8  1011.2  436.98 1011.67  442.78 1011.74   447.1 1011.75  452.85 1011.76
   453.5    1012  454.36 1012.08     457 1012.33     458 1012.42   460.1 1012.98
  461.24 1013.01  461.71 1013.54  462.26 1013.61  465.35 1013.88  465.51    1014
  465.79 1014.68  469.25 1014.87  471.75    1015  471.84    1015  472.08 1016.18
  472.77    1017   473.1 1017.06  475.41 1017.52  475.71 1017.53   475.8 1017.16
  478.21 1017.47  482.86 1017.47  484.16 1017.47  484.33 1017.47  485.73 1017.47
  486.06 1017.47  491.09 1017.48     500 1017.85  500.31 1017.86  503.38 1017.91
  504.51 1017.94  506.38 1017.99  506.57    1018  507.79 1018.15  513.95 1018.24
  521.65 1018.32  522.95 1018.34  524.02  1018.2  527.83 1018.22  529.54 1018.47
  530.81 1018.53  536.12 1018.76   541.7 1018.82  546.69 1018.87  547.98 1018.97
```

548.65	1019	549.34	1019	551.54	1019.1	553.95	1019	555.27	1019
555.95	1019	566.72	1019	578.1	1019	585.94	1019		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	29.6	.035	513.95	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.6	513.95	401.42	401.42	401.42	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	23.5	1024.74	F
519.22	585.94	1023.72	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: -417

INPUT
Description:
Station Elevation Data num= 201

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1021	15.84	1021	17.56	1021.13	23.5	1021.05	26.83	1021
31.44	1019.94	32.32	1019.69	35.45	1019.25	36.33	1019.23	38.71	1019
39.8	1018	41.66	1017.3	42.01	1017.3	42.74	1017.22	43.79	1017.21
46.55	1016.43	48.66	1015.81	49.56	1015.75	50.2	1015.71	50.57	1015.67
51.08	1015.59	52.01	1015.47	57.75	1015	58.57	1015	58.83	1014.65
60.46	1014.62	63.77	1014.09	64.13	1014.08	65.12	1013.9	66.97	1013.73
67.27	1013.38	68.89	1013.38	69	1013.02	69.82	1012.86	74.69	1012
76.45	1011.66	77.72	1011.64	78.71	1011.23	79.56	1010.72	81.76	1010
83	1009.28	83.95	1009.11	87.41	1008.51	89.77	1007.65	91.53	1007.6
92.41	1007.41	100.58	1007.28	103.89	1007.27	113.12	1008.21	149.55	1007.9
151.83	1007.52	159.86	1007.39	171	1007.28	177.21	1007.77	178.66	1008
180.9	1008.01	183.17	1008.06	185.78	1008	188.19	1008	189.49	1008
197.7	1007.92	200.83	1007.92	202.12	1007.94	202.56	1007.94	205.29	1007.97
207.18	1008.01	210.09	1008.04	212.76	1008.06	213.8	1008.04	214.11	1008.04
214.3	1007.89	215.3	1007.78	215.63	1007.77	216.44	1007.58	220.04	1007.85
222.33	1007.75	224.14	1007.74	225.02	1007.78	228.72	1007.72	228.78	1007.72
229.13	1007.74	231.45	1007.9	232.83	1008.01	233.04	1008.08	234.18	1008.08
234.39	1008.08	235.48	1008.11	244.83	1008.26	252.88	1008.26	256.46	1008.26
257.41	1008.03	257.56	1008.04	258.38	1007.8	258.89	1007.72	259.15	1007.72
259.47	1007.72	260.82	1007.72	262.37	1007.72	263.35	1007.72	266.29	1007.72
267.76	1007.72	268.14	1007.72	268.56	1007.92	271.48	1007.96	273.5	1007.99
274.41	1008.11	274.96	1008.11	277.31	1008.09	280.81	1008.41	283.06	1008.43
285.58	1008.43	288.28	1008.48	288.89	1008.34	291.07	1008.33	291.77	1008.02
292.35	1007.76	292.58	1007.75	294.07	1007.78	303.5	1007.94	313.76	1007.94
323.07	1007.57	329.68	1007.35	331.49	1007.32	332.99	1007.32	335.01	1007.32
335.24	1007.32	336.72	1007.32	340.85	1007.76	346.27	1007.76	347.2	1007.96
348.85	1008.09	350.52	1008.23	352.87	1008.51	353.97	1008.52	364.38	1008.32
370.68	1008.25	373.25	1008.19	375.39	1008.17	377.99	1008.06	390.48	1007.57
391.54	1007.6	391.88	1007.59	400.6	1007.92	421.47	1008.35	423.48	1008.43
430.94	1009	438.43	1009.63	441.36	1009.75	444.92	1009.84	447.59	1010.11
450.91	1010.2	454.9	1010.47	461.39	1011	464.35	1011.5	466.77	1011.84
471.68	1011.94	472.36	1012	474.82	1012.69	479.56	1013.02	480.74	1013.05
481.45	1012.92	483.9	1013.4	487.33	1014.11	487.96	1014.74	488.32	1014.74
491.19	1014.74	491.53	1014.68	491.87	1014.84	494.01	1015.99	495.93	1016.62
498.81	1016.62	499.35	1016.7	500	1016.65	500.15	1016.64	500.69	1016.62
503.61	1016.62	505.06	1017.99	505.69	1018.01	507.86	1017.82	512.45	1017.97
517.59	1018	517.84	1017.92	521.37	1017.97	521.7	1017.99	522.29	1018
522.35	1018	522.94	1018.01	526.77	1018.3	528.04	1018.3	533.28	1018.02
544	1018.89	550.39	1018.89	551.91	1018.89	555.23	1018.89	557.34	1018.8
558.08	1018.74	566.13	1018.53	566.87	1018.5	574.74	1017.54	596.49	1017.83
600.65	1017.83								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	26.83	.035	517.59	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
26.83	517.59	549.14	549.14	549.14	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	22.41	1023.71	F
523.03	600.65	1024.02	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: -966

INPUT
Description:
Station Elevation Data   num=   198

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1018.4	6.98	1018.4	18.72	1018.32	24.16	1018.33	29.6	1018.26
31.59	1018.21	32.34	1018	35.17	1017.36	37.46	1017	40.89	1016.18
41.6	1015.58	43.64	1015.46	43.84	1015.09	45.35	1015.04	46.24	1015.13
47.11	1014.86	50.74	1014.17	52.05	1014	52.25	1014	55.59	1013.34
56.1	1013.36	57.77	1013.36	59.02	1013	61.04	1013	62.5	1013
62.65	1012.55	62.87	1012.48	63.93	1012.38	64.38	1012.45	66.68	1012.44
68.62	1011.72	68.96	1011.68	69.75	1011.68	71.07	1011.38	71.66	1011.31
74.69	1010.99	77.36	1010.74	77.62	1010.67	77.92	1010.67	78.15	1010.63
78.43	1010.59	82.05	1009.85	83.38	1009.56	84.83	1009.42	86.78	1009.44
91.71	1009.24	92.08	1009.11	92.25	1009.11	97.43	1008.03	97.54	1007.99
101.2	1007.82	101.64	1007.83	106.27	1006.79	106.38	1006	106.46	1006
110.74	1006.07	112.86	1006.06	114.67	1006.06	115.76	1006.09	121.63	1006.21
121.71	1006.11	121.95	1006.1	122.01	1005.98	122.2	1005.89	122.29	1005.85
122.43	1005.85	122.64	1005.85	125.16	1005.85	129.22	1006	129.73	1006
129.9	1006.08	130.35	1006.13	130.44	1006.13	130.68	1006.64	132.98	1006.64
134.65	1006.56	237.75	1006.62	254.78	1006.62	254.8	1006.6	256.24	1006.61
258.9	1006.63	322.09	1006.44	335.58	1006.22	337.47	1006.19	339.25	1006.08
342.01	1005.99	351.55	1006	352.17	1006.01	357	1006.03	357.66	1006.03
358.51	1005.99	359.05	1006.12	360.71	1006.19	362.21	1006.21	363.24	1006.68
364.17	1007	366.98	1007.45	367	1007.45	367.08	1007.46	373.62	1007.68
376.71	1007.52	380.64	1007.45	381.73	1007.45	382.38	1006.99	385.64	1006.99
389.08	1006.99	390.07	1007	390.42	1007.25	398.88	1007.37	402.69	1007.37
407.38	1007.26	408.39	1007.14	409.22	1007.14	410.66	1007.14	417.27	1007.35
422.8	1007.71	423.45	1007.72	424.82	1007.75	427.93	1008	428.63	1008.06
429.26	1008.49	431.25	1008.5	436.58	1008.29	443.15	1008.73	444.63	1008.77
445.22	1009.04	445.97	1009.1	447.51	1009.12	451.44	1009.26	451.75	1010.68
452.13	1010.69	455.59	1010.9	455.85	1010.97	456.08	1011.01	458.37	1012.4
459.22	1012.41	460.8	1012.52	461.94	1013.5	462.27	1013.66	462.32	1014.06
463.03	1014.13	463.57	1014.27	465.09	1015.42	465.95	1015.43	466.54	1015.84
471.82	1015.87	480.56	1016	480.62	1016.01	492.12	1016.25	500	1016.37
502.55	1016.41	506.55	1016.48	511.11	1016.7	514.35	1016.7	515.76	1016.66
530.01	1017	536.98	1017	539.09	1017.01	539.4	1017.01	539.62	1017.06
541.85	1016.97	543.34	1016.9	544.11	1016.9	544.6	1016.95	544.62	1016.95
544.77	1016.95	545.06	1016.96	547.6	1017	547.68	1017.05	552.63	1017.24
559.12	1017.24	559.17	1017.24	565.01	1017.28	566.21	1017.27	568.52	1017.21
572.75	1017.4	577.63	1017.42	578.21	1017.42	581.16	1017.38	582.22	1017.4
586.94	1017.62	592.3	1017.67	594.29	1017.67	594.5	1017.67	594.6	1017.77
604.65	1017.58	604.87	1017.58	605.44	1017.58	608.61	1017.51	633.18	1017.07
636.55	1017	640.39	1016.82	641.26	1016.8	641.77	1016.79	641.98	1016.78
642.14	1016.79	643.36	1016.76	645.28	1016.76				

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	32.34	.035	536.98	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
32.34	536.98	446.71	446.71	446.71	.1	.3

Ineffective Flow   num=   2

Sta L	Sta R	Elev	Permanent
0	28.58	1020.48	F
543.87	645.28	1020.94	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: -1415

INPUT
Description: Via Montezuma
Station Elevation Data   num=   277

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1015.16	3.54	1015.18	5.68	1015.16	11.07	1015.12	15.77	1015.08
16.48	1015.08	16.7	1015.06	16.93	1015.06	20.58	1014.74	26.64	1014.74
29.29	1014.76	37.06	1014.82	42.55	1014.66	45.37	1014.62	53.1	1014.53
54.63	1014.23	57.08	1014.08	58.59	1014.14	60.33	1014.14	63.33	1013.87
64.6	1013.81	66.46	1013.54	72.48	1013.59	74.53	1013.51	74.63	1013.5

```
   75.41 1013.49   76.07 1013.46   81.84 1013.08    86.1    1013   86.29 1012.97
   86.38 1012.96   86.54 1012.94   86.61    1012   87.22 1012.84   88.26 1012.07
   88.76 1012.07   89.06 1012.35    89.2 1012.29   89.45  1012.1   89.89 1012.06
   90.07 1012.19   90.26  1012.2   90.82 1011.65   91.83    1011   93.59 1010.81
   94.47 1010.66   95.37 1010.66   96.24  1010.3   97.37 1010.68   98.27 1010.57
   99.17 1009.75   99.72 1009.45  100.05 1009.45  101.32 1009.19  102.68    1009
   103.4 1008.59  104.88 1008.32  108.06 1008.16  109.36    1008  109.83 1007.85
   110.2 1007.89  111.02 1007.82  116.57 1007.31  121.42 1006.94  125.51 1006.61
   126.8 1006.44  129.43 1006.32  129.53 1006.01  129.64 1005.99  130.75 1006.03
  131.71 1005.77  132.68  1005.7  133.61 1005.64   134.5 1005.64  134.63 1005.63
  143.05 1005.09  144.26 1004.64  146.61 1004.64  146.94 1004.64  147.83 1004.64
  148.33 1004.64   150.4 1004.64  150.74 1004.64  151.25 1004.64  152.92 1004.64
  154.05 1004.64  154.25 1004.64  155.22 1004.64  155.28 1004.64  156.55 1004.64
  156.65 1004.64  156.79 1004.64  163.09 1004.64  165.16 1004.64  165.65 1004.64
  169.18 1004.64  172.04 1004.64  175.02 1004.64  175.76 1004.64  176.81 1004.64
  177.76 1004.64  178.82 1004.64  183.51 1004.64   184.8 1004.64  185.78 1004.64
  189.45 1004.64   192.2 1004.64  194.24 1004.64  195.93 1004.64   197.1 1004.64
  197.58 1004.64  200.75 1004.64  201.79 1004.64   210.7 1004.64  215.95 1004.64
  228.33 1004.64   228.5 1004.64  228.68 1004.64  238.32 1004.66  238.69 1004.64
  239.01 1004.64  254.52 1004.64  263.01 1004.64  270.71 1004.64  274.94 1004.64
  277.45 1004.64  277.93 1004.64  278.71 1004.64  279.12 1004.64  280.23 1004.64
  281.24 1004.64  282.44 1004.64  282.84 1004.64  284.07 1004.64  285.47 1004.64
   285.9    1005  286.23 1005.15  286.56 1005.15  291.62 1005.32  296.03 1005.32
  297.27 1005.32  297.47 1005.28  297.63 1005.27  297.83 1005.27  301.02 1005.23
   304.9 1005.18  308.39 1005.17  308.51    1005   308.7    1005  308.97 1004.69
  309.21 1004.69  309.65 1004.69  309.88 1004.69  311.12 1004.69  312.81 1004.69
  313.35 1004.69  314.35 1004.69  315.02 1005.09  315.58 1005.03  315.64 1005.04
  322.02 1005.12  324.08  1005.2  327.29 1005.22  334.15 1005.28  336.45 1005.37
   340.7  1005.4     342 1005.37  342.18 1005.39  342.41 1005.39  344.34 1004.62
  344.37 1004.62  346.89 1004.62  347.17 1004.62  348.45 1004.62  354.22 1004.62
  360.19 1004.62  360.67 1004.62  362.21 1004.62  363.35 1004.62  367.59 1004.62
  371.48 1004.62  372.54 1004.62  373.86 1004.62  380.22 1004.62  382.12 1004.62
  382.98 1004.62  384.43 1004.62  385.81 1004.62  387.42 1004.62  387.79 1004.62
  388.81 1004.62  389.09 1004.62  389.28 1004.62  389.44 1004.62  389.76 1004.62
   393.1 1005.27  396.45 1005.57  397.84 1005.82  400.06 1005.97  400.78    1006
  402.41  1006.3  402.81 1006.34  404.12 1006.51  405.98 1006.74  408.71 1006.76
  412.69 1007.39  413.97  1007.5  416.41    1008  418.75    1008   418.8 1008.01
  423.03 1008.59  423.24 1008.62  423.42 1009.04     424    1009  424.95 1008.94
   425.9 1009.22  426.03 1009.25  427.64 1009.62  429.23    1010  430.53 1010.49
  431.27 1011.04  432.79    1011   432.8    1011  434.99  1011.7  435.96    1012
   436.8 1012.26  436.95 1012.31   437.1 1012.35  437.24 1012.39  437.41 1012.44
  437.53 1012.48   437.6  1012.5  437.66 1012.51  437.73 1012.53   437.8 1012.55
   437.9 1012.58  438.13    1013  438.22 1012.67  438.26    1013  439.45    1013
  439.56 1013.11  439.85  1013.1   439.9 1013.11  441.16 1013.38  443.38 1013.31
  443.49 1013.32  443.56 1013.87  444.22    1014  444.75 1014.26   445.4 1014.31
  446.21 1014.66  446.61 1014.64  448.21 1014.58  448.57  1014.7  450.27    1015
  450.78 1015.15  450.94 1015.18   451.5  1015.2  451.57 1015.21  452.04 1015.26
  452.24 1015.14  455.38 1015.16  456.25 1015.75  457.37 1015.78  459.42 1015.98
  459.77 1016.03  461.34 1016.14  461.57 1016.13  462.57  1016.1  463.35 1016.09
     464 1016.06  465.88    1016  466.29 1015.99  466.46    1016   467.9 1015.98
  468.31 1015.99  468.97 1015.99

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   11.07    .016  459.42    .016

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         11.07  459.42            42.27   42.27   42.27             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    9.64 1019.22       F
  462.05  468.97 1018.55       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -1451

INPUT
Description: Via Montezuma
Station Elevation Data    num=     120
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1012.44    7.89 1012.44    9.52 1011.97    9.58 1011.97   11.91 1011.87
    20.7 1011.51   23.65  1011.3   23.72  1011.3   33.71 1010.66   36.94 1010.32
   47.65 1009.59   47.86 1009.44   54.55 1009.03   55.08 1008.87   62.21 1008.58
   63.57 1008.48   68.18 1008.25   72.62    1008   86.63 1007.28   90.61 1007.26
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    91.39 1007.02   95.47 1006.74   98.56  1006.6  106.46 1006.31  116.59    1006
   117.08 1006.06  118.72 1005.93  125.01  1005.7  127.27 1005.46  134.78 1005.34
   142.65 1005.25  147.59 1005.03  148.12 1004.92  150.74 1004.78  153.68 1004.74
   154.47 1004.64  155.55 1004.64   157.3 1004.64  157.59 1004.64   157.8 1004.64
   158.68 1004.64  158.73 1004.64  162.51 1004.64  164.38 1004.64  164.82 1004.64
   165.06 1004.64  167.56 1004.64  174.29 1004.64  176.38 1004.64  180.38 1004.64
   187.87 1004.64  191.53 1004.64  193.14 1004.64  209.69 1004.61  209.95 1004.61
   225.33 1004.61  238.67 1004.64  240.36 1004.64  243.98 1004.54  247.84 1004.54
   248.81  1004.6  250.78  1004.6  251.14  1004.6   266.4 1004.64  283.07 1004.64
   298.49 1004.61  308.65 1004.63  309.27 1004.64  311.32 1004.64  311.56 1004.64
   311.83 1004.64  312.08 1004.64  312.36 1004.64   314.5 1004.64  314.87 1004.64
   315.28 1004.64  320.72 1004.64  322.57 1004.64   326.2 1004.64  330.78 1004.64
   332.01 1004.64  336.07 1004.64  337.13 1004.64  338.48 1004.64  345.25 1004.64
   346.01 1004.64  347.07 1004.64  348.39 1004.73  352.44 1004.64  355.16 1004.64
    356.3 1004.92  357.81 1004.64  357.91 1004.64  358.99 1005.02  365.12 1005.23
   365.13 1005.17  375.68 1005.36  387.28 1005.94  393.71 1005.94  394.12 1005.99
    403.2 1006.31  408.27  1006.4  417.45 1006.52  424.81 1007.23  424.98 1007.24
   425.54 1007.75  426.54 1007.75  435.24 1007.75   439.6 1007.61  442.79 1007.79
    444.9 1007.99  445.13 1008.27  451.68 1008.55  456.24 1008.75  456.51 1008.88
   459.56 1008.88  461.91  1008.8   463.1 1009.19  473.85 1009.68  476.51 1009.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016    9.52    .016  473.85    .016

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9.52  473.85           612.44  612.44  612.44             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    8.47 1013.32       F
   474.8  476.51 1013.78       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -2068

INPUT
Description:
Station Elevation Data    num=     218
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1013.09    7.16 1013.16   11.22 1013.04   12.39    1013   14.78 1012.86
    19.59 1013.01   24.92 1012.85    31.1 1012.94   34.95 1012.95   39.38 1012.92
    41.28 1012.86   41.87 1012.82    42.8 1012.58   47.23 1012.56   47.41 1012.56
    47.42    1012   48.31  1012.4   49.58 1011.06   49.76 1011.06   49.99 1011.05
       50  1010.9   50.02  1010.9   50.25  1010.8   51.97 1010.08   52.15    1010
    52.18 1009.84    52.9 1009.21   53.58 1010.18   53.79 1010.14      54 1008.91
    54.06 1008.78   54.34    1009   54.91    1009   57.16 1008.33   57.31 1008.29
     57.4    1009   57.82 1008.69    58.3 1008.69   58.92 1008.65   59.25 1008.76
    59.56 1008.85   59.77    1009    60.4    1009   60.47    1009      61 1008.86
    66.09 1008.53   67.22    1008   74.88 1007.89   76.07 1007.93   85.39 1007.37
    91.27 1007.37   95.01 1007.41   95.33 1007.04   96.16 1007.07   96.72 1007.05
    96.87 1007.05   97.26    1007   97.87    1007  102.77    1007  116.05  1006.2
   119.67 1005.88  134.14 1005.46  135.58  1005.5  150.41  1005.3  168.03 1004.77
   170.48 1004.77  176.56 1004.47  182.44 1004.33  195.18  1004.6  205.17 1004.54
   208.09 1004.35  211.17 1004.38  217.79 1004.45  227.52 1004.37  228.51 1004.01
   228.57    1004  228.64 1003.99  230.93 1003.26  231.82 1003.15  232.83 1003.08
   233.29 1003.06  234.42 1003.07   234.8 1003.07  238.88 1003.05  243.37 1003.05
   244.91 1003.05  245.55 1003.39  246.44 1003.39  248.77 1003.26  251.67 1003.39
   253.12 1003.77  253.61  1003.9  254.25  1004.2  254.61 1004.28  259.46 1004.28
   259.99 1004.19  261.06 1004.19  261.78  1004.3  262.24  1004.3  289.29 1004.27
   314.81 1004.17  314.91 1004.17  315.26    1004  315.48    1004  315.62 1003.89
   315.96 1003.86  316.07 1003.73  316.34 1003.62  318.74 1003.62  320.55 1003.61
   323.93 1003.59   324.1 1003.59  324.26 1003.59  324.37 1003.59   324.7 1003.59
   324.88    1004     325    1004  326.41 1003.84   326.6 1003.59  326.85 1003.59
   327.27 1003.61  329.35 1003.59  330.27 1003.59  331.41 1003.59   332.2 1004.19
    332.3 1004.21  332.41 1004.08  333.52 1004.11  338.12 1004.19     345 1004.09
   345.62 1004.08  345.72 1004.11  346.18 1004.11  353.02  1004.1  355.67 1004.11
   357.91 1004.11  358.04 1004.08  358.09 1003.73  358.63 1003.71  359.02 1003.59
    359.4 1003.59  363.35 1003.59  365.65 1003.59  365.93 1003.81  366.26 1003.81
   366.42    1004  366.63 1004.27  381.95 1004.27  453.52 1004.27   455.5 1004.42
   464.75 1004.83   467.1    1005  468.09    1005  469.88 1005.31  472.51  1005.9
   481.15    1006   481.2 1006.15  485.93 1006.15  488.37 1006.24  498.64 1006.17
   499.29 1006.17     500 1006.38   500.1 1006.41  507.92    1007  512.95    1007
   516.85    1007  517.71 1007.06  518.09 1007.49  525.65 1007.87   528.4 1008.08
      531 1008.23  538.59 1008.73  540.13 1009.19  540.53 1009.19  544.63  1009.5
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  545.71 1009.58  551.24 1009.71  551.95 1009.71  552.37    1010  554.78    1010
  555.09    1010  560.23 1010.43  568.28 1011.04  578.64 1011.94  579.38 1012.56
  586.17 1012.94   587.2 1013.03  587.38 1013.02  594.48    1014  594.92    1014
  599.83 1014.26  600.86 1014.31   601.1 1014.85  603.17    1015  607.19 1015.54
  610.42 1015.54  610.95 1015.77  644.07 1015.84  652.26 1015.89  656.71 1015.92
  660.31 1015.95  661.85 1015.96  664.63 1016.01  667.14 1016.01  668.98  1015.9
  672.02 1015.94  675.45 1015.97  681.81 1015.84  684.68 1015.84  687.61 1015.87
  701.14 1015.75  712.04 1015.79  723.42 1015.75  724.07 1015.58  724.61 1015.58
   737.3 1015.51  743.15 1015.54  744.37 1015.54

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   41.28    .035  610.95    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         41.28  610.95           368.66  368.66  368.66             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   36.09  1018.9       F
  618.04  744.37 1019.43       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -2437

INPUT
Description:
Station Elevation Data    num=     202
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1012.11    1.07 1012.11    1.22 1012.11    5.71 1012.18   12.82 1012.37
   24.09 1012.39   25.08 1012.39   25.99 1012.08   36.81    1012   36.88 1012.06
   39.37 1012.06   40.97 1012.16    50.1 1012.14   52.82 1012.14   58.02 1012.13
   58.56 1012.13   58.81 1011.89   59.65 1010.62   60.04 1010.53   60.61    1010
   60.89 1009.45   61.26 1009.33   61.34 1009.28   61.97 1008.99   62.08 1008.97
    62.3 1008.96   62.54 1008.94   63.28 1008.35   63.61 1008.45   64.26 1008.04
   64.38 1007.95   64.83 1007.77   64.95 1007.57    65.7 1007.52   67.49 1007.97
   69.96 1007.31   73.37 1006.87   74.66 1007.15   74.91 1007.16   85.59    1007
    87.4 1006.88   87.83 1006.89   88.92 1006.41    90.3 1006.37   94.52 1006.34
    99.8 1006.53  107.15 1006.37  120.12    1006  120.15 1005.87  123.34 1005.94
  126.53 1005.95  127.33 1005.82  141.84 1005.64  144.41 1005.64  149.41 1005.64
  154.35 1005.66   156.2  1005.7  163.99 1005.66  169.66 1005.64  176.35 1005.62
  182.78 1005.53  189.06 1005.49  195.17 1005.32  200.85 1005.32  208.14 1005.31
  212.02 1005.24  221.28 1005.22  224.02 1005.08  225.13 1005.05  228.82 1005.18
  233.29 1005.32  235.71 1005.42  237.29 1005.36  240.34 1005.34  242.81 1005.34
  244.15    1005  244.23    1005   244.6    1005  244.71    1005  244.93 1005.02
  245.75 1005.02  248.44  1004.9  294.01 1004.31   298.6 1004.25  298.81 1004.25
  298.95 1004.25  299.26 1004.17  300.08  1004.1  301.14 1003.97  301.34    1004
  301.73 1003.95   302.6  1003.9  304.24 1003.71  306.28 1003.62  309.71 1003.62
  313.19 1003.59  313.66 1003.78  314.19    1004  315.62 1004.35  316.16 1004.39
  342.03 1005.03  355.02 1004.41  360.97 1004.13  363.39    1004  364.72    1004
  463.89 1004.04  470.42 1003.33  475.19 1003.01  475.68    1003  476.25 1003.19
  477.76 1002.67  478.03 1002.92  478.14 1003.06  478.22 1003.06   478.3 1003.15
  480.56 1003.11  481.71  1003.1  481.81  1003.1  481.95 1003.05  482.36  1002.8
  482.61 1002.68  484.11 1002.67   485.7 1002.96   485.9    1003  485.94 1003.02
  487.97 1003.09  488.17    1004  489.02 1004.17  490.13 1004.99  490.46    1005
  490.48    1005  491.94    1005  502.04 1005.65  512.66  1006.1   514.3 1006.13
  519.39 1005.75  520.13 1005.99  526.62 1006.19  527.21 1006.19  529.43 1006.72
  533.88 1006.78  534.79 1006.82  538.12  1007.3  539.24  1007.3  540.14  1007.4
   541.6    1008  549.33    1008  549.45 1008.01  550.36 1008.06  559.19  1008.4
  563.13  1008.4  565.32  1008.6  571.14 1008.77  571.82 1009.05  573.93  1009.2
  578.28 1009.87  584.52 1010.13  585.69 1009.95  585.99 1011.02  595.51 1011.16
  595.62 1011.16  598.28 1011.16  603.63 1011.71  607.24 1011.88  608.13 1012.11
  609.77 1012.48  612.55 1012.48  615.08 1012.63   619.2    1013  623.46 1013.47
  626.63 1014.07  627.44 1014.15  631.02 1014.77  633.16 1014.84  636.65    1015
  636.84 1015.01  639.13 1015.25  640.03 1015.25  642.33    1015  644.41    1015
  658.11    1015  663.52    1015  667.14 1014.82  669.08 1014.17  694.63 1014.09
   700.6 1014.09  706.55 1014.07  707.26 1014.07  707.35 1014.07  707.54 1014.07
  707.55 1014.07  708.86 1014.08  712.78 1014.12   718.9 1014.18  719.11 1014.18
  719.66 1014.06  728.09 1014.29  728.22 1014.21  728.39 1013.93  730.41 1013.88
  732.03    1014  736.85    1014

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042    50.1    .035  636.65    .042
```

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
50.1	636.65	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	46.01	1018.27	F
641.63	736.85	1020.6	F

SUMMARY OF MANNING'S N VALUES

River:Murrieta Creek

Reach	River Sta.	n1	n2	n3
Main - EC	3430	.042	.035	.042
Main - EC	3069	.042	.035	.042
Main - EC	2700	.042	.035	.042
Main - EC	2540	.042	.035	.042
Main - EC	2399	.042	.035	.042
Main - EC	2343	Bridge		
Main - EC	2295	.042	.035	.042
Main - EC	2022	.042	.035	.042
Main - EC	1737	.042	.035	.042
Main - EC	1265	.042	.035	.042
Main - EC	1130	.042	.035	.042
Main - EC	1000	.042	.035	.042
Main - EC	954	Bridge		
Main - EC	912	.042	.035	.042
Main - EC	642	.042	.035	.042
Main - EC	343	.042	.035	.042
Main - EC	-16	.042	.035	.042
Main - EC	-417	.042	.035	.042
Main - EC	-966	.042	.035	.042
Main - EC	-1415	.016	.016	.016
Main - EC	-1451	.016	.016	.016
Main - EC	-2068	.042	.035	.042
Main - EC	-2437	.042	.035	.042

SUMMARY OF REACH LENGTHS

River: Murrieta Creek

Reach	River Sta.	Left	Channel	Right
Main - EC	3430	360.57	360.57	360.57
Main - EC	3069	368.55	368.55	368.55
Main - EC	2700	161.15	161.15	161.15
Main - EC	2540	141.07	141.07	141.07
Main - EC	2399	103.93	103.93	103.93
Main - EC	2343	Bridge		
Main - EC	2295	272.93	272.93	272.93
Main - EC	2022	284.86	284.86	284.86
Main - EC	1737	471.89	471.89	471.89
Main - EC	1265	137.3	137.3	137.3
Main - EC	1130	131.85	131.85	131.85
Main - EC	1000	85.15	85.15	85.15
Main - EC	954	Bridge		
Main - EC	912	267.2	267.2	267.2
Main - EC	642	298.19	298.19	298.19
Main - EC	343	358.82	358.82	358.82
Main - EC	-16	401.42	401.42	401.42
Main - EC	-417	549.14	549.14	549.14
Main - EC	-966	446.71	446.71	446.71
Main - EC	-1415	42.27	42.27	42.27
Main - EC	-1451	612.44	612.44	612.44
Main - EC	-2068	368.66	368.66	368.66
Main - EC	-2437	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Murrieta Creek

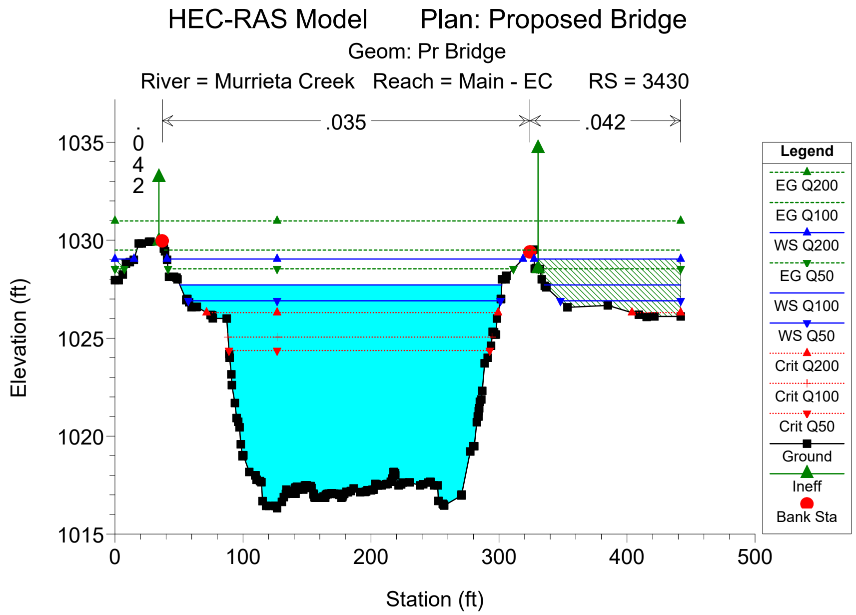
Reach	River Sta.	Contr.	Expan.
Main - EC	3430	.1	.3
Main - EC	3069	.1	.3
Main - EC	2700	.1	.3
Main - EC	2540	.1	.3
Main - EC	2399	.1	.3
Main - EC	2343	Bridge	
Main - EC	2295	.1	.3
Main - EC	2022	.1	.3
Main - EC	1737	.1	.3
Main - EC	1265	.3	.5
Main - EC	1130	.1	.3
Main - EC	1000	.3	.5
Main - EC	954	Bridge	
Main - EC	912	.3	.5
Main - EC	642	.1	.3
Main - EC	343	.1	.3
Main - EC	-16	.1	.3
Main - EC	-417	.1	.3
Main - EC	-966	.1	.3
Main - EC	-1415	.1	.3
Main - EC	-1451	.1	.3
Main - EC	-2068	.1	.3
Main - EC	-2437	.1	.3

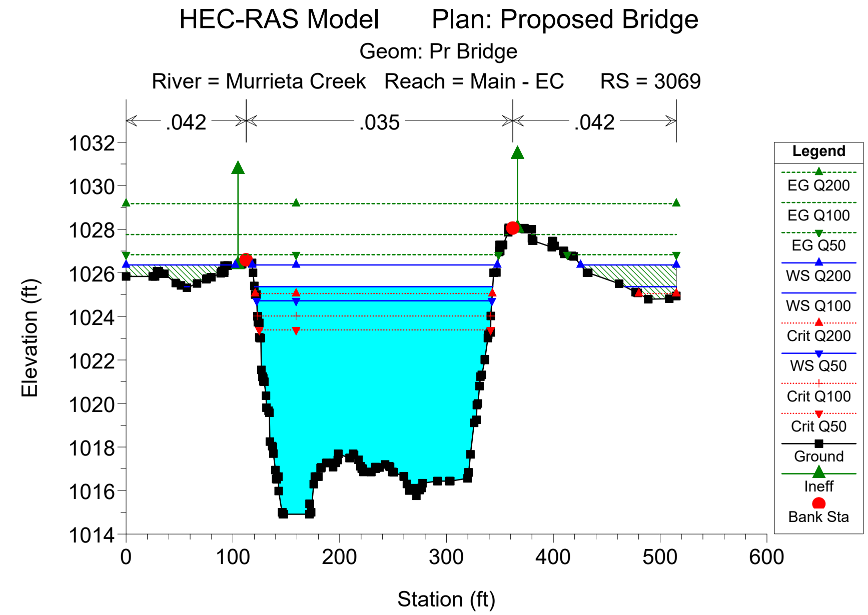
Profile Output Table - ERSC

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Area (sq ft)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Mann Wtd Chnl
Main - EC	3430	Q100	22300.00	1027.72	0.003943	10.71	2210.31	2081.73	357.95	0.66	0.035
Main - EC	3430	Q200	27200.00	1029.04	0.003984	11.18	2717.14	2434.80	407.64	0.67	0.035
Main - EC	3430	Q50	19300.00	1026.91	0.003967	10.26	1928.43	1881.02	337.71	0.65	0.035
Main - EC	3069	Q100	22300.00	1025.36	0.005586	12.41	1817.02	1796.66	275.76	0.77	0.035
Main - EC	3069	Q200	27200.00	1026.37	0.005815	13.45	2173.97	2022.93	421.16	0.80	0.035
Main - EC	3069	Q50	19300.00	1024.72	0.005413	11.68	1653.02	1653.02	220.10	0.75	0.035
Main - EC	2700	Q100	22300.00	1025.34	0.001830	7.44	2996.38	2996.38	353.43	0.45	0.035
Main - EC	2700	Q200	27200.00	1026.57	0.001762	7.92	3440.45	3432.39	379.15	0.45	0.035
Main - EC	2700	Q50	19300.00	1024.55	0.001887	7.11	2715.80	2715.80	352.20	0.45	0.035
Main - EC	2540	Q100	22300.00	1024.69	0.002465	8.59	2595.48	2595.48	307.36	0.52	0.035
Main - EC	2540	Q200	27200.00	1025.87	0.002404	9.19	2960.52	2960.52	310.37	0.52	0.035
Main - EC	2540	Q50	19300.00	1023.92	0.002472	8.17	2362.65	2362.65	302.78	0.52	0.035
Main - EC	2399	Q100	22300.00	1024.44	0.002089	8.22	2713.58	2713.58	297.38	0.48	0.035
Main - EC	2399	Q200	27200.00	1025.62	0.002102	8.87	3065.84	3065.84	299.99	0.49	0.035
Main - EC	2399	Q50	19300.00	1023.68	0.002050	7.75	2489.42	2489.42	293.79	0.47	0.035

Main - EC	2343	Winchester Road	Bridge									
Main - EC	2295		Q100	22300.00	1023.67	0.002476	8.72	2556.83	2556.83	293.33	0.52	0.035
Main - EC	2295		Q200	27200.00	1024.81	0.002494	9.40	2893.60	2893.60	297.56	0.53	0.035
Main - EC	2295		Q50	19300.00	1022.94	0.002458	8.24	2343.65	2343.65	292.17	0.51	0.035
Main - EC	2022		Q100	22300.00	1022.71	0.003132	9.39	2517.39	2376.03	406.33	0.58	0.035
Main - EC	2022		Q200	27200.00	1023.85	0.003047	10.02	2993.64	2715.23	419.18	0.59	0.035
Main - EC	2022		Q50	19300.00	1021.98	0.003170	8.92	2246.04	2163.21	349.69	0.58	0.035
Main - EC	1737		Q100	22300.00	1022.07	0.002488	8.58	2772.86	2600.01	434.63	0.52	0.035
Main - EC	1737		Q200	27200.00	1023.25	0.002464	9.20	3288.81	2961.06	444.73	0.52	0.035
Main - EC	1737		Q50	19300.00	1021.33	0.002493	8.12	2458.33	2376.18	413.93	0.51	0.035
Main - EC	1265		Q100	22300.00	1021.05	0.002199	8.10	2753.63	2753.63	332.29	0.50	0.035
Main - EC	1265		Q200	27200.00	1022.27	0.002169	8.59	3166.98	3166.98	346.32	0.50	0.035
Main - EC	1265		Q50	19300.00	1020.31	0.002168	7.69	2508.69	2508.69	323.58	0.49	0.035
Main - EC	1130		Q100	22300.00	1020.70	0.002237	8.25	2701.45	2701.45	321.27	0.50	0.035
Main - EC	1130		Q200	27200.00	1021.90	0.002208	8.79	3093.61	3093.61	331.27	0.51	0.035
Main - EC	1130		Q50	19300.00	1019.97	0.002211	7.81	2469.68	2469.68	316.31	0.49	0.035
Main - EC	1000		Q100	22300.00	1020.20	0.002738	8.82	2527.24	2527.24	315.13	0.55	0.035
Main - EC	1000		Q200	27200.00	1021.43	0.002778	9.25	2976.50	2940.59	390.91	0.56	0.035
Main - EC	1000		Q50	19300.00	1019.53	0.002440	8.29	2327.66	2327.66	292.18	0.52	0.035
Main - EC	954	Overland Drive	Bridge									
Main - EC	912		Q100	22300.00	1019.50	0.003246	9.69	2301.13	2301.13	282.96	0.60	0.035
Main - EC	912		Q200	27200.00	1020.48	0.004072	10.50	2591.39	2591.39	335.58	0.67	0.035
Main - EC	912		Q50	19300.00	1018.91	0.003076	9.03	2136.50	2136.50	280.59	0.58	0.035
Main - EC	642		Q100	22300.00	1019.01	0.002497	7.67	2907.17	2907.17	417.14	0.51	0.035
Main - EC	642		Q200	27200.00	1019.96	0.002521	8.22	3335.16	3310.17	474.51	0.52	0.035
Main - EC	642		Q50	19300.00	1018.40	0.002502	7.28	2651.74	2651.74	412.35	0.51	0.035
Main - EC	343		Q100	22300.00	1017.57	0.004126	9.39	2399.69	2374.83	443.08	0.65	0.035
Main - EC	343		Q200	27200.00	1018.41	0.004192	10.12	2787.50	2688.04	474.11	0.67	0.035

Main - EC	343		Q50	19300.00	1017.02	0.004070	8.88	2174.62	2174.60	363.83	0.64	0.035
Main - EC	-16		Q100	22300.00	1016.52	0.003071	8.23	2709.90	2709.90	409.65	0.56	0.035
Main - EC	-16		Q200	27200.00	1017.39	0.003092	8.87	3066.00	3066.00	415.57	0.58	0.035
Main - EC	-16		Q50	19300.00	1015.95	0.003095	7.80	2474.63	2474.63	408.39	0.56	0.035
Main - EC	-417		Q100	22300.00	1015.54	0.002493	7.51	2967.81	2967.81	441.66	0.51	0.035
Main - EC	-417		Q200	27200.00	1016.41	0.002509	8.10	3359.19	3359.19	448.69	0.52	0.035
Main - EC	-417		Q50	19300.00	1014.95	0.002456	7.11	2712.95	2712.95	433.47	0.50	0.035
Main - EC	-966		Q100	22300.00	1013.00	0.005106	9.69	2301.96	2301.96	398.86	0.71	0.035
Main - EC	-966		Q200	27200.00	1013.88	0.004854	10.22	2661.92	2661.92	409.46	0.71	0.035
Main - EC	-966		Q50	19300.00	1012.44	0.005271	9.28	2080.32	2080.32	394.34	0.71	0.035
Main - EC	-1415	Via Montezuma	Q100	22300.00	1012.05	0.000973	9.98	2233.97	2233.97	345.75	0.69	0.016
Main - EC	-1415	Via Montezuma	Q200	27200.00	1012.65	0.001103	11.14	2442.42	2442.42	350.98	0.74	0.016
Main - EC	-1415	Via Montezuma	Q50	19300.00	1011.65	0.000895	9.21	2095.68	2095.68	344.01	0.66	0.016
Main - EC	-1451	Via Montezuma	Q100	22300.00	1012.46	0.000603	7.71	2899.33	2894.41	476.51	0.54	0.016
Main - EC	-1451	Via Montezuma	Q200	27200.00	1013.20	0.000617	8.40	3252.41	3239.95	476.51	0.56	0.016
Main - EC	-1451	Via Montezuma	Q50	19300.00	1011.97	0.000591	7.23	2673.43	2669.51	467.00	0.53	0.016
Main - EC	-2068		Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66	530.11	0.45	0.035
Main - EC	-2068		Q200	27200.00	1012.77	0.002127	7.13	3814.61	3814.61	541.10	0.47	0.035
Main - EC	-2068		Q50	19300.00	1011.54	0.001926	6.11	3157.72	3157.72	524.85	0.44	0.035
Main - EC	-2437		Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54	511.52	1.00	0.035
Main - EC	-2437		Q200	27200.00	1009.71	0.010932	11.91	2284.27	2284.27	516.46	1.00	0.035
Main - EC	-2437		Q50	19300.00	1008.76	0.011961	10.74	1797.13	1797.13	507.88	1.01	0.035


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 3430
.035
.042
.042
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1015
1020
1025
1030
1035
0
100
200
300
400
500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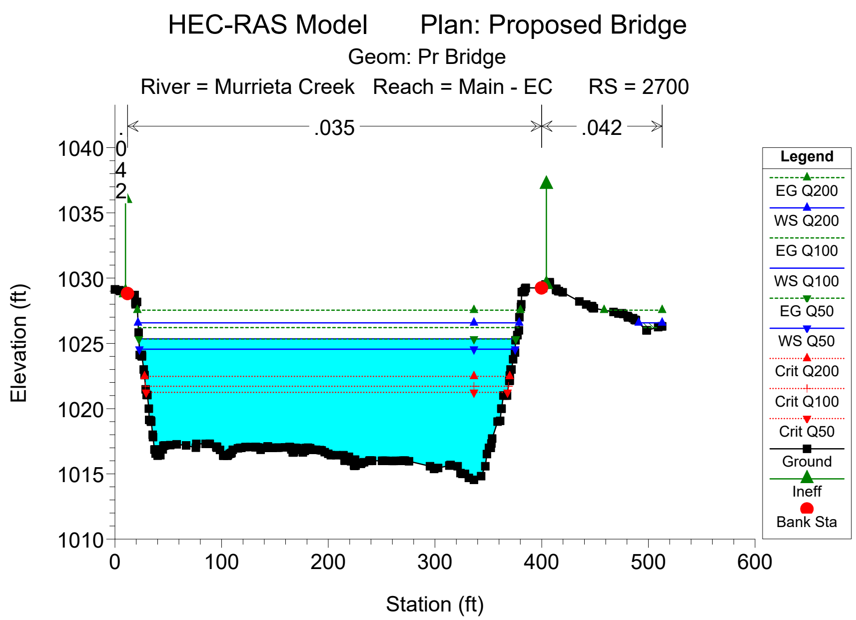
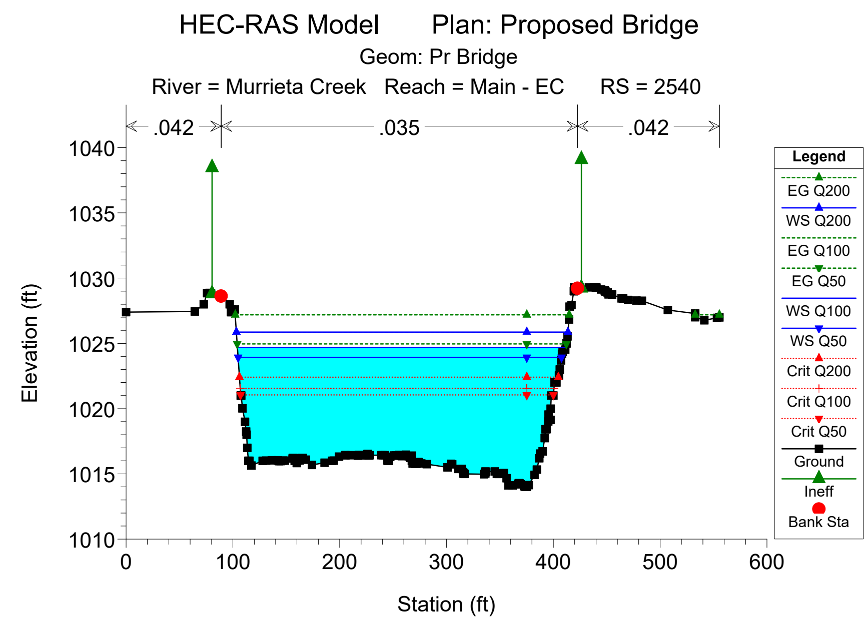
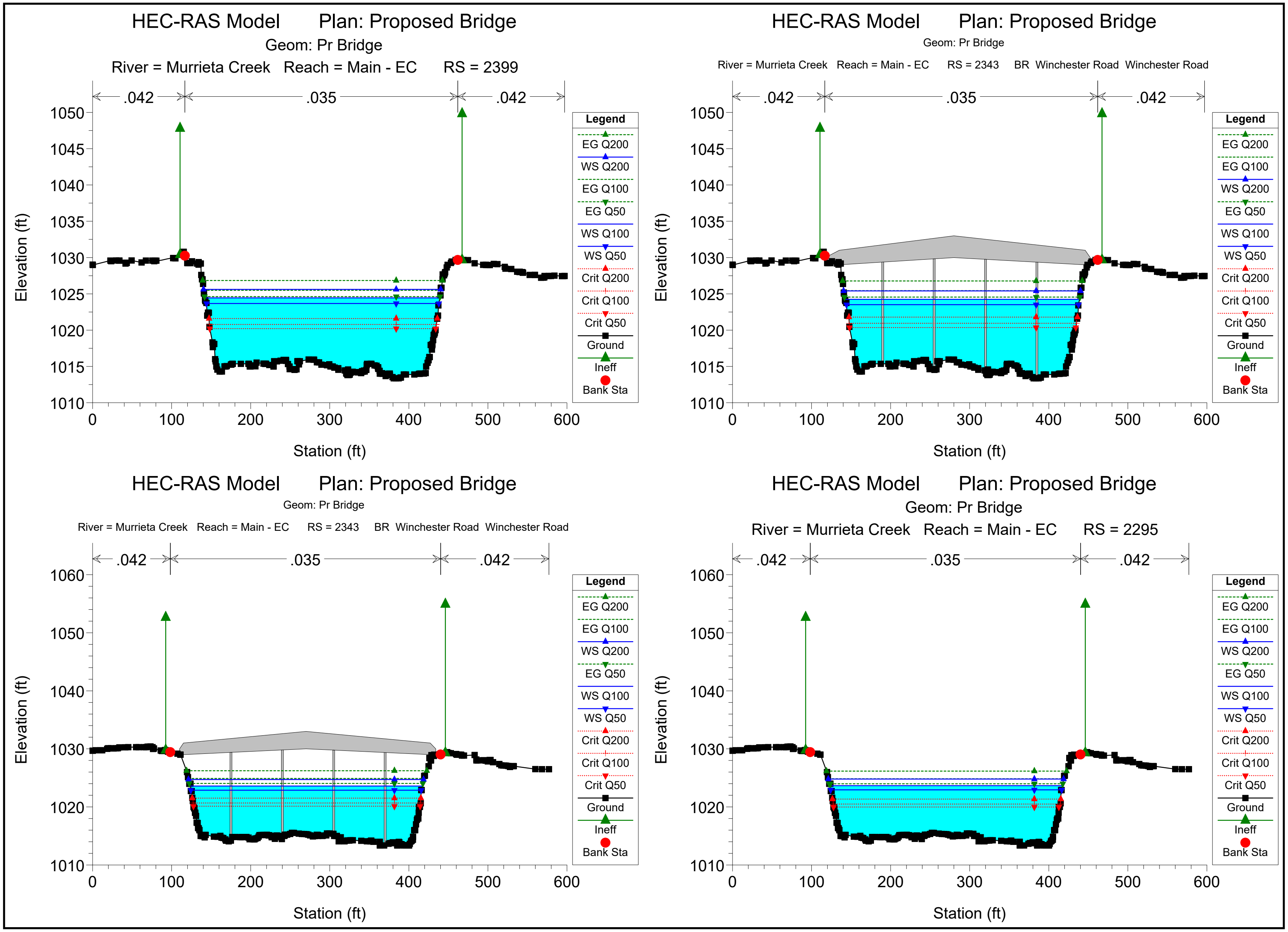
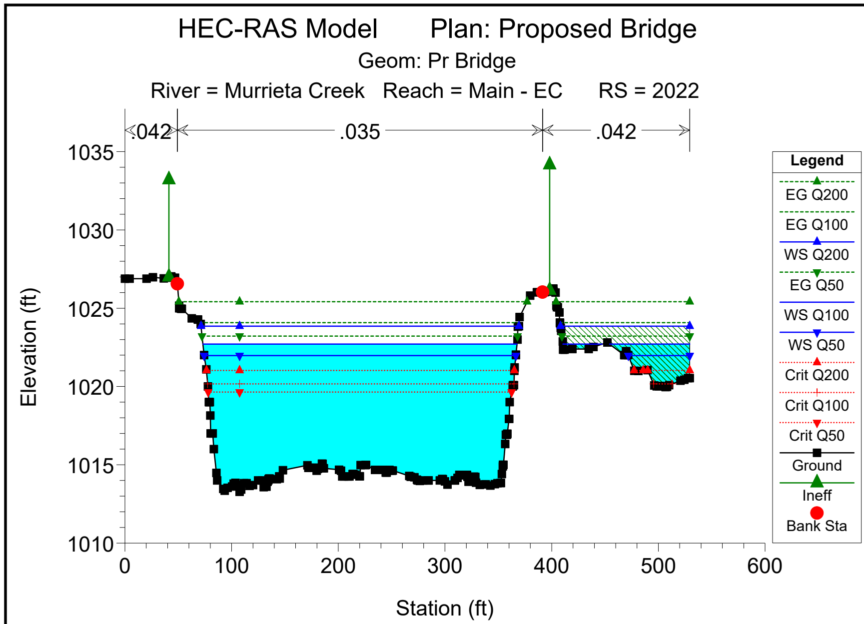
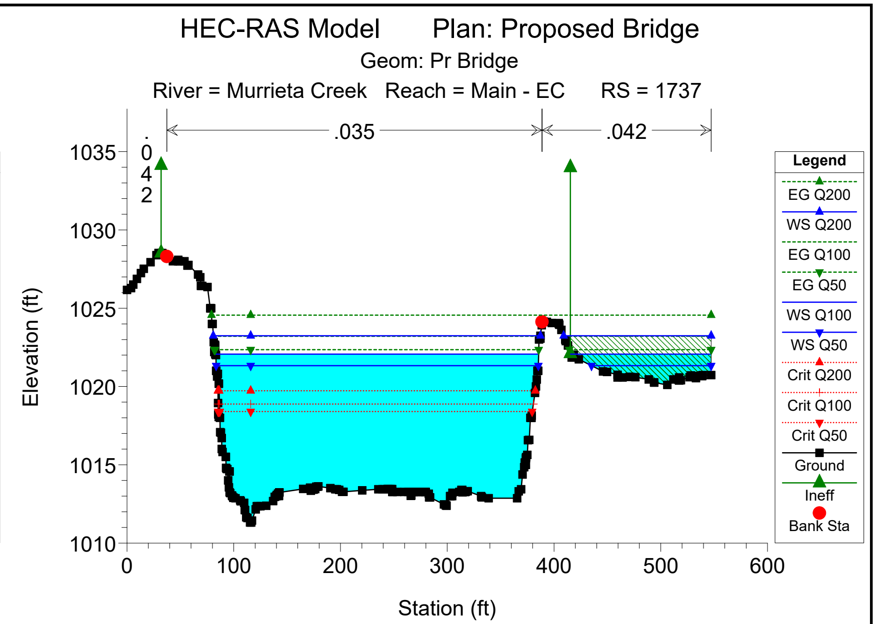
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 3069
.042
.035
.042
Legend
EG Q200
EG Q100
EG Q50
WS Q200
WS Q100
Crit Q200
WS Q50
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1014
1016
1018
1020
1022
1024
1026
1028
1030
1032
0
100
200
300
400
500
600

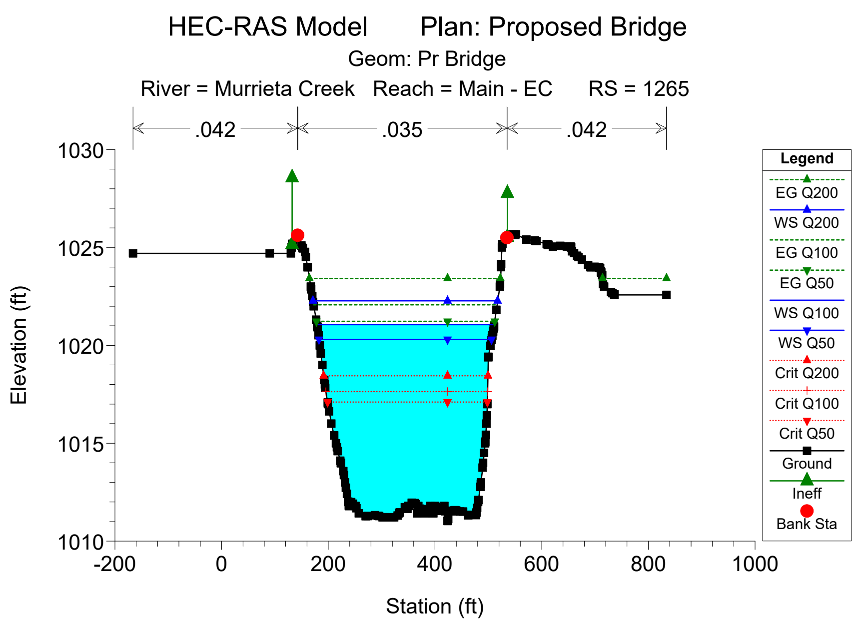

HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 2700
.042
.035
.042
Legend
EG Q200
WS Q200
EG Q100
WS Q100
EG Q50
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1010
1015
1020
1025
1030
1035
1040
0
100
200
300
400
500
600


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 2540
.042
.035
.042
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1010
1015
1020
1025
1030
1035
1040
0
100
200
300
400
500
600


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 2399
.042 .035 .042
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 2343 BR Winchester Road Winchester Road
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 2343 BR Winchester Road Winchester Road
HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 2295


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 2022
.042
.035
.042
Elevation (ft)
Station (ft)
1010
1015
1020
1025
1030
1035
0
100
200
300
400
500
600
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 1737
.042
.035
.042
Elevation (ft)
Station (ft)
1010
1015
1020
1025
1030
1035
0
100
200
300
400
500
600
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta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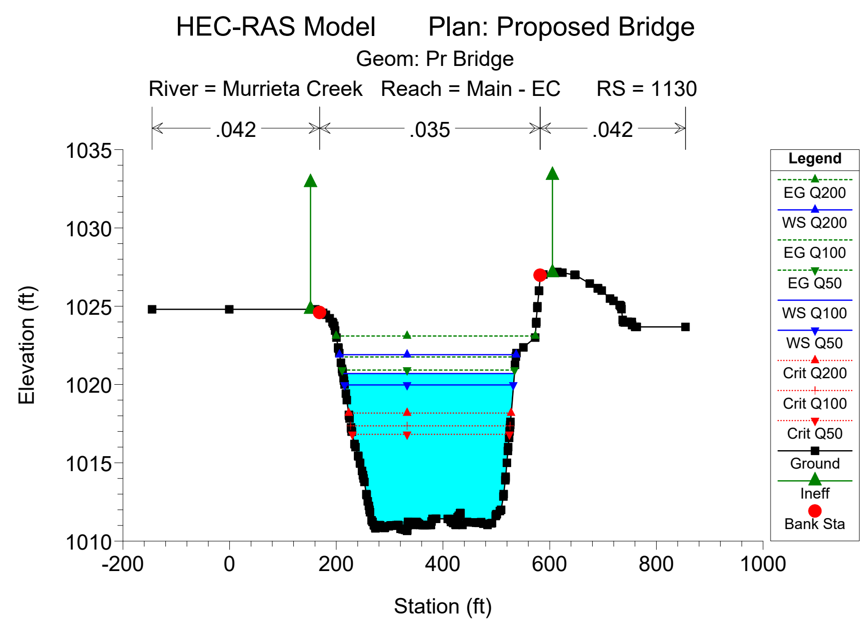
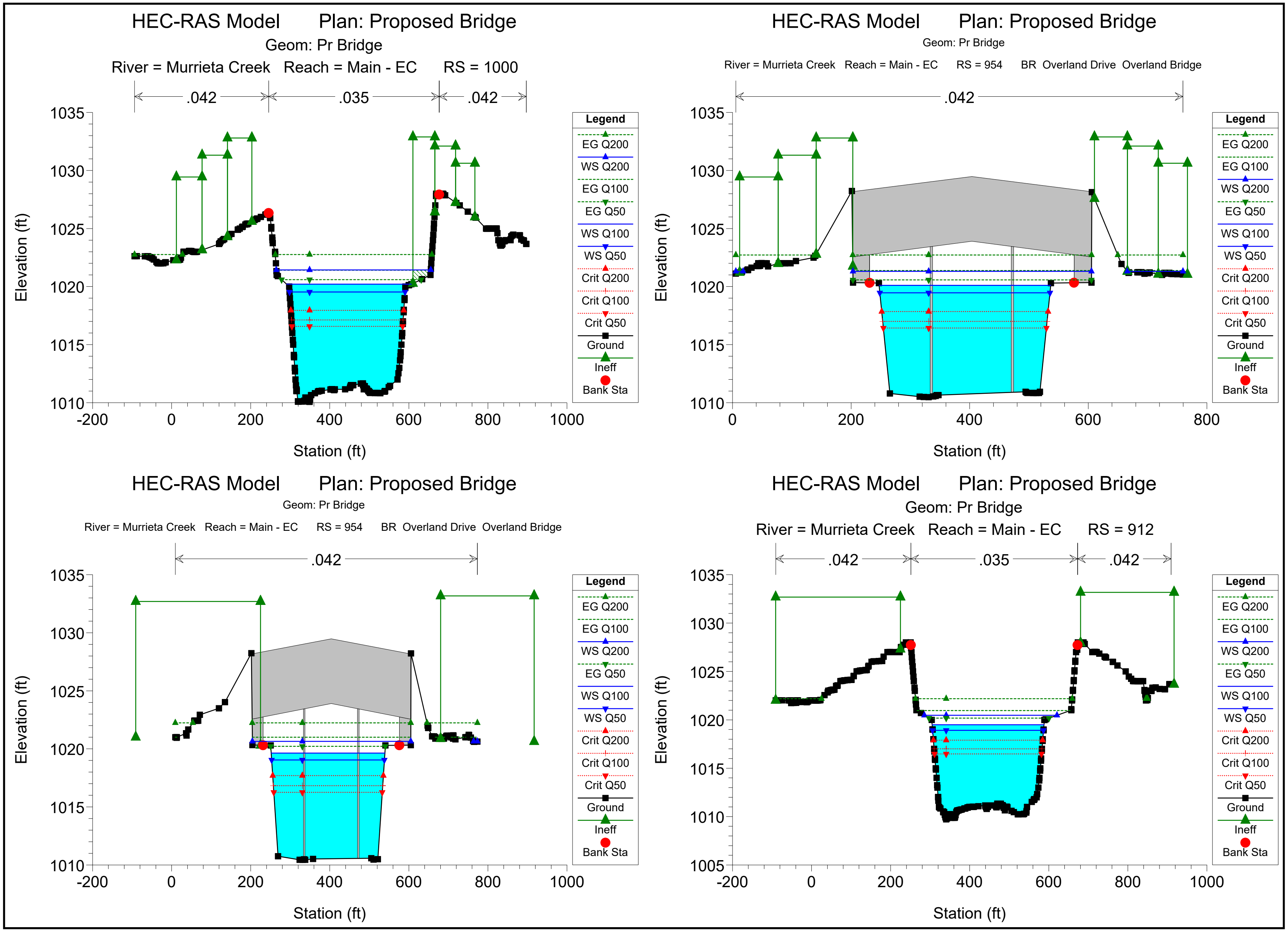
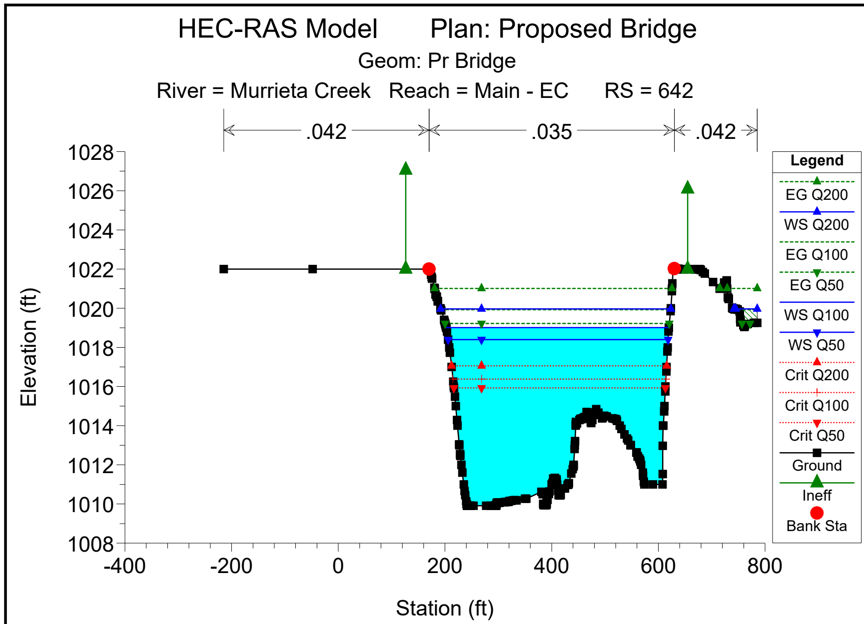
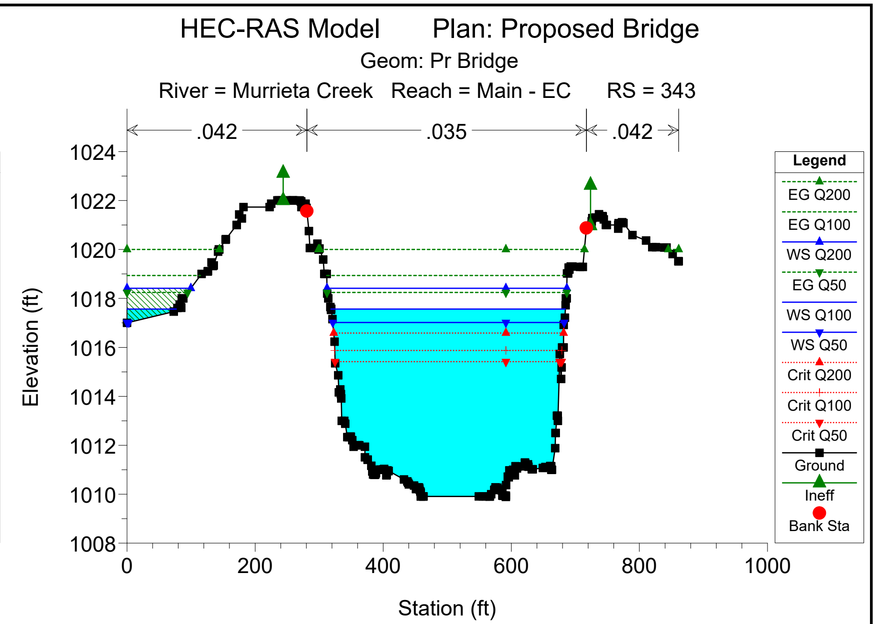
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 1265
.042
.035
.042
Elevation (ft)
Station (ft)
1010
1015
1020
1025
1030
-200
0
200
400
600
800
1000
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

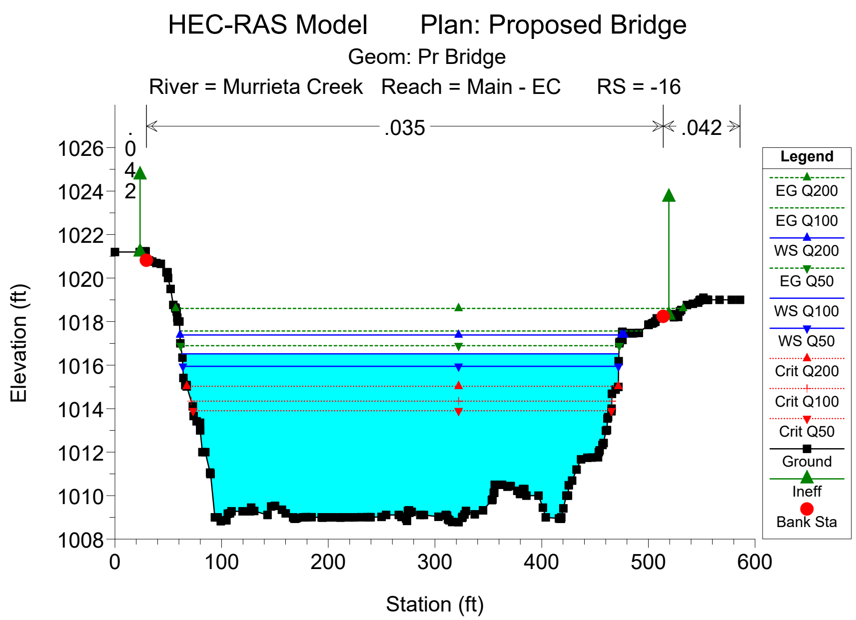

HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 1130
.042
.035
.042
Elevation (ft)
Station (ft)
1010
1015
1020
1025
1030
1035
-200
0
200
400
600
800
1000
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

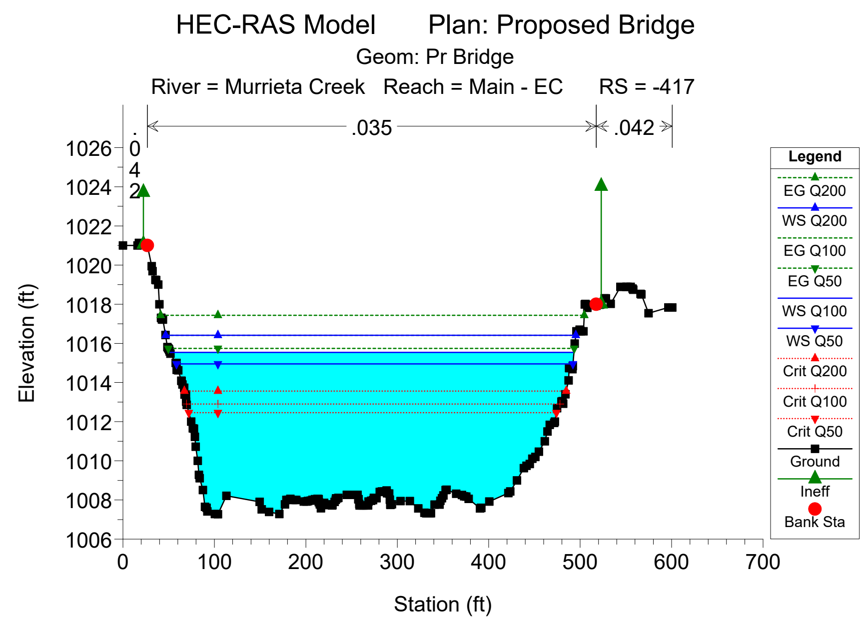


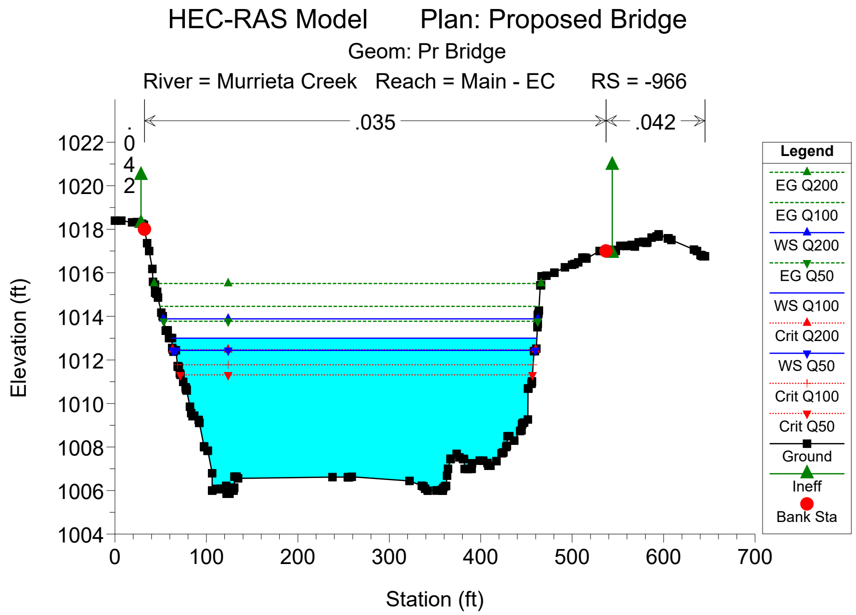
HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 1000
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 954 BR Overland Drive Overland Bridge
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 954 BR Overland Drive Overland Bridge
.042
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 912
.042 .035 .042
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 642
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = 343
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = -16
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = -417
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta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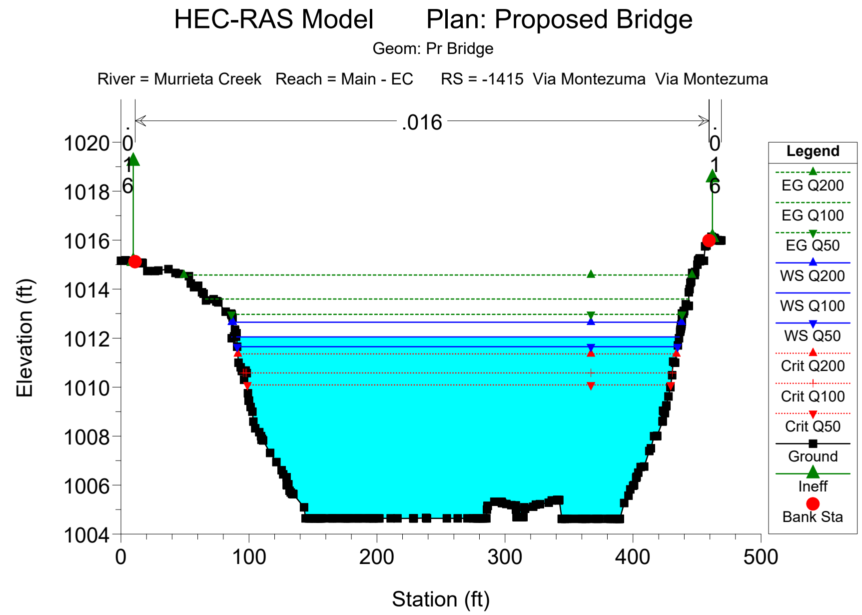
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = -966
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
Crit Q200
WS Q50
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta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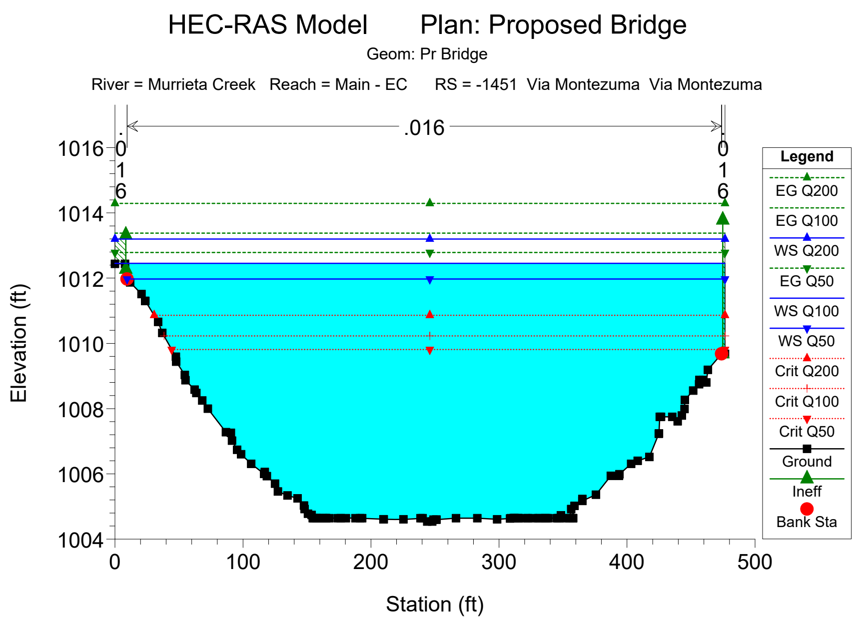
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = -1415 Via Montezuma Via Montezuma
.016
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
EG Q50
WS Q200
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta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Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = -1451 Via Montezuma Via Montezuma
.016
Elevation (ft)
Station (ft)
Legend
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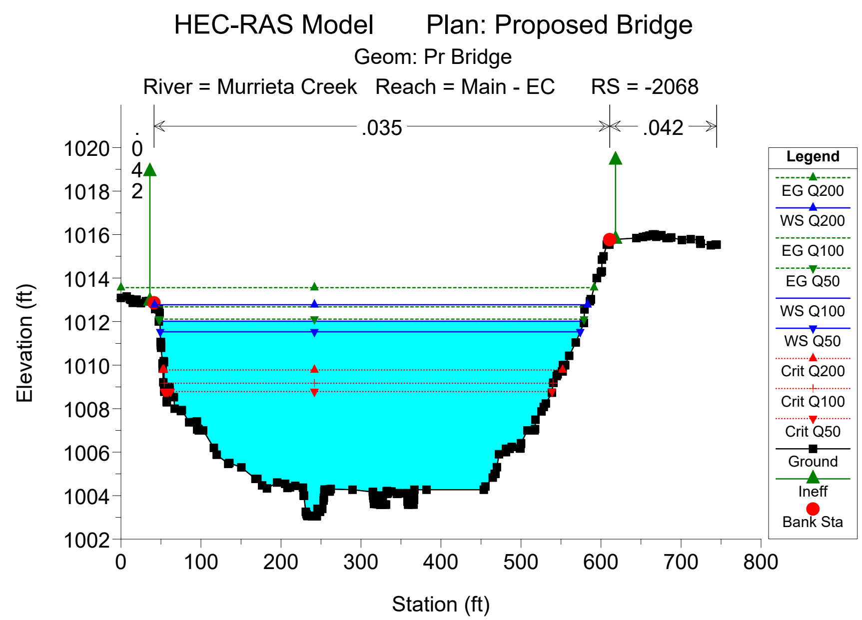
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta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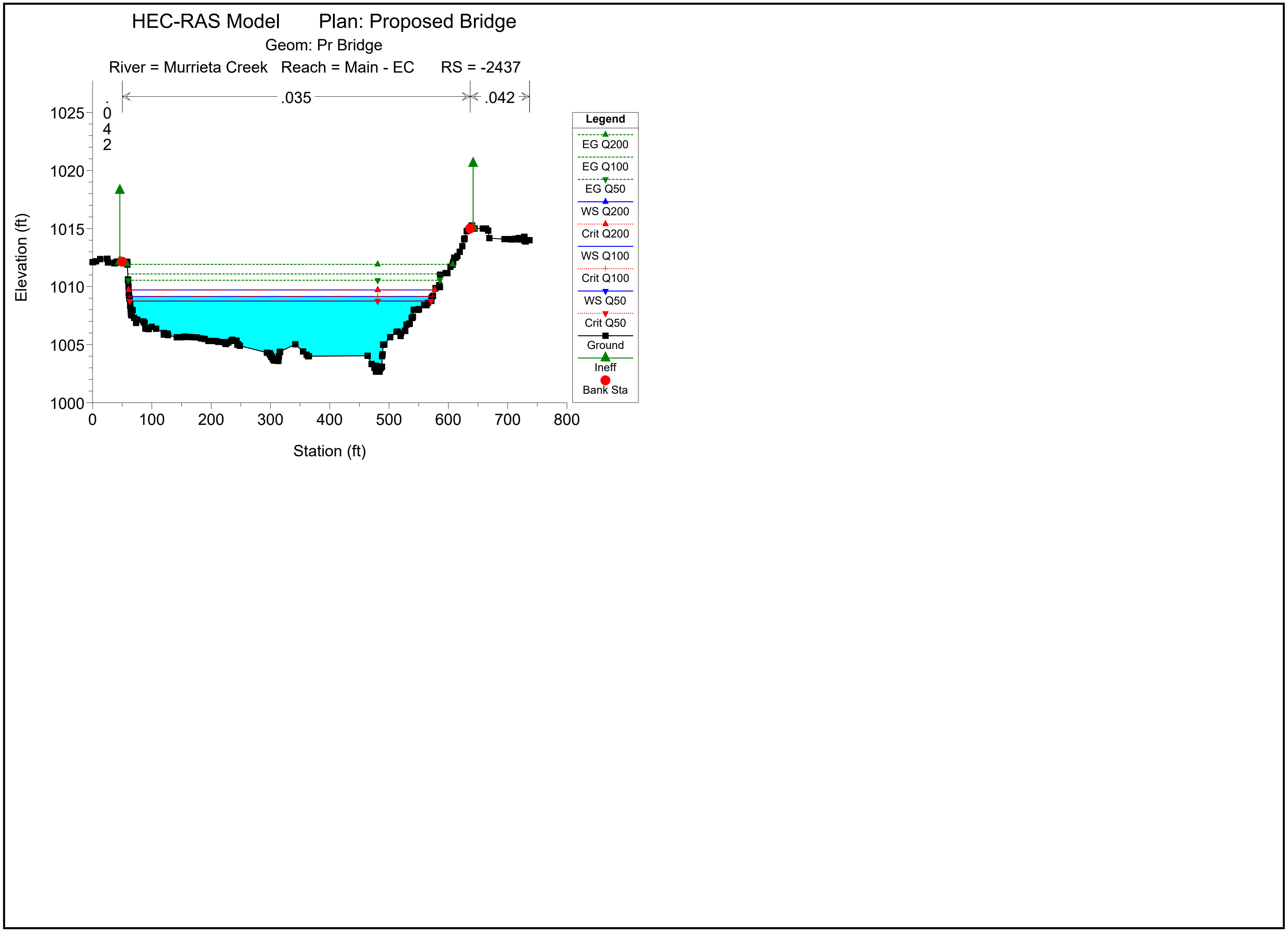
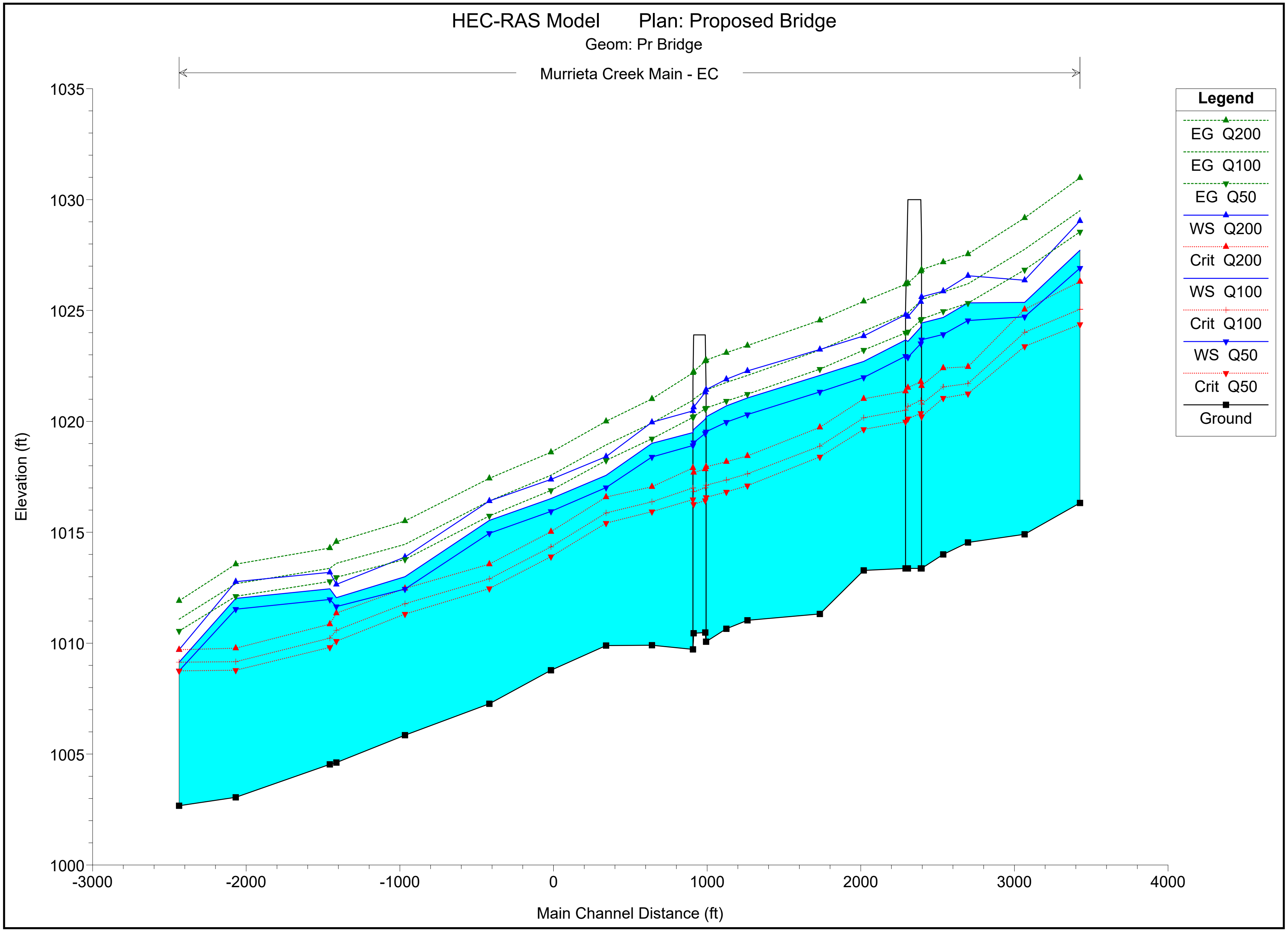
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = -2068
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
River = Murrieta Creek Reach = Main - EC RS = -2437
.035
.042
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
EG Q50
WS Q200
Crit Q200
WS Q100
Crit Q100
WS Q50
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: Proposed Bridge
Geom: Pr Bridge
Murrieta Creek Main - EC
Legend
EG Q200
EG Q100
EG Q50
WS Q200
Crit Q200
WS Q100
Crit Q100
WS Q50
Crit Q50
Ground
Elevation (ft)
1035
1030
1025
1020
1015
1010
1005
1000
-3000
-2000
-1000
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                       HEC-RAS HEC-RAS 5.0.7 March 2019
                         U.S. Army Corps of Engineers
                        Hydrologic Engineering Center
                              609 Second Street
                              Davis, California


            X     X  XXXXXX    XXXX        XXXX       XX      XXXX
            X     X  X        X    X       X   X     X  X    X
            X     X  X        X            X   X    X    X   X
            XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
            X     X  X        X            X  X     X    X        X
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PROJECT DATA
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Project File : 19009001_Murrieta Creek.prj
Run Date and Time: 6/2/2020 8:09:46 AM

Project in English units

Project Description:


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Plan File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.p03

Geometry Title: Bridge w/o VM
Geometry File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.g01

Flow Title   : Flood Design
Flow File   : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.f01

Plan Description:
Murrieta Creek in Proposed water crossing at Overland Drive

```
Plan Summary Information:
Number of:  Cross Sections =   21    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    2    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.33
    Flow tolerance factor                =  0.001
```

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Flood Design
Flow File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.f01

Flow Data (cfs)

River	Reach	RS	Q100	Q200	Q50
Murrieta Creek	Main - EC	3430	22300	27200	19300

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Murrieta Creek	Main - EC	Q100	Critical	Critical
Murrieta Creek	Main - EC	Q200	Critical	Critical
Murrieta Creek	Main - EC	Q50	Critical	Critical

GEOMETRY DATA

Geometry Title: Bridge w/o VM
Geometry File : T:\Projects\19009001 -Temecula - Murrieta Creek Bridge at Overland Dr\DESIGN\REPORTS & STUDIES\HYDROLOGY\Hydrologic & Hydraulic Analysis Report\Geo Hec Ras\19009001_Murrieta Creek.g01

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC   RS: 3430

INPUT
Description:
Station Elevation Data   num=   178

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1027.96	2.84	1027.96	6.07	1028.25	8.57	1028.8	11.66	1028.88
14.68	1029	18.56	1029.83	20.8	1029.83	26.61	1029.92	27.71	1029.93
36.93	1029.96	38.2	1029.57	39.13	1029.43	40.72	1029	42.22	1028.13
46.23	1028.13	48.06	1028.09	48.83	1028	55.72	1026.94	56.1	1027
56.63	1027	57.94	1026.83	59.81	1026.58	63.23	1026.59	64	1026.6
74.7	1026.18	75.19	1026.18	76.06	1026.16	76.46	1026.01	87.28	1026
89.31	1024.19	89.55	1024	90.95	1023.15	91.29	1022.6	93.62	1021.69
95.06	1020.92	96.28	1020.73	97.3	1020.45	98.26	1019.58	99.65	1018.97
99.73	1019.03	100.35	1019.02	104.88	1018.17	109.54	1018	109.85	1018
110.71	1017.77	113.34	1017.7	114.42	1017.65	115.28	1016.68	118.05	1016.44
120.32	1016.44	125.04	1016.44	125.81	1016.44	126.71	1016.32	130.38	1016.64
131.88	1016.89	133.48	1017.05	133.89	1017.27	135.82	1017.19	139.2	1017.07
140.19	1017.06	140.62	1017.34	140.98	1017.06	141.19	1017.38	142.14	1017.42
143.09	1017.27	147.15	1017.27	148.34	1017.48	149.37	1017.48	149.99	1017.48
152.8	1017.45	153.45	1017.35	155.02	1017.07	155.32	1017.02	155.53	1017
155.82	1016.88	156.64	1016.85	157.09	1016.85	163.03	1016.92	163.19	1016.85
164.28	1016.85	164.69	1017	165.57	1017.04	165.8	1017.03	166.07	1017.03
166.99	1017.07	169.28	1017.08	171.39	1017.07	172.51	1017.05	173.67	1017.05
175.26	1017	176.84	1016.85	177.56	1016.89	178.21	1016.98	179.16	1017.06
180.88	1017.16	182.1	1017.13	184.18	1017.2	186.47	1017.33	191.53	1017.14
191.63	1017.14	195.47	1017.15	196.24	1017.17	197.38	1017.24	200.1	1017.23
201.19	1017.26	202.12	1017.27	203.33	1017.56	204.22	1017.55	205.58	1017.48
205.74	1017.48	208.17	1017.48	211.62	1017.54	213.01	1017.56	215.44	1017.67
216.52	1017.83	217.46	1018.16	217.79	1018.17	218.06	1018.11	218.79	1018.11
219.01	1018	221.57	1017.48	223.57	1017.53	224.8	1017.63	230.13	1017.64
238.26	1017.48	240.81	1017.54	244.58	1017.63	246.16	1017.66	246.48	1017.66
249.23	1017.48	252.05	1017.48	252.69	1016.69	256.03	1016.54	256.59	1016.51
257.15	1016.45	270.66	1016.97	270.76	1017.02	277.56	1019.21	280.09	1019.48

```
  280.64 1019.48  282.64 1020.71  283.38    1021  284.04    1021  284.15 1021.27
  284.59 1021.42  284.98 1021.75   286.1 1021.87  286.89 1022.31  288.74 1023.71
  291.13    1024  293.75 1024.61  295.06 1025.32  296.12 1025.31  296.65 1025.18
  297.61 1025.18  298.39    1026  301.37    1027  301.67    1027  302.26    1028
  305.15    1028  305.58 1028.18  305.93 1028.18  324.08  1029.4  324.94 1029.46
  326.85 1029.52  327.88 1028.55  329.27 1028.58  331.95 1028.52  333.39    1028
  335.76 1027.67  337.03 1027.59  353.43 1026.57  384.91 1026.67  409.21  1026.2
  415.29 1026.08   421.3 1026.11  441.98 1026.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   36.93    .035  324.08    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.93  324.08           360.57  360.57  360.57             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   34.39  1033.2       F
  330.56  441.98 1034.68       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 3069

INPUT
Description:
Station Elevation Data    num=     186
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1025.83   24.86 1025.83   27.17 1025.83   28.86 1026.07   30.65 1026.07
    33.1 1025.96   35.79 1025.96    46.4 1025.53   51.43 1025.42   57.01 1025.32
    66.4 1025.51   75.04 1025.71   75.49 1025.74   79.87  1025.8   88.64 1025.98
   89.08    1026   89.22 1026.01   89.52 1026.05    90.3 1026.09   91.71    1026
    91.8    1026   91.87 1026.09   92.18 1026.33   94.86 1026.33   95.38 1026.33
  108.66  1026.4  112.49  1026.6  117.97 1026.46  118.89    1026  120.11  1025.4
  120.88    1025  122.16    1025  122.84    1024  123.33    1024   123.4 1023.73
  124.67  1023.7  124.73 1023.03  125.31    1023  126.21    1023  126.59 1021.54
   127.7 1021.22  128.02 1021.23  128.51 1021.15  128.56 1021.02   129.1    1021
   129.3    1021   129.4    1021  130.96 1020.36  131.44 1019.81   133.4 1019.67
  134.14 1019.57  134.54 1018.25  136.64 1018.04   137.4    1018  137.91  1017.7
  139.91 1016.94  140.44 1016.53  141.16 1016.51  141.28 1016.64  142.69 1016.64
  142.77 1015.98  146.05    1015   146.3    1015  146.81 1014.91  147.65 1014.91
  171.68 1014.91  171.82 1015.39  172.01 1015.39  173.31    1015  175.66 1016.29
  176.78 1016.64  178.01 1016.64  180.08 1016.64  182.13 1017.03  182.48 1017.06
  182.85 1017.06  187.36 1017.26  188.07 1017.27  193.64 1017.27   193.8 1017.07
  196.44 1017.27  198.22  1017.4  198.43 1017.69   198.7 1017.68  209.17 1017.49
  209.54  1017.5   212.5 1017.69  213.41 1017.64   217.7 1017.41   219.4 1017.12
  220.67 1017.01  220.72    1017  221.73    1017  222.26 1016.85  229.23 1016.85
   229.7 1016.85  233.45    1017  233.59 1017.08  235.02 1017.06  237.31 1017.06
  242.56  1017.2  246.23 1017.12  247.19 1017.09  248.98 1016.85  249.73 1016.85
  250.57 1016.84  259.96 1016.65  260.27 1016.64  262.95  1016.3  265.06 1016.03
  265.28    1016   268.5  1016.1  269.11 1016.11  271.78 1015.76  274.76 1016.02
  276.61 1016.12  277.57 1016.34  291.41 1016.43  291.98 1016.43  302.38 1016.43
  303.08 1016.43  303.48 1016.43  319.74 1016.56  320.24 1016.83  320.69 1016.83
  322.44 1017.66  325.82 1019.11  328.06 1019.25  328.44 1019.93  328.58 1019.93
  329.47    1020  330.92  1020.8  331.73 1021.23  333.01 1021.31  335.85    1022
  335.95 1022.03  338.69    1023  339.12 1023.16  341.24 1023.26  341.51 1024.02
  344.19    1026  344.27    1026  346.62 1026.02  349.17 1026.96  349.21    1027
  349.31    1027  349.62 1027.28  349.92 1027.28  350.08    1027  350.26    1027
  350.89 1027.28  351.35 1027.28  352.54 1027.28  352.73 1027.28  352.92 1027.28
  357.77 1027.86  358.01    1028  358.28 1028.07  362.15 1028.05  372.74 1028.05
  373.06 1028.03  373.23 1028.01  379.76    1028  379.93 1027.58  380.39 1027.48
  381.18 1027.47  398.61 1027.18  398.83 1027.46  399.72 1027.46  401.04 1027.24
  409.33 1027.01  409.43    1027  409.77    1027  409.97    1027  410.27 1026.87
   417.2 1026.78  419.15 1026.75  431.52    1026  432.69    1026  461.64  1025.5
  477.14 1025.11  479.07 1025.08  488.98 1024.79  508.53 1024.81  515.06 1024.94
  515.09 1024.94

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042  112.49    .035  362.15    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        112.49  362.15           368.55  368.55  368.55             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
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0	104.79	1030.75	F
366.55	515.09	1031.44	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 2700

INPUT
Description:
Station Elevation Data num= 237

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1029.13	.14	1029.13	4.23	1029.07	5	1029.01	10.32	1028.86
11.83	1028.81	12.69	1028.78	18.51	1028.71	19.17	1028.12	19.32	1028
20.19	1028.17	20.61	1028.18	22.13	1025.83	23.25	1024.11	24.92	1024.04
25.12	1024.12	25.26	1024	26.92	1023	27.7	1022.57	28.72	1021.48
29.69	1021.05	30.42	1021.04	31.76	1020	32.14	1019.14	33.62	1019.09
33.77	1019	33.96	1019	35.44	1018	35.73	1017.82	37.08	1016.86
37.84	1016.87	38.1	1016.55	40.08	1016.39	42.59	1016.43	44.76	1016.87
45.39	1017.16	45.66	1017.16	46.95	1017.18	51.88	1017.2	57.88	1017.27
66.75	1017.18	75.9	1017.01	76.25	1017.3	84.95	1017.3	88.66	1017.3
88.74	1017.3	88.83	1017.3	94.98	1017.08	95.2	1017.06	95.42	1017.01
95.56	1017.08	98.54	1016.84	101.41	1016.4	102.21	1016.4	105.16	1016.4
105.41	1016.4	106.03	1016.44	107.64	1016.54	108.83	1016.57	109.25	1016.62
110.41	1016.85	115.25	1016.96	117.16	1016.99	118.51	1017	122.34	1017.06
126.95	1017.06	131.55	1017.04	131.89	1017.06	131.94	1017.06	132.23	1017.06
134.02	1017.03	136.51	1016.85	139.01	1017	141.51	1017	141.9	1017
143.02	1017.06	143.11	1017.1	143.4	1017.09	144.47	1017	147.78	1017
151.77	1017.01	153.37	1017.01	159.53	1017.03	163.51	1017.06	163.76	1017.06
164.07	1017.03	165.32	1016.87	166.73	1016.64	167.37	1016.64	167.56	1016.68
167.65	1016.71	168.21	1016.99	169.33	1016.99	169.67	1016.98	170.77	1016.97
173.24	1016.85	174.73	1016.85	176.11	1016.64	177.85	1016.76	178.84	1016.98
180.93	1017.01	182.25	1016.96	183.07	1016.97	183.65	1016.85	184.94	1016.85
188.61	1016.85	192.34	1016.82	193.81	1016.8	196.69	1016.67	199.92	1016.54
202.35	1016.43	207.39	1016.43	214.26	1016.43	215.27	1016.01	215.77	1016.01
219.24	1016.31	220.57	1016.05	221.16	1016	221.41	1015.97	224.07	1015.67
224.36	1015.61	224.55	1016.08	224.74	1016.08	225.07	1016.09	225.45	1015.65
225.64	1015.63	230.59	1015.77	231.28	1015.85	233.56	1015.89	238.41	1015.99
238.78	1016	238.97	1016.01	239.06	1016.01	239.22	1016.01	240.6	1016.01
240.64	1016	241	1016	250.37	1016	251.13	1016	251.52	1016
252.97	1016	254.16	1016	259.98	1015.99	261.48	1015.99	263.2	1016
267.88	1016	269.9	1016	270.13	1016	270.68	1016.01	271.96	1016.01
275.58	1015.97	295.22	1015.58	299.17	1015.39	299.25	1015.38	302.89	1015.45
313.41	1015.64	314.56	1015.69	321.28	1015.58	323.93	1015.06	325.77	1015
328.14	1015	331.75	1014.69	336.51	1014.54	343.17	1014.83	347.19	1015.58
348.69	1016.52	350.57	1017	352.3	1017	352.87	1017.33	353.51	1017.71
358.67	1019	361.04	1019.06	362.12	1020	362.4	1020	364.14	1021
366.01	1021	367.59	1021	369.55	1022.13	370.01	1022.14	370.04	1022.53
370.79	1023	371.7	1023	373.21	1023.78	375.06	1024.3	375.44	1025.24
377.07	1025.63	377.24	1025.63	378.57	1026	379.06	1027	380.5	1027.79
380.88	1028	381.28	1028.93	382.87	1028.93	382.96	1028.95	383.19	1029
384.08	1029	384.41	1029.19	385.06	1029.26	398.9	1029.24	399.84	1029.24
401.26	1029.23	403.45	1029.5	404.26	1029.51	407.47	1029.68	407.71	1029.52
413.47	1029.09	413.56	1029.18	413.73	1029.17	415.56	1029.01	415.59	1029
416.02	1029	419.62	1028.91	435.31	1028.22	441.66	1027.98	446.23	1027.86
446.78	1027.83	446.91	1027.83	447.07	1027.83	447.31	1027.83	447.91	1027.7
448.84	1027.69	467.31	1027.41	471.93	1027.28	475.22	1027.31	476.71	1027.25
480.48	1027.1	481.05	1026.99	481.16	1027.01	485.66	1026.93	487.11	1026.81
487.85	1026.79	488.29	1026.77	498.29	1026	498.48	1026	509.2	1026.24
512.25	1026.31	512.86	1026.31						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	11.83	.035	399.84	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
11.83	399.84	161.15	161.15	161.15	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	9.83	1036.11	F
404.34	512.86	1037.18	F

CROSS SECTION

RIVER: Murrieta Creek

```
REACH: Main - EC          RS: 2540

INPUT
Description:
Station Elevation Data    num=     177
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1027.4   64.26 1027.45   72.65    1028   75.81 1028.85   75.96 1028.85
   78.08 1028.86   79.61 1028.82   88.99 1028.62   96.92    1028   98.21 1027.39
   98.69 1027.39   98.94  1027.6  101.81  1027.6  107.28    1021  107.69    1021
  107.75    1021  108.96 1020.02  111.31 1018.99  112.47 1018.24  112.86    1018
  113.48    1017  114.58    1016  115.45    1016  117.38 1015.63  127.91    1016
  131.17 1016.01  136.33 1016.04  141.88 1016.04  142.88 1015.99   143.1 1015.98
  144.69 1015.98  146.93 1016.01  148.73 1016.01  155.85 1016.17  156.24 1016.22
  156.32 1016.22  157.87    1016  159.76 1015.83  160.78 1016.03  162.33 1016.03
  163.12 1016.21  165.07 1016.22  165.13 1016.22  165.31 1016.22  168.26 1016.09
  174.03 1015.68  185.91 1015.86  192.96    1016  194.46 1016.01  199.31 1016.32
  205.07 1016.43  205.79 1016.43  210.28 1016.43  217.07 1016.39  217.93 1016.45
  221.08 1016.42  225.97 1016.52  226.26 1016.53  226.79 1016.43  227.06 1016.41
  228.26 1016.43  239.03 1016.43  240.58 1016.43   242.2 1016.43  244.61 1016.04
  245.01    1016  245.47    1016  246.06    1016  247.28 1016.31  250.77 1016.41
  252.77 1016.41  254.32 1016.41  255.68 1016.46  258.17 1016.36  260.31  1016.4
  262.05 1016.47  264.66 1016.34  265.87 1016.22  267.39 1016.38  267.45 1016.39
  267.49    1016  268.26  1015.8  268.54  1015.8  269.01 1015.86  270.99 1015.77
  271.82 1015.77  273.72  1015.9  276.35 1015.79  281.52 1015.75  301.04  1015.5
  304.31 1015.77  305.37 1015.73  310.97 1015.38  314.26 1015.38  315.47 1015.13
  315.76 1015.05  316.04    1015  317.21    1015  335.18 1014.97  335.37    1015
  336.13 1015.17  336.42 1015.03  336.51 1015.17  337.04 1015.17  345.18 1015.18
  347.16    1015  347.89    1015  349.16    1015  353.22 1015.05   353.7 1015.06
  356.29 1014.67  358.13 1014.12  361.89 1014.12  367.26 1014.22  367.62 1014.29
   368.3 1014.27  369.25  1014.2  372.67 1014.05  373.47 1014.02  374.54 1014.01
   375.2    1014  377.02 1014.14  382.29 1014.92  384.58 1015.33  386.88  1016.2
  387.56 1016.55  389.98 1016.73  391.96 1017.74  392.66 1018.41  393.82 1018.43
  395.22 1019.01  395.55 1019.54  397.34 1019.14  397.54    1020  398.09    1021
  400.02    1021  401.13    1022  402.54    1022  402.91    1022  405.27 1022.55
  406.08    1023   407.2 1023.69  408.15  1024.2  408.78 1024.34  411.18 1024.51
  412.29    1025   413.2 1025.53  414.78 1026.82  415.13 1027.81  416.92 1027.93
  419.23    1029  419.45    1029  419.59 1029.28  421.84 1029.22  422.71 1029.22
  433.37 1029.29  438.19 1029.32  439.01 1029.31  439.87 1029.29  440.37 1029.27
  444.75 1029.13  448.13 1029.05  448.72 1028.98  450.92  1028.9  451.75 1028.76
  455.08 1028.74  463.87 1028.45  465.47 1028.44     470 1028.33  477.86 1028.28
     483 1028.27  507.17 1027.56  532.89 1027.28  532.92    1027  541.46 1026.77
  553.24 1026.95  555.53 1026.99

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   88.99    .035  422.71    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         88.99  422.71           141.07  141.07  141.07              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   80.45 1038.47       F
  426.35  555.53 1039.09       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 2399

INPUT
Description:
Station Elevation Data    num=     261
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.02     .23 1028.98   22.55 1029.59   23.49  1029.5   29.83  1029.6
   33.36 1029.58   33.69 1029.59   33.73 1029.58   33.77 1029.58   33.91 1029.57
   41.61 1029.17   41.98 1029.29   42.25 1029.26   43.21 1029.26   49.37  1029.6
   61.96 1029.33   67.52 1029.59   75.64 1029.59   77.95  1029.5   78.56 1029.59
   78.95 1029.59   80.71 1029.57  101.89 1029.93  102.08 1029.93  102.59 1029.93
  104.77  1029.9  115.26 1030.79   116.8 1030.25  119.69 1029.24  120.83 1029.24
  122.96 1029.24  123.62 1029.24  125.75 1029.48  131.99 1029.18  134.02 1029.03
  134.12 1029.36  134.22 1029.36  134.97 1029.19  136.87 1029.18   137.5 1027.61
  138.31    1027  139.14    1027  139.63 1026.37  140.72 1025.17  140.93 1025.04
  142.25 1024.17  142.51    1024  143.94 1023.76  144.07 1023.76  144.97    1022
   145.6    1022     146 1022.41  147.06  1022.4  147.86 1020.45  151.62 1018.31
  152.19 1017.66  153.31  1018.1  153.87 1018.08  155.01    1016  155.51  1015.7
  156.52    1015   156.7    1015  157.89 1014.55  160.65  1014.3  163.52  1014.3
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  166.77 1014.99  166.91    1015  168.47    1015  169.73 1015.04  174.96 1015.24
  175.49 1015.26  175.61 1015.29  176.63 1015.35  177.29 1015.35  187.57 1015.35
  197.06 1015.35  197.74 1015.35  198.81    1015  199.84    1015  202.28 1015.05
  204.27 1015.14     206 1015.01   207.5 1015.52  216.13 1015.39  218.13 1015.35
  218.67 1015.35  218.89 1015.35  219.07 1015.35  219.55 1015.35  223.49 1015.19
  228.85    1015   228.9    1015  228.92    1015   229.7 1015.71  233.05  1015.7
  237.76 1015.79  241.62 1015.89  244.67 1015.89   244.7 1015.77   247.2 1015.32
  249.06 1014.98  249.27 1014.62  250.97 1014.62  253.39 1014.62  254.25 1014.62
  255.42 1014.53  257.59 1014.61  258.02  1014.6  259.06 1015.71  259.56 1015.71
  260.91 1015.28  262.15 1015.71  273.22 1015.95   279.3 1015.93   280.1 1015.93
  283.81 1015.57  286.47 1015.56  289.48 1015.25  296.41 1015.17  296.49 1015.17
  296.58 1015.17  299.33 1015.29  300.84    1015  303.68    1015  305.77 1014.84
  306.25 1014.84  310.77 1014.76  310.94 1014.54  318.89 1014.44  320.47 1014.44
  320.83 1014.04     321 1014.07  321.12 1014.06  321.59 1013.96  322.47 1013.81
  322.87 1013.86  323.17 1014.57  323.53 1013.81  324.05 1013.83  325.26 1013.87
  326.29 1014.12  327.45 1014.26  329.05 1014.26  332.89 1014.22  335.16 1014.18
   336.4 1014.19  339.61 1014.08  340.84 1014.34  341.17 1014.26  341.57 1014.26
  343.27 1014.43  344.09 1014.43   344.2  1014.3  346.26 1014.52  346.72 1015.18
  347.19 1015.35  351.46 1015.35  352.76 1015.36   356.6 1015.14  359.12 1015.09
  360.97 1014.88  361.06 1014.87  361.13 1014.88  361.24 1014.66  363.03  1014.4
  363.29    1014  365.04    1014  365.89 1014.02   366.1 1014.06  366.93 1013.98
  370.65 1013.68  374.41  1013.9  374.54  1013.9  374.82    1014  375.76    1014
  375.92    1014  376.04 1013.81  379.33 1013.53  380.89 1013.37   383.7 1013.37
  387.15 1013.37  389.22 1013.45  389.96 1013.48  393.61 1013.89  396.28 1013.89
  406.93 1013.89  412.86 1013.98  414.09 1013.98  414.81 1014.01  418.93 1014.02
  421.31 1014.08  421.99    1015  423.69 1015.51  424.89 1015.85  425.76 1016.29
  426.38 1016.29   427.7 1017.96  428.17 1017.96  429.18 1017.31  429.37  1017.8
  429.53 1018.07  429.84    1018  430.81 1018.63  431.36 1019.35  432.31 1019.41
  432.88 1019.63  433.78    1020  435.91 1021.58  436.87    1022  437.43 1023.41
  439.86  1024.8  440.12  1024.8  440.35 1025.83  441.23 1025.85  442.61    1027
  442.78 1027.68  444.57 1027.55  445.42 1027.81  445.98    1028  447.93 1028.64
  449.04    1029  453.28 1029.26  454.22 1029.45  459.09 1029.67  461.93 1029.67
  468.98 1029.67  474.81 1029.65  483.23  1029.2  493.97    1029  497.21    1029
  498.15 1028.98  498.65 1028.98  499.98 1028.97  502.45 1028.97  507.32 1029.13
  511.95  1029.1   521.3 1028.72  522.22 1028.48  529.56 1028.43  537.05 1028.04
  539.33 1028.03  540.17 1028.04  540.36    1028  540.72    1028  540.97    1028
  543.29    1028  544.09 1027.92  544.36 1027.91  552.82  1027.6  559.36  1027.6
  559.55  1027.6  567.27 1027.21  570.03 1027.23  571.43 1027.26  571.66 1027.46
  576.73 1027.46  579.79 1027.46  584.15 1027.51   593.7 1027.44  595.27 1027.44
  596.93 1027.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   116.8    .035  461.93    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         116.8  461.93           103.93  103.93  103.93             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  110.61  1047.8       F
  467.29  596.93  1049.8       F

BRIDGE


RIVER: Murrieta Creek
REACH: Main - EC          RS: 2343

INPUT
Description: Winchester Road
Distance from Upstream XS =       5
Deck/Roadway Width        =      84
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   117.5    1030  1028.2     135    1031    1029     280    1033    1030
     280    1033    1030     446    1031    1029   452.5    1030  1028.2

Upstream Bridge Cross Section Data
Station Elevation Data    num=     261
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.02     .23 1028.98   22.55 1029.59   23.49  1029.5   29.83  1029.6
   33.36 1029.58   33.69 1029.59   33.73 1029.58   33.77 1029.58   33.91 1029.57
   41.61 1029.17   41.98 1029.29   42.25 1029.26   43.21 1029.26   49.37  1029.6
   61.96 1029.33   67.52 1029.59   75.64 1029.59   77.95  1029.5   78.56 1029.59
   78.95 1029.59   80.71 1029.57  101.89 1029.93  102.08 1029.93  102.59 1029.93
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  104.77  1029.9  115.26 1030.79   116.8 1030.25  119.69 1029.24  120.83 1029.24
  122.96 1029.24  123.62 1029.24  125.75 1029.48  131.99 1029.18  134.02 1029.03
  134.12 1029.36  134.22 1029.36  134.97 1029.19  136.87 1029.18   137.5 1027.61
  138.31    1027  139.14    1027  139.63 1026.37  140.72 1025.17  140.93 1025.04
  142.25 1024.17  142.51    1024  143.94 1023.76  144.07 1023.76  144.97    1022
   145.6    1022     146 1022.41  147.06  1022.4  147.86 1020.45  151.62 1018.31
  152.19 1017.66  153.31  1018.1  153.87 1018.08  155.01    1016  155.51  1015.7
  156.52    1015   156.7    1015  157.89 1014.55  160.65  1014.3  163.52  1014.3
  166.77 1014.99  166.91    1015  168.47    1015  169.73 1015.04  174.96 1015.24
  175.49 1015.26  175.61 1015.29  176.63 1015.35  177.29 1015.35  187.57 1015.35
  197.06 1015.35  197.74 1015.35  198.81    1015  199.84    1015  202.28 1015.05
  204.27 1015.14     206 1015.01   207.5 1015.52  216.13 1015.39  218.13 1015.35
  218.67 1015.35  218.89 1015.35  219.07 1015.35  219.55 1015.35  223.49 1015.19
  228.85    1015   228.9    1015  228.92    1015   229.7 1015.71  233.05  1015.7
  237.76 1015.79  241.62 1015.89  244.67 1015.89   244.7 1015.77   247.2 1015.32
  249.06 1014.98  249.27 1014.62  250.97 1014.62  253.39 1014.62  254.25 1014.62
  255.42 1014.53  257.59 1014.61  258.02  1014.6  259.06 1015.71  259.56 1015.71
  260.91 1015.28  262.15 1015.71  273.22 1015.95   279.3 1015.93   280.1 1015.93
  283.81 1015.57  286.47 1015.56  289.48 1015.25  296.41 1015.17  296.49 1015.17
  296.58 1015.17  299.33 1015.29  300.84    1015  303.68    1015  305.77 1014.84
  306.25 1014.84  310.77 1014.76  310.94 1014.54  318.89 1014.44  320.47 1014.44
  320.83 1014.04     321 1014.07  321.12 1014.06  321.59 1013.96  322.47 1013.81
  322.87 1013.86  323.17 1014.57  323.53 1013.81  324.05 1013.83  325.26 1013.87
  326.29 1014.12  327.45 1014.26  329.05 1014.26  332.89 1014.22  335.16 1014.18
   336.4 1014.19  339.61 1014.08  340.84 1014.34  341.17 1014.26  341.57 1014.26
  343.27 1014.43  344.09 1014.43   344.2  1014.3  346.26 1014.52  346.72 1015.18
  347.19 1015.35  351.46 1015.35  352.76 1015.36   356.6 1015.14  359.12 1015.09
  360.97 1014.88  361.06 1014.87  361.13 1014.88  361.24 1014.66  363.03  1014.4
  363.29    1014  365.04    1014  365.89 1014.02   366.1 1014.06  366.93 1013.98
  370.65 1013.68  374.41  1013.9  374.54  1013.9  374.82    1014  375.76    1014
  375.92    1014  376.04 1013.81  379.33 1013.53  380.89 1013.37   383.7 1013.37
  387.15 1013.37  389.22 1013.45  389.96 1013.48  393.61 1013.89  396.28 1013.89
  406.93 1013.89  412.86 1013.98  414.09 1013.98  414.81 1014.01  418.93 1014.02
  421.31 1014.08  421.99    1015  423.69 1015.51  424.89 1015.85  425.76 1016.29
  426.38 1016.29   427.7 1017.96  428.17 1017.96  429.18 1017.31  429.37  1017.8
  429.53 1018.07  429.84    1018  430.81 1018.63  431.36 1019.35  432.31 1019.41
  432.88 1019.63  433.78    1020  435.91 1021.58  436.87    1022  437.43 1023.41
  439.86  1024.8  440.12  1024.8  440.35 1025.83  441.23 1025.85  442.61    1027
  442.78 1027.68  444.57 1027.55  445.42 1027.81  445.98    1028  447.93 1028.64
  449.04    1029  453.28 1029.26  454.22 1029.45  459.09 1029.67  461.93 1029.67
  468.98 1029.67  474.81 1029.65  483.23  1029.2  493.97    1029  497.21    1029
  498.15 1028.98  498.65 1028.98  499.98 1028.97  502.45 1028.97  507.32 1029.13
  511.95  1029.1   521.3 1028.72  522.22 1028.48  529.56 1028.43  537.05 1028.04
  539.33 1028.03  540.17 1028.04  540.36    1028  540.72    1028  540.97    1028
  543.29    1028  544.09 1027.92  544.36 1027.91  552.82  1027.6  559.36  1027.6
  559.55  1027.6  567.27 1027.21  570.03 1027.23  571.43 1027.26  571.66 1027.46
  576.73 1027.46  579.79 1027.46  584.15 1027.51   593.7 1027.44  595.27 1027.44
  596.93 1027.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   116.8    .035  461.93    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
         116.8  461.93             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  110.61  1047.8       F
  467.29  596.93  1049.8       F

Downstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     110    1030  1028.2     115    1031    1029     270    1033    1030
     270    1033    1030     427    1031    1029     434    1030  1028.2

Downstream Bridge Cross Section Data
Station Elevation Data    num=     265
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1029.69     .27 1029.69    3.98 1029.77    9.71 1029.77   12.09 1029.77
   18.45    1030   19.68 1030.12   23.19 1030.12   26.48 1030.07      30 1030.12
   31.88 1030.12   33.85 1030.26   41.44 1030.27   45.05 1030.29   55.06 1030.29
   58.32 1030.29   65.21 1030.29   67.57 1030.29   69.59 1030.38   71.02 1030.38
   72.13 1030.39   73.33 1030.41   75.79 1030.29   76.38    1030   76.62 1029.98
   77.61 1030.07   86.22 1029.73   87.53 1029.65   90.23 1029.65   91.49 1029.79
    92.3 1029.79   95.36 1029.51   98.27 1029.43  107.35 1029.18  110.91    1029
  111.16    1029  119.42    1026  120.71 1025.12  122.34 1023.99  122.46 1024.03
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   123.84 1024.01  124.24 1022.73  125.35 1022.73     126 1021.57  126.85    1021
   127.66    1020  128.36 1019.88  128.54 1019.75  128.74 1019.75  129.57    1019
   129.99    1019  130.92 1018.45  131.67 1017.28  132.97 1017.23  133.35 1016.39
   134.32  1016.3  135.04    1016  135.15    1016  136.73    1015  138.68 1014.99
   140.04 1014.99  140.32 1014.99  140.63 1015.01  140.72 1015.11  141.06 1015.02
   141.74 1014.76  141.85 1015.17  143.02 1015.19  153.55 1014.87  158.02 1014.85
   161.64 1015.02  163.12 1014.72  165.38 1014.65  167.91  1014.4  168.84 1014.19
   172.28 1014.08  174.96  1014.2  176.63 1014.81  180.46 1014.82  186.54 1014.79
   188.64  1014.8  189.42 1014.81  191.22 1014.81   193.3 1014.81  194.56 1014.81
   197.18 1014.71  198.54 1014.44  202.49 1014.44  203.17 1014.43   204.6 1014.43
   204.67 1014.43  204.79 1014.43  205.87 1014.55  206.58 1014.57  208.59 1014.66
   209.94 1014.91  210.98 1015.14  212.96 1015.17  215.12 1015.17  216.17 1015.17
   217.36 1015.17  220.33 1015.21  222.65 1015.11  222.89  1015.1   223.2 1015.12
    226.1 1015.05  226.42 1014.99  226.47  1014.8  226.72  1014.8  227.16 1014.89
   227.76 1014.94  230.56 1014.52  233.15 1015.08  233.25 1015.08  235.36    1015
   235.81    1015  238.31 1014.78  239.32 1014.48  242.42 1015.01   243.2 1015.13
   243.37 1015.23  246.07 1015.23   249.8 1015.35  252.11 1015.53  252.84 1015.53
   254.59 1015.53  260.82 1015.42   264.7 1015.35  267.76 1015.32  270.64  1015.3
   272.83 1015.22  275.23  1015.1  278.69 1014.92   280.7    1015  281.51    1015
   283.59 1015.21     285 1015.18  285.44 1015.01  290.77 1015.01  291.68 1015.09
   295.54 1015.11  296.53 1015.44  299.65 1015.44  304.54 1015.37  305.42 1015.01
   307.77 1015.01  308.93    1015  308.98    1015  311.26 1014.08  313.79 1014.77
   318.61 1014.08  321.21 1014.19  322.35 1014.22   324.6  1014.2  326.13 1014.26
   329.14 1014.26  339.84 1014.17  346.93 1014.08     351 1014.08  351.81 1014.08
   352.25  1014.2  352.58 1014.18  355.23    1014   363.3    1014  363.37 1013.37
   363.51 1013.37  363.96 1013.37  368.71 1013.37  374.34 1013.65  376.21 1013.77
   377.77 1013.75   379.6  1013.9   380.6 1013.88  385.29 1013.37  385.57 1013.37
   387.14 1013.85  387.24 1013.98  387.84 1013.92  389.78 1013.61  390.47 1013.54
   391.01 1013.55  392.55 1013.43  392.63 1013.42  392.77 1013.41  393.45 1013.37
   396.28 1013.37  397.62 1013.37  398.99 1013.37  399.99 1013.37  400.17 1013.37
   400.29 1013.43  401.29 1013.65  402.72 1014.06  403.65 1014.21  403.85 1014.23
   405.12 1014.34  405.37 1014.86  406.81    1016  407.25    1016  407.94    1016
   409.08    1017  410.31 1017.78  410.85    1018  411.99    1018  412.42    1019
   412.82    1020  414.03    1020     415 1020.61  415.63 1022.91  416.31 1022.91
    419.4 1025.34  420.34 1025.39  424.93    1027  425.16    1027  426.05 1028.42
   426.35 1028.43   427.6    1028  428.01    1028  428.55 1028.92  431.38 1028.78
   431.75 1028.81  432.17    1029  438.34    1029   439.4 1028.96  440.26 1029.02
   440.41 1029.03  447.75 1029.39  448.07 1029.41  448.39 1029.41  449.13 1029.32
   450.19  1029.3  453.08 1029.26   459.7 1029.12  460.57 1029.01  461.25    1029
    463.6    1029  465.55    1029  465.96 1028.99  466.13 1028.99  467.13 1028.84
    469.7 1028.84  483.25 1028.95  485.32 1028.18  485.52    1028  487.24    1028
   494.17 1028.04  495.72    1028  497.44 1027.97  497.93 1027.97  499.87 1027.84
    502.1 1028.09  503.26 1028.08  506.45 1027.71  514.39 1027.39  517.03 1027.18
   519.41 1027.12  521.02 1027.12  523.23  1027.1  525.66 1027.05  527.97 1026.88
    531.7 1027.02  532.69 1027.03  559.93 1026.51  568.43  1026.5  577.23  1026.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   98.27    .035  440.26    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
         98.27  440.26             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   92.45 1052.63       F
  446.22  577.23 1054.89       F

Upstream Embankment side slope             =       3 horiz. to 1.0 vertical
Downstream Embankment side slope           =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Piers =  4

Pier Data
Pier Station     Upstream=     190    Downstream=     175
Upstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035
Downstream     num=       2
    Width   Elev    Width   Elev
     2.5    1010     2.5    1035

Pier Data
```

Pier Station Upstream= 255 Downstream= 240

Upstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Downstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Pier Data

Pier Station Upstream= 320 Downstream= 305

Upstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Downstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Pier Data

Pier Station Upstream= 385 Downstream= 370

Upstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Downstream num= 2

Width	Elev	Width	Elev
2.5	1010	2.5	1035

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy
Momentum Cd = 1.2
Yarnell KVal = 1.05

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 2295

INPUT
Description:
Station Elevation Data num= 265

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1029.69	.27	1029.69	3.98	1029.77	9.71	1029.77	12.09	1029.77
18.45	1030	19.68	1030.12	23.19	1030.12	26.48	1030.07	30	1030.12
31.88	1030.12	33.85	1030.26	41.44	1030.27	45.05	1030.29	55.06	1030.29
58.32	1030.29	65.21	1030.29	67.57	1030.29	69.59	1030.38	71.02	1030.38
72.13	1030.39	73.33	1030.41	75.79	1030.29	76.38	1030	76.62	1029.98
77.61	1030.07	86.22	1029.73	87.53	1029.65	90.23	1029.65	91.49	1029.79
92.3	1029.79	95.36	1029.51	98.27	1029.43	107.35	1029.18	110.91	1029
111.16	1029	119.42	1026	120.71	1025.12	122.34	1023.99	122.46	1024.03
123.84	1024.01	124.24	1022.73	125.35	1022.73	126	1021.57	126.85	1021
127.66	1020	128.36	1019.88	128.54	1019.75	128.74	1019.75	129.57	1019
129.99	1019	130.92	1018.45	131.67	1017.28	132.97	1017.23	133.35	1016.39
134.32	1016.3	135.04	1016	135.15	1016	136.73	1015	138.68	1014.99
140.04	1014.99	140.32	1014.99	140.63	1015.01	140.72	1015.11	141.06	1015.02
141.74	1014.76	141.85	1015.17	143.02	1015.19	153.55	1014.87	158.02	1014.85
161.64	1015.02	163.12	1014.72	165.38	1014.65	167.91	1014.4	168.84	1014.19
172.28	1014.08	174.96	1014.2	176.63	1014.81	180.46	1014.82	186.54	1014.79
188.64	1014.8	189.42	1014.81	191.22	1014.81	193.3	1014.81	194.56	1014.81
197.18	1014.71	198.54	1014.44	202.49	1014.44	203.17	1014.43	204.6	1014.43
204.67	1014.43	204.79	1014.43	205.87	1014.55	206.58	1014.57	208.59	1014.66
209.94	1014.91	210.98	1015.14	212.96	1015.17	215.12	1015.17	216.17	1015.17
217.36	1015.17	220.33	1015.21	222.65	1015.11	222.89	1015.1	223.2	1015.12
226.1	1015.05	226.42	1014.99	226.47	1014.8	226.72	1014.8	227.16	1014.89
227.76	1014.94	230.56	1014.52	233.15	1015.08	233.25	1015.08	235.36	1015

```
   235.81    1015  238.31 1014.78  239.32 1014.48  242.42 1015.01   243.2 1015.13
   243.37 1015.23  246.07 1015.23   249.8 1015.35  252.11 1015.53  252.84 1015.53
   254.59 1015.53  260.82 1015.42   264.7 1015.35  267.76 1015.32  270.64  1015.3
   272.83 1015.22  275.23  1015.1  278.69 1014.92   280.7    1015  281.51    1015
   283.59 1015.21     285 1015.18  285.44 1015.01  290.77 1015.01  291.68 1015.09
   295.54 1015.11  296.53 1015.44  299.65 1015.44  304.54 1015.37  305.42 1015.01
   307.77 1015.01  308.93    1015  308.98    1015  311.26 1014.08  313.79 1014.77
   318.61 1014.08  321.21 1014.19  322.35 1014.22   324.6  1014.2  326.13 1014.26
   329.14 1014.26  339.84 1014.17  346.93 1014.08     351 1014.08  351.81 1014.08
   352.25  1014.2  352.58 1014.18  355.23    1014   363.3    1014  363.37 1013.37
   363.51 1013.37  363.96 1013.37  368.71 1013.37  374.34 1013.65  376.21 1013.77
   377.77 1013.75   379.6  1013.9   380.6 1013.88  385.29 1013.37  385.57 1013.37
   387.14 1013.85  387.24 1013.98  387.84 1013.92  389.78 1013.61  390.47 1013.54
   391.01 1013.55  392.55 1013.43  392.63 1013.42  392.77 1013.41  393.45 1013.37
   396.28 1013.37  397.62 1013.37  398.99 1013.37  399.99 1013.37  400.17 1013.37
   400.29 1013.43  401.29 1013.65  402.72 1014.06  403.65 1014.21  403.85 1014.23
   405.12 1014.34  405.37 1014.86  406.81    1016  407.25    1016  407.94    1016
   409.08    1017  410.31 1017.78  410.85    1018  411.99    1018  412.42    1019
   412.82    1020  414.03    1020     415 1020.61  415.63 1022.91  416.31 1022.91
    419.4 1025.34  420.34 1025.39  424.93    1027  425.16    1027  426.05 1028.42
   426.35 1028.43   427.6    1028  428.01    1028  428.55 1028.92  431.38 1028.78
   431.75 1028.81  432.17    1029  438.34    1029   439.4 1028.96  440.26 1029.02
   440.41 1029.03  447.75 1029.39  448.07 1029.41  448.39 1029.41  449.13 1029.32
   450.19  1029.3  453.08 1029.26   459.7 1029.12  460.57 1029.01  461.25    1029
    463.6    1029  465.55    1029  465.96 1028.99  466.13 1028.99  467.13 1028.84
    469.7 1028.84  483.25 1028.95  485.32 1028.18  485.52    1028  487.24    1028
   494.17 1028.04  495.72    1028  497.44 1027.97  497.93 1027.97  499.87 1027.84
    502.1 1028.09  503.26 1028.08  506.45 1027.71  514.39 1027.39  517.03 1027.18
   519.41 1027.12  521.02 1027.12  523.23  1027.1  525.66 1027.05  527.97 1026.88
    531.7 1027.02  532.69 1027.03  559.93 1026.51  568.43  1026.5  577.23  1026.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   98.27    .035  440.26    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         98.27  440.26           272.93  272.93  272.93             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   92.45 1052.63       F
  446.22  577.23 1054.89       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 2022

INPUT
Description:
Station Elevation Data    num=     204
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1026.88    4.38 1026.88   20.26 1026.88    26.3 1026.98   36.49  1026.9
    43.12 1027.03   43.52 1027.03   44.18 1026.95   46.88 1026.95   49.17 1026.56
    50.83 1025.16   50.88    1025   52.45 1024.97   53.43 1024.97    62.6 1024.35
    68.31 1024.28    68.5 1024.27   71.04    1024   74.19    1022   76.31  1021.1
    77.77    1020   78.63    1019   78.82    1019   79.61    1019   80.06 1018.15
    80.35    1017   81.69    1017   82.25    1017   83.28    1016   85.69 1014.48
    86.45    1014   92.23 1013.46   93.58 1013.35   96.18 1013.53   100.4 1013.61
   101.99  1013.8  103.51 1013.85  105.79 1013.71  107.53 1013.28  108.94 1013.42
   111.62 1013.83  113.99 1013.83   116.7 1013.65  120.04 1013.71  124.79    1014
   128.54    1014  130.05 1013.57  132.64  1013.6  133.71 1013.92   134.5 1014.01
   134.58 1014.08  135.23 1014.12  135.83 1014.11  142.37 1014.08   144.7 1014.26
   144.85 1014.26  145.03 1014.12  148.05 1014.65  171.06 1014.97  171.89 1014.81
   172.35 1014.81  177.64 1014.82  179.73 1014.62  180.73 1014.74  184.42 1014.78
   184.72 1015.07  185.28 1015.06  185.85 1014.79  186.51 1014.78  200.69 1014.69
   202.48 1014.62   203.7 1014.26  205.48 1014.26  209.04 1014.26   210.4 1014.26
   213.44 1014.41   214.2 1014.41  216.03 1014.37  219.67 1014.27  220.13 1014.27
   220.92 1014.98  225.16 1014.98  226.05 1014.99  234.47 1014.68  241.77 1014.68
   244.47  1014.5   245.3  1014.5   247.9 1014.68  248.38 1014.62  250.29 1014.62
   251.11 1014.63  266.47 1014.29  267.83 1014.24  271.35 1014.21  273.65 1014.05
   274.48    1014  276.44 1013.97  279.73    1014  283.98    1014   284.6    1014
   295.13    1014  297.39 1014.09  297.94 1014.08   299.9 1013.94  302.35 1013.74
   309.17    1014  309.24    1014  309.38 1014.01   311.8 1014.17  313.44 1014.36
   316.11 1014.33  316.29 1014.33  316.37 1014.33  316.48 1014.33  320.41 1014.36
   320.54 1014.34  321.04 1014.24  322.09 1013.92  322.69    1014  323.09    1014
   323.27    1014  325.47    1014  326.13 1014.15  327.22 1014.25  328.46 1014.23
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329.12	1013.86	332.54	1013.72	334.84	1013.75	338.16	1013.76	342.5	1013.68
346.63	1013.77	349.24	1013.83	352.15	1013.84	352.46	1013.84	353.26	1014.41
354.16	1014.9	354.36	1015	354.73	1015	356.41	1016.33	357.08	1016.92
358.03	1016.92	358.35	1016.98	358.39	1016.98	360.03	1017.93	360.15	1017.93
360.59	1019	363.48	1020	363.62	1020.09	364.71	1020.09	364.98	1021
365.32	1021.22	366.48	1022	366.54	1022.04	367.91	1023	368.29	1023.82
369.34	1023.85	369.96	1024.43	379.77	1025.8	386.04	1026.02	386.54	1026.02
391.57	1026.03	393.69	1026.03	396.11	1026.07	401.02	1026.25	401.61	1026.25
401.8	1026.06	403.59	1026	404.38	1025.17	404.9	1025.07	405.72	1025.06
407.2	1024.73	407.63	1024.08	407.74	1024.08	407.83	1024.04	408.47	1023.75
408.95	1023.56	410.38	1022.87	410.71	1022.35	412.02	1022.35	419.45	1022.39
434.61	1022.39	439.16	1022.53	452.21	1022.81	467.89	1022	468.72	1022
469.79	1022.25	469.88	1022.25	471.76	1022	477.33	1021	481.26	1020.99
489.79	1021.05	496.18	1020.07	498.33	1020.01	500.76	1020.01	501.72	1020.03
506.13	1020	506.41	1020	506.75	1019.96	508.11	1019.98	510.07	1020.09
520.71	1020.37	524.25	1020.43	527.69	1020.53	529.36	1020.53		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	49.17	.035	391.57	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
49.17	391.57	284.86	284.86	284.86	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.18	1033.2	F
398.13	529.36	1034.15	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1737

INPUT
Description:
Station Elevation Data num= 234

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1026.17	3.76	1026.28	5.88	1026.51	9.22	1026.87	13.05	1027.24
15.71	1027.52	22.07	1027.94	27.52	1028.38	29.52	1028.53	32.24	1028.53
33.06	1028.52	37.36	1028.3	43.05	1028	47.87	1028	47.94	1028.09
49.25	1028	53.8	1028	56.65	1027.72	56.76	1027.72	57.51	1027.76
66.6	1027.15	68.62	1026.98	69.2	1026.42	70.38	1026.42	75.35	1026.35
77.92	1025	78.12	1025	78.78	1025	79.6	1024	80.15	1024
81.17	1022.83	81.76	1022.2	82.48	1022.67	82.61	1022.59	82.67	1022.06
83.3	1022	83.55	1021	83.69	1021	84.34	1020.64	84.68	1020.77
85.12	1020.81	85.22	1018.94	85.37	1018.22	85.84	1018.05	86	1020.19
86.06	1020.18	87.12	1018	87.27	1017.08	88.04	1017.05	88.67	1016.71
88.75	1016.01	89.53	1015.82	92.47	1015.51	92.65	1015.5	92.75	1014.81
93.18	1014.75	93.91	1014.73	94.69	1014	95.52	1013.56	95.93	1014.57
96.06	1014.57	96.1	1013.25	96.7	1013.2	98.29	1013.04	98.62	1013
99.49	1012.91	99.73	1012.91	99.89	1012.89	101.61	1012.87	105.95	1012.74
106.5	1012.67	109.75	1012.57	110.39	1012.11	110.69	1012.11	111.6	1011.65
112.83	1011.6	115.33	1011.32	116.3	1011.32	117.02	1011.44	120.52	1012.15
121.5	1012.36	122.66	1012.36	125.01	1012.36	130.46	1012.39	136.82	1012.68
138.39	1012.95	139.67	1012.99	140.28	1013.07	141.54	1013.16	142.05	1013.01
142.36	1013.01	142.54	1013.24	142.84	1013.24	165.1	1013.46	171.49	1013.54
172.15	1013.35	174.25	1013.42	174.95	1013.42	176.21	1013.45	177.25	1013.6
178.54	1013.6	179.33	1013.62	190.55	1013.51	195.09	1013.44	196.67	1013.44
198.76	1013.4	201.39	1013.28	202.82	1013.28	220.37	1013.37	235.48	1013.44
239.23	1013.44	240.55	1013.44	243.87	1013.45	244.63	1013.45	244.76	1013.45
246.89	1013.45	248.32	1013.45	248.47	1013.27	249.08	1013.27	253.14	1013.27
259.56	1013.27	263.72	1013.27	265.7	1013.27	265.83	1013.02	265.94	1013.02
266.37	1013.04	267.85	1013.27	268.52	1013.27	268.93	1013.27	270.55	1013.27
272.87	1013.27	275.12	1013.27	276.99	1013.27	278.69	1013.27	279.34	1013.27
279.91	1013.27	282.67	1013.15	283.02	1012.92	283.65	1012.92	283.89	1012.92
296.95	1012.47	298.63	1012.42	298.81	1012.42	299.36	1012.39	302.65	1013
303.18	1013	304.6	1013	304.89	1013.22	311.29	1013.27	313.2	1013.4
314.03	1013.4	314.33	1013.25	316.51	1013.27	317.08	1013.27	317.59	1013.3
319.04	1013.32	331.68	1013	331.92	1012.97	332.39	1012.92	338.79	1012.87
365.44	1012.87	366.92	1013.31	369.24	1013.44	370.51	1014.38	372.08	1014.85
372.63	1015.15	373.23	1015	373.67	1015	373.71	1015.41	373.84	1015.49
374.95	1015.63	375.67	1016.57	376.84	1016.59	377.82	1018	378.73	1018
378.91	1018	379.01	1018.15	382.26	1019.6	383.16	1020	383.79	1020.44
384.46	1021	384.79	1021	385.26	1021	385.93	1023.01	387.32	1023.06
387.37	1023.24	388.53	1023.91	388.61	1024.13	388.77	1024.13	388.81	1024.16
390.36	1024.15	393.32	1024.13	397.98	1024.06	404.45	1024.05	404.59	1024

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  405.02 1023.94  406.89 1023.62   410.5    1023  410.96  1022.9  411.06  1022.9
  413.08 1022.62  416.54 1021.85  418.09 1021.85   418.1 1022.01  418.67 1022.03
  423.28 1021.74  445.92 1020.96  449.72 1020.93  459.49 1020.75  459.62 1020.58
  464.27 1020.58  470.84 1020.62  471.62 1020.62  476.15  1020.6  488.81 1020.45
  493.76 1020.27  493.93 1020.25  506.16 1020.11  511.94 1020.45  516.77 1020.41
  517.06 1020.44   517.1 1020.58  517.25 1020.38  518.95  1020.4  526.98  1020.6
  528.14 1020.71  528.28 1020.62  533.04 1020.53  535.64 1020.68  538.27 1020.71
  538.59 1020.67  538.79 1020.67  539.49 1020.73  547.23 1020.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   37.36    .035  388.77    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         37.36  388.77           471.89  471.89  471.89            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   31.88 1034.12       F
  415.39  547.23 1033.98       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: 1265

INPUT
Description:
Station Elevation Data    num=     220
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -166.1  1024.7   90.27  1024.7  129.68  1024.7  131.38    1025  132.11 1025.13
  132.27 1025.16  133.08 1025.19  142.71 1025.62  149.53  1025.1  150.71    1025
   152.1 1024.95  156.46 1024.77  157.79 1024.51  161.24    1024  161.34 1023.99
   167.1    1023   167.9 1022.86  169.88 1022.52  171.43 1022.22  172.62    1022
  177.15 1021.31   179.2    1021  179.63 1020.94  179.72 1020.93  181.49 1020.52
  183.99    1020  185.93 1019.59  188.79    1019  192.32 1018.23  193.48    1018
  194.28 1017.83  198.89 1017.08  199.35    1017  201.51 1016.63  205.56    1016
  210.98  1015.4  214.33    1015  216.08 1014.79   217.7  1014.6  222.35 1014.11
  223.48    1014  223.65 1013.98  227.96 1013.58  229.25 1013.37  231.44    1013
  232.91 1012.73  234.92 1012.42  237.33 1012.02  237.44    1012  238.53 1011.83
  238.69 1011.79  239.18 1011.82  242.83 1011.99  246.29 1011.91  250.75  1011.8
  252.67 1011.68  257.01 1011.42  269.93 1011.27  273.96 1011.28  287.44 1011.32
  292.78 1011.29  295.25 1011.28   301.9 1011.22  304.99 1011.22  305.74 1011.22
  311.56 1011.22  319.32 1011.22  323.53 1011.22  330.01 1011.31  332.74 1011.42
   333.9 1011.46  334.18 1011.47  343.54 1011.73  348.38 1011.65  349.56  1011.8
  350.99  1011.8  356.53 1011.96  359.44  1011.9  361.84 1011.94  363.52 1011.89
  366.29 1011.44  366.48 1011.42  366.53 1011.42  368.55  1011.8  371.78 1011.66
  374.28 1011.63  377.03 1011.55   381.1 1011.42  381.95 1011.49  383.96 1011.61
  385.03 1011.63  391.56  1011.8  392.07 1011.73  394.34 1011.42  396.02 1011.42
  396.88 1011.42  398.79 1011.64  400.14  1011.8  401.58 1011.75  403.74 1011.67
  405.08 1011.65  405.37 1011.67  405.39 1011.69  406.51 1011.61   408.9 1011.55
  409.87 1011.61     411 1011.61  412.21 1011.64  417.49  1011.8  419.31 1011.53
  423.62 1011.03  424.24 1011.09  424.76 1011.13  428.12 1011.55  432.76 1011.52
   436.6 1011.58  438.29 1011.58  440.54 1011.54  447.14 1011.51  452.53 1011.51
  462.15 1011.33  462.21 1011.33  462.23 1011.33  462.25 1011.33  462.49 1011.33
  477.01 1011.33  477.69 1011.46  479.12  1011.7  480.81    1012  481.44  1012.1
  485.39 1012.78  485.95 1012.93  486.22    1013  489.15 1013.76  490.09    1014
  492.02 1014.51  493.89    1015  494.18 1015.08  495.52 1015.42  495.52 1015.43
  496.51    1016  497.23 1016.42  498.24    1017  499.94 1019.39  499.94 1019.42
  503.85 1019.98  505.83 1020.27  506.67 1020.39  507.43  1020.5  508.89 1020.71
  510.06 1020.87  510.19 1020.89  510.66 1020.96  514.94 1021.82  521.55    1023
  521.86 1023.15  523.57    1024  523.87 1024.15   525.6    1025  526.32 1025.17
  530.94 1025.44   534.9  1025.5  536.91 1025.58  541.14 1025.66  547.19 1025.67
  549.32 1025.65  551.72 1025.67  571.41  1025.4  587.48 1025.35  590.27 1025.33
  609.43 1025.17  611.29 1025.15  612.17 1025.14  612.63 1025.13  621.09 1025.04
  635.01 1025.08  647.29 1025.05  652.65 1025.04  654.69 1025.04  655.17    1025
  656.72 1024.81  660.55 1024.72  666.37 1024.58   669.1 1024.51  675.43 1024.38
  687.11  1024.1  691.54    1024  691.57    1024  691.69    1024  691.71    1024
  691.72    1024  692.76    1024  699.12 1024.01  701.98    1024  706.53    1024
   707.4 1023.98  707.86 1023.98  709.37 1023.95  710.91 1023.78  711.16 1023.76
  711.21 1023.76   711.7 1023.72  713.56 1023.58  714.92 1023.13  716.96    1023
  729.99 1022.72  732.72 1022.67  736.02 1022.61  736.04 1022.61  736.06 1022.61
  736.08 1022.61   736.1 1022.61  736.13 1022.61  736.15 1022.61  736.16 1022.62
  736.18 1022.62  736.19 1022.62  736.21 1022.62   736.5 1022.58   833.9 1022.58

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

-166.1	.042	142.71	.035	534.9	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
142.71	534.9	137.3	137.3	137.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-166.1	132.3	1028.56	F
535.53	833.9	1027.76	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1130

INPUT
Description:
Station Elevation Data num= 226

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-145.41	1024.8	-.53	1024.8	160.6	1024.8	168.58	1024.6	175.21	1024.58
180.44	1024.45	187.62	1024.23	192.66	1024	194.08	1023.9	196.19	1023.75
197.73	1023.44	200.05	1023	203.53	1022.36	203.66	1022.34	203.93	1022.29
205.46	1022	208.62	1021.39	210.67	1021	211.29	1020.88	211.88	1020.79
213.77	1020.4	214.4	1020.25	215.44	1020	217.93	1019.42	219.64	1019
223.7	1018.06	223.97	1018	224.72	1017.83	227.34	1017.26	227.66	1017.19
228.96	1017	228.98	1017	229.06	1016.99	234.16	1016.2	234.18	1016.2
235.96	1016	240.92	1015.45	241.35	1015.41	244.28	1015	244.44	1014.98
244.66	1014.95	248.08	1014.48	249.94	1014.22	250.01	1014.21	251.22	1014
252.55	1013.78	256.3	1013	256.96	1012.95	257	1012.94	259.06	1012.54
260.94	1012.25	262.3	1012	263.2	1011.85	266.11	1011.33	267.8	1011.22
270.45	1011.03	270.64	1011.02	270.93	1011	273.1	1010.87	273.47	1010.82
274.06	1010.84	274.55	1010.87	274.77	1010.88	279.65	1011	279.7	1011
280.51	1011.01	280.95	1011.02	281	1010.96	281.72	1011.01	282.35	1011
286.16	1010.92	290.01	1010.84	291.08	1010.86	298.48	1010.95	301.23	1010.99
302.84	1011	303.6	1011	303.77	1011	306.64	1011.01	312.29	1011.02
315.67	1011.03	316.51	1011	316.57	1011	316.88	1010.99	320.26	1010.79
321.49	1010.79	322.71	1010.79	323.31	1010.78	324.13	1010.77	324.8	1010.76
326.37	1010.75	329.04	1010.71	332.82	1010.65	333.02	1010.71	333.91	1011
333.97	1011.02	334.59	1011.22	334.63	1011.22	339.77	1011.2	341.47	1011.19
343.46	1011.03	348.82	1011.16	350	1011.22	351.06	1011.19	352.35	1011.16
354.59	1011.1	354.76	1011.1	357.31	1011.03	360.55	1011.03	361.67	1011.03
362.12	1011.03	363.55	1011.03	363.85	1011.03	365.66	1011.03	366.06	1011.03
366.49	1011.03	369.36	1011.03	370.86	1011.03	376.23	1011.03	377.23	1011.03
378.49	1011.26	380.22	1011.42	385.75	1011.43	387.27	1011.43	408.84	1011.42
412.98	1011.42	413.54	1011.38	414.7	1011.22	418.64	1011.18	419.41	1011.15
423.58	1011.05	424.2	1011.03	424.35	1011.05	427.28	1011.53	429.66	1011.62
432.16	1011.77	432.33	1011.79	432.38	1011.79	432.58	1011.79	432.69	1011.78
436.4	1011.03	444.16	1011.2	445	1011.22	457.5	1011.19	462.01	1011.17
466.65	1011.16	471.39	1011.21	475.64	1011.11	483.49	1011.03	490.25	1011.13
492.02	1011.15	498.63	1011.6	499.32	1011.65	499.47	1011.67	499.65	1011.69
500.91	1011.73	506.58	1011.92	509.09	1012	513.09	1012.85	513.77	1013
516.88	1013.89	517.22	1014	517.48	1014.11	519.86	1015	521.48	1015.76
522.18	1016	523.87	1016.59	524.97	1017	525.52	1017.23	525.91	1017.42
526.33	1017.62	534.94	1021.26	536.52	1021.78	537.89	1022	550.49	1022.37
572.89	1023	574.71	1023.89	574.93	1024	576.74	1024.89	576.96	1025
579.99	1025.98	580.08	1026	582.07	1026.98	582.12	1027	582.52	1027
583.49	1027.01	585.57	1027.02	588.16	1027.03	614.18	1027.19	623.78	1027.14
646.51	1027	647.35	1027	647.44	1027	647.52	1027	647.71	1027
647.74	1027	675.03	1026.45	690.16	1026.15	690.55	1026.14	690.76	1026.14
697.58	1026	713.24	1025.49	719.65	1025.34	731.17	1025.08	732.51	1025.04
733.85	1025	733.89	1024.98	734.6	1024.81	736.77	1024.13	737.67	1024
738.21	1023.99	740.74	1023.97	741.95	1023.96	742.06	1023.96	746.04	1024
746.14	1024	746.75	1024	746.89	1024	747.19	1024	752.28	1024
754.02	1024	754.56	1023.79	760.13	1023.68	762.61	1023.68	763.19	1023.68
854.59	1023.68								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-145.41	.042	168.58	.035	582.07	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
168.58	582.07	131.85	131.85	131.85	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-145.41	151.57	1032.9	F
605.3	854.59	1033.36	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 1000

INPUT
Description:
Station Elevation Data num= 294

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-93.92	1022.62	-92.63	1022.62	-88.09	1022.62	-67.86	1022.61	-60.89	1022.61
-60.63	1022.61	-58.99	1022.6	-55.98	1022.55	-54.26	1022.53	-51.91	1022.49
-48.84	1022.42	-45.26	1022.33	-38.72	1022.13	-36.37	1022.06	-34.9	1022
-31.84	1022	-30.44	1022	-27.09	1022	-26.4	1022	-21.05	1022
-16.62	1022.08	-15.18	1022.1	4.06	1022.27	18.49	1022.3	19.11	1022.3
21.46	1022.33	23.6	1022.48	29.94	1022.98	30.18	1023	31.14	1023
31.63	1023.01	32.39	1023.01	33.09	1023.01	44.07	1023.07	45.3	1023.08
45.85	1023.07	48.35	1023.07	50.09	1023.06	53.92	1023.01	54.09	1023.01
54.17	1023.01	54.26	1023.01	55.66	1023	56.46	1023	56.67	1023
56.72	1023	56.85	1023	58.33	1023	58.56	1023	60.69	1023
60.71	1023	61.23	1023	61.25	1023	63.99	1023	119.88	1023.67
121.72	1023.75	124.15	1023.89	128.74	1024	131.53	1024.07	132.91	1024.1
145.27	1024.4	151.4	1024.54	167.1	1024.89	168.24	1024.92	172.29	1025
178.3	1025.13	179.87	1025.16	186.43	1025.34	189.7	1025.41	190.01	1025.39
190.13	1025.38	190.46	1025.37	190.56	1025.37	193.76	1025.44	209.65	1025.73
214.19	1025.81	215.58	1025.84	217.05	1025.86	225.68	1026	237.14	1026.19
238.49	1026.21	240.44	1026.24	245.49	1026.33	245.95	1026.3	248.64	1026
249.06	1025.95	249.47	1025.89	251.94	1025.13	252.21	1025	254.49	1024.23
254.93	1024	255.62	1023.74	261.64	1023	262.04	1022.8	263.62	1022
264.96	1021.33	265.61	1021	268.62	1020.9	297.39	1020	298.23	1019.53
299.27	1019	300.32	1018.49	301.33	1018	302.35	1017.49	303.32	1017
304.32	1016.5	305.26	1016	306.48	1015.41	307.44	1015	309.14	1014.11
309.38	1014	309.55	1013.91	311.39	1013	311.9	1012.7	313.32	1012
314.32	1011.5	315.31	1011	315.71	1011.09	316.18	1011.13	316.55	1011
319.42	1010.12	319.46	1010.1	319.58	1010.1	319.6	1010.1	319.62	1010.1
319.65	1010.1	321.3	1010.1	321.66	1010.1	328.8	1010.1	334.85	1010.1
335.4	1010.17	338.52	1010.45	341.83	1010.29	342.5	1010.26	347.22	1010.1
348.82	1010.07	349.55	1010.21	350.13	1010.31	352.7	1010.65	352.76	1010.65
362.49	1010.82	370.12	1010.96	372.19	1011	373.71	1011	379.82	1011.03
401.56	1011.13	403.69	1011.14	403.95	1011.14	404.15	1011.14	405.18	1011.15
405.4	1011.15	405.42	1011.15	405.56	1011.15	405.64	1011.15	409.52	1011.11
411.37	1011.08	412.66	1011.15	438.94	1011.15	451.21	1011.28	451.99	1011.4
453.56	1011.5	453.72	1011.51	457.48	1011.51	458.05	1011.51	459.45	1011.51
478.37	1011.64	479.16	1011.64	483.64	1011.66	484.45	1011.5	485.91	1011.15
486.93	1011.31	488.5	1011.43	492.69	1011.23	493.71	1011.16	494.53	1011.13
497.48	1011.02	497.79	1011.01	497.9	1011.01	498.27	1011	498.82	1010.98
500.37	1010.93	501.01	1010.89	501.75	1010.86	502.7	1010.84	513.76	1010.84
513.97	1010.84	519.08	1010.84	522.49	1010.84	526.93	1010.82	527.93	1010.82
538.41	1010.95	539.38	1010.98	539.58	1011	539.7	1011	539.72	1011
549.25	1011.34	552.37	1011.45	571.31	1012	573.72	1012.53	575.75	1013
577.73	1013.64	578.67	1014	579.48	1014.35	581.09	1015	582.6	1015.72
583.18	1016	584.74	1016.78	585.19	1017	586.82	1017.79	587.27	1018
588.99	1018.84	589.33	1019	591.12	1019.88	591.38	1020	599.6	1020.12
600.83	1020.13	606.38	1020.21	633.82	1020.64	654.78	1021	655.82	1021.51
656.81	1022	657.8	1022.49	658.86	1023	659.8	1023.47	660.89	1024
661.8	1024.45	662.93	1025	663.8	1025.43	664.97	1026	665.8	1026.41
667	1027	668.63	1027.8	669.04	1028	676.83	1027.93	677.58	1027.92
683.24	1027.97	684.83	1027.99	685.45	1028	686.48	1027.99	686.74	1027.98
687.38	1027.97	691.93	1027.86	720	1027.2	728.61	1027	749.21	1026.46
766.95	1026	769	1025.93	795.27	1025	796.83	1024.99	797.93	1024.98
799.42	1024.99	799.91	1024.99	801.66	1025	801.81	1025	802.06	1025
802.25	1025	803.68	1025	804.88	1025	812.41	1025	816.21	1025
817.8	1025	820.49	1025	820.78	1025	821.55	1025	822.2	1025
824.15	1024.6	826.43	1024	827.75	1024	830.06	1023.72	831.42	1023.55
832.22	1023.58	832.96	1023.53	833.85	1023.58	835.51	1023.6	836.93	1023.68
841.85	1023.9	842.75	1023.95	842.93	1023.96	843.46	1023.97	845.47	1024
845.82	1024	847.45	1024	857.19	1024	857.19	1024.07	858.98	1024.33
862.21	1024.4	864.07	1024.48	879.96	1024.42	881.13	1024.4	884.17	1024.06
890.06	1024	891.28	1023.94	896.73	1023.68	897.04	1023.67		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-93.92	.042	245.49	.035	676.83	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
245.49	676.83	85.15	85.15	85.15	.3	.5

Ineffective Flow num= 6

```
   Sta L   Sta R    Elev  Permanent
   11.92   76.99 1029.44       F
   76.99     141 1031.31       F
     141  202.86 1032.79       F
  610.37  665.84 1032.89       F
  665.84  718.11  1032.1       F
  718.11  767.18 1030.62       F
Skew Angle = 7.71

BRIDGE


RIVER: Murrieta Creek
REACH: Main - EC          RS: 954

INPUT
Description: Overland Bridge
Distance from Upstream XS =       5
Deck/Roadway Width        =   75.92
Weir Coefficient          =     2.6
Bridge Deck/Roadway Skew  =    7.71
Upstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   201.5 1028.17 1022.55  403.65 1029.48  1023.9  605.81 1028.17 1022.55

Upstream Bridge Cross Section Data
Station Elevation Data    num=      82
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
5.519999 1021.129.889999 1021.22   13.26 1021.22   15.58 1021.28   15.91 1021.28
    24.7 1021.42   25.85 1021.47   26.21 1021.42   31.95 1021.63   40.76 1021.77
   43.08 1021.81    43.3    1022   43.53    1022   43.75 1021.82   43.92 1021.77
   46.33 1021.79   49.05 1022.03   53.48 1021.93   53.69 1021.93   54.27    1022
   57.73    1022      60 1021.74   78.21    1022   81.37    1022   83.51 1022.01
   88.31    1022   88.73    1022   94.31 1022.01    97.9    1022  106.83  1022.2
  136.73 1022.49  139.56 1022.65  201.34 1028.23  203.69 1020.36  231.45 1020.33
  246.73 1020.31  265.41  1010.8  315.63 1010.52  322.54 1010.49  330.67 1010.48
  338.58 1010.54  342.62 1010.58  344.47 1010.65  344.78 1010.65  347.39 1010.65
   494.2 1010.94  495.65 1010.88  497.51 1010.84  506.91 1010.84  507.74 1010.84
  512.66 1010.84  516.89 1010.84  518.49 1010.94  537.06  1020.3  574.84 1020.43
  605.37 1020.53  605.94 1028.13  655.96 1021.94  667.84 1021.18  668.78 1021.23
  682.69 1021.23  684.47 1021.23   684.5 1021.24  689.47 1021.24  694.76 1021.11
  694.82 1021.13   698.8 1021.17  699.74 1021.19  700.41 1021.15   703.2 1021.22
  703.47 1021.21  724.19    1021   725.5 1021.09  728.51 1021.12  728.57 1021.19
  736.65 1021.19  738.73 1021.13  739.86  1021.1  742.44 1021.08  750.23 1021.07
  759.32 1021.05  759.59 1021.05

Manning's n Values        num=       1
     Sta   n Val
5.519999    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
        231.45  574.84             .3       .5
Ineffective Flow     num=       6
   Sta L   Sta R    Elev  Permanent
   11.92   76.99 1029.44       F
   76.99     141 1031.31       F
     141  202.86 1032.79       F
  610.37  665.84 1032.89       F
  665.84  718.11  1032.1       F
  718.11  767.18 1030.62       F
Skew Angle = 7.71

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  201.53 1028.17 1022.55  403.69 1029.48  1023.9  605.85 1028.17 1022.55

Downstream Bridge Cross Section Data
Station Elevation Data    num=      77
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    9.22    1021    12.2    1021   12.59 1020.95   13.09    1021   36.65 1021.34
   37.71 1021.15   41.88 1021.67   57.12 1022.42   57.35 1022.42   59.66 1022.44
   63.88 1022.41   66.95 1022.42   71.15 1022.93  119.53  1023.5   134.8 1024.03
  201.71 1028.24  204.25 1020.47  231.75 1020.38  250.22 1020.32  269.13 1010.76
  323.75 1010.45  331.52 1010.45  335.22 1010.49  337.66 1010.45  357.58 1010.52
  504.93 1010.58  510.72 1010.47  521.51  1010.5  541.03 1020.36  575.99 1020.41
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  604.76 1020.45  605.54 1028.22  647.46    1022  648.84 1021.81  648.95 1021.81
  649.02 1021.81  658.73 1021.08  663.83 1021.08  666.86    1021  666.92 1020.88
  680.24 1020.88  682.65 1020.86  684.36 1020.98  684.76 1020.99  688.98 1020.88
  690.09 1020.99  694.39 1021.09  695.54 1021.13  695.97 1021.13  696.09 1021.13
  698.27 1021.14  706.54 1021.14  706.64  1021.1  706.75 1021.06  706.93    1021
  707.13    1021  708.97    1021  709.61 1020.98  709.93 1021.04  710.26 1021.04
  711.77 1020.95  711.83 1020.88  712.13 1021.17  712.96 1021.14  717.79 1020.82
  742.96    1021  744.15    1021  749.33 1021.04  751.09 1021.04  751.61 1021.21
  752.38 1021.19   756.9 1020.97  762.62 1020.68  765.04 1020.61  765.34 1020.63
  765.86 1020.63  773.33 1020.63

Manning's n Values        num=       1
     Sta   n Val
    9.22    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
        231.75  575.99             .3       .5
Ineffective Flow     num=       6
   Sta L   Sta R    Elev  Permanent
   12.76   46.89 1027.65       F
   46.89   114.1 1031.16       F
   114.1  199.44  1032.7       F
  605.87  669.88  1032.7       F
  669.88  721.08 1031.71       F
  721.08  763.75 1030.39       F
Skew Angle = 7.71

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
   201.5 1022.55  231.23 1022.75  231.23    1013
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  201.53 1022.55  231.26 1022.75  231.26    1013

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  576.08    1013  576.08 1022.75  605.81 1022.55
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  576.12    1013  576.12 1022.75  605.85 1022.55

Number of Piers =  2

Pier Data
Pier Station     Upstream=  335.28    Downstream=  335.31
Upstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024
Downstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024

Pier Data
Pier Station     Upstream=  472.03    Downstream=  472.07
Upstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024
Downstream     num=       2
    Width   Elev    Width   Elev
       4    1000       4    1024

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
```

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 912

INPUT
Description:
Station Elevation Data num= 393

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-92.57	1022.01	-86.6	1022.01	-84.71	1022.01	-76.37	1022.01	-60.06	1022
-55.96	1022	-54.96	1022	-53.88	1022	-53.49	1021.73	-52.85	1021.86
-52.58	1021.89	-52.16	1021.95	-52.01	1021.93	-51.43	1021.9	-47.65	1021.74
-41.64	1021.76	-40.48	1021.81	-40.32	1021.83	-40.2	1021.83	-39.54	1021.87
-39.02	1022	-38.84	1022	-38.03	1022	-37.62	1022	-37.28	1022
-36.14	1021.99	-24.89	1021.84	-14.43	1021.82	-11.14	1021.89	-6.74	1022
-2.51	1022.01	-.28	1022.01	5.23	1022	6.47	1022.01	7.68	1022
8.01	1022	8.82	1022	9.99	1022	10.02	1022	11.83	1022
14.52	1022	16.22	1022.01	16.23	1022.01	19.39	1022.03	19.87	1022.04
20.53	1022.06	30.49	1022.55	38.79	1022.84	39.98	1023	40.75	1023.01
41.29	1023.01	44.44	1023.05	46.82	1023.06	47.14	1023.06	47.5	1023.07
48.08	1023.07	48.57	1023.08	49.63	1023.09	50.22	1023.09	50.5	1023.09
50.64	1023.09	51.16	1023.1	51.5	1023.1	51.65	1023.1	53.55	1023.12
54.05	1023.12	55.8	1023.12	59.93	1023.51	62.82	1023.51	63.57	1023.56
63.93	1023.56	70.77	1024	74.09	1024.03	77.03	1024.04	80.57	1024.07
81.51	1024.08	82.03	1024.08	88.25	1024.11	89.86	1024.11	94.63	1024.13
97.75	1024.14	98.93	1024.14	104.23	1024.51	104.58	1024.54	104.62	1024.54
111.99	1025	112.75	1025.02	116.21	1025.03	120	1025.07	121.24	1025.09
121.79	1025.09	126.08	1025.11	127.14	1025.11	133.18	1025.13	134.02	1025.14
134.34	1025.14	136.83	1025.15	137.77	1025.15	141.36	1025.51	142.52	1025.59
149.6	1026	154.37	1026.03	156.05	1026.04	156.2	1026.04	156.32	1026.04
161.2	1026.05	167.94	1026.07	169.47	1026.07	174.24	1026.08	174.76	1026.08
174.93	1026.08	175.2	1026.08	175.29	1026.08	176.16	1026.08	176.44	1026.08
180.19	1026.52	189.67	1027	193.84	1027	194.04	1027	196.74	1027
196.95	1027	197.09	1027	202.11	1027	209.02	1027	210.19	1027
217.73	1027	219.44	1027	219.91	1027	220.2	1027	220.28	1027
220.31	1027	220.32	1027	224.35	1027.52	224.36	1027.52	230.37	1027.76
236.46	1028	242.61	1027.81	244.05	1027.77	244.82	1027.79	245.89	1027.83
247.79	1027.94	247.97	1027.96	248.52	1028	249.09	1027.72	249.73	1027.41
250.55	1027	251.62	1026.47	252.57	1026	253.53	1025.53	254.63	1025
255.72	1024.46	256.67	1024	258.48	1023.32	259.18	1023	261.1	1022.08
261.26	1022	262.11	1021.59	263.19	1021	274.51	1020.7	301.98	1020
303.97	1019.01	303.98	1019	303.99	1018.99	306.01	1018	306.02	1018
308.02	1017	308.58	1016.72	310.07	1016	310.29	1015.87	312.16	1015
312.43	1014.86	314.31	1014	315.71	1013.25	316.22	1013	318.02	1012.03
318.1	1012	318.79	1011.64	320.05	1011	321.36	1010.94	323.88	1010.84
330.93	1010.54	330.98	1010.45	333.45	1010.45	334.96	1010.2	336.36	1010
337.24	1009.87	338.52	1009.72	340.55	1009.82	344.93	1009.99	345.21	1010
347.27	1010.19	347.99	1010.26	348.86	1010.17	350.67	1010	351.03	1009.96
351.95	1009.88	356.9	1009.88	359.98	1009.88	360.49	1009.95	360.85	1010
362.02	1010.16	363.83	1010.45	365.41	1010.56	366.33	1010.6	367.2	1010.65
369.78	1010.64	371.79	1010.68	374.54	1010.71	375.89	1010.72	378.14	1010.74
384.31	1010.83	385.49	1010.83	387.07	1010.85	392.1	1010.93	392.77	1010.94
393.31	1010.95	397.08	1011	397.24	1011	402.68	1011	405.87	1011.01
405.93	1011.01	407.43	1011.01	408.7	1011.01	420.08	1011.08	436.98	1011.15
437.98	1011.07	438.77	1011	440.08	1010.89	441.1	1010.79	443.63	1010.99
443.73	1011	443.88	1011.01	445.53	1011.15	452.11	1011.15	456	1011.15
459.19	1011.15	463.79	1011.15	464.64	1011.07	465.06	1011.04	465.41	1011
465.44	1011	465.74	1010.97	465.77	1010.97	465.9	1011	466.25	1011.06
467.55	1011.33	469.83	1011.33	470.55	1011.33	470.83	1011.31	472.38	1011.15
472.52	1011.16	476.56	1011.33	480.52	1011.19	481.59	1011.15	481.93	1011.11
483.16	1011	484.11	1010.91	487.02	1010.65	490.66	1010.97	490.99	1011
491.01	1011	491.38	1011.03	492.17	1011	492.19	1011	492.39	1010.99
493.5	1010.95	503.79	1010.6	509.69	1010.46	519.46	1010.24	521.53	1010.24
533.51	1010.24	535.73	1010.29	541.04	1010.42	541.68	1010.59	542.89	1011

555.04	1011.52	560	1011.73	560.89	1011.77	561.21	1011.79	561.74	1011.81
567.33	1012	568.8	1012.33	571.83	1013	573.79	1013.74	574.38	1014
576.11	1014.75	576.65	1015	578.27	1015.78	578.7	1016	580.34	1016.82
580.71	1017	582.46	1017.83	582.83	1018	584.75	1018.92	584.92	1019
586.95	1019.98	586.99	1020	590.43	1020.06	654.92	1021	655.16	1021.11
656.93	1022	657.16	1022.11	658.95	1023	659.18	1023.11	660.97	1024
661.2	1024.11	662.84	1025	663.07	1025.11	665	1026	665.23	1026.11
667.15	1027	670.05	1027.24	670.94	1027.72	671.46	1028	675.15	1027.96
677.05	1027.94	679.16	1027.95	685.26	1027.99	685.29	1027.99	685.84	1028
688.99	1027.85	708.13	1027	708.82	1027	709.26	1027	712.34	1027.01
715.26	1027.01	715.62	1027.01	716.5	1027.01	719.26	1027	725.87	1026.84
739.22	1026.53	740.8	1026.49	742.79	1026.44	759.82	1026	760.37	1025.98
771.64	1025.62	792.76	1025	800.39	1024.48	806.36	1024.24	811.33	1024.02
811.72	1024	813.92	1024	816.7	1024	821.8	1024	822.59	1024
824.04	1024	826.73	1024	827.4	1024	829.36	1024	830.97	1024
836.78	1024	840.15	1023.08	840.42	1023	842.14	1022.62	843.31	1022.4
843.74	1022.33	843.91	1022	844.39	1022.21	844.46	1022.21	845.39	1022.27
845.74	1022.83	846.97	1022.04	847.12	1022.06	847.39	1022.09	848.61	1022.26
854.06	1023	854.75	1022.99	855.51	1023	856.06	1023	856.26	1023.02
857.08	1023	857.56	1023	857.81	1023	858.03	1023.03	860.18	1023.31
862.63	1023.33	868.4	1023.35	878.51	1023.19	891.03	1023.18	891.75	1023.17
891.94	1023.16	902.99	1023.68	903	1023.68	903.18	1023.67	903.35	1023.67
903.53	1023.67	903.71	1023.67	903.9	1023.67	904.09	1023.67	904.3	1023.67
904.51	1023.67	904.91	1023.67	907.43	1023.67				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-92.57	.042	249.09	.035	670.94	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
249.09	670.94	267.2	267.2	267.2	.3	.5

Ineffective Flow num= 6

Sta L	Sta R	Elev	Permanent
12.76	46.89	1027.65	F
46.89	114.1	1031.16	F
114.1	199.44	1032.7	F
605.87	669.88	1032.7	F
669.88	721.08	1031.71	F
721.08	763.75	1030.39	F

Skew Angle = 7.71

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 642

INPUT
Description:
Station Elevation Data num= 290

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214.59	1022	-47.94	1022	170.16	1022	173.79	1021.71	175	1021.59
175.81	1021.51	180.19	1021.04	180.61	1021	180.78	1020.98	182.1	1020.7
184.25	1020.6	184.48	1020.58	186.47	1020.37	186.79	1020.35	191.33	1020
191.56	1019.98	192.2	1019.93	193.03	1019.89	198.23	1019.41	199.17	1019.33
200.07	1019.23	200.71	1019.17	201.45	1019.1	202.16	1019.03	202.26	1019.02
202.41	1019	202.45	1018.99	203.74	1018.81	205.83	1018.4	207.89	1018
209.26	1017.73	212.33	1017	215.43	1016.25	216.44	1016.01	216.86	1015.91
218.7	1015.48	220.26	1015	222.58	1014.29	223.53	1014	226.63	1013.05
226.8	1013	228.29	1012.54	228.31	1012.54	228.35	1012.53	228.67	1012.46
230.78	1012	232.6	1011.6	235.32	1011	236.84	1010.66	237.79	1010.45
239.72	1010.14	240.59	1010	240.75	1009.98	241.22	1009.91	241.38	1009.91
241.8	1009.91	242.18	1009.91	242.52	1009.91	244.22	1009.91	245.97	1009.91
247.39	1009.91	247.67	1009.91	253.49	1009.91	277.22	1009.91	285.41	1009.91
293.29	1009.91	293.35	1009.91	293.53	1009.91	293.86	1009.91	293.98	1009.91
294.19	1009.91	295.17	1009.91	295.29	1009.91	295.77	1009.91	295.85	1009.91
296.05	1009.93	296.68	1010	297	1010.03	297.3	1010.07	298.46	1010.07
299.15	1010.07	300.22	1010.07	300.6	1010.07	301.35	1010.07	302.05	1010.07
302.82	1010.07	310.4	1010.09	313.46	1010.1	314.39	1010.1	317.49	1010.11
317.98	1010.11	318.6	1010.11	319.31	1010.11	320.33	1010.15	323.27	1010.16
326.05	1010.17	328.63	1010.19	331.45	1010.2	334.06	1010.18	350.14	1010.27
352.42	1010.27	380.61	1010.62	382.73	1010.61	383.12	1010.5	384.18	1010.01
384.2	1010	384.43	1009.94	385.63	1009.94	386.26	1009.94	386.73	1009.94
387.18	1009.94	389.5	1009.94	389.92	1009.94	390.24	1009.98	390.39	1010
390.62	1010	392.24	1010.21	394.65	1010.51	395.78	1010.64	400.17	1010.99
400.23	1011	401.45	1011.08	402.89	1011.3	406.23	1011.33	409.05	1011.27
409.51	1011.18	410.39	1011	412.05	1010.68	413.14	1010.45	415.69	1010.43

416.94	1010.46	423.19	1010.79	424.97	1010.79	429.87	1010.97	431.42	1011
431.61	1011	432.17	1011.06	436.72	1011.55	439.35	1011.78	441	1011.91
441.08	1011.95	441.19	1012	442.9	1012.81	443.29	1013	443.73	1013.21
445.03	1014	445.13	1014.06	445.35	1014.19	447.2	1014.12	447.53	1014.12
452.06	1014.29	453.73	1014.35	455.74	1014.33	457.01	1014.36	457.85	1014.37
458.55	1014.38	460.08	1014.4	460.21	1014.4	462.19	1014.44	465.31	1014.7
468.46	1014.67	472.52	1014.34	473.27	1014.17	474.09	1014.13	476.22	1014.29
479.64	1014.55	483.46	1014.84	487.64	1014.66	494.61	1014.37	496.08	1014.42
498.39	1014.51	503.21	1014.47	513.66	1014.38	517.61	1014.35	520.81	1014.33
522.37	1014.25	527.4	1014	530.89	1013.83	536.42	1013.55	541.35	1013.34
543.4	1013.24	547.78	1013.01	547.9	1013.01	548.12	1013	558.57	1012.62
559.26	1012.64	561.43	1012.43	561.44	1012.43	561.47	1012.43	561.49	1012.44
564.07	1012.32	565.54	1012.24	566.38	1012.16	567.74	1012	570.91	1011.6
571.38	1011.44	572.67	1011.14	573.71	1011	589.9	1011	607.89	1011
608.02	1011.53	608.27	1012.97	608.73	1014	609.27	1014	610.78	1014.73
611.33	1015	612.85	1015.75	613.35	1016	614.91	1016.77	615.38	1017
616.98	1017.79	617.4	1018	619.04	1018.81	619.42	1019	622.85	1019.85
623.46	1020	625.23	1020.87	625.49	1021	626.02	1021.27	627.51	1022
629.93	1022.02	633.13	1022.03	636.92	1022.01	638.13	1022.01	638.8	1022
639.13	1022	639.16	1022	639.18	1022	639.41	1022	641.19	1022
645.24	1021.99	647.06	1022	647.59	1021.99	648.03	1021.99	648.72	1021.99
649.35	1022	649.99	1022	654.14	1022	665.15	1022	665.37	1022
668.01	1021.97	675.28	1022	675.92	1022	676.25	1022	676.37	1022
676.87	1022	676.96	1022	678.76	1021.97	679.58	1021.95	683.35	1021.85
686.85	1021.77	702.71	1021.34	714.87	1021	715.28	1021	715.34	1021
715.55	1021.02	723.38	1021.31	728.01	1021.42	728.03	1021.42	729.09	1021
730.21	1020.56	731.07	1020.53	731.97	1020.47	731.98	1020.47	738.32	1020.03
738.94	1020	739.48	1020	740.05	1019.98	741.12	1019.97	741.65	1019.96
743.16	1019.94	744.27	1019.96	744.73	1019.97	745.35	1019.96	747.09	1019.95
747.4	1019.94	748.87	1019.92	752.42	1019.83	752.67	1019.82	753.14	1019.44
753.7	1019.28	753.71	1019.3	753.72	1019.35	753.93	1019.35	759.16	1019.12
761.03	1019.04	761.94	1019.07	767.54	1019.2	779.09	1019.25	785.41	1019.25

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-214.59	.042	170.16	.035	629.93	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
170.16	629.93	298.19	298.19	298.19	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214.59	126.31	1027.05	F
654.9	785.41	1026.09	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: 343

INPUT
Description:
Station Elevation Data num= 236

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1017	72.95	1017.46	78.66	1017.61	82.22	1017.75	84.24	1017.64
84.73	1017.62	85.38	1018	87.81	1018	116.51	1019	125.91	1019.1
126.43	1019.11	131.93	1019.47	133.9	1019.32	135.41	1019.35	142.1	1019.91
143.46	1020	144.26	1020	153.86	1020.4	154.18	1020.41	154.44	1020.42
171.05	1021	171.28	1021	175.17	1021.43	179.27	1021.27	181.79	1021.73
222.54	1021.73	225.06	1021.87	234.86	1022.01	237.33	1022.01	241.5	1022
241.88	1022	247.97	1022	249.43	1022.01	258.11	1022.01	259.41	1022.01
261.23	1022	268.23	1022	268.8	1022	269.83	1022	271.02	1021.97
272.17	1021.96	272.39	1021.73	274.58	1021.73	277.67	1021.73	278.79	1021.87
280.41	1021.7	280.9	1021.57	283.99	1020.75	285.6	1020.06	286.3	1020.06
297.16	1020.24	298.98	1020	299.3	1020	300.6	1020.04	306.32	1019.59
308.13	1019	309.13	1019	311.74	1019	312.41	1018.2	314.23	1018
317.45	1017.65	318.55	1017.53	318.82	1017.58	320.79	1017.15	323.97	1016.23
324.93	1015.35	329.63	1014.86	330.86	1014.16	333.02	1014.28	333.94	1014.09
334.62	1013.91	335.19	1013	339.16	1013	340.76	1012.88	344.11	1012.33
346.66	1012.33	348.3	1012.35	349.49	1012.35	351.7	1012.21	353.81	1011.94
360.96	1012	361.32	1012	362.65	1012	371.42	1011.94	371.54	1011.51
375.76	1011.41	375.81	1011.41	381.52	1011.16	383.05	1010.93	383.75	1010.93
384.29	1010.8	386.24	1010.79	386.85	1010.8	387.76	1010.8	388.27	1010.85
388.71	1010.87	391.49	1011	393.48	1011	395.85	1011	396.13	1011
400.19	1011.01	400.63	1011.01	401.46	1011.03	404.92	1010.77	405.51	1010.79
406.76	1010.97	407.99	1010.94	408.52	1010.95	432.39	1010.6	437.75	1010.52
438.92	1010.46	440.09	1010.4	448.27	1010.35	451.1	1010.21	454.11	1010.28

455.12	1010.28	455.97	1010.27	456.05	1010.25	456.78	1010.19	457.98	1010.12
458.31	1010.07	458.61	1010.06	458.73	1009.91	459.06	1009.91	462.13	1009.91
462.54	1009.91	463	1009.91	549.44	1009.91	555.44	1009.91	560.45	1009.91
565.73	1009.91	565.84	1009.91	566.12	1009.91	566.58	1009.91	568.6	1010
573.28	1010.17	574.19	1010.19	575.41	1010.28	577.65	1010.25	578.32	1010.27
581.59	1010.18	581.83	1010.2	584.91	1010.16	585.71	1010.15	586.13	1009.94
587.46	1009.94	588.2	1009.94	590.28	1009.94	591.46	1009.89	591.63	1009.94
591.79	1010.37	594.46	1010.72	595.97	1010.69	597.17	1010.97	597.4	1010.97
602.71	1011	604.58	1010.96	605.58	1010.77	606.66	1011.14	607.81	1011.12
608.74	1011.05	609.78	1011.13	609.89	1011.13	621.18	1011.29	621.61	1011.27
622.43	1011.14	623.63	1011.14	626.04	1011.22	626.8	1011.12	632.08	1011.02
633.43	1011.02	649.2	1011.07	653.14	1011.11	660.66	1011.15	662.35	1011.14
662.55	1011	663.42	1011	668.44	1011.88	668.96	1012.5	669.36	1012.5
671.22	1013.21	672.41	1013.21	672.7	1013	675.66	1015.73	675.68	1015.73
677.7	1014.71	678.53	1015.18	679.16	1016	681.39	1016	681.52	1016
681.76	1016.92	683.63	1017.21	684.67	1017.72	685.25	1018	686.48	1018
687.06	1019.02	688.67	1019.02	689.37	1019.26	690.06	1019.26	690.7	1019.18
692.77	1019.3	695.36	1019.3	707.2	1019.29	711.8	1019.29	717.21	1020.88
717.74	1020.88	725.17	1021	725.56	1021.15	726.46	1021.28	731.55	1021.31
737.04	1021.44	741.13	1021.36	742.15	1021.36	742.32	1021.35	742.51	1021.35
742.75	1021.35	744.54	1021.23	747.6	1021	749.23	1021	766.87	1021
766.92	1020.85	767.4	1021.07	772.54	1021.07	772.98	1021.11	773.18	1021.1
773.5	1021.1	775.11	1021.08	789.26	1020.59	810.4	1020.37	820.06	1020.09
825.82	1020.09	838.78	1020.08	842.45	1020.08	851.91	1019.81	860.9	1019.52
861.44	1019.52								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	280.9	.035	717.21	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
280.9	717.21	358.82	358.82	358.82	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	243.81	1023.12	F
723.66	861.44	1022.63	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: -16

INPUT
Description:
Station Elevation Data num= 199

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1021.2	23.3	1021.2	23.98	1021.2	24.99	1021.2	28.09	1021.23
28.83	1021.23	29.6	1020.82	29.87	1020.82	32.01	1020.81	34.9	1020.76
38.77	1020.69	43	1020.66	48.22	1020.27	49.32	1020.27	49.72	1020
52.19	1019.5	54.64	1018.77	56.58	1018.64	56.94	1018.6	57.87	1018.47
58.5	1018.18	58.78	1018	60.33	1018	61.36	1017	63.23	1016.34
64.21	1015.41	65.95	1015.08	66.82	1015.08	67.2	1015.08	67.34	1015.02
73.07	1014.1	73.71	1013.66	76.52	1013.42	79.71	1013.35	79.89	1013
82.04	1012	84.71	1012	89.2	1011.06	89.53	1011	89.58	1010.99
93.65	1009	96.28	1009	99.24	1008.82	103.84	1008.87	104.47	1008.87
105.84	1009.17	107.77	1009.18	109.29	1009.28	119.66	1009.28	126.45	1009.28
127.77	1009.45	130.56	1009.29	142.95	1009.11	146.43	1009.5	150.02	1009.53
156.47	1009.35	160.06	1009.18	166.98	1009	168.14	1008.94	169.18	1008.94
169.85	1008.97	170.56	1008.97	176.24	1009	178.42	1009.01	179.98	1009.01
184.16	1009.01	193.74	1009	194.48	1008.99	194.76	1008.99	195.03	1009
201.75	1009	203.73	1009	211.1	1008.99	211.67	1008.99	212.12	1009
218.68	1009	221.15	1009	224.25	1009	230.67	1009.01	236.68	1009.01
238.71	1009.01	239.69	1009.01	249.8	1009.02	254.22	1009.11	266.04	1009.11
268.61	1009.02	268.85	1009.02	269.32	1009.03	272.91	1008.94	273.73	1008.84
274.55	1009.29	275.62	1009.32	275.84	1009.21	275.97	1009.23	276.34	1009.24
277.39	1009.26	278.14	1009.25	286.34	1009.11	289.64	1009.11	303.2	1009.03
310.17	1009.1	310.31	1009.11	311.37	1009.08	312.29	1008.91	313.48	1008.87
316.15	1008.79	322.07	1008.78	325.47	1008.98	325.8	1009.02	327.69	1009.13
329.07	1009.29	337.32	1009.14	345.01	1009.32	353.24	1009.79	353.91	1009.82
355.13	1010.13	355.47	1010.13	355.96	1010.5	362.95	1010.5	368.03	1010.41
370.98	1010.44	377.09	1010.22	379.66	1010.11	379.78	1010.07	382.51	1010.3
383.65	1010.3	385.65	1010	397.12	1010	401.12	1009.45	403.87	1009
416.28	1008.95	417.27	1008.94	417.72	1008.94	417.99	1008.94	418.28	1009
420.34	1009.41	423.14	1010	424.67	1010	425.42	1010.48	428.6	1010.69
432.8	1011.2	436.98	1011.67	442.78	1011.74	447.1	1011.75	452.85	1011.76
453.5	1012	454.36	1012.08	457	1012.33	458	1012.42	460.1	1012.98

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  461.24 1013.01  461.71 1013.54  462.26 1013.61  465.35 1013.88  465.51    1014
  465.79 1014.68  469.25 1014.87  471.75    1015  471.84    1015  472.08 1016.18
  472.77    1017   473.1 1017.06  475.41 1017.52  475.71 1017.53   475.8 1017.16
  478.21 1017.47  482.86 1017.47  484.16 1017.47  484.33 1017.47  485.73 1017.47
  486.06 1017.47  491.09 1017.48     500 1017.85  500.31 1017.86  503.38 1017.91
  504.51 1017.94  506.38 1017.99  506.57    1018  507.79 1018.15  513.95 1018.24
  521.65 1018.32  522.95 1018.34  524.02  1018.2  527.83 1018.22  529.54 1018.47
  530.81 1018.53  536.12 1018.76   541.7 1018.82  546.69 1018.87  547.98 1018.97
  548.65    1019  549.34    1019  551.54  1019.1  553.95    1019  555.27    1019
  555.95    1019  566.72    1019   578.1    1019  585.94    1019

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042    29.6    .035  513.95    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          29.6  513.95           401.42  401.42  401.42             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    23.5 1024.74       F
  519.22  585.94 1023.72       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -417

INPUT
Description:
Station Elevation Data    num=     201
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1021   15.84    1021   17.56 1021.13    23.5 1021.05   26.83    1021
   31.44 1019.94   32.32 1019.69   35.45 1019.25   36.33 1019.23   38.71    1019
    39.8    1018   41.66  1017.3   42.01  1017.3   42.74 1017.22   43.79 1017.21
   46.55 1016.43   48.66 1015.81   49.56 1015.75    50.2 1015.71   50.57 1015.67
   51.08 1015.59   52.01 1015.47   57.75    1015   58.57    1015   58.83 1014.65
   60.46 1014.62   63.77 1014.09   64.13 1014.08   65.12  1013.9   66.97 1013.73
   67.27 1013.38   68.89 1013.38      69 1013.02   69.82 1012.86   74.69    1012
   76.45 1011.66   77.72 1011.64   78.71 1011.23   79.56 1010.72   81.76    1010
      83 1009.28   83.95 1009.11   87.41 1008.51   89.77 1007.65   91.53  1007.6
   92.41 1007.41  100.58 1007.28  103.89 1007.27  113.12 1008.21  149.55  1007.9
  151.83 1007.52  159.86 1007.39     171 1007.28  177.21 1007.77  178.66    1008
   180.9 1008.01  183.17 1008.06  185.78    1008  188.19    1008  189.49    1008
   197.7 1007.92  200.83 1007.92  202.12 1007.94  202.56 1007.94  205.29 1007.97
  207.18 1008.01  210.09 1008.04  212.76 1008.06   213.8 1008.04  214.11 1008.04
   214.3 1007.89   215.3 1007.78  215.63 1007.77  216.44 1007.58  220.04 1007.85
  222.33 1007.75  224.14 1007.74  225.02 1007.78  228.72 1007.72  228.78 1007.72
  229.13 1007.74  231.45  1007.9  232.83 1008.01  233.04 1008.08  234.18 1008.08
  234.39 1008.08  235.48 1008.11  244.83 1008.26  252.88 1008.26  256.46 1008.26
  257.41 1008.03  257.56 1008.04  258.38  1007.8  258.89 1007.72  259.15 1007.72
  259.47 1007.72  260.82 1007.72  262.37 1007.72  263.35 1007.72  266.29 1007.72
  267.76 1007.72  268.14 1007.72  268.56 1007.92  271.48 1007.96   273.5 1007.99
  274.41 1008.11  274.96 1008.11  277.31 1008.09  280.81 1008.41  283.06 1008.43
  285.58 1008.43  288.28 1008.48  288.89 1008.34  291.07 1008.33  291.77 1008.02
  292.35 1007.76  292.58 1007.75  294.07 1007.78   303.5 1007.94  313.76 1007.94
  323.07 1007.57  329.68 1007.35  331.49 1007.32  332.99 1007.32  335.01 1007.32
  335.24 1007.32  336.72 1007.32  340.85 1007.76  346.27 1007.76   347.2 1007.96
  348.85 1008.09  350.52 1008.23  352.87 1008.51  353.97 1008.52  364.38 1008.32
  370.68 1008.25  373.25 1008.19  375.39 1008.17  377.99 1008.06  390.48 1007.57
  391.54  1007.6  391.88 1007.59   400.6 1007.92  421.47 1008.35  423.48 1008.43
  430.94    1009  438.43 1009.63  441.36 1009.75  444.92 1009.84  447.59 1010.11
  450.91  1010.2   454.9 1010.47  461.39    1011  464.35  1011.5  466.77 1011.84
  471.68 1011.94  472.36    1012  474.82 1012.69  479.56 1013.02  480.74 1013.05
  481.45 1012.92   483.9  1013.4  487.33 1014.11  487.96 1014.74  488.32 1014.74
  491.19 1014.74  491.53 1014.68  491.87 1014.84  494.01 1015.99  495.93 1016.62
  498.81 1016.62  499.35  1016.7     500 1016.65  500.15 1016.64  500.69 1016.62
  503.61 1016.62  505.06 1017.99  505.69 1018.01  507.86 1017.82  512.45 1017.97
  517.59    1018  517.84 1017.92  521.37 1017.97   521.7 1017.99  522.29    1018
  522.35    1018  522.94 1018.01  526.77  1018.3  528.04  1018.3  533.28 1018.02
     544 1018.89  550.39 1018.89  551.91 1018.89  555.23 1018.89  557.34  1018.8
  558.08 1018.74  566.13 1018.53  566.87  1018.5  574.74 1017.54  596.49 1017.83
  600.65 1017.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   26.83    .035  517.59    .042
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```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         26.83  517.59          549.14  549.14  549.14             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   22.41 1023.71       F
  523.03  600.65 1024.02       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -966

INPUT
Description:
Station Elevation Data    num=     198
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1018.4    6.98  1018.4   18.72 1018.32   24.16 1018.33    29.6 1018.26
   31.59 1018.21   32.34    1018   35.17 1017.36   37.46    1017   40.89 1016.18
    41.6 1015.58   43.64 1015.46   43.84 1015.09   45.35 1015.04   46.24 1015.13
   47.11 1014.86   50.74 1014.17   52.05    1014   52.25    1014   55.59 1013.34
    56.1 1013.36   57.77 1013.36   59.02    1013   61.04    1013    62.5    1013
   62.65 1012.55   62.87 1012.48   63.93 1012.38   64.38 1012.45   66.68 1012.44
   68.62 1011.72   68.96 1011.68   69.75 1011.68   71.07 1011.38   71.66 1011.31
   74.69 1010.99   77.36 1010.74   77.62 1010.67   77.92 1010.67   78.15 1010.63
   78.43 1010.59   82.05 1009.85   83.38 1009.56   84.83 1009.42   86.78 1009.44
   91.71 1009.24   92.08 1009.11   92.25 1009.11   97.43 1008.03   97.54 1007.99
   101.2 1007.82  101.64 1007.83  106.27 1006.79  106.38    1006  106.46    1006
  110.74 1006.07  112.86 1006.06  114.67 1006.06  115.76 1006.09  121.63 1006.21
  121.71 1006.11  121.95  1006.1  122.01 1005.98   122.2 1005.89  122.29 1005.85
  122.43 1005.85  122.64 1005.85  125.16 1005.85  129.22    1006  129.73    1006
   129.9 1006.08  130.35 1006.13  130.44 1006.13  130.68 1006.64  132.98 1006.64
  134.65 1006.56  237.75 1006.62  254.78 1006.62   254.8  1006.6  256.24 1006.61
   258.9 1006.63  322.09 1006.44  335.58 1006.22  337.47 1006.19  339.25 1006.08
  342.01 1005.99  351.55    1006  352.17 1006.01     357 1006.03  357.66 1006.03
  358.51 1005.99  359.05 1006.12  360.71 1006.19  362.21 1006.21  363.24 1006.68
  364.17    1007  366.98 1007.45     367 1007.45  367.08 1007.46  373.62 1007.68
  376.71 1007.52  380.64 1007.45  381.73 1007.45  382.38 1006.99  385.64 1006.99
  389.08 1006.99  390.07    1007  390.42 1007.25  398.88 1007.37  402.69 1007.37
  407.38 1007.26  408.39 1007.14  409.22 1007.14  410.66 1007.14  417.27 1007.35
   422.8 1007.71  423.45 1007.72  424.82 1007.75  427.93    1008  428.63 1008.06
  429.26 1008.49  431.25  1008.5  436.58 1008.29  443.15 1008.73  444.63 1008.77
  445.22 1009.04  445.97  1009.1  447.51 1009.12  451.44 1009.26  451.75 1010.68
  452.13 1010.69  455.59  1010.9  455.85 1010.97  456.08 1011.01  458.37  1012.4
  459.22 1012.41   460.8 1012.52  461.94  1013.5  462.27 1013.66  462.32 1014.06
  463.03 1014.13  463.57 1014.27  465.09 1015.42  465.95 1015.43  466.54 1015.84
  471.82 1015.87  480.56    1016  480.62 1016.01  492.12 1016.25     500 1016.37
  502.55 1016.41  506.55 1016.48  511.11  1016.7  514.35  1016.7  515.76 1016.66
  530.01    1017  536.98    1017  539.09 1017.01   539.4 1017.01  539.62 1017.06
  541.85 1016.97  543.34  1016.9  544.11  1016.9   544.6 1016.95  544.62 1016.95
  544.77 1016.95  545.06 1016.96   547.6    1017  547.68 1017.05  552.63 1017.24
  559.12 1017.24  559.17 1017.24  565.01 1017.28  566.21 1017.27  568.52 1017.21
  572.75  1017.4  577.63 1017.42  578.21 1017.42  581.16 1017.38  582.22  1017.4
  586.94 1017.62   592.3 1017.67  594.29 1017.67   594.5 1017.67   594.6 1017.77
  604.65 1017.58  604.87 1017.58  605.44 1017.58  608.61 1017.51  633.18 1017.07
  636.55    1017  640.39 1016.82  641.26  1016.8  641.77 1016.79  641.98 1016.78
  642.14 1016.79  643.36 1016.76  645.28 1016.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   32.34    .035  536.98    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         32.34  536.98          446.71  446.71  446.71             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   28.58 1020.48       F
  543.87  645.28 1020.94       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC          RS: -1415

INPUT
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```
Description: Via Montezuma Removal to Natural Surface
Station Elevation Data    num=     277
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1015.16    3.54 1015.18    5.68 1015.16   11.07 1015.12   15.77 1015.08
   16.48 1015.08    16.7 1015.06   16.93 1015.06   20.58 1014.74   26.64 1014.74
   29.29 1014.76   37.06 1014.82   42.55 1014.66   45.37 1014.62    53.1 1014.53
   54.63 1014.23   57.08 1014.08   58.59 1014.14   60.33 1014.14   63.33 1013.87
    64.6 1013.81   66.46 1013.54   72.48 1013.59   74.53 1013.51   74.63  1013.5
   75.41 1013.49   76.07 1013.46   81.84 1013.08    86.1    1013   86.29 1012.97
   86.38 1012.96   86.54 1012.94   86.61    1012   87.22 1012.84   88.26 1012.07
   88.76 1012.07   89.06 1012.35    89.2 1012.29   89.45  1012.1   89.89 1012.06
   90.07 1012.19   90.26  1012.2   90.82 1011.65   91.83    1011   93.59 1010.81
   94.47 1010.66   95.37 1010.66   96.24  1010.3   97.37 1010.68   98.27 1010.57
   99.17 1009.75   99.72 1009.45  100.05 1009.45  101.32 1009.19  102.68    1009
   103.4 1008.59  104.88 1008.32  108.06 1008.16  109.36    1008  109.83 1007.85
   110.2 1007.89  111.02 1007.82  116.57 1007.31  121.42 1006.94  125.51 1006.61
   126.8 1006.44  129.43 1006.32  129.53 1006.01  129.64 1005.99  130.75 1006.03
  131.71 1005.77  132.68  1005.7  133.61 1005.64   134.5 1005.64  134.63 1005.63
  143.05 1005.09  144.26 1004.64  146.61 1004.64  146.94 1004.64  147.83 1004.64
  148.33 1004.64   150.4 1004.64  150.74 1004.64  151.25 1004.64  152.92 1004.64
  154.05 1004.64  154.25 1004.64  155.22 1004.64  155.28 1004.64  156.55 1004.64
  156.65 1004.64  156.79 1004.64  163.09 1004.64  165.16 1004.64  165.65 1004.64
  169.18 1004.64  172.04 1004.64  175.02 1004.64  175.76 1004.64  176.81 1004.64
  177.76 1004.64  178.82 1004.64  183.51 1004.64   184.8 1004.64  185.78 1004.64
  189.45 1004.64   192.2 1004.64  194.24 1004.64  195.93 1004.64   197.1 1004.64
  197.58 1004.64  200.75 1004.64  201.79 1004.64   210.7 1004.64  215.95 1004.64
  228.33 1004.64   228.5 1004.64  228.68 1004.64  238.32 1004.66  238.69 1004.64
  239.01 1004.64  254.52 1004.64  263.01 1004.64  270.71 1004.64  274.94 1004.64
  277.45 1004.64  277.93 1004.64  278.71 1004.64  279.12 1004.64  280.23 1004.64
  281.24 1004.64  282.44 1004.64  282.84 1004.64  284.07 1004.64  285.47 1004.64
   285.9    1005  286.23 1005.15  286.56 1005.15  291.62 1005.32  296.03 1005.32
  297.27 1005.32  297.47 1005.28  297.63 1005.27  297.83 1005.27  301.02 1005.23
   304.9 1005.18  308.39 1005.17  308.51    1005   308.7    1005  308.97 1004.69
  309.21 1004.69  309.65 1004.69  309.88 1004.69  311.12 1004.69  312.81 1004.69
  313.35 1004.69  314.35 1004.69  315.02 1005.09  315.58 1005.03  315.64 1005.04
  322.02 1005.12  324.08  1005.2  327.29 1005.22  334.15 1005.28  336.45 1005.37
   340.7  1005.4     342 1005.37  342.18 1005.39  342.41 1005.39  344.34 1004.62
  344.37 1004.62  346.89 1004.62  347.17 1004.62  348.45 1004.62  354.22 1004.62
  360.19 1004.62  360.67 1004.62  362.21 1004.62  363.35 1004.62  367.59 1004.62
  371.48 1004.62  372.54 1004.62  373.86 1004.62  380.22 1004.62  382.12 1004.62
  382.98 1004.62  384.43 1004.62  385.81 1004.62  387.42 1004.62  387.79 1004.62
  388.81 1004.62  389.09 1004.62  389.28 1004.62  389.44 1004.62  389.76 1004.62
   393.1 1005.27  396.45 1005.57  397.84 1005.82  400.06 1005.97  400.78    1006
  402.41  1006.3  402.81 1006.34  404.12 1006.51  405.98 1006.74  408.71 1006.76
  412.69 1007.39  413.97  1007.5  416.41    1008  418.75    1008   418.8 1008.01
  423.03 1008.59  423.24 1008.62  423.42 1009.04     424    1009  424.95 1008.94
   425.9 1009.22  426.03 1009.25  427.64 1009.62  429.23    1010  430.53 1010.49
  431.27 1011.04  432.79    1011   432.8    1011  434.99  1011.7  435.96    1012
   436.8 1012.26  436.95 1012.31   437.1 1012.35  437.24 1012.39  437.41 1012.44
  437.53 1012.48   437.6  1012.5  437.66 1012.51  437.73 1012.53   437.8 1012.55
   437.9 1012.58  438.13    1013  438.22 1012.67  438.26    1013  439.45    1013
  439.56 1013.11  439.85  1013.1   439.9 1013.11  441.16 1013.38  443.38 1013.31
  443.49 1013.32  443.56 1013.87  444.22    1014  444.75 1014.26   445.4 1014.31
  446.21 1014.66  446.61 1014.64  448.21 1014.58  448.57  1014.7  450.27    1015
  450.78 1015.15  450.94 1015.18   451.5  1015.2  451.57 1015.21  452.04 1015.26
  452.24 1015.14  455.38 1015.16  456.25 1015.75  457.37 1015.78  459.42 1015.98
  459.77 1016.03  461.34 1016.14  461.57 1016.13  462.57  1016.1  463.35 1016.09
     464 1016.06  465.88    1016  466.29 1015.99  466.46    1016   467.9 1015.98
  468.31 1015.99  468.97 1015.99

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042   11.07    .035  459.42    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        11.07  459.42            42.27   42.27   42.27             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    9.64 1019.22       F
  462.05  468.97 1018.55       F

CROSS SECTION


RIVER: Murrieta Creek
REACH: Main - EC         RS: -1451
```

INPUT
Description: Via Montezuma Removal to Natural Surface
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1012.44	7.89	1012.44	9.52	1011.97	9.58	1011.97	11.91	1011.87
20.7	1011.51	23.65	1011.3	23.72	1011.3	33.71	1010.66	36.94	1010.32
47.65	1009.59	47.86	1009.44	54.55	1009.03	55.08	1008.87	62.21	1008.58
63.57	1008.48	68.18	1008.25	72.62	1008	86.63	1007.28	90.61	1007.26
91.39	1007.02	95.47	1006.74	98.56	1006.6	106.46	1006.31	116.59	1006
117.08	1006.06	118.72	1005.93	125.01	1005.7	127.27	1005.46	134.78	1005.34
142.65	1005.25	147.59	1005.03	148.12	1004.92	150.74	1004.78	153.68	1004.74
154.47	1004.64	155.55	1004.64	157.3	1004.64	157.59	1004.64	157.8	1004.64
158.68	1004.64	158.73	1004.64	162.51	1004.64	164.38	1004.64	164.82	1004.64
165.06	1004.64	167.56	1004.64	174.29	1004.64	176.38	1004.64	180.38	1004.64
187.87	1004.64	191.53	1004.64	193.14	1004.64	209.69	1004.61	209.95	1004.61
225.33	1004.61	238.67	1004.64	240.36	1004.64	243.98	1004.54	247.84	1004.54
248.81	1004.6	250.78	1004.6	251.14	1004.6	266.4	1004.64	283.07	1004.64
298.49	1004.61	308.65	1004.63	309.27	1004.64	311.32	1004.64	311.56	1004.64
311.83	1004.64	312.08	1004.64	312.36	1004.64	314.5	1004.64	314.87	1004.64
315.28	1004.64	320.72	1004.64	322.57	1004.64	326.2	1004.64	330.78	1004.64
332.01	1004.64	336.07	1004.64	337.13	1004.64	338.48	1004.64	345.25	1004.64
346.01	1004.64	347.07	1004.64	348.39	1004.73	352.44	1004.64	355.16	1004.64
356.3	1004.92	357.81	1004.64	357.91	1004.64	358.99	1005.02	365.12	1005.23
365.13	1005.17	375.68	1005.36	387.28	1005.94	393.71	1005.94	394.12	1005.99
403.2	1006.31	408.27	1006.4	417.45	1006.52	424.81	1007.23	424.98	1007.24
425.54	1007.75	426.54	1007.75	435.24	1007.75	439.6	1007.61	442.79	1007.79
444.9	1007.99	445.13	1008.27	451.68	1008.55	456.24	1008.75	456.51	1008.88
459.56	1008.88	461.91	1008.8	463.1	1009.19	473.85	1009.68	476.51	1009.68

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	9.52	.035	473.85	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9.52	473.85	612.44	612.44	612.44	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	8.47	1013.32	F
474.8	476.51	1013.78	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: -2068

INPUT
Description:
Station Elevation Data num= 218

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1013.09	7.16	1013.16	11.22	1013.04	12.39	1013	14.78	1012.86
19.59	1013.01	24.92	1012.85	31.1	1012.94	34.95	1012.95	39.38	1012.92
41.28	1012.86	41.87	1012.82	42.8	1012.58	47.23	1012.56	47.41	1012.56
47.42	1012	48.31	1012.4	49.58	1011.06	49.76	1011.06	49.99	1011.05
50	1010.9	50.02	1010.9	50.25	1010.8	51.97	1010.08	52.15	1010
52.18	1009.84	52.9	1009.21	53.58	1010.18	53.79	1010.14	54	1008.91
54.06	1008.78	54.34	1009	54.91	1009	57.16	1008.33	57.31	1008.29
57.4	1009	57.82	1008.69	58.3	1008.69	58.92	1008.65	59.25	1008.76
59.56	1008.85	59.77	1009	60.4	1009	60.47	1009	61	1008.86
66.09	1008.53	67.22	1008	74.88	1007.89	76.07	1007.93	85.39	1007.37
91.27	1007.37	95.01	1007.41	95.33	1007.04	96.16	1007.07	96.72	1007.05
96.87	1007.05	97.26	1007	97.87	1007	102.77	1007	116.05	1006.2
119.67	1005.88	134.14	1005.46	135.58	1005.5	150.41	1005.3	168.03	1004.77
170.48	1004.77	176.56	1004.47	182.44	1004.33	195.18	1004.6	205.17	1004.54
208.09	1004.35	211.17	1004.38	217.79	1004.45	227.52	1004.37	228.51	1004.01
228.57	1004	228.64	1003.99	230.93	1003.26	231.82	1003.15	232.83	1003.08
233.29	1003.06	234.42	1003.07	234.8	1003.07	238.88	1003.05	243.37	1003.05
244.91	1003.05	245.55	1003.39	246.44	1003.39	248.77	1003.26	251.67	1003.39
253.12	1003.77	253.61	1003.9	254.25	1004.2	254.61	1004.28	259.46	1004.28
259.99	1004.19	261.06	1004.19	261.78	1004.3	262.24	1004.3	289.29	1004.27
314.81	1004.17	314.91	1004.17	315.26	1004	315.48	1004	315.62	1003.89
315.96	1003.86	316.07	1003.73	316.34	1003.62	318.74	1003.62	320.55	1003.61
323.93	1003.59	324.1	1003.59	324.26	1003.59	324.37	1003.59	324.7	1003.59
324.88	1004	325	1004	326.41	1003.84	326.6	1003.59	326.85	1003.59
327.27	1003.61	329.35	1003.59	330.27	1003.59	331.41	1003.59	332.2	1004.19
332.3	1004.21	332.41	1004.08	333.52	1004.11	338.12	1004.19	345	1004.09
345.62	1004.08	345.72	1004.11	346.18	1004.11	353.02	1004.1	355.67	1004.11

357.91	1004.11	358.04	1004.08	358.09	1003.73	358.63	1003.71	359.02	1003.59
359.4	1003.59	363.35	1003.59	365.65	1003.59	365.93	1003.81	366.26	1003.81
366.42	1004	366.63	1004.27	381.95	1004.27	453.52	1004.27	455.5	1004.42
464.75	1004.83	467.1	1005	468.09	1005	469.88	1005.31	472.51	1005.9
481.15	1006	481.2	1006.15	485.93	1006.15	488.37	1006.24	498.64	1006.17
499.29	1006.17	500	1006.38	500.1	1006.41	507.92	1007	512.95	1007
516.85	1007	517.71	1007.06	518.09	1007.49	525.65	1007.87	528.4	1008.08
531	1008.23	538.59	1008.73	540.13	1009.19	540.53	1009.19	544.63	1009.5
545.71	1009.58	551.24	1009.71	551.95	1009.71	552.37	1010	554.78	1010
555.09	1010	560.23	1010.43	568.28	1011.04	578.64	1011.94	579.38	1012.56
586.17	1012.94	587.2	1013.03	587.38	1013.02	594.48	1014	594.92	1014
599.83	1014.26	600.86	1014.31	601.1	1014.85	603.17	1015	607.19	1015.54
610.42	1015.54	610.95	1015.77	644.07	1015.84	652.26	1015.89	656.71	1015.92
660.31	1015.95	661.85	1015.96	664.63	1016.01	667.14	1016.01	668.98	1015.9
672.02	1015.94	675.45	1015.97	681.81	1015.84	684.68	1015.84	687.61	1015.87
701.14	1015.75	712.04	1015.79	723.42	1015.75	724.07	1015.58	724.61	1015.58
737.3	1015.51	743.15	1015.54	744.37	1015.54				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.042	41.28	.035	610.95	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
41.28	610.95	368.66	368.66	368.66	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	36.09	1018.9	F
618.04	744.37	1019.43	F

CROSS SECTION

RIVER: Murrieta Creek
REACH: Main - EC RS: -2437

INPUT
Description:
Station Elevation Data num= 202

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1012.11	1.07	1012.11	1.22	1012.11	5.71	1012.18	12.82	1012.37
24.09	1012.39	25.08	1012.39	25.99	1012.08	36.81	1012	36.88	1012.06
39.37	1012.06	40.97	1012.16	50.1	1012.14	52.82	1012.14	58.02	1012.13
58.56	1012.13	58.81	1011.89	59.65	1010.62	60.04	1010.53	60.61	1010
60.89	1009.45	61.26	1009.33	61.34	1009.28	61.97	1008.99	62.08	1008.97
62.3	1008.96	62.54	1008.94	63.28	1008.35	63.61	1008.45	64.26	1008.04
64.38	1007.95	64.83	1007.77	64.95	1007.57	65.7	1007.52	67.49	1007.97
69.96	1007.31	73.37	1006.87	74.66	1007.15	74.91	1007.16	85.59	1007
87.4	1006.88	87.83	1006.89	88.92	1006.41	90.3	1006.37	94.52	1006.34
99.8	1006.53	107.15	1006.37	120.12	1006	120.15	1005.87	123.34	1005.94
126.53	1005.95	127.33	1005.82	141.84	1005.64	144.41	1005.64	149.41	1005.64
154.35	1005.66	156.2	1005.7	163.99	1005.66	169.66	1005.64	176.35	1005.62
182.78	1005.53	189.06	1005.49	195.17	1005.32	200.85	1005.32	208.14	1005.31
212.02	1005.24	221.28	1005.22	224.02	1005.08	225.13	1005.05	228.82	1005.18
233.29	1005.32	235.71	1005.42	237.29	1005.36	240.34	1005.34	242.81	1005.34
244.15	1005	244.23	1005	244.6	1005	244.71	1005	244.93	1005.02
245.75	1005.02	248.44	1004.9	294.01	1004.31	298.6	1004.25	298.81	1004.25
298.95	1004.25	299.26	1004.17	300.08	1004.1	301.14	1003.97	301.34	1004
301.73	1003.95	302.6	1003.9	304.24	1003.71	306.28	1003.62	309.71	1003.62
313.19	1003.59	313.66	1003.78	314.19	1004	315.62	1004.35	316.16	1004.39
342.03	1005.03	355.02	1004.41	360.97	1004.13	363.39	1004	364.72	1004
463.89	1004.04	470.42	1003.33	475.19	1003.01	475.68	1003	476.25	1003.19
477.76	1002.67	478.03	1002.92	478.14	1003.06	478.22	1003.06	478.3	1003.15
480.56	1003.11	481.71	1003.1	481.81	1003.1	481.95	1003.05	482.36	1002.8
482.61	1002.68	484.11	1002.67	485.7	1002.96	485.9	1003	485.94	1003.02
487.97	1003.09	488.17	1004	489.02	1004.17	490.13	1004.99	490.46	1005
490.48	1005	491.94	1005	502.04	1005.65	512.66	1006.1	514.3	1006.13
519.39	1005.75	520.13	1005.99	526.62	1006.19	527.21	1006.19	529.43	1006.72
533.88	1006.78	534.79	1006.82	538.12	1007.3	539.24	1007.3	540.14	1007.4
541.6	1008	549.33	1008	549.45	1008.01	550.36	1008.06	559.19	1008.4
563.13	1008.4	565.32	1008.6	571.14	1008.77	571.82	1009.05	573.93	1009.2
578.28	1009.87	584.52	1010.13	585.69	1009.95	585.99	1011.02	595.51	1011.16
595.62	1011.16	598.28	1011.16	603.63	1011.71	607.24	1011.88	608.13	1012.11
609.77	1012.48	612.55	1012.48	615.08	1012.63	619.2	1013	623.46	1013.47
626.63	1014.07	627.44	1014.15	631.02	1014.77	633.16	1014.84	636.65	1015
636.84	1015.01	639.13	1015.25	640.03	1015.25	642.33	1015	644.41	1015
658.11	1015	663.52	1015	667.14	1014.82	669.08	1014.17	694.63	1014.09
700.6	1014.09	706.55	1014.07	707.26	1014.07	707.35	1014.07	707.54	1014.07

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  707.55 1014.07  708.86 1014.08  712.78 1014.12   718.9 1014.18  719.11 1014.18
  719.66 1014.06  728.09 1014.29  728.22 1014.21  728.39 1013.93  730.41 1013.88
  732.03    1014  736.85    1014

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .042    50.1    .035  636.65    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          50.1  636.65                0       0       0             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   46.01 1018.27       F
  641.63  736.85  1020.6       F
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SUMMARY OF MANNING'S N VALUES

River:Murrieta Creek

Reach	River Sta.	n1	n2	n3
Main - EC	3430	.042	.035	.042
Main - EC	3069	.042	.035	.042
Main - EC	2700	.042	.035	.042
Main - EC	2540	.042	.035	.042
Main - EC	2399	.042	.035	.042
Main - EC	2343	Bridge		
Main - EC	2295	.042	.035	.042
Main - EC	2022	.042	.035	.042
Main - EC	1737	.042	.035	.042
Main - EC	1265	.042	.035	.042
Main - EC	1130	.042	.035	.042
Main - EC	1000	.042	.035	.042
Main - EC	954	Bridge		
Main - EC	912	.042	.035	.042
Main - EC	642	.042	.035	.042
Main - EC	343	.042	.035	.042
Main - EC	-16	.042	.035	.042
Main - EC	-417	.042	.035	.042
Main - EC	-966	.042	.035	.042
Main - EC	-1415	.042	.035	.042
Main - EC	-1451	.042	.035	.042
Main - EC	-2068	.042	.035	.042
Main - EC	-2437	.042	.035	.042

SUMMARY OF REACH LENGTHS

River: Murrieta Creek

Reach	River Sta.	Left	Channel	Right
Main - EC	3430	360.57	360.57	360.57
Main - EC	3069	368.55	368.55	368.55
Main - EC	2700	161.15	161.15	161.15
Main - EC	2540	141.07	141.07	141.07
Main - EC	2399	103.93	103.93	103.93
Main - EC	2343	Bridge		
Main - EC	2295	272.93	272.93	272.93
Main - EC	2022	284.86	284.86	284.86
Main - EC	1737	471.89	471.89	471.89
Main - EC	1265	137.3	137.3	137.3
Main - EC	1130	131.85	131.85	131.85
Main - EC	1000	85.15	85.15	85.15
Main - EC	954	Bridge		
Main - EC	912	267.2	267.2	267.2
Main - EC	642	298.19	298.19	298.19
Main - EC	343	358.82	358.82	358.82
Main - EC	-16	401.42	401.42	401.42
Main - EC	-417	549.14	549.14	549.14
Main - EC	-966	446.71	446.71	446.71
Main - EC	-1415	42.27	42.27	42.27
Main - EC	-1451	612.44	612.44	612.44

Main - EC	-2068	368.66	368.66	368.66
Main - EC	-2437	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Murrieta Creek

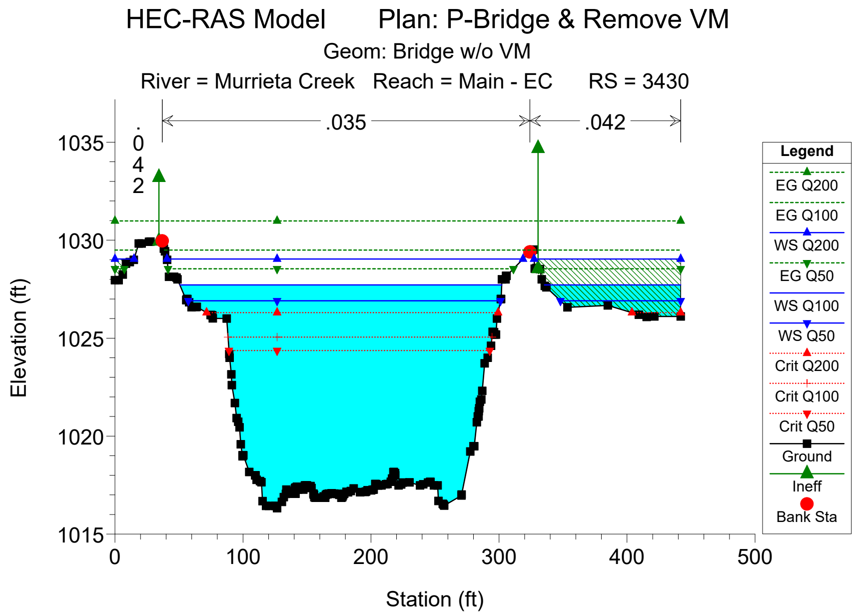
Reach	River Sta.	Contr.	Expan.
Main - EC	3430	.1	.3
Main - EC	3069	.1	.3
Main - EC	2700	.1	.3
Main - EC	2540	.1	.3
Main - EC	2399	.1	.3
Main - EC	2343	Bridge	
Main - EC	2295	.1	.3
Main - EC	2022	.1	.3
Main - EC	1737	.1	.3
Main - EC	1265	.3	.5
Main - EC	1130	.1	.3
Main - EC	1000	.3	.5
Main - EC	954	Bridge	
Main - EC	912	.3	.5
Main - EC	642	.1	.3
Main - EC	343	.1	.3
Main - EC	-16	.1	.3
Main - EC	-417	.1	.3
Main - EC	-966	.1	.3
Main - EC	-1415	.1	.3
Main - EC	-1451	.1	.3
Main - EC	-2068	.1	.3
Main - EC	-2437	.1	.3

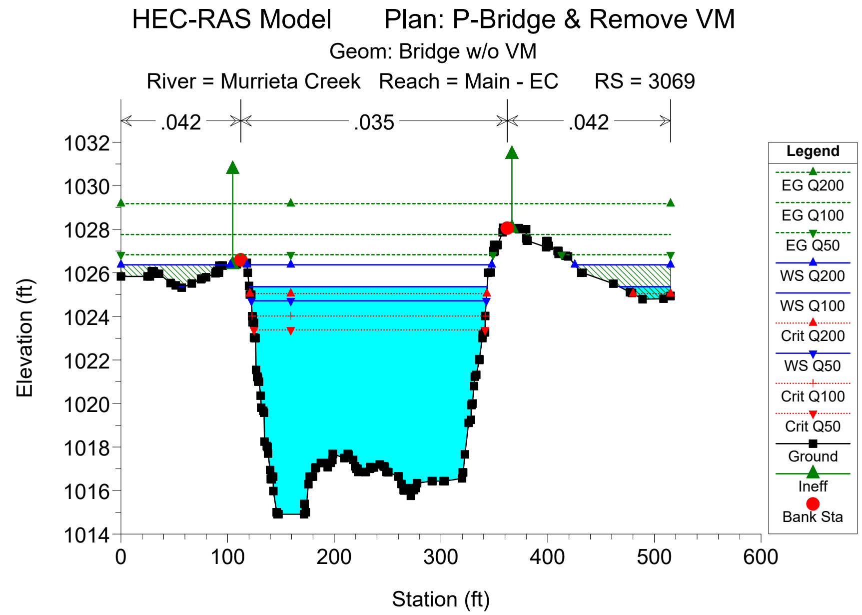
Profile Output Table - ERSC

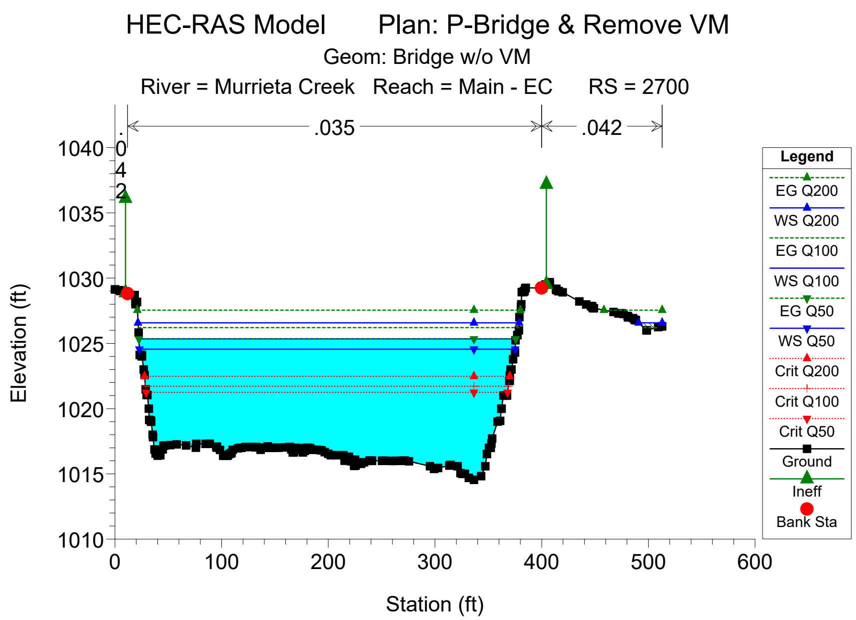
Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Area (sq ft)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Mann Wtd Chnl
Main - EC	3430	Q100	22300.00	1027.72	0.003943	10.71	2210.31	2081.73	357.95	0.66	0.035
Main - EC	3430	Q200	27200.00	1029.04	0.003984	11.18	2717.19	2434.84	407.65	0.67	0.035
Main - EC	3430	Q50	19300.00	1026.91	0.003967	10.26	1928.39	1880.99	337.70	0.65	0.035
Main - EC	3069	Q100	22300.00	1025.37	0.005583	12.41	1817.43	1796.99	275.97	0.77	0.035
Main - EC	3069	Q200	27200.00	1026.37	0.005811	13.44	2174.85	2023.41	421.60	0.80	0.035
Main - EC	3069	Q50	19300.00	1024.72	0.005412	11.67	1653.18	1653.18	220.10	0.75	0.035
Main - EC	2700	Q100	22300.00	1025.35	0.001829	7.44	2996.99	2996.99	353.43	0.45	0.035
Main - EC	2700	Q200	27200.00	1026.57	0.001761	7.92	3441.38	3433.26	379.18	0.45	0.035
Main - EC	2700	Q50	19300.00	1024.55	0.001887	7.11	2716.10	2716.10	352.20	0.45	0.035
Main - EC	2540	Q100	22300.00	1024.69	0.002463	8.59	2596.15	2596.15	307.37	0.52	0.035
Main - EC	2540	Q200	27200.00	1025.87	0.002402	9.18	2961.50	2961.50	310.38	0.52	0.035
Main - EC	2540	Q50	19300.00	1023.93	0.002471	8.17	2363.02	2363.02	302.78	0.52	0.035

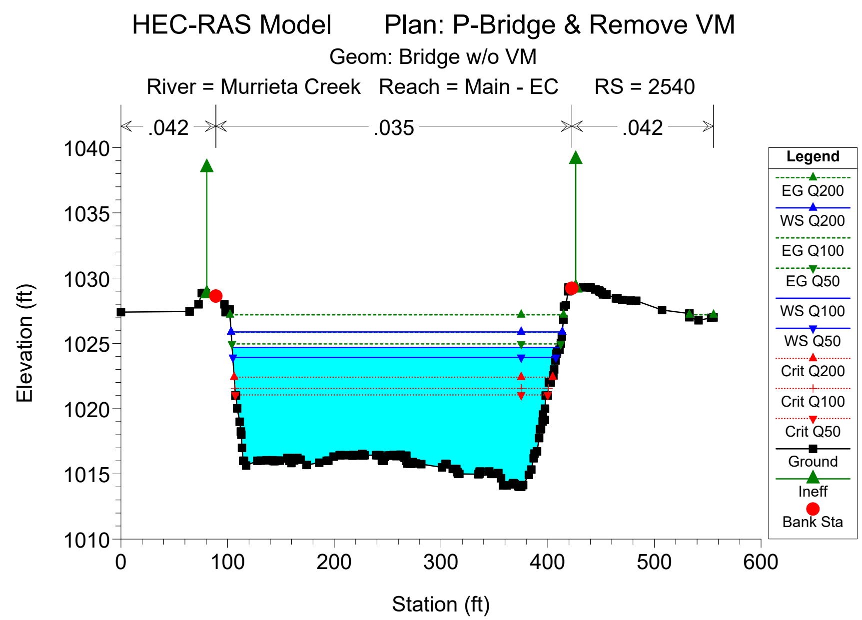
Main - EC	2399		Q100	22300.00	1024.44	0.002087	8.22	2714.31	2714.31	297.39	0.48	0.035
Main - EC	2399		Q200	27200.00	1025.62	0.002100	8.87	3066.87	3066.87	299.99	0.49	0.035
Main - EC	2399		Q50	19300.00	1023.68	0.002049	7.75	2489.81	2489.81	293.79	0.47	0.035
Main - EC	2343	Winchester Road		Bridge								
Main - EC	2295		Q100	22300.00	1023.67	0.002473	8.72	2557.80	2557.80	293.33	0.52	0.035
Main - EC	2295		Q200	27200.00	1024.81	0.002490	9.40	2894.87	2894.87	297.57	0.53	0.035
Main - EC	2295		Q50	19300.00	1022.94	0.002456	8.23	2344.15	2344.15	292.18	0.51	0.035
Main - EC	2022		Q100	22300.00	1022.71	0.003124	9.38	2519.70	2377.71	406.73	0.58	0.035
Main - EC	2022		Q200	27200.00	1023.86	0.003039	10.01	2996.58	2717.32	419.21	0.58	0.035
Main - EC	2022		Q50	19300.00	1021.98	0.003165	8.92	2247.17	2164.15	349.72	0.58	0.035
Main - EC	1737		Q100	22300.00	1022.08	0.002480	8.57	2776.29	2602.40	434.67	0.52	0.035
Main - EC	1737		Q200	27200.00	1023.25	0.002456	9.19	3292.91	2963.94	444.81	0.52	0.035
Main - EC	1737		Q50	19300.00	1021.33	0.002489	8.12	2460.27	2377.60	414.07	0.51	0.035
Main - EC	1265		Q100	22300.00	1021.07	0.002189	8.09	2757.91	2757.91	332.44	0.49	0.035
Main - EC	1265		Q200	27200.00	1022.29	0.002159	8.58	3171.84	3171.84	346.47	0.50	0.035
Main - EC	1265		Q50	19300.00	1020.32	0.002162	7.69	2511.24	2511.24	323.67	0.49	0.035
Main - EC	1130		Q100	22300.00	1020.71	0.002224	8.24	2706.25	2706.25	321.38	0.50	0.035
Main - EC	1130		Q200	27200.00	1021.91	0.002198	8.78	3098.81	3098.81	331.45	0.51	0.035
Main - EC	1130		Q50	19300.00	1019.98	0.002203	7.81	2472.67	2472.67	316.37	0.49	0.035
Main - EC	1000		Q100	22300.00	1020.22	0.002738	8.80	2532.80	2532.80	316.84	0.55	0.035
Main - EC	1000		Q200	27200.00	1021.45	0.002756	9.23	2984.44	2947.62	390.99	0.56	0.035
Main - EC	1000		Q50	19300.00	1019.54	0.002429	8.28	2331.07	2331.07	292.23	0.52	0.035
Main - EC	954	Overland Drive		Bridge								
Main - EC	912		Q100	22300.00	1019.52	0.003214	9.66	2308.49	2308.49	283.06	0.60	0.035
Main - EC	912		Q200	27200.00	1020.51	0.003836	10.45	2603.52	2601.77	339.46	0.65	0.035
Main - EC	912		Q50	19300.00	1018.93	0.003054	9.01	2141.45	2141.45	280.66	0.58	0.035
Main - EC	642		Q100	22300.00	1019.05	0.002459	7.63	2922.07	2922.07	418.02	0.51	0.035
Main - EC	642		Q200	27200.00	1020.04	0.002450	8.14	3370.87	3342.45	479.87	0.52	0.035

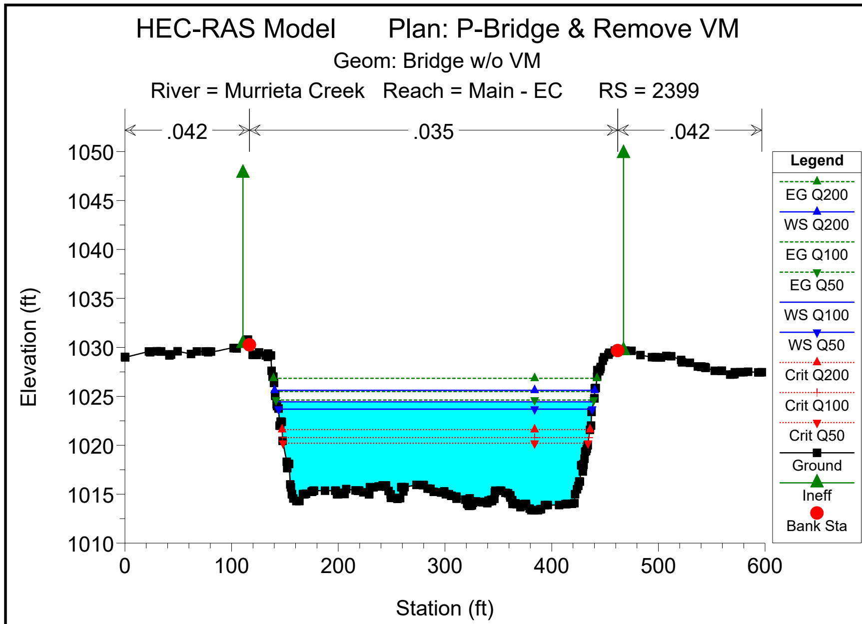
Main - EC	642		Q50	19300.00	1018.42	0.002471	7.25	2662.16	2662.16
412.53	0.50	0.035							
Main - EC	343		Q100	22300.00	1017.66	0.003948	9.25	2441.85	2409.52
448.18	0.64	0.035							
Main - EC	343		Q200	27200.00	1018.61	0.003841	9.85	2880.24	2760.86
479.96	0.64	0.035							
Main - EC	343		Q50	19300.00	1017.09	0.003925	8.77	2200.64	2200.04
375.68	0.63	0.035							
Main - EC	-16		Q100	22300.00	1016.72	0.002792	7.99	2790.71	2790.71
410.37	0.54	0.035							
Main - EC	-16		Q200	27200.00	1017.69	0.002863	8.51	3196.90	3196.90
435.52	0.55	0.035							
Main - EC	-16		Q50	19300.00	1016.11	0.002837	7.59	2541.17	2541.17
408.59	0.54	0.035							
Main - EC	-417		Q100	22300.00	1015.88	0.002131	7.14	3121.81	3121.81
445.39	0.48	0.035							
Main - EC	-417		Q200	27200.00	1016.86	0.002128	7.64	3561.19	3561.19
458.83	0.48	0.035							
Main - EC	-417		Q50	19300.00	1015.25	0.002130	6.79	2843.49	2843.49
437.97	0.47	0.035							
Main - EC	-966		Q100	22300.00	1014.50	0.002451	7.65	2916.19	2916.19
414.88	0.51	0.035							
Main - EC	-966		Q200	27200.00	1015.46	0.002439	8.20	3315.39	3315.39
422.34	0.52	0.035							
Main - EC	-966		Q50	19300.00	1013.90	0.002429	7.24	2667.07	2667.07
409.53	0.50	0.035							
Main - EC	-1415	VM Removed	Q100	22300.00	1012.99	0.003051	8.71	2561.54	2561.54
352.07	0.57	0.035							
Main - EC	-1415	VM Removed	Q200	27200.00	1013.71	0.003601	9.63	2825.93	2825.93
378.25	0.62	0.035							
Main - EC	-1415	VM Removed	Q50	19300.00	1012.51	0.002826	8.06	2395.30	2395.30
350.42	0.54	0.035							
Main - EC	-1451	VM Removed	Q100	22300.00	1013.19	0.001987	6.89	3250.55	3238.12
476.51	0.46	0.035							
Main - EC	-1451	VM Removed	Q200	27200.00	1013.99	0.002054	7.53	3630.41	3630.41
476.51	0.48	0.035							
Main - EC	-1451	VM Removed	Q50	19300.00	1012.67	0.001930	6.45	3001.85	2994.74
476.51	0.45	0.035							
Main - EC	-2068		Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66
530.11	0.45	0.035							
Main - EC	-2068		Q200	27200.00	1012.77	0.002127	7.13	3814.61	3814.61
541.10	0.47	0.035							
Main - EC	-2068		Q50	19300.00	1011.54	0.001926	6.11	3157.72	3157.72
524.85	0.44	0.035							
Main - EC	-2437		Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54
511.52	1.00	0.035							
Main - EC	-2437		Q200	27200.00	1009.71	0.010932	11.91	2284.27	2284.27
516.46	1.00	0.035							
Main - EC	-2437		Q50	19300.00	1008.76	0.011961	10.74	1797.13	1797.13
507.88	1.01	0.035							

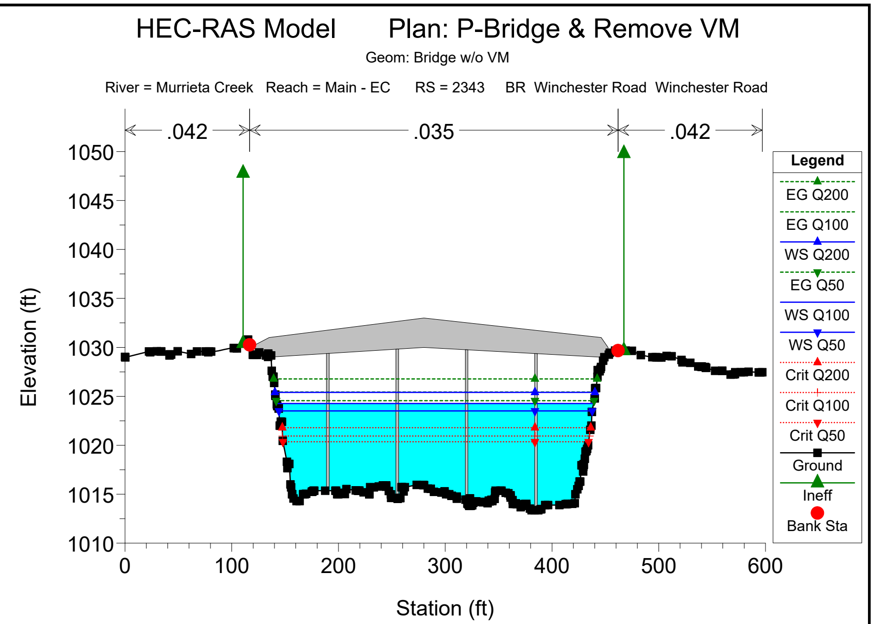

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 3430
.035
.042
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

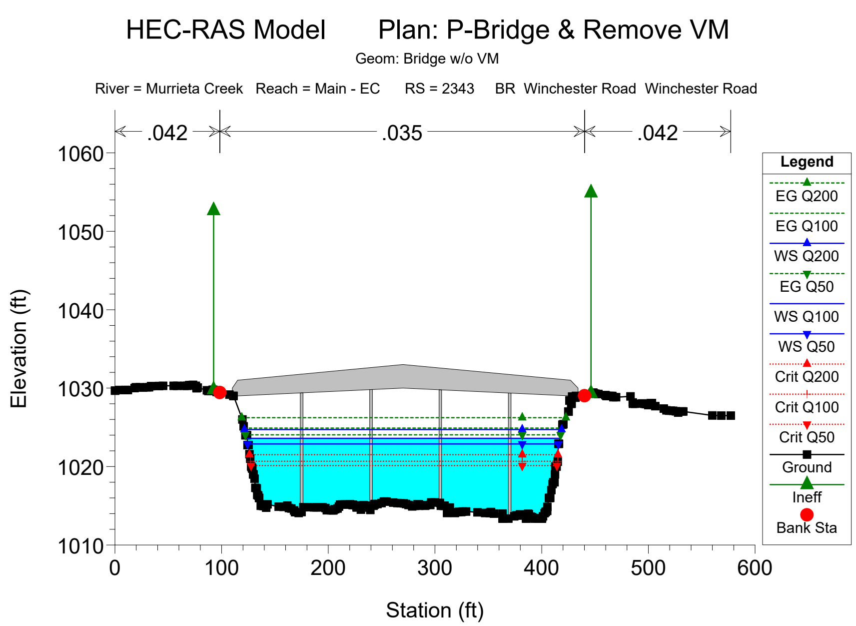

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 3069
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
EG Q50
WS Q200
WS Q100
Crit Q200
WS Q50
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

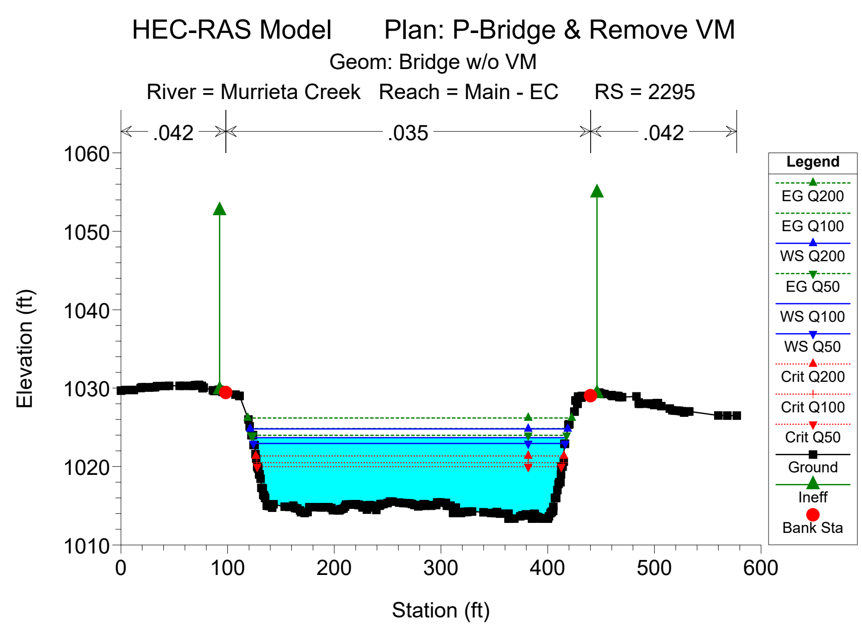

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 2700
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
WS Q100
EG Q50
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

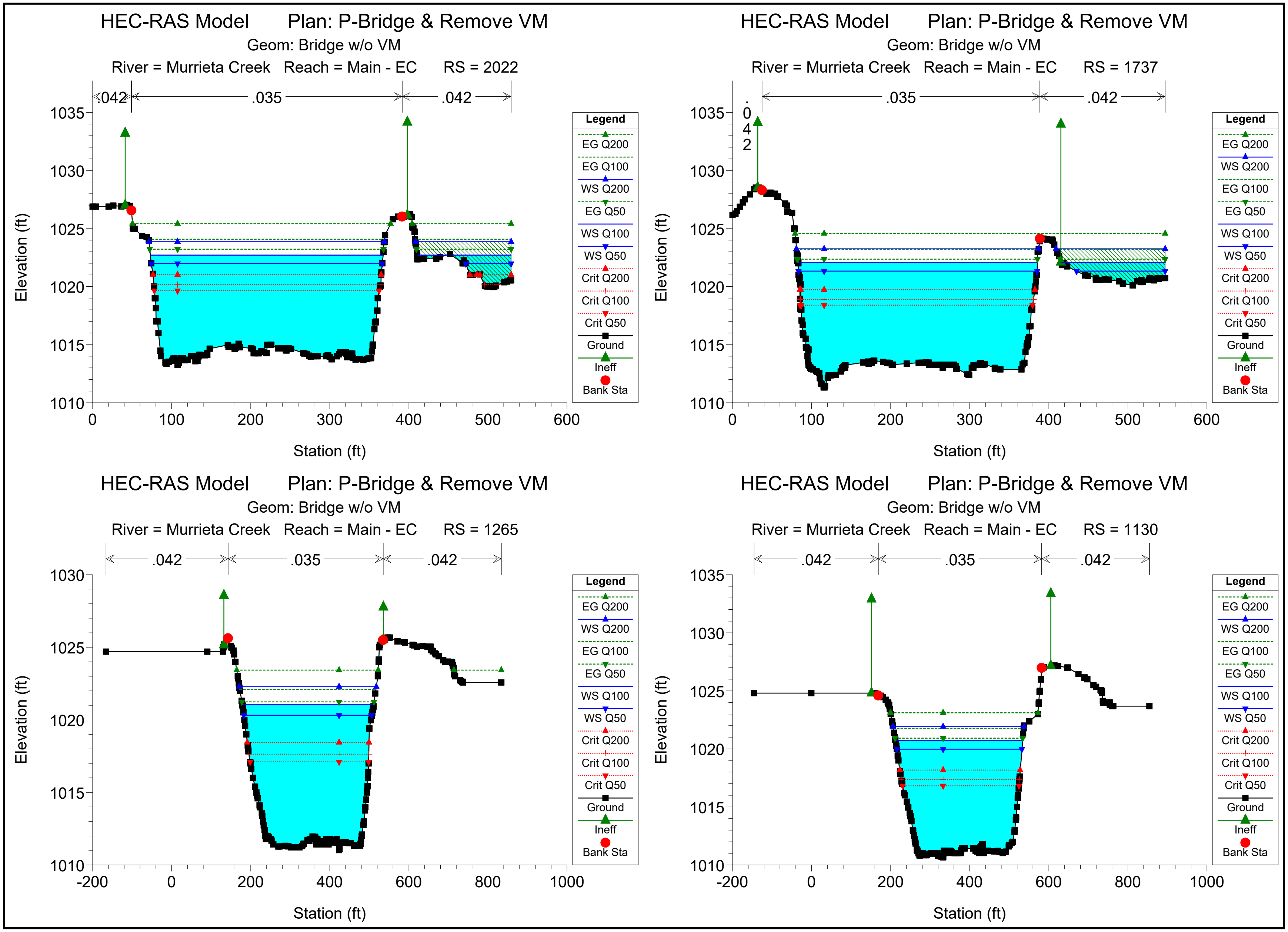

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 2540
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

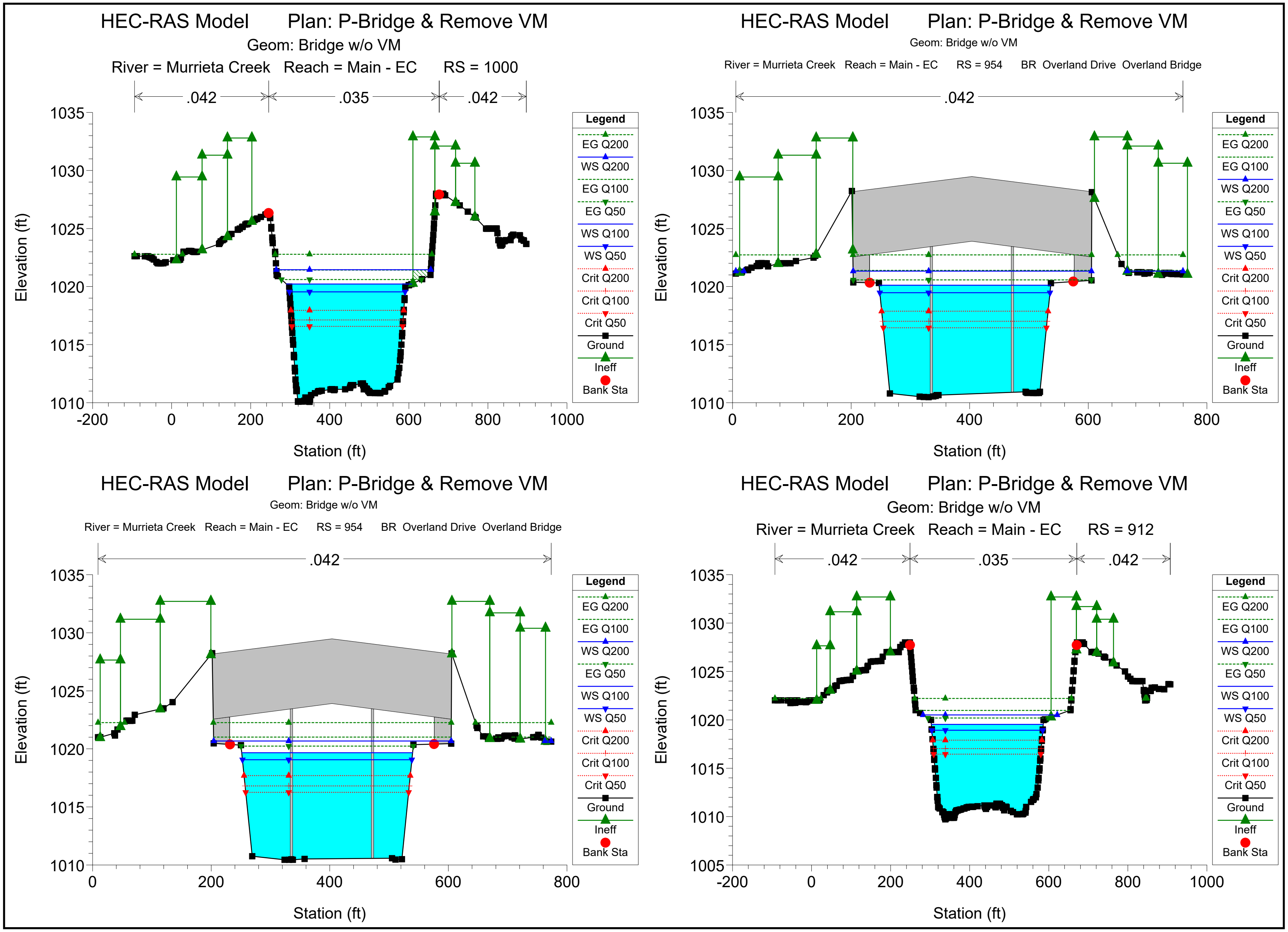

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 2399
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

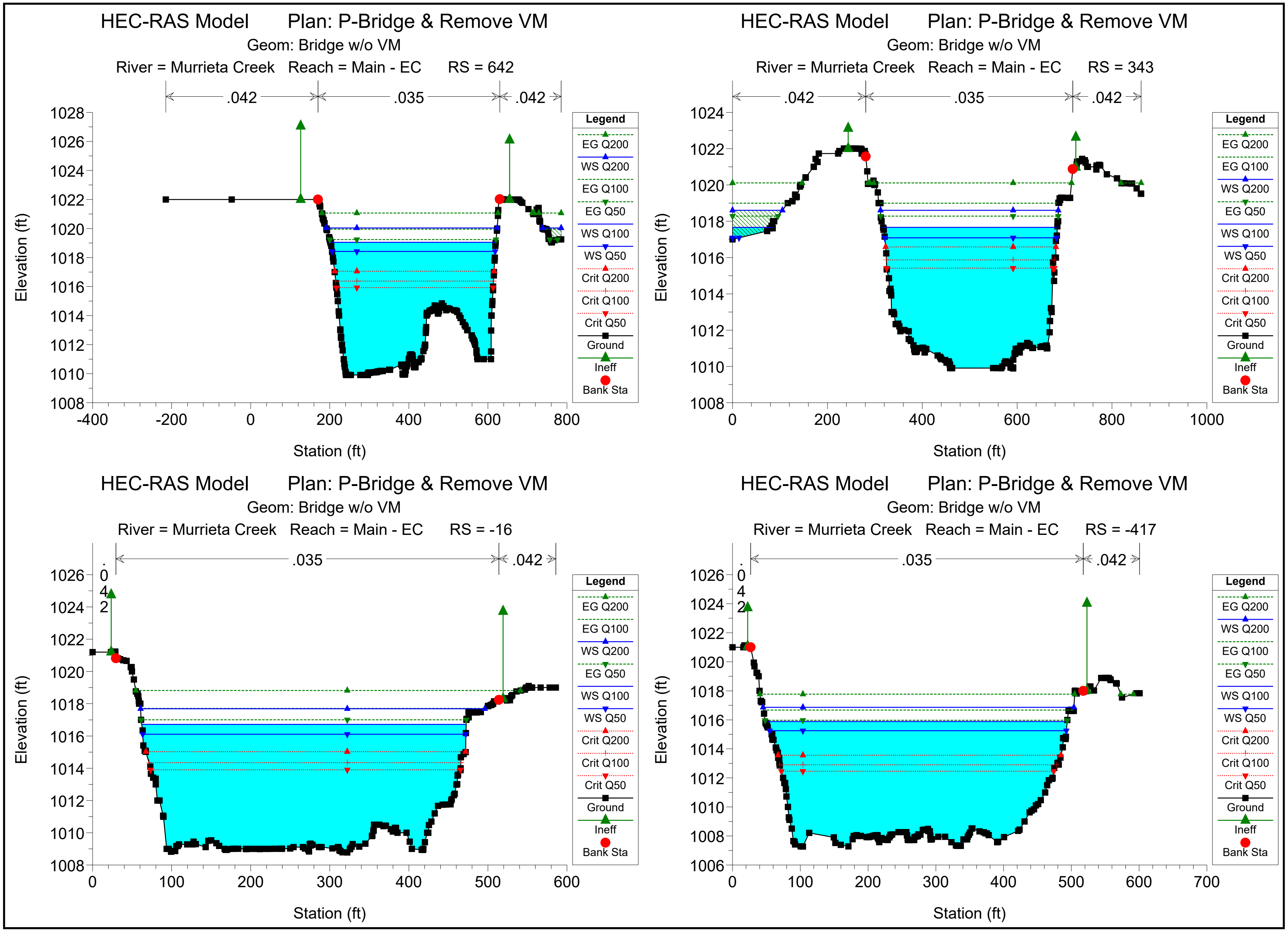

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 2343 BR Winchester Road Winchester Road
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

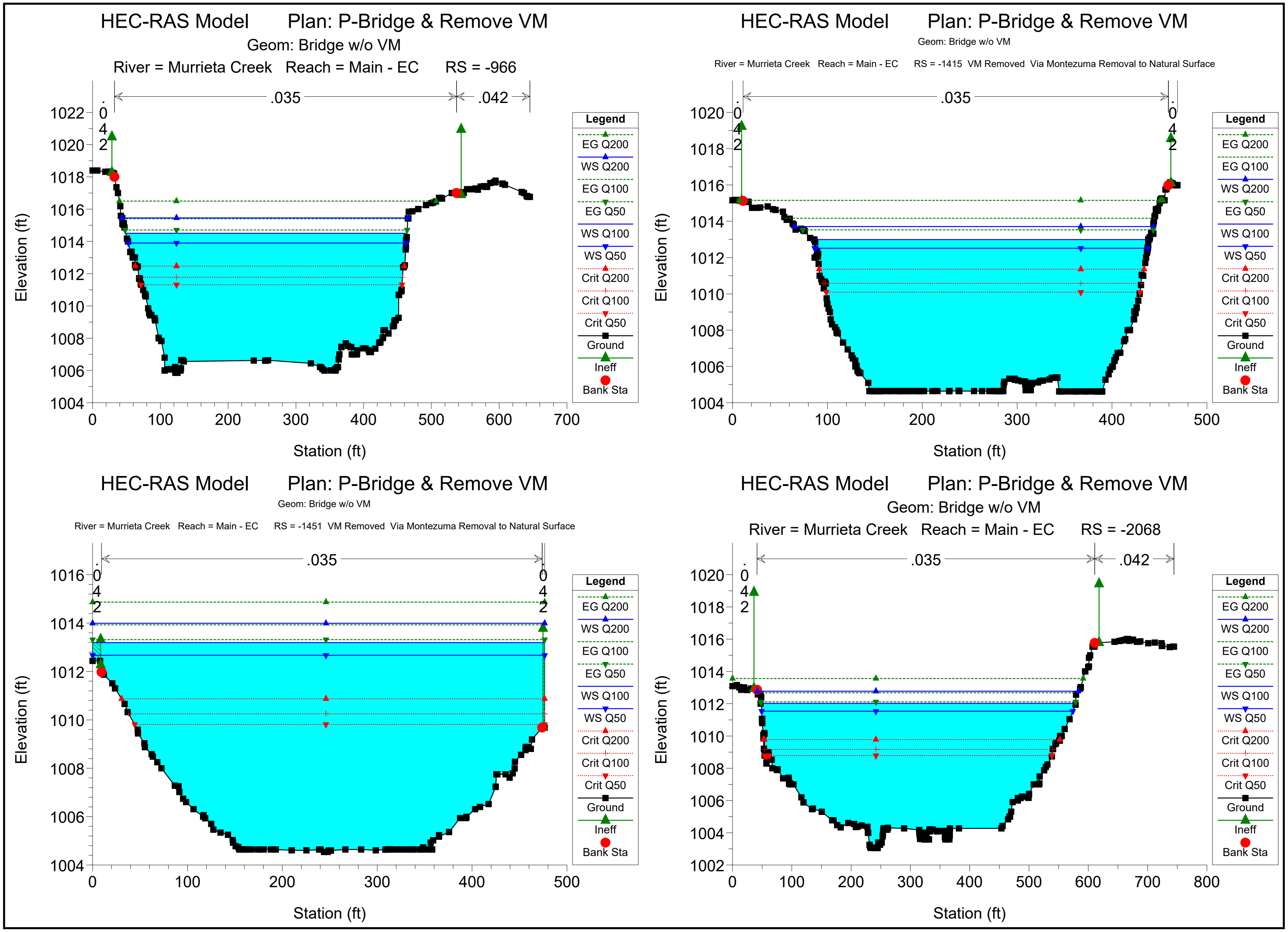

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 2343 BR Winchester Road Winchester Road
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

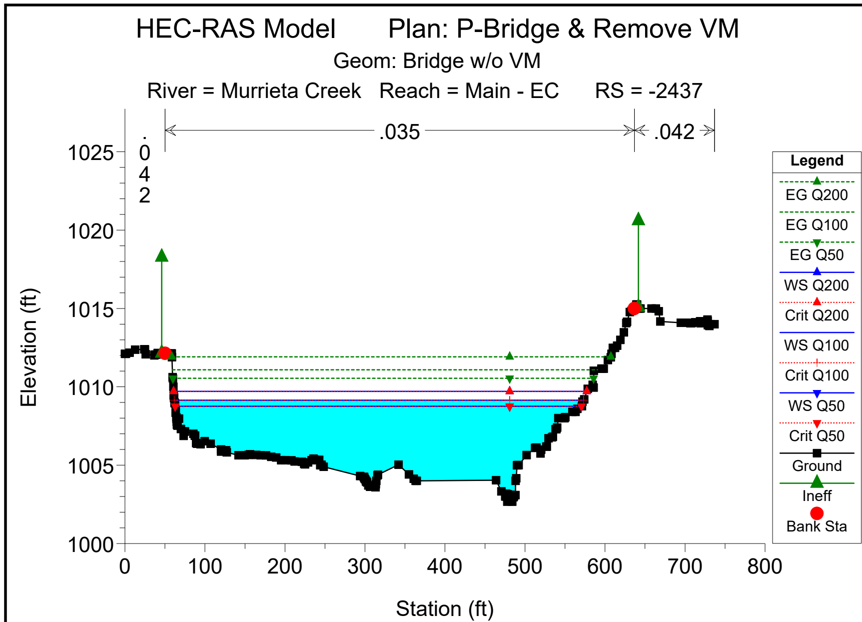

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 2295
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

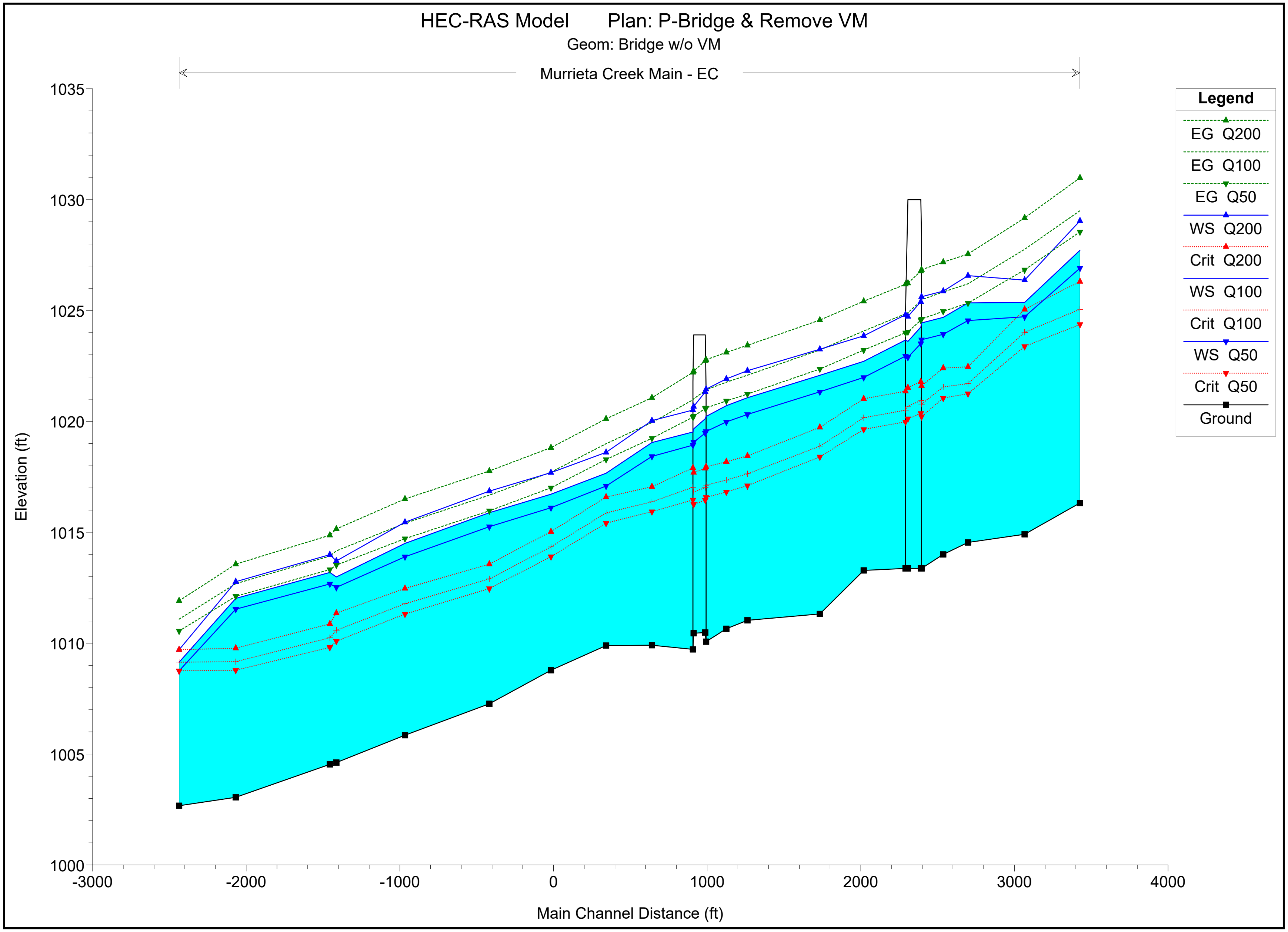

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 2022
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 1737
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 1265
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 1130
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta

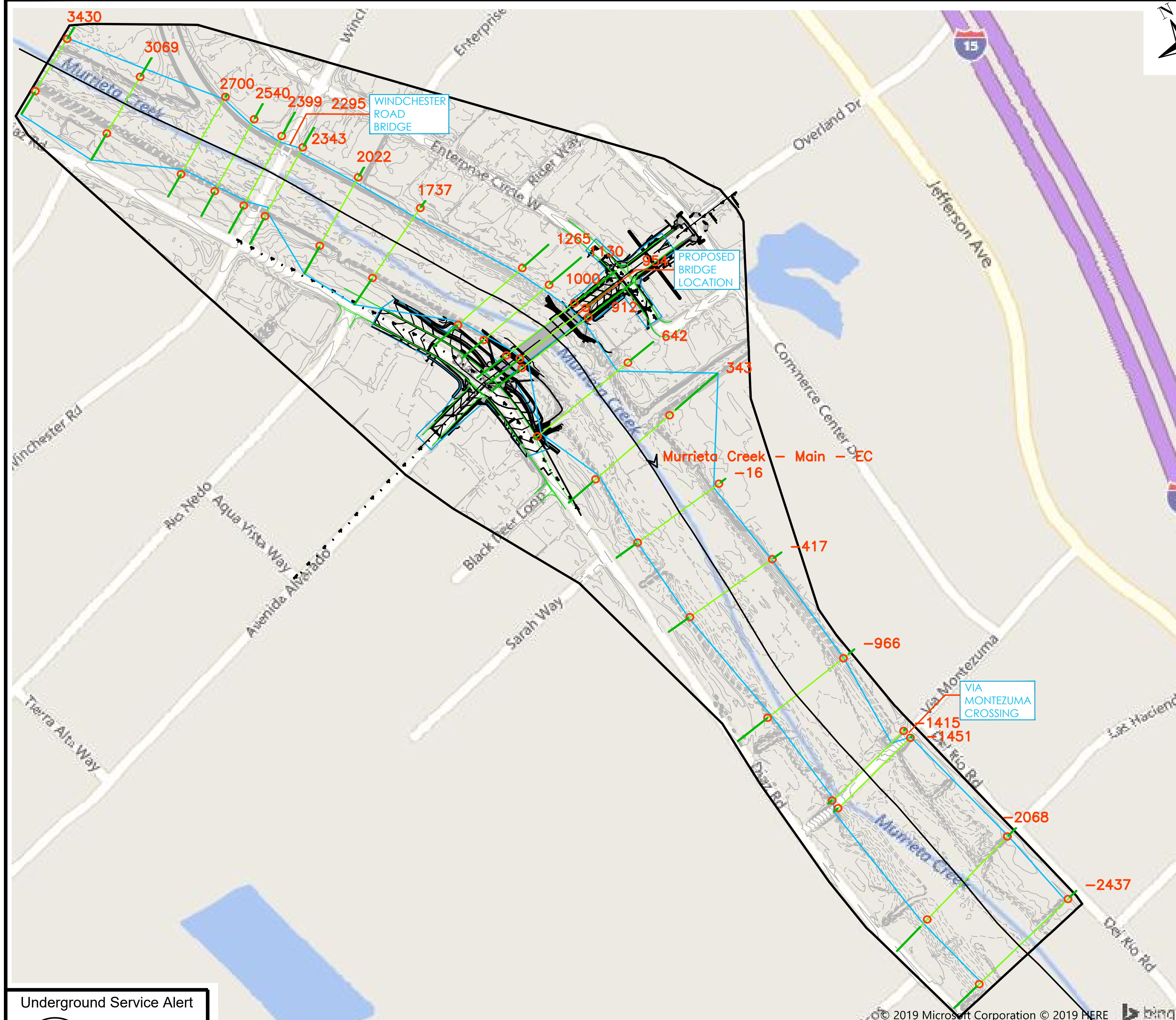

HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 1000
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 954 BR Overland Drive Overland Bridge
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 954 BR Overland Drive Overland Bridge
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 912
.042
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 642
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = 343
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = -16
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = -417
.042 .035 .042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = -966
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = -1415 VM Removed Via Montezuma Removal to Natural Surface
.035
Elevation (ft)
Station (ft)
Legend
EG Q200
EG Q100
WS Q200
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = -1451 VM Removed Via Montezuma Removal to Natural Surface
.035
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta
HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = -2068
.035
.042
Elevation (ft)
Station (ft)
Legend
EG Q200
WS Q200
EG Q100
EG Q50
WS Q100
WS Q50
Crit Q200
Crit Q100
Crit Q50
Ground
Ineff
Bank Sta


HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
River = Murrieta Creek Reach = Main - EC RS = -2437
.042
.035
.042
Legend
EG Q200
EG Q100
EG Q50
WS Q200
Crit Q200
WS Q100
Crit Q100
WS Q50
Crit Q50
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1000
1005
1010
1015
1020
1025
0
100
200
300
400
500
600
700
800


HEC-RAS Model Plan: P-Bridge & Remove VM
Geom: Bridge w/o VM
Murrieta Creek Main - EC
Legend
EG Q200
EG Q100
EG Q50
WS Q200
Crit Q200
WS Q100
Crit Q100
WS Q50
Crit Q50
Ground
Elevation (ft)
1035
1030
1025
1020
1015
1010
1005
1000
-3000
-2000
-1000
0
1000
2000
3000
4000
Main Channel Distance (ft)



N

LEGEND

- BANK STATION
- HEC-RAS CROSS SECTIONS
- INEFFECTIVE FLOW AREA
- HEC-RAS RIVER REACH
- 100 YEAR INUNDATION BOUNDARY
- BOUNDARY OF SURVEY
- PROPOSED

SUMMARY TABLE FOR PROPOSED CONDITIONS

HEC-RAS Plan: P-Bridge w/o VM River: Murrieta Creek Reach: Main - EC Profile: Q100

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Area (sq ft)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Mann Wtd Chnl
Main - EC	3430	Q100	22300.00	1027.72	0.003943	10.71	2210.31	2081.73	357.95	0.66	0.035
Main - EC	3069	Q100	22300.00	1025.37	0.005583	12.41	1817.43	1796.99	275.97	0.77	0.035
Main - EC	2700	Q100	22300.00	1025.35	0.001829	7.44	2996.99	2996.99	353.43	0.45	0.035
Main - EC	2540	Q100	22300.00	1024.69	0.002463	8.59	2596.15	2596.15	307.37	0.52	0.035
Main - EC	2399	Q100	22300.00	1024.44	0.002087	8.22	2714.31	2714.31	297.39	0.48	0.035
Main - EC	2343 Winchester Road		Bridge								
Main - EC	2295	Q100	22300.00	1023.67	0.002473	8.72	2557.80	2557.80	293.33	0.52	0.035
Main - EC	2022	Q100	22300.00	1022.71	0.003124	9.38	2519.70	2377.71	406.73	0.58	0.035
Main - EC	1737	Q100	22300.00	1022.08	0.002480	8.57	2776.29	2602.40	434.67	0.52	0.035
Main - EC	1265	Q100	22300.00	1021.07	0.002189	8.09	2757.91	2757.91	332.44	0.49	0.035
Main - EC	1130	Q100	22300.00	1020.71	0.002224	8.24	2706.25	2706.25	321.38	0.50	0.035
Main - EC	1000	Q100	22300.00	1020.22	0.002738	8.80	2532.80	2532.80	316.84	0.55	0.035
Main - EC	954 Overland Drive		Bridge								
Main - EC	912	Q100	22300.00	1019.52	0.003214	9.66	2308.49	2308.49	283.06	0.60	0.035
Main - EC	642	Q100	22300.00	1019.05	0.002459	7.63	2922.07	2922.07	418.02	0.51	0.035
Main - EC	343	Q100	22300.00	1017.66	0.003948	9.25	2441.85	2409.52	448.18	0.64	0.035
Main - EC	-16	Q100	22300.00	1016.72	0.002792	7.99	2790.71	2790.71	410.37	0.54	0.035
Main - EC	-417	Q100	22300.00	1015.88	0.002131	7.14	3121.81	3121.81	445.39	0.48	0.035
Main - EC	-966	Q100	22300.00	1014.50	0.002451	7.65	2916.19	2916.19	414.88	0.51	0.035
Main - EC	-1415 VM Removed	Q100	22300.00	1012.99	0.003051	8.71	2561.54	2561.54	352.07	0.57	0.035
Main - EC	-1451 VM Removed	Q100	22300.00	1013.19	0.001987	6.89	3250.55	3238.12	476.51	0.46	0.035
Main - EC	-2068	Q100	22300.00	1012.02	0.002010	6.53	3413.66	3413.66	530.11	0.45	0.035
Main - EC	-2437	Q100	22300.00	1009.15	0.011375	11.17	1995.54	1995.54	511.52	1.00	0.035

0 500 1000
Feet

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CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE	BENCH MARK	SCALE	SEAL:
Contractor ______						RIVERSIDE COUNTY FLOOD CONTROL BENCH MARK No. Z10320 AN 1/2" IP, WITH RCFC TRI STAR CAP. 173; ± EAST OF DIAZ RD CL AND 34' ± NORTH BLOCK WALL, FLUSH ELEVATION: 1028.38 (NAVD88)	Horizontal	
Inspector ______							Vertical	
Date Completed ______								

Designed By	Drawn By	Checked By

Plans Prepared Under Supervision Of

STEVEN LATINO, PE — Date ______

R.C.E. No. XXXXX — Expires XX-XX-XX

RECOMMENDED BY: ______ DATE: ______
NINO ABAD, ASSOCIATE ENGINEER

ACCEPTED BY: ______ DATE: ______
PATRICK A. THOMAS
DIRECTOR OF PUBLIC WORKS/CITY ENGINEER

R.C.E. No. 44223 Expires: 06-30-2019

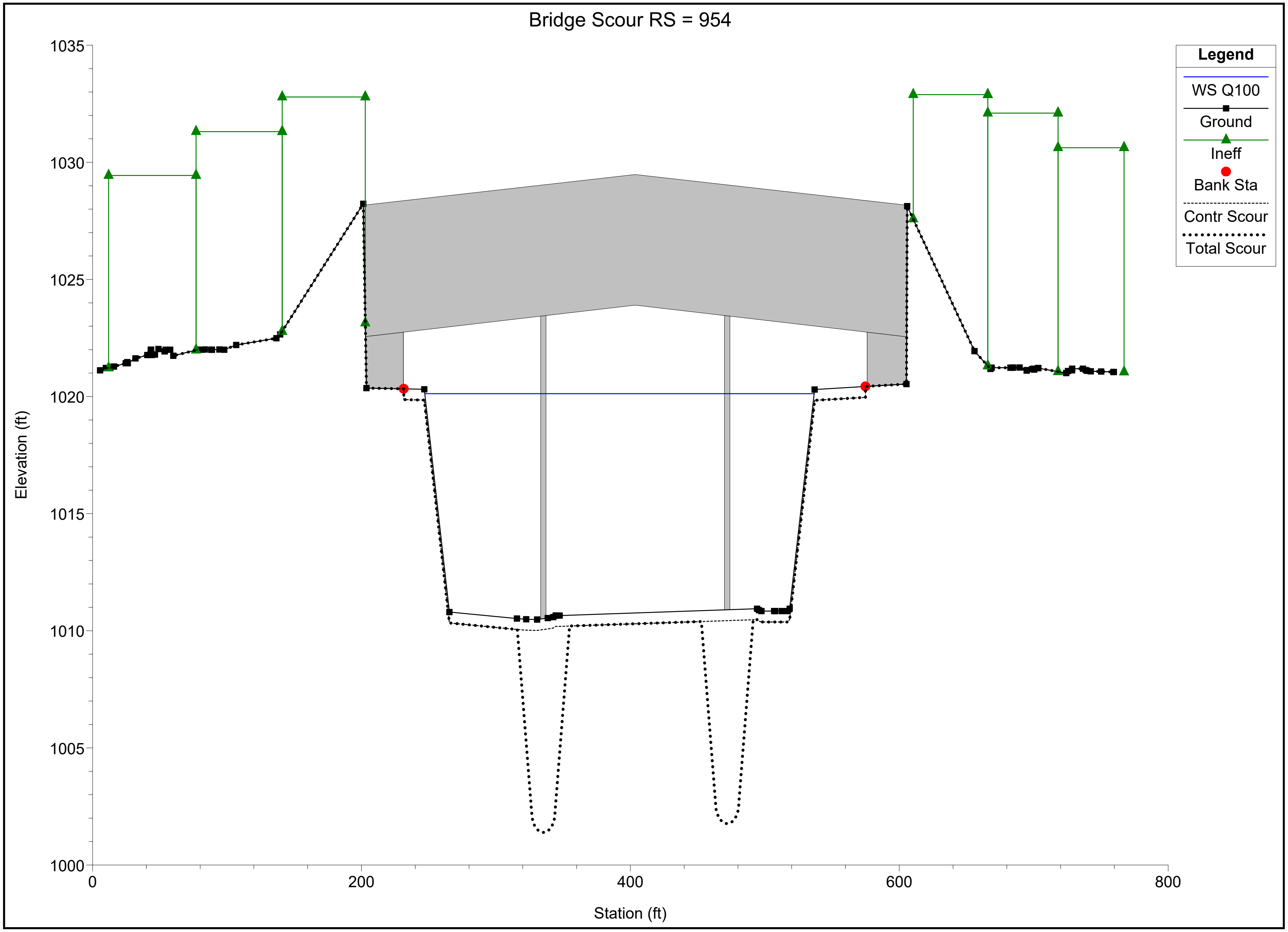
CITY OF TEMECULA — DEPARTMENT OF PUBLIC WORKS

MURRIETA CREEK BRIDGE AT OVERLAND DRIVE PROJECT NO. PW 16-05 PROPOSED CONDITION WORK MAP

Drawing No. **WM - 2**

Sheet 1 of 2

June 2, 2020


Bridge Scour RS = 954
Legend
WS Q100
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
1035
1030
1025
1020
1015
1010
1005
1000
0
200
400
600
800
Station (ft)

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):		8.42	
	Approach Velocity (ft/s):		8.24	
	Br Average Depth (ft):		8.76	
	BR Opening Flow (cfs):		22300.00	
	BR Top WD (ft):		281.61	
	Grain Size D50 (mm):	0.03	0.03	0.03
	Approach Flow (cfs):		22300.00	
	Approach Top WD (ft):		321.38	
	K1 Coefficient:		0.690	
Results				
	Scour Depth Ys (ft):		0.46	
	Critical Velocity (ft/s):		0.74	
	Equation:		Live	

Pier Scour

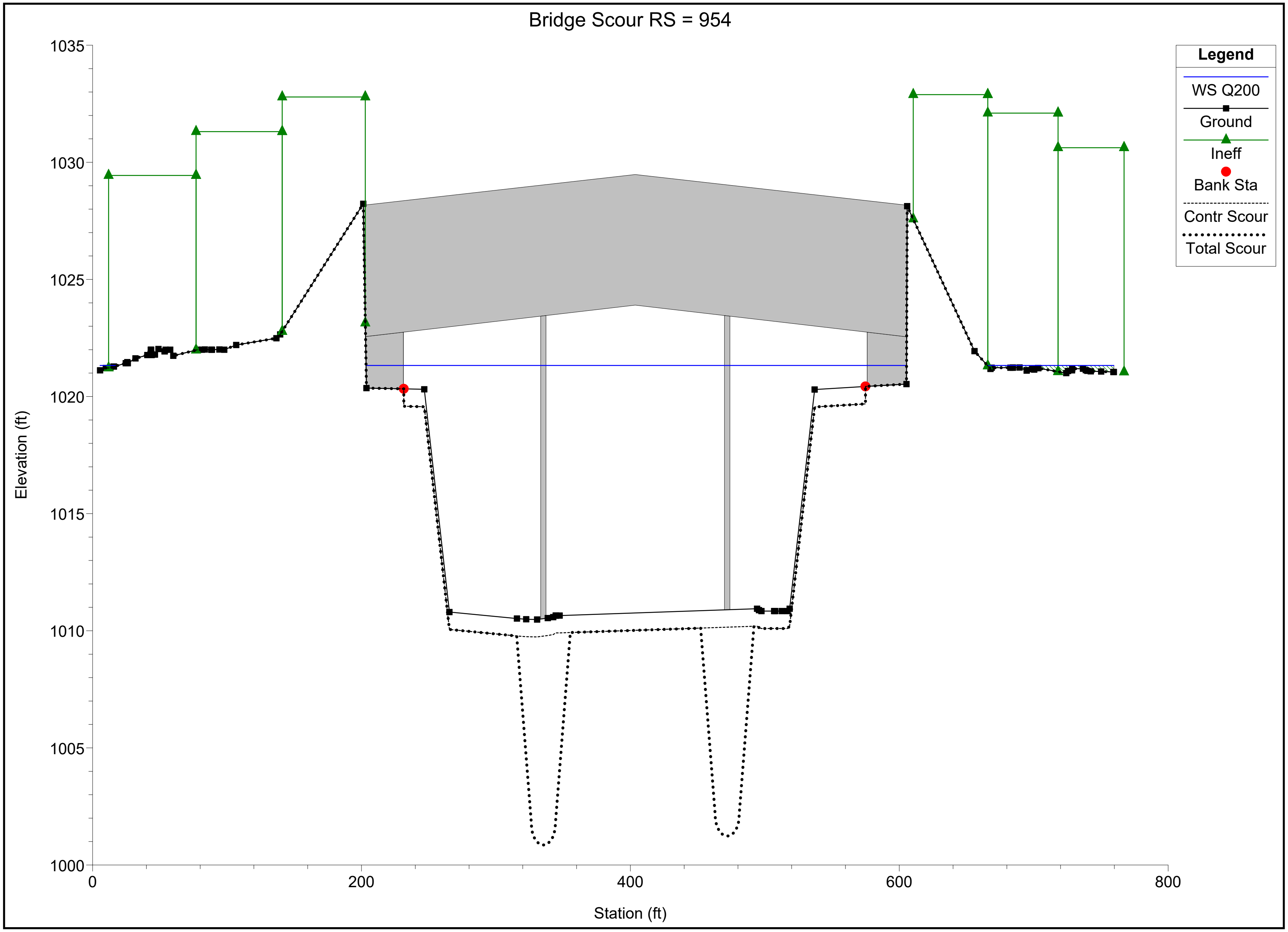
All piers have the same scour depth

Input Data		
	Pier Shape:	Group of Cylinders
	Pier Width (ft):	4.00
	Grain Size D50 (mm):	0.03000
	Depth Upstream (ft):	7.99
	Velocity Upstream (ft/s):	8.80
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	75.92
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.30000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	8.66
	Froude #:	0.55
	Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel: 9.13



Bridge Scour RS = 954
Legend
WS Q200
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
Station (ft)
1035
1030
1025
1020
1015
1010
1005
1000
0
200
400
600
800

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):		9.35	
	Approach Velocity (ft/s):		8.78	
	Br Average Depth (ft):	0.17	8.53	0.90
	BR Opening Flow (cfs):	0.78	27197.43	1.79
	BR Top WD (ft):	6.62	335.39	1.24
	Grain Size D50 (mm):	0.03	0.03	0.03
	Approach Flow (cfs):		27200.00	
	Approach Top WD (ft):		331.45	
	K1 Coefficient:		0.690	
Results				
	Scour Depth Ys (ft):		0.74	
	Critical Velocity (ft/s):		0.75	
	Equation:		Live	

Pier Scour

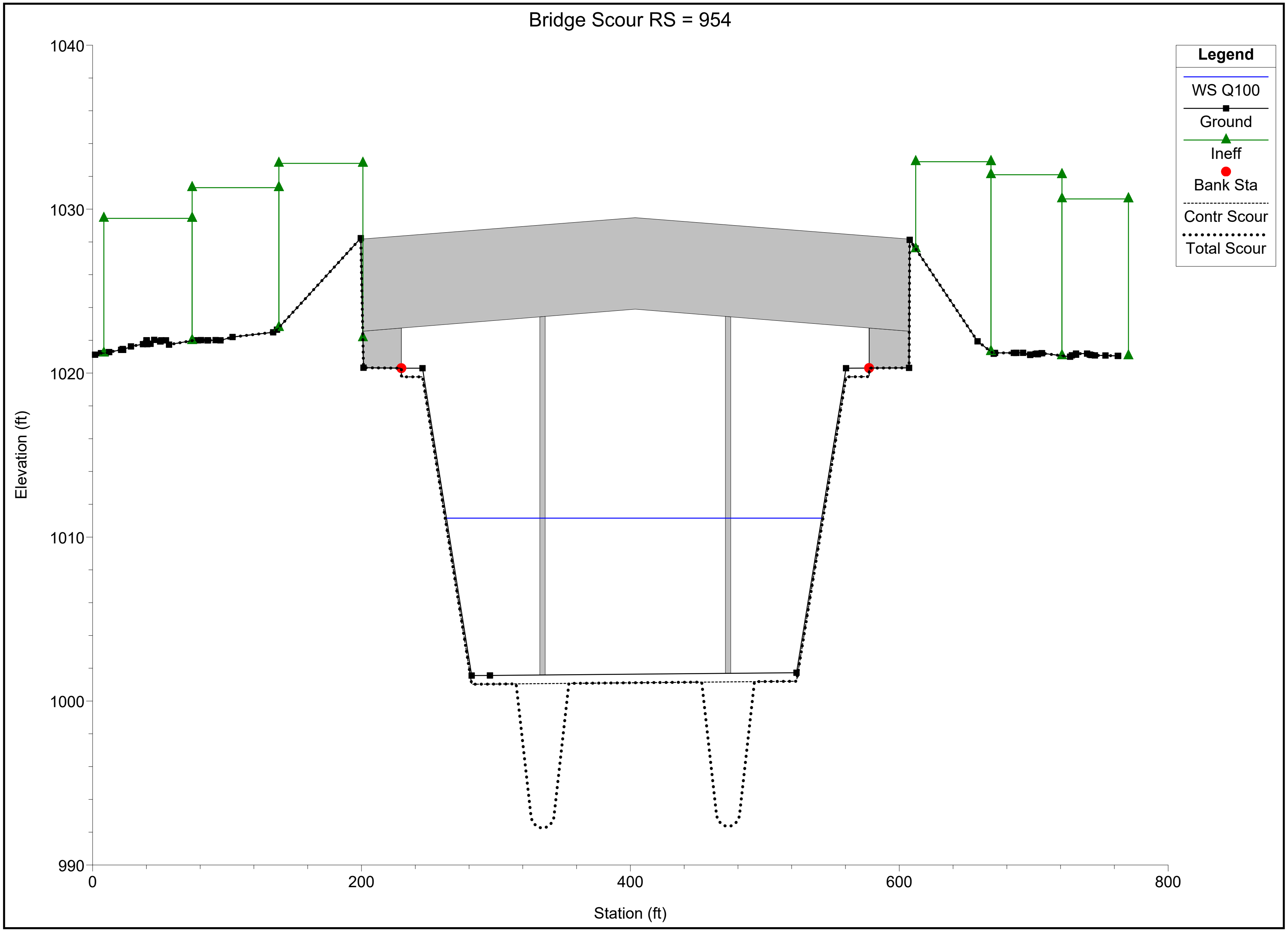
All piers have the same scour depth

Input Data		
	Pier Shape:	Group of Cylinders
	Pier Width (ft):	4.00
	Grain Size D50 (mm):	0.03000
	Depth Upstream (ft):	8.53
	Velocity Upstream (ft/s):	9.23
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	75.92
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.30000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	8.92
	Froude #:	0.56
	Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel:	9.66


Bridge Scour RS = 954
Legend
WS Q100
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
1040
1030
1020
1010
1000
990
Station (ft)
0
200
400
600
800

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):		9.10	
	Approach Velocity (ft/s):		8.64	
	Br Average Depth (ft):		8.86	
	BR Opening Flow (cfs):		22300.00	
	BR Top WD (ft):		271.05	
	Grain Size D50 (mm):	.03	.03	.03
	Approach Flow (cfs):		22300.00	
	Approach Top WD (ft):		283.46	
	K1 Coefficient:		0.690	
Results				
	Scour Depth Ys (ft):		0.53	
	Critical Velocity (ft/s):		0.75	
	Equation:		Live	

Pier Scour

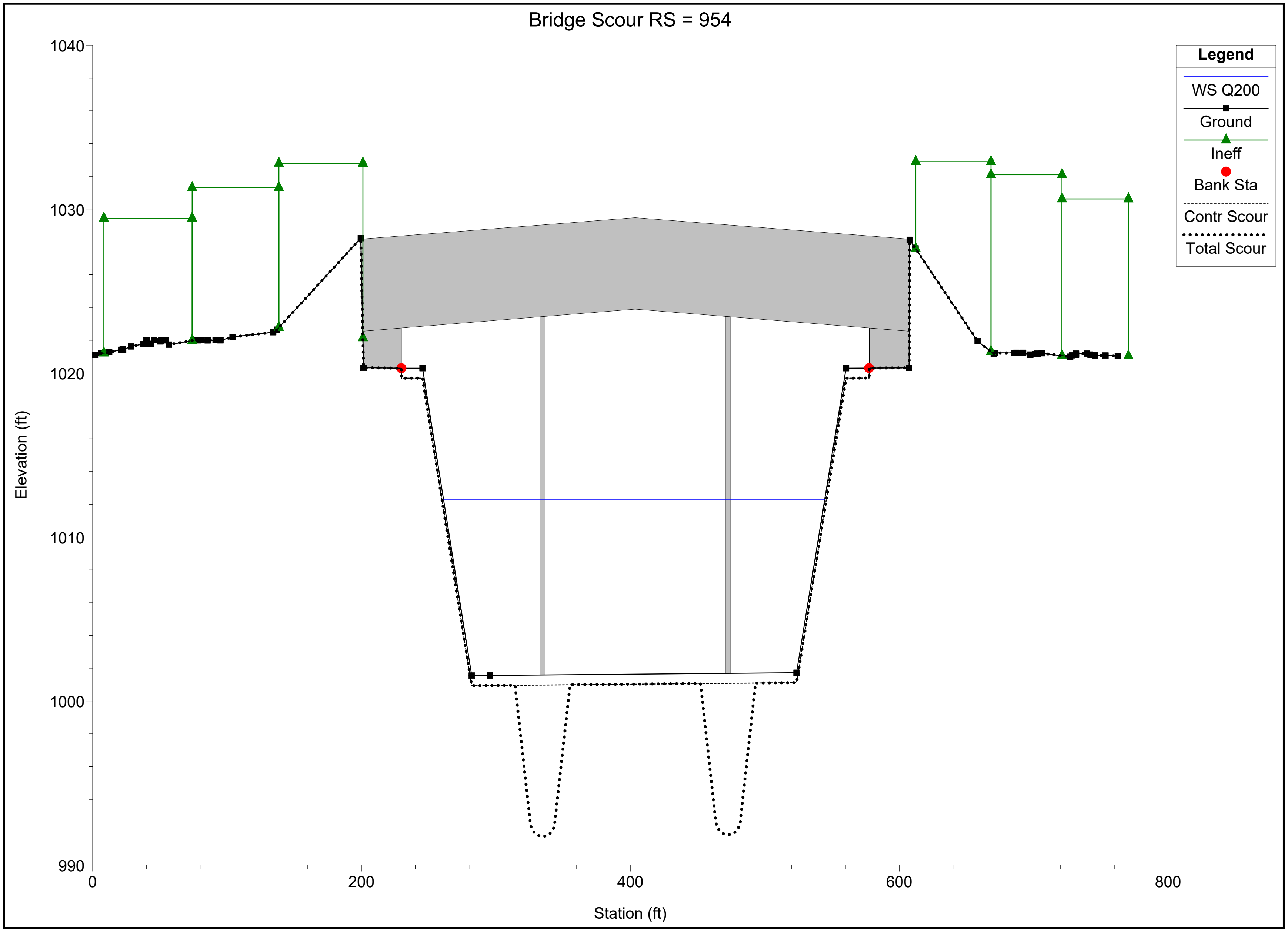
All piers have the same scour depth

Input Data		
	Pier Shape:	Group of Cylinders
	Pier Width (ft):	4.00
	Grain Size D50 (mm):	0.03000
	Depth Upstream (ft):	9.02
	Velocity Upstream (ft/s):	8.80
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	75.92
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.30000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	8.80
	Froude #:	0.52
	Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel: 9.33


Bridge Scour RS = 954
Legend
WS Q200
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
Station (ft)
1040
1030
1020
1010
1000
990
0
200
400
600
800

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):		10.11	
	Approach Velocity (ft/s):		9.34	
	Br Average Depth (ft):		9.82	
	BR Opening Flow (cfs):		27200.00	
	BR Top WD (ft):		275.43	
	Grain Size D50 (mm):	0.03	0.03	0.03
	Approach Flow (cfs):		27200.00	
	Approach Top WD (ft):		288.21	
	K1 Coefficient:		0.690	
Results				
	Scour Depth Ys (ft):		0.61	
	Critical Velocity (ft/s):		0.76	
	Equation:		Live	

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	4.00
	Grain Size D50 (mm):	0.03000
	Depth Upstream (ft):	10.01
	Velocity Upstream (ft/s):	9.51
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	75.92
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.30000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	9.23
	Froude #:	0.53
	Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel: 9.84

APPENDIX B

US Army Corps
of Engineers
Los Angeles District

MURRIETA CREEK PHASE II
FLOOD CONTROL, ENVIRONMENTAL RESTORATION,
AND RECREATION PROJECT

DESIGN DOCUMENTATION REPORT

Appendix C
Hydrology and Hydraulics Analysis

U.S. Army Corps of Engineers
Los Angeles District

Hydrology and Hydraulics Branch

February 2014

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1. PURPOSE

The purpose of this appendix is to document the hydrology & hydraulic analyses completed in support of the Murrieta Creek Flood Control and Environmental Restoration Project in Riverside County, California (see Figure 1: Project Location Map). This design is based on the Locally-Preferred Recommended Plan selected in the Feasibility Report (Ref. 1).

1.2. DESCRIPTION OF STUDY AREA

The study area is located in Riverside County, California and covers the Santa Margarita River watershed. It extends from the unincorporated area of Wildomar, through the cities of Murrieta and Temecula to the confluence with Temecula Creek. Murrieta Creek is a major tributary to the Santa Margarita River. The project is a multi-purpose flood control, environmental restoration and recreation project along approximately 7.1 miles of Murrieta Creek. The major project features include channel widening and deepening; an environmental corridor along the length of the project; a multi-purpose detention basin; a wetland restoration area; a recreation park and three bridge replacements. The project is divided into four construction phases: Phase 1 from approximately the USGS gauging station at the downstream end to downstream of First Street; Phase 2 beginning around First Street and extending to the confluence with Santa Gertudis Creek; Phase 3 from the confluence to Elm Street; and Phase 4 encompassing Elm Street to Tenaja Road. Phase 1 is the only reach that has been constructed, with the exception of the downstream end of the project, denoted as Phase 1A. Phase 2 is defined to extend just upstream of the Winchester Road bridge to approximately 800 ft downstream of the First Street bridge, from River Station 189+00 to River Station 59+00, respectively. Refer to Figure 1 for location of project Phases.

2. HYDROLOGY

2.1. INITIAL DESIGN AND HYDROLOGY OF ORIGINAL PROJECT

The level of protection for the project was analyzed in the Feasibility Report (Ref. 1). The primary objective of the hydrologic analysis was to determine the Existing and Future With- and Without-Project discharge for a range of return periods, including 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-yr (0.50, 0.20, 0.10, 0.04, 0.02, 0.01, 0.005 and 0.002 expected Annual Exceedance Probabilities {AEP}) event. The Hydrology Appendix in the Feasibility Report includes the following information for the Murrieta Creek Watershed: climatic and hydrologic characteristics; discharge-frequency data for Existing and Future With- and Without-Project Conditions; volume-frequency data; and a summary of the hydrologic modeling process. For a detailed description of the methodologies and assumptions used in the analysis refer to the Feasibility Report. Refer to Table 1 for With-Project discharges and Figure 2 for the adopted discharge-frequency curve. The design of the project is to provide a minimum level of flood protection to local resident equivalent to control the 1% Annual Chance Exceedance (ACE) event with a 95% confidence of containment.

3. HYDRAULIC ANALYSIS AND DESIGN

3.1. GENERAL CONSIDERATIONS

The hydraulic design of the channel for construction of Phase 2 of the Murrieta Creek project is based on applicable U.S. Army Corps of Engineers guidance, as well as guidance provided in other technical references on applied hydraulics engineering. A list of the references used is included in section 7.

3.2. EXISTING CHANNEL

The existing channel for Murrieta Creek within Phase 2 has natural invert and side slopes. There is significant vegetation along the banks and along the invert of the creek. Phase 2 is defined to extend just upstream of the Winchester Road bridge to approximately 800 ft downstream of the First Street bridge, from River Station 189+00 to River Station 59+00, respectively. Phase 2 is bounded by the natural channel of Phase 3 near Winchester Road at the upstream end and constructed Phase 1 near First Street at the downstream end.

3.3. CHANNEL MODIFICATIONS

The channel modifications were originally designed to convey a design discharge of 23,200 ft^3/s (Ref. 1). However, the need to incorporate some relatively minor design revisions, as discussed in the Channel Design Criteria and Procedures section, required the design discharge to be reduced to 22,300 ft^3/s to avoid increasing the size of the channel downstream of Phase 3. The detention basin in Phase 3 will be sized appropriately to maximum outflow of 22,300 ft^3/s. The channel modifications for Phase 2 extends from River Station 189+00 to River Station 59+00 (upstream end of constructed Phase 1). Throughout this reach the channel will be widened by excavation to provide a trapezoidal cross section. The excavation will provide a design invert slope of 0.002 from River Station 189+00 to 83+00, flattening to 0.0015 from River Station 83+00 to 61+00, and 0.0035 from River Station 60+00 to 59+00. The design bottom width will range from 140 ft to 363.6 ft throughout Phase 2. Downstream of the First Street bridge, the channel bottom widens to tie in with the width of constructed Phase 1. Side slopes will be landscaped except for the Old Town Temecula reach, which will be soil cement.

Specific ecosystem restoration measures for Murrieta Creek focused on alternatives that would provide greater extent and/or quality of in-channel riparian and peripheral channel habitat. As such, a larger vegetated corridor was allowable in Phase 2. The unmaintained vegetation is a 2 ft high riparian terrace that will be allowed to grow across approximately 20 ft to 150 ft of the channel bottom extending outward from the toe of the left side slope for the entire reach of construction. The vegetation in the remaining invert will be subject to annual mowing and periodic sediment removal. Maintenance of the side slopes of the channel is not scheduled but will be performed as necessary and in the event of an emergency. The channel bottom widths through Phase 2 are provided in Table 2.

The channel depths of the channel will vary from 15.7 ft to 25.7 ft along Phase 2. The side slopes will be typically 2 horizontal to 1 vertical (2H:1V) or 3H:1V, with the exception of the reach through and downstream of Old Town Temecula, where near-vertical walls of 1H:4V were incorporated because of right-of-way limitations, and at the downstream end where Phase 2 ties into constructed Phase 1. The design channel depths and side slopes through Phase 2 are provided in Table 3.

To eliminate the potential for upstream headcutting, a grouted stone grade stabilizer will be located approximately 300 ft upstream of the Rancho California Road bridge. The stabilizer will be 20 ft in length and extend to the whole channel width, with grouted riprap provided for slope protection.

3.4. DESIGN DEPARTURES FROM RECOMMENDED PLAN

A preliminary design for the recommend plan project was prepared in the Feasibility Study (Ref. 1). However, detailed design studies prepared since the completion of the feasibility report have revealed the need for several design departures from the recommended plan. These departures are necessitated by several constraints involving difficult excavation, interference with major utilities, and right-of-way limitations.

In Phase 2 the design invert slope was flattened from 0.002 to 0.0015 just upstream of the Main Street bridge to the downstream end of the reach. The slope was flattened to match the reduced slope for constructed Phase 1.

The original side slopes were changed from gabions to a vegetative corridor to improve the project aesthetics. As discussed above, the vegetation will be allowed to grow unmaintained across 20 to 150 ft of the channel bottom extending outward from the toe of the left side slope for the entire reach of construction.

The side slopes through Old Town Temecula were steepened from 3H:1V to 1H:4V (0.25H:1V) because of right-of-way constraints. The side slope construction material was also changed from gabions to soil cement.

At the upstream end of the constructed Phase 1 the channel bottom width was increased to take advantage of wider available right-of-way, thereby providing an increased width of riparian habitat. To accommodate this widening, the downstream end of Phase 2 from Station 65+50 to 59+00 was also widened.

The width of the service road and equestrian trail was increased to 15 ft. The service road will be along both sides of the channel, where the right bank service road will be shared usage for an equestrian route. Maintenance road access ramps were incorporated after the 90% submittal. There will be five access ramps along Phase 2. The width of the concrete access ramp is 15 ft along the top and slopes down at a 10% gradient.

Paved undercrossings beneath bridges on both sides of the channel will be used for maintenance and provide connectivity for trails that ensure adequate safety for pedestrians/riders by enabling them to cross these roads without interfering with traffic on busy arterial routes. Design criteria adhere's to HH Policy Memorandum Number 3 Hydraulic Design and Criteria for Underpasses and Access Ramps (Ref. 2) A minimum clearance of 14 ft is provided at all bridge undercrossings.

Appropriate design values for Manning's roughness coefficient "n" were evaluated in detail for the feasibility study. However, subsequent discussions with the RCFC&WCD on vegetation planting and maintenance required refinement to the roughness values. A new analysis to determine roughness values was performed in May 2007. Refer to Section 4.3 for selection of roughness coefficients.

The original unmaintained environmental corridor consisted of a two tier 2 ft high riparian terrace. However, the upper terrace in constructed Phase 1 was not able to receive adequate amounts of water to support restoration efforts. Therefore, the decision was made to delete the upper riparian terrace from the Phase 2 and Phase 4 design. The Environmental Resources Branch, their contractor and RCFC&WCD were in agreement that it would not affect environmental mitigation requirements along Murrieta Creek. In a subsequent meeting the decision was made to delete the lower terrace in order to accommodate a wider unmaintained width (10 ft wider) at the upstream end from River Sta. 185+00 to 180+00. This was done per request of the resource agencies to find areas where the project could have more unmaintained area without diminishing the project's flood control intent.

The drop structure near Rancho California Road bridge was modified to a grade stabilizer. The design invert elevation was lowered by approximately 2.7 ft from River Station 113+00 to the upstream end to decrease the potential for headcutting.

4. CHANNEL DESIGN CRITERIA AND PROCEDURES

4.1. GENERAL CONSIDERATIONS

Water surface profile computations for the design discharge were prepared with the U.S. Army Corps of Engineers (USACE) Hydrological Engineering Center's River Analysis System (HEC-RAS) computer program, version 4.1 (Ref. 3). The full design discharge of 23,200 ft^3/s for the subject reach was initially carried over from the feasibility study, but was later reduced slightly, as discussed below. The need to incorporate some relatively minor design revisions required the design discharge to be reduced to 22,300 ft^3/s to avoid increasing the size of the channel. Design studies to optimize the size of the upstream detention basin are pending (Phase 3). The design discharge was reduced to 22,300 ft^3/s, which is maximum design ouflow from the detention basin. The water surface profile computations were started at River Station 28+75, which is about 100 ft downstream of the USGS gauging station. The hydraulic model calibration is provided in the Feasibility Report (Ref. 1) Hydraulic analysis indicates that flows do not pass through critical depth in the vicinity of the gauge; therefore, the starting water surface elevation was set to a normal depth slope of 0.002. The top of bank or top of levee elevations were set to be a minimum of 3 ft above the computed water surface profile for the design discharge. The performance and reliability of the project design was assessed with a risk-based analysis as described in Section 5.

4.2. MAPPING

Eagle Aerial completed topography, by photogrammetric method, of the Murrieta Creek site in 2002. All elevations are based on North American Vertical Datum of 1988 (NAVD88) and all horizontal distances are based on North American Datum of 1983 (NAD83). The topography was developed using State Plane coordinates California Zone VI.

4.3. ROUGHNESS COEFFICIENTS

The roughness coefficients for the channel bed and side slopes were estimated in the Feasibility Study. Since the roughness coefficients is highly variable and depends on a number of factors, a range including a minimum, normal, and maximum value is typically provided for a given channel condition. The minimum and maximum values would be utilized to estimate the maximum velocity and depth, respectively, within the channel. Thus, the velocity and capacity conditions refer to the minimum and maximum values, respectively, of the roughness coefficient for a given condition. The normal value is approximately the mean of the minimum and maximum, and it corresponds to the best-estimate (most likely) roughness coefficient and was used to compute the anticipated depth and velocity within the channel. The roughness coefficients for the channel bed and side slopes are provided in Table 2 of the Hydraulics Appendix in the Feasibility Study. A brief summary is provided below.

For Phase 2 the maintained portion of the channel invert will be subject to annual mowing and sediment removal. Specifically, the maintenance would entail annual mowing and sediment removal when deemed necessary, of 75% of the channel invert, with the remaining 25% allowed for vegetation to mature, but constrained by the deposition of no more than 3 ft of sediment. Without such maintenance, the future with-project condition would induce a higher water surface profile and corresponding 100-yr floodplain. The best-estimate of the roughness coefficients for the annually mowed bed section, fully mature vegetation along the riparian terrace and vegetated side slopes are 0.027, 0.07, and 0.095, respectively. In the mowed section, the roughness coefficients are based on 6-in high vegetation and selected from Chow's Open Channel Hydraulics (Ref. 4). For the fully mature vegetation section, the best-estimated roughness coefficient was estimated using a combination of Cowan's vegetation classification (Ref. 5) and Chow. It also reflects a condition where half of the vegetated region having a roughness coefficient of 0.12 is washed out. The roughness coefficient for the vegetative side slopes were based on field and/or from the 1994 orthophotos using the Cowan's Method (Ref. 5).

The roughness coefficients for the channel invert of 0.07 for the unmaintained riparian corridor and 0.027 for the maintained section are still appropriate. However, subsequent discussions with the RCFC&WCD on vegetation planting and maintenance required additional refinement to the roughness values along the side slopes. On 22 March 2007, a meeting was held to determine an acceptable roughness coefficient value for the vegetation that will likely develop on the channel side slopes along Phase 2. Based on the meeting, no woody vegetation such as trees would be planted along the side slopes. The RCFC&WCD's normal annual maintenance operations will prevent large woody vegetation from becoming established. As such, the RCFC&WCD crews will conduct regular inspections to ensure that invasive species do not become established and will remove all obvious or conspicuous trees from the side slopes. In addition, large shrubs will be maintained by means of chopping, sawing, or similar method to a 3-4 ft height. Therefore, a new analysis to determine roughness values along the channel side slopes was performed. Table 4 documents the results of the analysis for Phase 2 and the paragraphs that follow describe the selection of the roughness coefficients.

<u>Phase 2 2H:1V Side Slopes (River Station 189+00 to 183+00)</u>

The existing concrete side slopes downstream of the Winchester Road Bridge will be removed and replaced with grouted stone. The roughness coefficient for the entire side slope was set to 0.025.

<u>Phase 2 3H:1V Side Slopes (River Station 183+00 to 98+00)</u>

Based on the typical planting scheme for Phase 2, upland species will cover about 65% of the total side slope, while the remaining 35% will be riparian/transition species. Therefore, a subdivision between the two zones (A1 and A2) was required. Refer to Figure 2 for typical cross section subdivisions. Each zone was further divided by plant species and then grouped by plant type (i.e. tree, shrub, forb, grass).

The mean of the maximum vegetation height by plant type from each zone was also determined. In the lower area (zone A1), the average maximum height of the shrubs is 3-4 ft and 3.2 ft for the forbs. For the upper area (zone A2), the average maximum height for the shrubs, forbs and grass is calculated to be 3.6 ft, 0.5 ft and 1.1 ft, respectively.

The average Phase 2 maximum average depth of flow is computed to be 14.5 ft for the design discharge (22,300 ft^3/s). As a result, vegetation in zone A1 was fully submerged while approximately 8.2 ft of zone A2 was inundated during a 1% ACE. Accordingly, the local average peak flow depth of flow in zones A2 and A1 is 4.1 ft and 11.3 ft, respectfully.

The roughness coefficient using Cowen's Method for the velocity and capacity conditions were estimated for the vegetation after it has fully matured by applying the adjustment factors as indicated in the U.S. Geological Survey (USGS) Water-Supply Paper 2339, *Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains,* 1989 (Ref. 5). Since the roughness coefficient is highly variable and depends on a number of factors, a range including a minimum, normal, and maximum value is typically provided for a given channel condition. The minimum and maximum values are utilized to estimate the maximum velocity and depth, respectively, within a channel. Thus, the velocity and capacity conditions referred to as the minimum and maximum values, respectively, of the roughness coefficient is for a given condition. The normal value is approximately the mean of the minimum and maximum, and corresponds to the best-estimated (most likely) roughness coefficient.

The Manning's roughness adjustment value t for the total side slope was calculated by taking into consideration the two zones of vegetation. The best-estimated adjustment values for both the shrubs and forbs in zone A1 is the average between 0.01 and 0.025, or 0.018. This corresponds to the USGS Paper classification in general as "amount of vegetation – medium," and in particular to “moderately dense stemmy grass, weeds, or tree seedlings growing where the average depth of flow is from two to three times the height of the vegetation.”

The best-estimated adjustment value for zone A2 was also separated by plant type. The adjustment value determined for the shrubs in this zone is classified in general as “amount of vegetation – large,” and in particular to “turf grass growing where the average depth of flow is about equal to the height of the vegetation,” where the average value for the adjustment value is between 0.025 and 0.050, or 0.038. The best-estimate for the forbs and grass averages between 0.01 and 0.025, or 0.018, is classified in general as “amount of vegetation – medium,” and in particular to “brushy, moderately dense vegetation growing along the banks and no significant vegetation is evident along the channel bottoms.”

The adjustment value best-estimated condition for zones A1 and A2 was then calculated using a single length-weighted average. The USGS paper classification for the amount of vegetation adjustment factor for the side slopes is 0.018 for zone A1 and 0.035 for zone A2.

Finally, the determination of an adjustment value was calculated for the total side slope conveyance. Conveyance of flow was subdivided into vertical subsections along the vegetated side slopes. The computed adjustment value is 0.020.

The base n value for the channel side slope corresponds to a relatively uniform and smooth earth surface, similar to a plane bed on the channel bottom. A roughness coefficient of 0.022 was adopted as the best-estimate base n value for the channel side slopes.

The composite roughness value for the side slopes is the sum of the base n value and the total adjustment value. Therefore, the best-estimated condition for roughness value for the 2H:1V side slopes along this reach of Phase 2 is 0.042 (0.020 + 0.022).

<u>Phase 2 1H:4V Side Slopes (River Station 98+00 to 65+50) and 1H:2V Side Slopes (65+50 to 59+00)</u>

The roughness coefficient for the entire side slope near-vertical walls (1H:4V) throughout the Old Town Temecula area was set to 0.023 for soil cement.

<u>Sensitivity Analysis</u>

A separate “n” value analysis was conducted to determine the sensitivity of n value selection. The analysis utilized a roughness value of 0.025 for the entire Phase 2 channel. The results from changing the values were compared to the values as stated above. The results are shown in Table 5. The results of utilizing the roughness value of 0.025 are denoted as “adjusted n values” in the table.

The results are very similar, however, the adjusted results for average flow velocity was slightly higher. The higher velocities were used to determine appropriate riprap thickness to protect bridge piers from potential scour.

4.4. SEDIMENTATION ANALYSIS

A one dimensional sediment transport analysis was performed by MAHR Works in 2007 (Ref. 6, and Exhibit A of this report) using the Sedimentation in Stream Networks program, HEC-6T (Ref. 7). The sediment transport model extends from Slaughter Canyon to the USGS Stream Gage Station, downstream of First Street. The model network consists of Murrieta Creek and the Warm Spring and Santa Gertrudis tributaries. Secondary flow sources of Carter Canyon and Long Canyon, as well as project features (detention basin, channelization, new vegetation), and bridges are also accounted for in the analysis. Overall, the models were stable, and the results were generally as expected. Phase 2 showed a general trend of degradation. A detailed discussion can be found in the 2007 analysis report in Exhibit A.

In 2008, two detention basin alternatives were analyzed using HEC-6T: Alternative 1 consists of full ecosystem restoration, i.e. constructing islands within the basin and a fully vegetated bottom; and Alternative 2 consists of no islands within the basin but with a fully vegetated bottom (for more capacity). The original 2007 HEC-6T model was used and revised to include the components of Alternative 1 and 2. The results from this analysis show that for both Alternatives the general trend is degradation (up to 4.3 ft with Alternative 1 and 3.8 ft with Alternative 2) throughout Phase 2; with the exception of the downstream end of Phase 2 which shows aggregation (up to 4.7 ft with Alternative 1 and 4.5 ft with Alternative 2) at the peak flow. Refer to Exhibit B for output HEC-6T results. Aggregation values were retained from Alternative 2 and added on top of the design invert using the "Fixed Sediment Elevations" tool in HEC-RAS. Aggregation results were incorporated to determine appropriate top of channel bank elevations.

A long term sediment analysis using HEC-6T was performed in 2012. The original 2007 HEC-6T model was used and was modified to include measured daily mean discharges since 1974. Daily mean discharges were extracted from the U.S. Geological Survey gage no. 11043000. Records following construction of the Skinner Reservoir were used in the analysis, 1974 to 2011. Results show up to 6.6 ft of general degradation in Phase 2. This area (from River Station 189+00 to 180+00) will require a toe down depth to 7 ft while the remainder of the channel will require 5 ft of toe down (River Station 180+00 to 59+00). Refer to Exhibit C for results. The largest degradation is at the upstream end of Phase 2 and decreases downstream. A temporary grouted stone drop structure will be constructed at the upstream end of Phase 2. The structure will be 20 ft in length and extend to the whole channel width, to a depth of approximately 7 ft. In this area flow velocities are high due to the drop which causes the flow to pass critical depth in order to balance the water surface profile equation. An apron will be provided on the downstream side of the drop structure. The required length of the apron as defined in the USACE Hydraulic Design Criteria (Ref. 8) by the following equation and will be a minimum of 33.2 ft.

$$L_B = C_L \sqrt{\mathrm{hd}_c}$$

Where d_{50} = particle size for which 50% is finer by weight, ft

L_B = length of basin, ft

C_L = empirical apron length coefficient

h = height of drop

d_c = critical depth over crest

Bridge pier protection will be constructed at bridge piers, which will eliminate the potential for scour. There are 5 bridges along Phase 2, all of which have piers except for Main Street. The bridge abutments will not be subject to the active flow of the design discharge. To determine the required size of stone for riprap at bridge piers, the Federal Highway Administration's (FHWA's) Hydraulic Engineering Circular No. 23 (Ref. 9) was used which recommends using the rearranged Isbach equation:

$$d_{50} = \frac{0.692(V_{des})^2}{(S_g \text{ -1})\,2\text{g}}$$

Where d_{50} = particle size for which 50% is finer by weight, ft

V_{des} = design velocity for local conditions a the pier, ft/s

S_g = specific gravity of riprap (usually taken as 2.65)

g = acceleration due to gravity (32.2 ft/s)

If the cross-section or channel average velocity, Vavg, is used, then it must be multiplied by factors that are a function of the shape of the pier and its location in the channel.

$$V_{des} = \mathrm{K}_1\mathrm{K}_2 V_{avg}$$

Where K_1= shape factor equal to 1.5 for round-nose piers

K_2 = velocity adjustment factor for location in the channel (ranges from 0.9 for a pier near the bank in a straight reach, to 1.7 for a pier located in the main current of flow around a sharp bend). An average value of 1.3 was used in this design.

V_{avg} = channel average velocity at the bridge, ft/s

The thickness of the riprap was determined using FHWA's No. 23 (Ref. 9). The minimum riprap thickness (t) is $3d_{50}$. To determine the upstream and downstream extent of riprap placement, the placement is 2 times the width of pier. Pier protection details are provided in Table 6.

4.5. CHANNEL DESIGN DATA

The minimum bank elevation was set at 3 ft above the computed water surface elevation for the design discharge. The HEC-RAS Output data is provided in Table 7. Note that the column titled "Min Ch El" represents the invert elevation plus sediment deposition results from the 2008 HEC-6T results. The standard output table was modified to include a column entitled "Min Ch El w/o

Sed," which provides invert elevations without the added sediment feature. The 1% ACE water surface profile is provided in Figure 4. Typical cross sections are provided in Figures 5 and 6.

4.6. SIDE SLOPE REVETMENT

The majority of the channel side slopes will have buried riprap with the exception of two areas. The first exception is through the highly constricted Old Town Temecula area where side slopes would not support growth of vegetation. The construction material for the near-vertical walls through this area will be soil cement. The other area is at the upstream end of Phase 2 where existing concrete side slopes will be replaced with grouted stone.

The program ChanlPro version 2.0 (Ref. 10) was used to determine appropriate stone size. The phase 2 area between River Stations 189+00 to 98+00 were divided into three sections based on similar side slope configuration or between bridges. The three sections are from River Sta. 189+00 to 169+00 (2H:1V side slopes); from River Sta. 169+00 to Rancho California Rd. bridge; and from Rancho California Rd. bridge to River Sta. 98+00 (3H:1V side slopes). ChanlPro input parameters for the three sections are provided in Table 8. The calculated D_{50} and D_{100} for all three sections is 6-in and 9-in, respectively. However, Los Angeles District policy requires a thickness layer no less than 12-in (Ref. 11). In USACE EM 1110-2-1601 Hydraulic Design of Flood Control Channels (Ref. 12), the riprap thickness is defined as $1D_{100}$, therefore, the minimum thickness is 12-in. The thickness and stone size was increased to 15-in to match what was already placed in constructed Phase 1. In Phase 2 riprap will extend to match the height of the existing riprap constructed in Phase 1.

Toe down depth was determined from the 2008 alternative sediment analysis and 2012 long term sediment analysis (refer to section 4.4). Based on the 2008 and 2012 analyses the deepest scour depth was 4.3 ft and 4.9 ft, respectively, below river station 179+00 to the end of Phase 2. The toe down depth was set to 5 ft from 180+00 to 59+00. Toe-down was set to 7 ft from 180+00 to 189+00 since the long term sediment analysis showed up to 6.4 ft of scour.
Riprap will be placed on the lower half of the channel banks. In order to reduce construction costs, the upper half of the sideslopes will be reinforced with a Turf Reinforcement Mat. For the purposes of this analysis, Propex Pyramat® was used for the design, but an equivalent turf reinforcement mat can also be used provided it has similar properties. Pyramat will be used in conjuction with topsoil and seeding to achieve the vegetated performance state.

The design parameters for using Propex Pyramat are listed in the Manufacturer's product specifications. These parameters include: Tensile Strength, UV Resistance, Max Flow Velocities, and Max Shear Stress.

ERDC's report on "Stability Thresholds and Performance Standards for Flexible Lining Materials in Channel and Slope Restoration Applications" under the Ecosystem Management and Restoration Research Program (EMRRP) describes the design criteria (Ref. 19). Tensile Strength should conform to ASTM D-6818 and have a minimum value of 3,000 x 3,000 lb/ft^2 for High Performance Turf Reinforcement Mats (HPTRM). Pyramat meets ASTM D-6818 and has a Tensile Strength of 4,000 x 3,000 lb/ft^2 which is adequate. Under ASTM D-4355 testing method, UV Resistance for Pyramat is 90% Tensile Strength retained @ 6000 hours. This translates to an estimated product design life of over 50 years. In the vegetated performance state for Pyramat, the channel's velocity cannot exceed 25 ft/sec and shear stress cannot exceed 15 lb/ft^2. Using HEC-RAS output tables, maximum velocity and shear stress for the channel were calculated to be 10.44 ft/s and 3.72 lb/ft^2,respectively. Therefore, the selection of Pyramat as the method of side slope revetment was determined to be adequate.

5. PROJECT PERFORMANCE RELIABILITY ANALYSIS

The section below is based on Phase 3 detention basin Alternative 2. Refer to Sedimentation Analysis section above for description of basin Alternative 2.

5.1. OBJECTIVE OF RISK-BASED ANALYSIS

The USACE process for the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) system evaluation is described in Engineering Circular (EC) 1110-2-6067 (Ref. 13). The USACE probability of exceedance and uncertainty analysis procedure for proposed flood damage reduction plans is described in Chapters 4 and 5 of Engineering Manual (EM) 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies (Ref. 14). For the Phase 2 incised channel the analysis will include the uncertainty in the discharge-probability function and in the stage-discharge function. A Monte Carlo simulation in the USACE's Hydrologic Engineering Center's Flood Damage Analysis (HEC-FDA) program version 1.2.5 (Ref. 15) was used to compute the uncertainty and assurance [conditional non exceedance probability (CNP)] of the incised channel to reduce the flood risks from the 1% ACE (design discharge) (Refs. 13 and 15). Essentially, this means that the incised channel must have a "conditional non-exceedance probability" (performance reliability) of 95%, with a minimum of 2 ft of freeboard added to the computed water surface elevation using the median estimate of the 1% ACE. Assurance between 90 and 95% can be found in accordance with NFIP system evaluation requirements if it is at least the FEMA required freeboard above the 1% ACE. Assurance less than 90% cannot be found in accordance with NFIP levee requirements (Ref. 13). The risk-based analysis was performed as described below.

5.2. COMPUTATIONAL METHODOLOGY PROCESS

Following the guidance found in EM 1110-2-1619 (Ref. 14) and HEC-FDA User's Manual (Ref. 15), the computational methodology for the risk-based analysis requires a two-part process to determine the necessary input information into the HEC-FDA program. The first part is to compute the "**Stage Uncertainty,**" and the second part is to determine "HEC-FDA Reliability Analysis." A discussion of its development is as follows:

5.2.1. Part One: Stage Uncertainty

Total stage uncertainty is a function of natural uncertainty ($S_{natural}$) and model uncertainty (S_{model}).

Natural uncertainty is a function of four parameters; watercourse bed composition, drainage area, 1% ACE flow, and stage range.

Watercourse Bed Composition (Bed Identifier). With respect to the watercourse bed composition factor, information in "Table 5-1" was utilized (Ref. 14). Refer to Table 9 in this report for the values. A higher value relates to higher "mobility" of the bed material. (Note this is completely independent of the smoothness of the bed material). Manning's n variation is a function of S_{model} (as will be discussed later.) For the bed material, consider how confident one can be that the bottom topography will remain unchanged over time. A less "mobile" material will resist scour and erosion better. Since the evaluation reach invert is comprised of sands, the bed composition factor corresponds to 4.

Drainage Area. As discussed in the Feasibility Report (Ref. 1), the contributing drainage at the Phase 2 location is 222 square miles.

The 1 % ACE (100-yr return period) Event. Through the evaluation reach, the 1% ACE peak discharge used for the analysis is 22,300 ft^3/s.

Stage Range. Range is defined as the maximum predicted or observed range of stage on the watercourse. The minimum flow in the river is set to zero, therefore, the minimum water surface elevation is equal to the invert elevation at any location. In a theoretical worst case scenario, the water surface could rise to the height of the bank and then by some additional surcharge value while overflowing. For this evaluation, the height of the bank plus one foot was determined to be the maximum water surface elevation at any given cross section river station since the river is essentially ephemeral with no flow for much of the year.

The four parameters listed above serve as inputs for the equation below, which yields natural uncertainty. As explained in Ref. 14, this equation is written to use metric units of measure and therefore requires conversion before calculating.

$$S_{tnatural} = [\ 0.07208 + 0.04936\, I_{bed} - 2.2626 \text{ x } 10^{-7}\ A_{basin} + \\ 0.02164\, H_{range} + 1.4194 \text{ x } 10^{-5}\ Q_{100}\ ]^2$$

Where I_{bed} = streambed identifier for the size of the bed material which controls flow in the reach of interest

A_{basin} = drainage basin area in square kilometers

H_{range} = maximum expected or observed range in stage in meters

Q_{100} = peak discharge of the (1% ACE) flood in cubic meters per second

Since an HEC-RAS model was available for the evaluation reach, invert and bank elevation data can be found in tabular form for each designated cross section. With this information, a $S_{natural}$ value was determined for each cross section. The hydrologic, hydraulic and natural uncertainty data are displayed in tabular format in Table 10: Computation of Uncertainty of Stage-Discharge Relationships.

5.2.1.1 **Model Uncertainty (S_{model}) from Computer Model Data**. As defined in EM 1110-2-1619 (Ref. 14), model uncertainty is associated with the accuracy of the Manning's n-values used in the model of the watercourse. Because the n-value is not a measurable quantity, there is some inherent uncertainty with the n-values used in a computer model or a mathematical calculation.

As mentioned, the Manning's n-value determination is not exact. This is demonstrated in the information presented in Figure 7 (Ref. 14, Figure 5-4), which plots n value standard deviation versus average of n values estimates. This figure provides information on a representative plus or minus range for any assumed n-values. i.e.; if the n value assigned is 0.042, the selected value is determined to be within 0.014 of that value, or between 0.028 and 0.056.

To calculate the model uncertainty, two modified geometries for the evaluation reach were created in HEC-RAS (Ref. 3); one with a lower range (assumed n minus uncertainty from Figure 5) and one with an upper range (assumed n plus uncertainty from Figure 7) of n-values. In addition to modifying Manning's n-values, debris parameters were adjusted in the HEC-RAS model to create a best and worst case scenario. For this study, the "best case" geometry with low n values was modeled with the debris option not factored in (i.e. turned off in the model). Debris for the high n-value geometry was set at two feet on each side of piers, stretching from the river bed to the waterline. This created what's referred to as "worst case" geometry.

The value of model uncertainty is the standard deviation of the variation in water surface elevations between the "best case" and "worst case" geometries. This being the case, a steady state analysis was conducted for each geometry using HEC-RAS. The output results from both iterations were then displayed on a spreadsheet with a focus on determining the water surface elevation at each cross section within the evaluation reach. Finally, in accordance with Ref. 14, these water surface values were averaged to determine an E_{mean} for each damage sub-reach. The sub-reaches used for this analysis are Phase 1 and Phase 2. The deviation in the water surface profiles were then calculated using Eqn. 5-7 (Ref. 14) below.

$$S_{\mathrm{model}} = \frac{E_{mean}}{4}$$

Where E_{mean} = mean difference between the upper and lower limits of the calculated stage

For this assessment, model uncertainty was averaged over each damage sub-reach.

5.2.1.2 **<u>Total Uncertainty (S_{total})</u>**. Model and natural uncertainty are related using the Eqn. 5-6 (Ref. 14) to calculate the total uncertainty at the damage reach's cross-sections stations. The natural uncertainty for the reach was averaged with the average model uncertainty for the encompassing reach to calculate the total uncertainty. The index location for the evaluation reach is specified to aggregate stage-damage functions with uncertainty for flood damage analysis calculations. For this analysis the index location was set at the cross section location with the least freeboard for the 1% ACE to ensure the reach meets the minimum freeboard criteria.

$$S_t = \sqrt{S^2{}_{natural} + S^2{}_{\mathrm{model}}}$$

Where S_t = total standard deviation of uncertainty

$S_{natural}$ = standard deviation of uncertainty as a function of pertinent natural physical characteristics of the watershed and conveyance

S_{model} = standard deviation of uncertainty of computed water surface data using mathematical models

The total uncertainty calculation for this analysis is summarized in Table 10.

5.2.2. **Part Two: HEC-FDA Reliability Analysis**

5.2.2.1 **Step One – Configure (Damage Reaches and Index Stations)**.

Defining Damage Reaches. The evaluation reach includes the limits of Phase 2.

Selecting Sub-Reach Index Stations. HEC-FDA (Ref. 15) evaluates the reliability of an entire damage reach based on the reliability at one index station within the sub-reach. However, for this project there is only one reach. Information on the reach index location parameters is shown in Table 10.

5.2.2.2 **Step Two – Hydraulic Data (Water Surface Profile, Stage-Discharge, Exceedance Probability).**

Water Surface Profile Data. The reliability analysis is based on the 1% ACE event and associated water surface elevations. The HEC-FDA analysis requires more information; specifically, water surface profiles for eight different frequency flow events. The normal default events are the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year events. These defaults were changed based on available information. This analysis utilized the 200-year event instead of the 250-year event which was developed in the Feasibility Report (Ref. 1), refer to Table 1 for Discharge-Frequency Results. Once all eight flow regimes were established, they were each used to complete a steady state analysis with the base project geometry in HEC-RAS. Appendix C of the HEC-RAS User's Manual (Ref. 3) describes in detail how to export the water surface profiles from the HEC-RAS model into the HEC-FDA program.

Stage Discharge Function with Uncertainty. Defining the uncertainty about each water surface profile across the different frequency flow events was required. Once the water surface profiles are established, the HEC-FDA program then retrieves a stage-discharge function from the water surface profile. Subsequently, the uncertainty then needs to be assigned for each index location. The HEC-FDA software will calculate the uncertainty based off a normal distribution and an error and stage input by the user. The uncertainty calculated at each index location is calculated and then applied along with the corresponding 1% ACE water surface elevation at the given index location. The normal distribution assumes that uncertainty will not be higher than the user-entered value, and this analysis also assumes that the uncertainty will reduce linearly to zero as flow reduces to zero.

Exceedance Probability Function with Uncertainty. The basic information for this task is to import the water surface profiles from HEC-RAS to HEC-FDA. The graphical determination option was used in the analysis to define the uncertainty in the discharge exceedance probability relationship. This approach requires a value in years for the equivalent record length. The discharge-frequency data was based on an equivalent streamgage record length of 92 years.

Crest Elevation Data: Top of bank elevations for the index location was inputted into HEC-FDA using the levee data option.

5.2.2.3 **Step Three – Reliability Analysis.**

With the above information as input into HEC-FDA program, an "Evaluation by Analysis Years" was performed on the evaluation reach. The results of this analysis, which specify the CNP for the specified frequency events, indicated that the evaluation reach has a 92% non-exceedance probability for the 1% ACE with over 3 feet of freeboard. These results for the 1% ACE are summarized in Table 10. Freeboard (FB) at the index location was also included in the table and discussed below.

5.3. RISK & UNCERTAINTY SUMMARY

The USACE probability of exceedance and uncertainty analysis procedure used in the HEC-FDA program is used to determine if the levee system has a CNP between 90 and 95%, with a minimum of 3 ft of freeboard added to the computed water surface elevation of the 1% ACE (Ref. 13). As discussed, the results from the HEC-FDA analysis confirmed that the evaluation reach has a 92% non-exceedance probability for the 1% ACE with greater than 3 ft of freeboard.

6. INTERIOR FLOOD CONTROL AND SIDE DRAINAGE

6.1. GENERAL CONSIDERATIONS

No interior flood control or side drainage facilities were originally planned for Phase 2. However, additional inspection of available topographic mapping and site visits were conducted by RCFC&WCD. As a result, additional side drain facilities were designed and constructed to ensure that all local runoff is intercepted and conveyed to facilities that will allow it to enter the channel without significant erosion of the side slopes. Hydraulic and civil design details of the side drainage facilities have been prepared following standards provided by the local sponsor.

6.2. SIDE DRAIN DESIGN HYDROLOGY

The side drain design hydrology for Phase 2 was prepared with the same criteria and procedure used for constructed Phase 1.

6.2.1. Introduction

This section of the report presents the results of the hydrology study for the existing and proposed side drain flood control facilities, excluding the major open channels that covey flows to the Murrieta Creek channel (i.e. Warm Springs Creek and Santa Gertrudis Channels), as shown in Figure 8. The hydrology analysis work was provided by the RCFC&WCD which is the lead local sponsor agency providing in-kind services to the USACE.

6.2.2. **Purpose**

The purpose of this study is to determine the peak flows tributary to the tributaries of Murrieta Creek. The primary objective of the hydrologic analysis was to determine the 100-year discharge at various concentration points along Murrieta Creek utilizing the RCFC&WCD methodology.

These peak flows were used to determine the adequacy of the existing facilities and the need to construct new facilities, which would daylight at the proposed locations to safely convey the tributary flows to Murrieta Creek Channel. Other locations utilized the use of earthen ditches to collect local flows from small tributary areas and direct it longitudinally alongside the access maintenance roads to an adequate inlet then to an underground facility under the access road and into the channel. The hydraulic solutions for each concentration point along the Murrieta Creek project varied depending on the complexity of each situation.

6.2.3. **Precipitation**

Point precipitation frequency estimates data were researched from the following sources:

- RCFC&WCD maintains records of precipitation data through rain gauge stations within Riverside County. The District analyzes these data based on methods described by the State of California, Department of Water Resources (DWR) in Bulletin Number 195.
- RCFC&WCD hydrology manual published maps.
- NOAA ATLAS 14.

After evaluating the precipitation data NOAA ATLAS 14 frequency estimates were used and summarized in Table 11.

6.2.4. **Methodology**

A Civil Design Computer Software program, HEC-1 Flood Hydrograph Package, was used in performing the hydrology studies in this section of the report. The program utilizes the Rational Table method and the Synthetic Unit hydrograph method described in RCFC&WCD's Hydrology Manual (Ref. 16) depending on the acreage of each tributary area. Three areas in this study ranging from approximately 400 to 700 acres utilized the Synthetic Unit Hydrograph method, all other areas ranging from approximately 0.1 acres to 300 acres utilized the Rational Table method.

6.2.4. **Results**

Results from the Civil Design Software program are summarized in Table 12: Subarea Design Discharge Data.

6.3. SIDE DRAIN FACILITIES

All existing pipes that drain into the channel will be protected in-place or upgraded based on the subarea design discharges provided by the RCFC&WCD. To prevent excessive erosion of the embankment slope, the existing and proposed pipes will include case-in-place concrete headwall and wingwalls. Energy dissipaters were added at the outlet for pipes that were 48" and higher in diameter since the channel is a soft bottom. Hydraulic Design Chart 722-6 Storm Drain Outlets from the Hydraulic Design Criteria Notebook was utilized in the design (Ref. 17). The H&H Policy Memo No. 1 for Side Drain Connections into Flood Control Channels (Ref. 18) was used to supplement criteria found in EM 1110-2-1601 (Ref. 12), which is appropriate for side drain inlets within the los Angeles District. All pipes will be extended to the new channel alignment. Table 13 is a list of side drains that will directly discharge into the channel.

6.4. DITCHES

Local surface runoff will be intercepted and collected by means of small earthen ditches, lined with a turf reinforcement mat (TRM), which extends along the landside of the maintenance road. The ditch will convey the flow to an on grade grated drop inlet, into an existing or new pipe and then discharged into the natural channel. The ditch will be V-shaped with typical side slopes of 3H:1V (unless where noted) and one foot in depth. The short-term maximum velocity for (Lanklok 450) unvegetated channels is 12 ft/s (per Propex Geosynthetics brochure).

7. REFERENCES

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TABLES

Table 1: Discharge Frequency Values

% AEP Event	Discharge
0.50 (2-yr)	5,390
0.20 (5-yr)	8,860
0.10 (10-yr)	11,700
0.04 (25-yr)	15,700
0.02 (50-yr)	19,300
0.01 (100-yr)	22,300*
0.005 (200-yr)	27,200
0.002 (500-yr)	37,100
AEP = annual exceedance probability *100-yr discharge reduced to 22,300 ft^3/s to avoid increasing the size of the channel in Phase 2. Maximum outflow of the basin will be 22,300 ft^3/s.	

Table 2: Design Channel Bottom Widths

River Station	Riparian Corridor Width (ft), Unmaintained	Invert Bottom Width (ft)	Total Bottom Width (ft), including riparian corridor
189+00	130.9	120.9	251.8
189+00 to 188+50	Transition	120.9	251.8 to 241.8
188+50 to 186+40	120.9	120.9	241.8
186+40 to 185+00	120.9	Transition	241.8 to 252
185+00 to 180+00	130.9	Transition	252 to 233.6
180+00 to 178+00	116.8	116.8	233.6
178+00 to 176+00	Transition	Transition	233.6 to 239.2
176+00 to 170+00	119.6	119.6	239.2
170+00 to 168+00	Transition	Transition	239.2 to 248.6
168+00 to 151+00	120.3	128.3	248.6
151+00 to 143+00	Transition	Transition	248.6 to 363.6
143+00 to 137+00	150	213.6	363.6
137+00 to 129+00	Transition	Transition	363.6 to 233.6
129+00 to 113+50	100	133.6	233.6
113+50 to 109+00	Transition	Transition	233.6 to 205
109+00 to 102+50	50	155	205
102+50 to 95+00	Transition	Transition	205 to 167
95+00 to 84+00	20	147	167
84+00 to 82+00	20	Transition	167 to 140
82+00 to 66+00	20	120	140
66+00 to 63+50	Transition	Transition	140 to 205
63+50 to 61+00	35	170	205
61+00 to 59+00	Transition	Transition	205 to 240
59+00	70	170	240

Table 3: Design Channel Depth Characteristics

River Station	Channel Depth (ft) LOB (above terrace)	Channel Depth (ft) ROB	Side Slope (ft) (horizontal:vertical)
189+00	21.7	25.2	2H:1V
189+00 to 188+50	Transition	Transition	2H:1V
188+50	22.2	25.7	2H:1V
188+50 to 187+40	Transition	25.7	2H:1V
187+40 to 186+40	23.7	25.7	2H:1V
186+40 to 183+00	Transition	Transition	2H:1V
183+00	19.7	22	2H:1V
183+00 to181+00	Transition	Transition	2H:1V
181+00 to 170+00	18.2	18.2	2H:1V
170+00 to 168+00	Transition	18.2	Transition
168+00	19.2	18.2	3H;1V
168+00 to 167+25	Transition	Transition	3H:1V
167+25	20.2	17.7	3H:1V
167+25 to 162+00	Transition	17.7	3H:1V
162+00	19.2	17.7	3H:1V
162+00 to 151+00	Transition	17.7	3H:1V
151+00 to 138+00	15.7	17.7	3H:1V
138+00 to 137+00	Transition	Transition	3H:1V
137+00 to 113+50	16.7	18.7	3H:1V
113+50 to 113+00	Transition	Transition	3H:1V
113+00 to 98+00	18	20	3H:1V
98+00 to 95+00	Transition	Transition	Transition
95+00 to 89+00	18.5	20.5	1H:4V
89+00 to 88+00	Transition	Transition	1H:4V
88+00 to 84+00	19.5	21.5	1H:4V
84+00 to 82+00	Transition	Transition	1H:4V
82+00 to 66+00	20	22	1H:4V
66+00 to 65+50	20	22	Transition
65+50 to 63+50	Transition	Transition	1H:2V
63+50 to 61+00	20.5	22.5	1H:2V
61+00 to 59+00	Transition	Transition	Transition
59+00	21	28	2H:1V

Note: LOB = left of bank, ROB = right of bank (looking downstream)

Table 4: Roughness Coefficients

River Station	Side Slopes	Invert (unmaintained)	Invert (maintained)
189+00 to 183+00	0.025	0.07	0.027
183+00 to 98+00	0.042	0.07	0.027
98+00 to 59+00	0.023	0.07	0.027

Table 5: Comparison of Roughness Coefficient Values

	Original USACE "n" values		Adjusted "n" values	
	minimum	maximum	minimum	maximum
Computed Water Surface Elevation (ft)	998.69	1021.51	998.39	1021.51
Flow Depth (ft)	5.64	17.21	5.64	16.81
Average Flow Velocity (ft/s)	4.27	13.68	5.29	13.83
Note: Analysis conducted on January 22, 2013.				

Table 6: Local Pier Protection Summary

From FHAW’s Hydraulic Engineering Cir. No. 23, 2009 (Determine local pier scour)

V_{des} = K1K2V_{avg}; where
K1 = shape factor equal to 1.5 for round-nose piers
K2 = velocity adjustment factor for location in the channel (ranges from 0.9-1.7), use 1.3 ave
V_{avg} = average velocity at bridge (from HEC-RAS)

$D_{50} = 0.692(Vdes)^2$ /(Sg-1)2g; where
D_{50} = particle size for which 50% is finer by weight
V_{des} = design velocity for local conditions at the pier
Sg = specific gravity of riprap (usually taken as 2.65)
G = acceleration due to gravity (32.2)

T = thinkness of riprap
T = $3D_{50}$

									Pier Width	
Bridge	V_{des}	K1	K2	V_{avg} ft/s	D_{50} ft	D_{50} roundup	D_{100}	T ft	A Ft	2a ft
Winchester Rd.	18.1	1.5	1.3	9.3	2.1	2.6	5	6.4	2.5	5
Overland Dr.	19.4	1.5	1.3	10	2.5	2.6	5	7.4	4	8
Rancho Calif. Rd.	11.5	1.5	1.3	5.9	0.9	1.0	2	2.6	4	8
First St.	15.7	1.5	1.3	8.0	1.6	1.6	3	4.8	3	6

Table 7: Summary of Pertinent Data and Hydraulic Elements (from HEC-RAS Output Table)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	Ch El with Sediment (ft)	W.S. Elev (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
18900	100-yr	22300	1004.74	1004.74	1018.38	1018.89	0.001188	5.72	3897	310.37	0.28
18850	100-yr	22300	1004.64	1004.64	1018.26	1018.83	0.001285	6.02	3703.98	298.04	0.3
18800	100-yr	22300	1004.54	1004.55	1018.2	1018.76	0.001275	6.01	3713.13	298.24	0.3
18740	100-yr	22300	1004.42	1004.44	1018.11	1018.68	0.001276	6.06	3680.76	296.57	0.3
18690.02	Winchester Rd Br										
18640	100-yr	22300	1004.22	1004.22	1017.44	1018.06	0.001441	6.29	3543.73	294.28	0.32
18600	100-yr	22300	1004.14	1004.14	1017.39	1017.99	0.00141	6.25	3570.32	295.99	0.32
18500	100-yr	22300	1003.94	1003.94	1017.21	1017.8	0.002571	6.17	3616.48	299.08	0.31
18400	100-yr	22300	1003.74	1003.74	1017	1017.55	0.002267	5.92	3767.05	317.04	0.3
18342.35	100-yr	22300	1003.625	1003.63	1016.78	1017.4	0.002735	6.28	3548.53	299.02	0.32
18300	100-yr	22300	1003.54	1003.54	1016.7	1017.27	0.002483	6.09	3661.73	304.63	0.31
18281	100-yr	22300	1003.502	1003.5	1016.59	1017.22	0.002996	6.33	3522.52	295.2	0.32
18244	100-yr	22300	1003.428	1003.43	1016.53	1017.09	0.002729	6.01	3710.28	309.36	0.31
18200	100-yr	22300	1003.34	1003.34	1016.32	1016.96	0.003051	6.39	3489.63	294.74	0.33
18100	100-yr	22300	1003.14	1003.14	1015.92	1016.62	0.003533	6.73	3311.78	284.72	0.35
18000	100-yr	22300	1002.94	1002.94	1015.53	1016.26	0.003724	6.84	3258.22	283.96	0.36
17900	100-yr	22300	1002.74	1002.74	1015.25	1015.98	0.00209	6.9	3234.02	283.62	0.36
17800	100-yr	22300	1002.54	1002.54	1015.04	1015.78	0.002096	6.9	3231.05	283.58	0.36
17700	100-yr	22300	1002.34	1002.35	1014.84	1015.56	0.002053	6.83	3264.45	286.39	0.36
17600	100-yr	22300	1002.14	1002.15	1014.65	1015.36	0.002004	6.75	3301.73	289.22	0.35
17574	100-yr	22300	1002.088	1002.1	1014.59	1015.3	0.002005	6.76	3301.04	289.21	0.35
17549	100-yr	22300	1002.037	1002.05	1014.54	1015.25	0.002005	6.76	3301.07	289.21	0.35
17534	100-yr	22300	1002.007	1002.02	1014.51	1015.22	0.002006	6.76	3300.46	289.14	0.35
17500	100-yr	22300	1001.94	1001.95	1014.45	1015.15	0.002004	6.75	3302.06	289.3	0.35
17410	100-yr	22300	1001.76	1001.76	1014.29	1014.97	0.001892	6.6	3380.35	319.33	0.36
17400	100-yr	22300	1001.74	1001.74	1014.28	1014.95	0.00187	6.57	3392.17	319.35	0.36
17365	100-yr	22300	1001.67	1001.67	1014.22	1014.88	0.001796	6.49	3433.67	319.42	0.35
17316.87	Overland Dr Br										
17260	100-yr	22300	1001.46	1001.46	1013.4	1014.13	0.002164	6.89	3237.82	317.04	0.38
17215	100-yr	22300	1001.37	1001.37	1013.26	1014.02	0.002288	7.03	3172.93	301.64	0.38
17200	100-yr	22300	1001.34	1001.34	1013.21	1013.99	0.002335	7.07	3154.85	302.06	0.39
17123	100-yr	22300	1001.186	1001.19	1013	1013.8	0.002436	7.19	3103.12	286.29	0.38
17100	100-yr	22300	1001.14	1001.14	1012.94	1013.75	0.002439	7.19	3102.16	286.42	0.39
17055	100-yr	22300	1001.05	1001.05	1012.83	1013.64	0.002456	7.2	3095.39	286.32	0.39
17000	100-yr	22300	1000.94	1000.94	1012.69	1013.5	0.002478	7.22	3086.88	286.2	0.39
16900	100-yr	22300	1000.74	1000.74	1012.56	1013.24	0.00202	6.6	3377.05	309.48	0.35
16800	100-yr	22300	1000.54	1000.54	1012.33	1013.03	0.002106	6.71	3323.01	317.36	0.37
16725	100-yr	22300	1000.39	1000.39	1012.18	1012.87	0.002069	6.67	3343.61	317.9	0.36
16700	100-yr	22300	1000.34	1000.34	1012.11	1012.82	0.002126	6.73	3313.16	316.99	0.37
16600	100-yr	22300	1000.14	1000.14	1011.9	1012.61	0.002119	6.73	3315.78	317.19	0.37
16500	100-yr	22300	999.94	999.94	1011.68	1012.39	0.002148	6.75	3302.17	316.79	0.37
16400	100-yr	22300	999.74	999.74	1011.47	1012.18	0.002141	6.75	3303.67	316.72	0.37
16300	100-yr	22300	999.54	999.54	1011.25	1011.96	0.00215	6.76	3300.5	316.95	0.37
16200	100-yr	22300	999.34	999.34	1011.04	1011.75	0.002161	6.77	3295.1	316.89	0.37
16100	100-yr	22300	999.14	999.14	1010.82	1011.53	0.002174	6.78	3288.55	316.72	0.37
16000	100-yr	22300	998.94	998.94	1010.59	1011.31	0.002188	6.79	3281.86	316.59	0.37
15900	100-yr	22300	998.74	998.74	1010.37	1011.09	0.002203	6.81	3274.26	316.4	0.37
15800	100-yr	22300	998.54	998.54	1010.15	1010.87	0.00222	6.83	3266.44	316.25	0.37
15700	100-yr	22300	998.34	998.34	1009.92	1010.65	0.002238	6.84	3258.06	316.09	0.38
15600	100-yr	22300	998.14	998.14	1009.71	1010.42	0.002203	6.75	3304.82	318.56	0.37
15500	100-yr	22300	997.94	997.94	1009.46	1010.19	0.00228	6.89	3238.81	315.83	0.38
15400	100-yr	22300	997.74	997.74	1009.22	1009.97	0.002304	6.91	3227.98	315.62	0.38
15300	100-yr	22300	997.54	997.54	1008.99	1009.73	0.002331	6.93	3215.79	315.34	0.38
15200	100-yr	22300	997.34	997.34	1008.74	1009.5	0.002361	6.96	3202.48	315.03	0.39
15100	100-yr	22300	997.14	997.14	1008.5	1009.26	0.002392	6.99	3189.52	314.89	0.39
15000	100-yr	22300	996.94	996.94	1008.33	1009.01	0.0021	6.63	3362.11	329.43	0.37
14900	100-yr	22300	996.74	996.74	1008.18	1008.8	0.001843	6.29	3543.27	344.09	0.35
14800	100-yr	22300	996.54	996.54	1008.07	1008.6	0.00154	5.86	3806.28	380.26	0.33
14719.18	100-yr	22300	996.378	996.38	1008.04	1008.52	0.000532	5.59	3988.84	377.18	0.3
14700	100-yr	22300	996.34	996.34	1008.03	1008.51	0.000517	5.53	4035.96	380.28	0.3
14669	100-yr	22300	996.278	996.28	1008.03	1008.49	0.000494	5.42	4112.65	385.44	0.29
14651	100-yr	22300	996.24	996.24	1008.03	1008.48	0.000481	5.36	4160.02	388.73	0.29

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	Ch El with Sediment (ft)	W.S. Elev (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
14633	100-yr	22300	996.206	996.21	1008.02	1008.46	0.000496	5.31	4197.19	390.63	0.29
14600	100-yr	22300	996.14	996.14	1008	1008.44	0.001192	5.31	4199.11	389.7	0.29
14500	100-yr	22300	995.94	995.94	1007.92	1008.31	0.001048	5.05	4417.44	404.82	0.27
14400	100-yr	22300	995.74	995.74	1007.85	1008.2	0.000913	4.75	4693.13	421.82	0.25
14300	100-yr	22300	995.54	995.54	1007.78	1008.11	0.000814	4.57	4878.19	435.2	0.24
14200	100-yr	22300	995.34	995.34	1007.71	1008.03	0.000786	4.52	4932.64	435.96	0.24
14100	100-yr	22300	995.14	995.14	1007.64	1007.95	0.000759	4.47	4988.38	436.72	0.23
14000	100-yr	22300	994.94	994.95	1007.57	1007.87	0.000734	4.42	5041.53	437.5	0.23
13900	100-yr	22300	994.74	994.75	1007.5	1007.8	0.000708	4.37	5099.67	438.3	0.23
13800	100-yr	22300	994.54	994.54	1007.44	1007.73	0.000681	4.32	5162.81	439.12	0.22
13700	100-yr	22300	994.34	994.34	1007.37	1007.66	0.000657	4.27	5223.31	439.94	0.22
13600	100-yr	22300	994.14	994.14	1007.29	1007.59	0.000697	4.41	5058.96	424.36	0.23
13500	100-yr	22300	993.94	993.94	1007.19	1007.51	0.000743	4.56	4887.98	408.74	0.23
13400	100-yr	22300	993.74	993.74	1007.09	1007.43	0.000799	4.73	4710.22	393.06	0.24
13300	100-yr	22300	993.54	993.65	1006.96	1007.35	0.000888	4.97	4490	377.28	0.25
13200	100-yr	22300	993.34	993.79	1006.8	1007.24	0.001054	5.32	4192.82	361.28	0.28
13100	100-yr	22300	993.14	993.25	1006.68	1007.14	0.001074	5.44	4096.03	345.45	0.28
13000	100-yr	22300	992.94	992.94	1006.52	1007.02	0.00117	5.69	3918.7	329.45	0.29
12900	100-yr	22300	992.74	992.74	1006.32	1006.89	0.001326	6.03	3700.54	313.25	0.31
12890	100-yr	22300	992.72	992.72	1006.31	1006.87	0.001324	6.02	3702.66	313.29	0.31
12800	100-yr	22300	992.54	992.54	1006.2	1006.75	0.001301	5.99	3723.44	313.69	0.31
12700	100-yr	22300	992.34	992.34	1006.07	1006.62	0.001276	5.95	3747.31	314.14	0.3
12600	100-yr	22300	992.14	992.14	1005.95	1006.5	0.001251	5.91	3772.06	314.62	0.3
12500	100-yr	22300	991.94	991.94	1005.83	1006.37	0.001225	5.87	3797.68	315.11	0.3
12400	100-yr	22300	991.74	991.74	1005.72	1006.25	0.001199	5.83	3824.17	315.61	0.3
12300	100-yr	22300	991.54	991.54	1005.6	1006.13	0.001173	5.79	3851.52	316.13	0.29
12200	100-yr	22300	991.34	991.34	1005.49	1006.01	0.001147	5.75	3879.74	316.67	0.29
12110	100-yr	22300	991.16	991.16	1005.4	1005.9	0.001124	5.71	3905.95	317.16	0.29
12100	100-yr	22300	991.14	991.14	1005.38	1005.89	0.001122	5.71	3908.71	317.22	0.29
12090	100-yr	22300	991.12	991.12	1005.37	1005.88	0.001119	5.7	3911.52	317.27	0.29
12000	100-yr	22300	990.94	990.94	1005.28	1005.78	0.001096	5.66	3938.58	317.78	0.28
11900	100-yr	22300	990.74	990.74	1005.18	1005.67	0.00107	5.62	3969.46	318.37	0.28
11800	100-yr	22300	990.54	990.54	1005.08	1005.56	0.001044	5.57	4001.25	318.97	0.28
11700	100-yr	22300	990.34	990.34	1004.98	1005.45	0.001019	5.53	4033.91	319.58	0.27
11660	100-yr	22300	990.26	990.26	1004.94	1005.41	0.001009	5.51	4047.21	319.83	0.27
11600	100-yr	22300	990.14	990.14	1004.89	1005.35	0.00098	5.44	4097.25	335.2	0.27
11500	100-yr	22300	989.94	989.94	1004.83	1005.25	0.000843	5.2	4290.58	336.06	0.26
11468.98	100-yr	22300	989.878	989.88	1004.76	1005.22	0.000846	5.42	4111.58	321.03	0.27
11418.98	100-yr	22300	989.778	989.78	1004.72	1005.17	0.000834	5.4	4131.19	321.4	0.27
11400	100-yr	22300	989.74	989.74	1004.7	1005.15	0.000926	5.39	4138.39	321.54	0.26
.98 stabliz	100-yr	22300	989.706	989.71	1004.7	1005.13	0.000924	5.31	4200.88	322.87	0.26
11370.*	100-yr	22300	989.68	989.68	1004.68	1005.13	0.000405	5.36	4162.07	322.56	0.26
11350	100-yr	22300	989.64	989.64	1004.68	1005.12	0.000398	5.32	4191.73	323.97	0.26
11300	100-yr	22300	989.54	990.58	1004.65	1005.09	0.000689	5.35	4169.24	338.63	0.27
11200	100-yr	22300	989.34	990.35	1004.54	1005.02	0.000741	5.5	4050.94	327.98	0.28
11132	100-yr	22300	989.204	990.2	1004.5	1004.96	0.000729	5.45	4091.11	324.11	0.27
11102	100-yr	22300	989.144	990.1	1004.44	1004.94	0.000799	5.67	3931.98	317.29	0.28
11100	100-yr	22300	989.14	990.13	1004.43	1004.93	0.000805	5.69	3920.7	316.87	0.29
11000	100-yr	22300	988.94	989.9	1004.35	1004.85	0.000822	5.7	3910.57	339.43	0.3
10900	100-yr	22300	988.74	989.67	1004.28	1004.77	0.000765	5.59	3988.97	327.42	0.28
10875	100-yr	22300	988.69	989.26	1004.29	1004.74	0.00066	5.38	4142.73	326.59	0.27
10845	100-yr	22300	988.63	988.77	1004.35	1004.7	0.000283	4.68	4769.15	367.21	0.23
10776.18	Rancho Calif Br										
10710	100-yr	22300	988.36	988.41	1003.93	1004.27	0.000292	4.72	4722.43	367.23	0.23
10695	100-yr	22300	988.34	988.42	1003.81	1004.24	0.000613	5.27	4232.1	325.87	0.26
10660	100-yr	22300	988.33	988.28	1003.79	1004.22	0.000618	5.28	4223.9	326.15	0.26
10600	100-yr	22300	988.26	988.14	1003.72	1004.17	0.000674	5.41	4121	327.3	0.27
10574	100-yr	22300	988.14	988.09	1003.67	1004.15	0.000724	5.55	4018.23	324.74	0.28
10500	100-yr	22300	987.94	987.94	1003.6	1004.1	0.000772	5.66	3940.34	312.22	0.28
10452	100-yr	22300	987.844	987.84	1003.56	1004.06	0.00077	5.68	3926.85	296.84	0.28
10417	100-yr	22300	987.774	987.77	1003.53	1004.03	0.000761	5.65	3944.15	297.57	0.27
10400	100-yr	22300	987.74	987.74	1003.52	1004.02	0.000757	5.64	3950.5	297.68	0.27
10350	100-yr	22300	987.64	987.64	1003.49	1003.98	0.000746	5.62	3970.1	298.08	0.27
10300	100-yr	22300	987.54	987.54	1003.45	1003.94	0.000736	5.59	3989.89	298.48	0.27

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	Ch El with Sediment (ft)	W.S. Elev (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
10250	100-yr	22300	987.438	987.44	1003.42	1003.9	0.000725	5.56	4010.41	298.88	0.27
10200	100-yr	22300	987.34	987.34	1003.35	1003.86	0.000759	5.71	3904.38	291.86	0.28
10100	100-yr	22300	987.14	987.14	1003.23	1003.78	0.000827	5.94	3751.51	279.04	0.29
10000	100-yr	22300	986.94	986.94	1003.07	1003.68	0.000888	6.31	3534.01	267.53	0.31
9900	100-yr	22300	986.74	986.74	1002.84	1003.58	0.001063	6.9	3230.59	249.01	0.34
9800	100-yr	22300	986.54	986.54	1002.61	1003.48	0.00076	7.45	2992.81	234.43	0.37
9700	100-yr	22300	986.34	986.34	1002.51	1003.4	0.000784	7.57	2946.63	215.58	0.36
9600	100-yr	22300	986.14	986.14	1002.39	1003.31	0.00082	7.7	2896.66	197.1	0.35
9500	100-yr	22300	985.94	985.94	1002.27	1003.22	0.000879	7.82	2851.12	178.63	0.35
9400	100-yr	22300	985.74	985.74	1002.2	1003.13	0.000857	7.76	2873.46	178.69	0.34
9300	100-yr	22300	985.54	985.54	1002.12	1003.05	0.000836	7.7	2895.88	178.75	0.34
9200	100-yr	22300	985.34	985.34	1002.05	1002.96	0.000815	7.64	2918.66	178.81	0.33
9100	100-yr	22300	985.14	985.14	1001.98	1002.87	0.000795	7.58	2941.81	178.88	0.33
9020	100-yr	22300	984.98	984.98	1001.93	1002.81	0.000779	7.53	2960.59	178.93	0.33
9000	100-yr	22300	984.94	984.94	1001.91	1002.79	0.000775	7.52	2965.42	178.97	0.33
8900	100-yr	22300	984.74	984.74	1001.9	1002.69	0.000669	7.13	3125.76	194.16	0.31
8810.82	100-yr	22300	984.562	984.56	1001.77	1002.62	0.000706	7.41	3008.74	179.14	0.32
8800	100-yr	22300	984.54	984.54	1001.76	1002.62	0.000704	7.41	3010.59	179.1	0.32
8760.82	100-yr	22300	984.46	984.46	1001.74	1002.59	0.000697	7.38	3020.78	179.13	0.32
8742.82	100-yr	22300	984.42	984.42	1001.73	1002.57	0.000693	7.37	3026.18	179.17	0.32
8724.82	100-yr	22300	984.389	984.39	1001.72	1002.56	0.000723	7.36	3029.64	179.2	0.32
8700	100-yr	22300	984.34	984.34	1001.7	1002.54	0.000719	7.35	3035.82	179.22	0.31
8600	100-yr	22300	984.14	984.14	1001.64	1002.47	0.0007	7.29	3060.67	179.29	0.31
8500	100-yr	22300	983.94	983.94	1001.58	1002.39	0.000682	7.23	3085.82	179.36	0.31
8400	100-yr	22300	983.74	983.74	1001.52	1002.32	0.000664	7.17	3111.29	179.43	0.3
8350	100-yr	22300	983.64	983.64	1001.44	1002.28	0.000707	7.35	3034.27	174.89	0.31
8300	100-yr	22300	983.54	983.54	1001.36	1002.24	0.000751	7.53	2961.76	170.42	0.32
8200	100-yr	22300	983.39	983.39	1000.99	1002.13	0.001048	8.57	2602.29	152.3	0.37
8100	100-yr	22300	983.24	983.24	1000.89	1002.02	0.001038	8.54	2609.97	152.32	0.36
8050	100-yr	22300	983.17	983.17	1000.84	1001.97	0.001034	8.53	2612.93	152.33	0.36
8007.01	Main St Br										
7970	100-yr	22300	983.05	983.21	1000.73	1001.88	0.001061	8.6	2592.16	152.34	0.37
7900	100-yr	22300	982.94	982.94	1000.67	1001.79	0.001022	8.5	2622.82	152.36	0.36
7800	100-yr	22300	982.79	982.79	1000.57	1001.69	0.001012	8.48	2630.7	152.39	0.36
7700	100-yr	22300	982.64	982.64	1000.48	1001.59	0.001002	8.45	2638.96	152.42	0.36
7600	100-yr	22300	982.49	982.49	1000.38	1001.48	0.000992	8.42	2647.38	152.45	0.36
7500	100-yr	22300	982.34	982.34	1000.29	1001.38	0.000982	8.4	2655.96	152.47	0.35
7400	100-yr	22300	982.19	982.19	1000.2	1001.28	0.000971	8.37	2664.71	152.5	0.35
7300	100-yr	22300	982.04	982.04	1000.1	1001.18	0.000961	8.34	2673.63	152.53	0.35
7200	100-yr	22300	981.89	981.89	1000.01	1001.09	0.000951	8.31	2682.69	152.56	0.35
7136	100-yr	22300	981.794	981.79	999.96	1001.02	0.000944	8.29	2689.27	152.58	0.35
7116	100-yr	22300	981.764	981.76	999.94	1001.01	0.000942	8.29	2690.94	152.58	0.35
7100	100-yr	22300	981.74	981.74	999.92	1000.99	0.000941	8.29	2691.6	152.57	0.35
7000	100-yr	22300	981.59	981.59	999.92	1000.86	0.000812	7.78	2864.62	182.74	0.35
6975	100-yr	22300	981.553	981.55	999.93	1000.83	0.00076	7.63	2922.92	182.78	0.34
6955	100-yr	22300	981.523	981.52	999.92	1000.81	0.000738	7.56	2948.18	182.81	0.33
6907.92	First St Br										
6850	100-yr	22300	981.366	981.37	999.58	1000.49	0.000768	7.66	2912.65	182.71	0.34
6825	100-yr	22300	981.328	981.33	999.54	1000.47	0.000792	7.73	2885.85	182.7	0.34
6800	100-yr	22300	981.29	981.29	999.46	1000.43	0.00085	7.89	2824.59	182.62	0.35
6700	100-yr	22300	981.14	981.14	999.26	1000.33	0.000952	8.31	2682.14	152.56	0.35
6696	100-yr	22300	981.134	981.13	999.26	1000.33	0.00095	8.31	2683.57	152.61	0.35
6671	100-yr	22300	981.097	981.1	999.23	1000.3	0.000949	8.31	2684.06	152.57	0.35
6600	100-yr	22300	980.99	982.6	998.87	1000.2	0.001333	9.24	2414.66	152.44	0.41
6550	100-yr	22300	980.92	983.89	998.86	1000.11	0.001346	8.95	2492.57	173.94	0.42
6545	100-yr	22300	980.91	984.02	998.85	1000.1	0.001365	8.96	2489.7	175.24	0.42
6500	100-yr	22300	980.84	983.85	998.93	999.99	0.001137	8.23	2709.21	187.18	0.38
6450	100-yr	22300	980.77	983.66	999	999.89	0.000944	7.55	2953.08	200.15	0.35
6400	100-yr	22300	980.69	983.47	999.05	999.8	0.000791	6.96	3202.67	213.36	0.32
6350	100-yr	22300	980.62	983.29	999.09	999.73	0.000672	6.46	3453.44	226.55	0.29
6300	100-yr	22300	980.54	983.09	999.06	999.7	0.000648	6.39	3491.59	226.61	0.29
6200	100-yr	22300	980.39	982.72	999.02	999.63	0.000608	6.26	3561.59	226.71	0.28
6100	100-yr	22300	980.24	982.34	998.98	999.56	0.000569	6.14	3634.47	226.82	0.27
6090	100-yr	22300	980.23	982.3	998.99	999.55	0.000552	6.02	3702.56	231.62	0.27

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	Ch El with Sediment (ft)	W.S. Elev (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
6080	100-yr	22300	980.21	982.26	998.99	999.54	0.000533	5.93	3760.87	236.22	0.26
6070	100-yr	22300	980.2	982.23	999.03	999.51	0.000514	5.55	4016.03	251.26	0.24
6060	100-yr	22300	980.18	982.19	999	999.51	0.000505	5.72	3895.38	245.73	0.25
6050	100-yr	22300	980.17	982.15	999	999.5	0.000493	5.63	3957.49	250.29	0.25
6040	100-yr	22300	980.15	982.11	999.01	999.49	0.00048	5.54	4024.45	254.92	0.25
6030	100-yr	22300	980.14	982.08	999.01	999.48	0.000471	5.46	4083.67	259.39	0.24
6020	100-yr	22300	980.12	982.04	999.02	999.47	0.000456	5.37	4150.87	264.01	0.24
6010	100-yr	22300	980.11	982	999.03	999.46	0.000445	5.28	4227.31	268.77	0.23
6000	100-yr	22300	980.09	981.96	999.03	999.45	0.000436	5.21	4278.5	272.94	0.23
5990	100-yr	22300	980.08	982.21	999.02	999.45	0.000458	5.25	4249.99	274.48	0.24
5980	100-yr	22300	980.06	982.45	999.02	999.44	0.00046	5.22	4272.56	281.88	0.24
5970	100-yr	22300	980.05	982.7	999.01	999.44	0.000474	5.23	4265.85	286.29	0.24
5960	100-yr	22300	980.03	982.94	999	999.43	0.000488	5.23	4260.17	290.66	0.24
5950	100-yr	22300	980.02	983.2	999	999.43	0.000507	5.26	4242.43	294.84	0.24
5940	100-yr	22300	980	983.44	998.99	999.42	0.000522	5.28	4225.07	298.98	0.25
5930	100-yr	22300	979.99	983.69	998.98	999.41	0.00054	5.29	4211.92	303.25	0.25
5920	100-yr	22300	979.97	983.93	998.97	999.41	0.000561	5.32	4194.61	307.33	0.25
5910	100-yr	22300	979.96	984.18	998.96	999.4	0.000581	5.34	4177.86	311.56	0.26
5900	100-yr	22300	979.94	984.42	998.95	999.4	0.000603	5.36	4161.66	315.72	0.26

Table 8: ChanlPro Input Parameters and Results

Input Parameters	189+00 to 169+00	169+00 to Rancho Calif	Rancho Calif to 98+00
Channel alignment	straight reach	straight reach	straight reach
Vave (ft/s)	6.3	5.7	6
Local flow depth (ft)	11.7	11.4	12.7
Trapezoidal or Natural channel	trapezoidal	trapezoidal	Trapezoidal
Unit wt of stone (lbs/ft3)	165	165	165
ETL or Alternate gradations	ETL	ETL	ETL
Channel side slopes (V:H)	1:2	1:3	1:3
Side slope correction factor	0.88	0.99	0.99
Correction for velocity profile	1	1	1
Riprap design safety factor	1.2	1.2	1.2
Output Results	189+00 to 169+00	169+00 to Rancho Calif	Rancho Calif to 98+00
D50 (in)	6	6	6
D100 (in)	9	9	9
USACE, Waterways Experiment Station. Technical Report CHL-98-20, *User's Manual for CHANLPRO, PC Program for Channel Protection Design*. July 1998			

Table 9: Bed Identifiers

Table 5-1 Bed Identifiers (I_{Bed})	
Material	Identifier
Rock/Resistant Clay	0
Boulders	1
Cobbles	2
Gravels	3
Sands	4
Engineer Manual EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, 1 August 1996	

TABLE 10
MURRIETA CREEK PROJECT PERFORMANCE RELIABILITY
Computation of Uncertainty of Stage-Discharge Relationships - Phase 2, 1 & 1A

Prepared by: Mylene Perry 6 February 2014

Refs.

1. HEC-RAS project "Reach2.prj"
2. Engineer Manual EM 1110-2-1619, *Risk-Based Analysis for Flood Damage Reduction Studies*, 1 August 1996.

Basic uncertainty relationships from Ref. 2:

$S_t = (S_{natural}^2 + S_{model}^2)^{0.5}$ (Eqn. 5-6, page 5-5)

where S_t = standard deviation of total uncertainty
$S_{natural}$ = standard deviation of uncertainty related to watershed characertistics
S_{model} = standard deviation of uncertianty related to computations from hydraulic model

$S_{natural} = (0.07208 + 0.04936\ I_{Bed} - 2.262\text{x}10^{-7}\ A_{basin} + 0.02164\ H_{range} + 1.4194\text{x}10^{-5}\ Q_{100})^2$ (m) (Eqn. 5-5, page 5-4)

where I_{Bed} = stream bed identifier related to bed material
A_{basin} = drainage basin area (km^2)
H_{Range} = maximum expected or observed range in stage (m)
Q_{100} = peak discharge from 100-year flood (m^3/sec)

$S_{Model} = E_{Mean} / 4$ (ft) (Eqn. 5-7, page 5-6)

where E_{Mean} = mean difference in stage between upper and lower limit water surface profiles (ft)

Values for I_{bed} assigned using Ref. 2, Table 5-1, based on bed material noted in Ref. 5.

For H_{Range} the minimum water surface elevation is the channel invert, since the channel is essentially ephemeral with no flow for much of the year. The maximum water surface elevation is assumed to be a foot above the lower levee top elevation.

				Snatural															Smodel				Stotal			
	Index Reach No.	Cross Section No.	100-year Discharge (ft^3/sec)	100-year Discharge (m^3/sec)	Drainage Area mi^2	Drainage Area (km^2)	Bottom Material	I_{Bed}	Channel Invert Elevation (ft NAVD)	Left Top of Levee Elevation (ft NAVD)	Right Top of Levee Elevation (ft NAVD)	Higher Top Elevation (ft NAVD)	Max. Possible Water Surface Elevation (ft NAVD)	H_{Range} (ft)	H_{Range} (m)	Natural Uncertainty S_n (m)	Natural Uncertainty S_n (ft)	Reach Average S_n (ft)	Minimum Water Surface Elevation Low N (ft) p61	Maximum Water Surface Elevation High N (ft) p60	Model Uncertainty *Smodel* (ft)	Reach Average *Smodel* (ft)	Total Uncertainty *Stotal* (ft)	Best Estimate Water Surface Elevation (ft NAVD)	Freeboard (ft)	Remarks
Upstrm	2	18900	22300	631.7	222	575.0	Sand	4	1014.41	1028.44	1029.94	1029.9	1030.9	16.5	5.0	0.15	0.49	0.58	1015.96	1020.54	1.14	1.09	1.23	1018.3	11.7	
	2	18850 dr	22300	631.7	222	575.0	Sand	4	1012.15	1028.84	1030.34	1030.3	1031.3	19.2	5.9	0.16	0.54		1015.79	1020.44	1.16			1018.1	12.2	
	2	18800	22300	631.7	222	575.0	Sand	4	1008.38	1029.44	1030.24	1030.2	1031.2	22.9	7.0	0.18	0.60		1015.73	1020.38	1.16			1018.1	12.2	
	2	18740	22300	631.7	222	575.0	Sand	4	1004.44	1030.14	1030.14	1030.1	1031.1	26.7	8.1	0.21	0.68		1015.63	1020.30	1.17			1018.0	12.2	
Winchester Rd Brdg		18690.02 Winchester Rd Br																								
	2	18640	22300	631.7	222	575.0	Sand	4	1004.22	1030.14	1030.14	1030.1	1031.1	26.9	8.2	0.21	0.68		1014.78	1019.69	1.23			1017.2	12.9	
	2	18600	22300	631.7	222	575.0	Sand	4	1004.14	1029.34	1029.34	1029.3	1030.3	26.2	8.0	0.20	0.67		1014.72	1019.64	1.23			1017.2	12.2	
	2	18500	22300	631.7	222	575.0	Sand	4	1003.94	1028.04	1028.04	1028.0	1029.0	25.1	7.7	0.20	0.65		1014.57	1019.45	1.22			1017.0	11.0	
	2	18400	22300	631.7	222	575.0	Sand	4	1003.74	1026.64	1026.64	1026.6	1027.6	23.9	7.3	0.19	0.62		1014.47	1019.18	1.18			1016.8	9.8	
	2	18342.35	22300	631.7	222	575.0	Sand	4	1003.63	1026.09	1026.09	1026.1	1027.1	23.5	7.2	0.19	0.62		1014.26	1018.95	1.17			1016.6	9.5	
	2	18300	22300	631.7	222	575.0	Sand	4	1003.54	1025.54	1025.54	1025.5	1026.5	23.0	7.0	0.18	0.61		1014.25	1018.83	1.15			1016.5	9.0	
	2	18281	22300	631.7	222	575.0	Sand	4	1003.5	1025.33	1025.33	1025.3	1026.3	22.8	7.0	0.18	0.60		1014.13	1018.73	1.15			1016.4	8.9	
	2	18244	22300	631.7	222	575.0	Sand	4	1003.43	1024.93	1024.38	1024.9	1025.9	22.5	6.9	0.18	0.60		1014.15	1018.63	1.12			1016.4	8.5	
	2	18200	22300	631.7	222	575.0	Sand	4	1003.34	1024.31	1023.44	1024.3	1025.3	22.0	6.7	0.18	0.59		1013.94	1018.41	1.12			1016.2	8.1	
	2	18100	22300	631.7	222	575.0	Sand	4	1003.14	1023.34	1021.34	1023.3	1024.3	21.2	6.5	0.17	0.57		1013.64	1017.94	1.08			1015.8	7.6	
	2	18000	22300	631.7	222	575.0	Sand	4	1002.94	1023.14	1021.14	1023.1	1024.1	21.2	6.5	0.17	0.57		1013.43	1017.45	1.01			1015.4	7.7	
	2	17900	22300	631.7	222	575.0	Sand	4	1002.74	1022.94	1020.94	1022.9	1023.9	21.2	6.5	0.17	0.57		1013.23	1017.14	0.98			1015.2	7.8	
	2	17800	22300	631.7	222	575.0	Sand	4	1002.54	1022.74	1020.74	1022.7	1023.7	21.2	6.5	0.17	0.57		1013.04	1016.92	0.97			1015.0	7.8	
	2	17700	22300	631.7	222	575.0	Sand	4	1002.35	1022.54	1020.54	1022.5	1023.5	21.2	6.5	0.17	0.57		1012.86	1016.72	0.97			1014.8	7.8	
	2	17600	22300	631.7	222	575.0	Sand	4	1002.15	1022.34	1020.34	1022.3	1023.3	21.2	6.5	0.17	0.57		1012.70	1016.52	0.95			1014.6	7.7	
	2	17574	22300	631.7	222	575.0	Sand	4	1002.1	1022.29	1020.29	1022.3	1023.3	21.2	6.5	0.17	0.57		1012.65	1016.46	0.95			1014.6	7.7	
	2	17549	22300	631.7	222	575.0	Sand	4	1002.05	1022.24	1020.24	1022.2	1023.2	21.2	6.5	0.17	0.57		1012.60	1016.41	0.95			1014.5	7.7	
	2	17534	22300	631.7	222	575.0	Sand	4	1002.02	1022.21	1020.31	1022.2	1023.2	21.2	6.5	0.17	0.57		1012.57	1016.38	0.95			1014.5	7.7	
	2	17500	22300	631.7	222	575.0	Sand	4	1001.95	1022.44	1020.44	1022.4	1023.4	21.5	6.6	0.18	0.58		1012.51	1016.31	0.95			1014.4	8.0	
	2	17410	22300	631.7	222	575.0	Sand	4	1001.76	1022.26	1020.26	1022.3	1023.3	21.5	6.6	0.18	0.58		1012.37	1016.16	0.95			1014.3	8.0	
	2	17400	22300	631.7	222	575.0	Sand	4	1001.74	1022.24	1020.24	1022.2	1023.2	21.5	6.6	0.18	0.58		1012.35	1016.15	0.95			1014.3	8.0	
	2	17365	22300	631.7	222	575.0	Sand	4	1001.67	1022.17	1020.17	1022.2	1023.2	21.5	6.6	0.18	0.58		1012.31	1016.09	0.95			1014.2	8.0	
Overland Drive Bridge		17316.87 Overland Dr Br																								
	2	17260	22300	631.7	222	575.0	Sand	4	1001.46	1021.96	1019.96	1022.0	1023.0	21.5	6.6	0.18	0.58		1011.38	1015.30	0.98			1013.3	8.6	
	2	17215	22300	631.7	222	575.0	Sand	4	1001.37	1021.87	1019.87	1021.9	1022.9	21.5	6.6	0.18	0.58		1011.23	1015.19	0.99			1013.2	8.7	
	2	17200	22300	631.7	222	575.0	Sand	4	1001.34	1021.84	1019.54	1021.8	1022.8	21.5	6.6	0.18	0.58		1011.17	1015.14	0.99			1013.2	8.7	
	2	17123	22300	631.7	222	575.0	Sand	4	1001.19	1021.69	1019.39	1021.7	1022.7	21.5	6.6	0.18	0.58		1010.97	1014.93	0.99			1013.0	8.7	
	2	17100	22300	631.7	222	575.0	Sand	4	1001.14	1021.44	1019.34	1021.4	1022.4	21.3	6.5	0.18	0.58		1010.92	1014.88	0.99			1012.9	8.5	

	Index Reach No.	Cross Section No.	100-year Discharge (ft^3/sec)	Snatural 100-year Discharge (m^3/sec)	Drainage Area mi^2	Drainage Area (km^2)	Bottom Material	I_{Bed}	Channel Invert Elevation (ft NAVD)	Left Top of Levee Elevation (ft NAVD)	Right Top of Levee Elevation (ft NAVD)	Higher Top Elevation (ft NAVD)	Max. Possible Water Surface Elevation (ft NAVD)	H_{Range} (ft)	H_{Range} (m)	Natural Uncertainty S_n (m)	Natural Uncertainty S_n (ft)	Reach Average S_n (ft)	Smodel Minimum Water Surface Elevation Low N (ft) p61	Maximum Water Surface Elevation High N (ft) p60	Model Uncertainty *Smodel* (ft)	Reach Average *Smodel* (ft)	Stotal Total Uncertainty *Stotal* (ft)	Best Estimate Water Surface Elevation (ft NAVD)	Freeboard (ft)	Remarks
	2	17055	22300	631.7	222	575.0	Sand	4	1001.05	1021.25	1019.25	1021.3	1022.3	21.2	6.5	0.17	0.57		1010.80	1014.77	0.99			1012.8	8.5	
	2	17000	22300	631.7	222	575.0	Sand	4	1000.94	1021.14	1019.14	1021.1	1022.1	21.2	6.5	0.17	0.57		1010.66	1014.64	1.00			1012.7	8.5	
	2	16900	22300	631.7	222	575.0	Sand	4	1000.74	1021.44	1018.94	1021.4	1022.4	21.7	6.6	0.18	0.58		1010.60	1014.48	0.97			1012.5	8.9	
	2	16800	22300	631.7	222	575.0	Sand	4	1000.54	1021.74	1018.74	1021.7	1022.7	22.2	6.8	0.18	0.59		1010.34	1014.27	0.98			1012.3	9.4	
	2	16725	22300	631.7	222	575.0	Sand	4	1000.39	1022.59	1018.09	1022.6	1023.6	23.2	7.1	0.19	0.61		1010.20	1014.12	0.98			1012.2	10.4	
	2	16700	22300	631.7	222	575.0	Sand	4	1000.34	1022.54	1018.04	1022.5	1023.5	23.2	7.1	0.19	0.61		1010.13	1014.06	0.98			1012.1	10.4	
	2	16600	22300	631.7	222	575.0	Sand	4	1000.14	1022.14	1017.84	1022.1	1023.1	23.0	7.0	0.18	0.61		1009.92	1013.86	0.99			1011.9	10.3	
	2	16500	22300	631.7	222	575.0	Sand	4	999.94	1021.74	1017.64	1021.7	1022.7	22.8	7.0	0.18	0.60		1009.71	1013.65	0.98			1011.7	10.1	
	2	16400	22300	631.7	222	575.0	Sand	4	999.74	1021.54	1017.44	1021.5	1022.5	22.8	7.0	0.18	0.60		1009.5	1013.45	0.99			1011.5	10.1	
	2	16300	22300	631.7	222	575.0	Sand	4	999.54	1020.94	1017.24	1020.9	1021.9	22.4	6.8	0.18	0.60		1009.29	1013.24	0.99			1011.3	9.7	
	2	16200	22300	631.7	222	575.0	Sand	4	999.34	1020.54	1017.04	1020.5	1021.5	22.2	6.8	0.18	0.59		1009.08	1013.03	0.99			1011.1	9.5	
	2	16100	22300	631.7	222	575.0	Sand	4	999.14	1020.04	1016.84	1020.0	1021.0	21.9	6.7	0.18	0.59		1008.87	1012.83	0.99			1010.9	9.2	
	2	16000	22300	631.7	222	575.0	Sand	4	998.94	1019.54	1016.64	1019.5	1020.5	21.6	6.6	0.18	0.58		1008.65	1012.62	0.99			1010.6	8.9	
	2	15900	22300	631.7	222	575.0	Sand	4	998.74	1019.04	1016.44	1019.0	1020.0	21.3	6.5	0.18	0.58		1008.44	1012.41	0.99			1010.4	8.6	
	2	15800	22300	631.7	222	575.0	Sand	4	998.54	1018.54	1016.24	1018.5	1019.5	21.0	6.4	0.17	0.57		1008.22	1012.2	1.00			1010.2	8.3	
	2	15700	22300	631.7	222	575.0	Sand	4	998.34	1018.04	1016.04	1018.0	1019.0	20.7	6.3	0.17	0.56		1008.01	1011.99	1.00			1010.0	8.0	
	2	15600	22300	631.7	222	575.0	Sand	4	998.14	1017.44	1015.84	1017.4	1018.4	20.3	6.2	0.17	0.56		1007.82	1011.8	0.99			1009.8	7.6	
	2	15500	22300	631.7	222	575.0	Sand	4	997.94	1016.94	1015.64	1016.9	1017.9	20.0	6.1	0.17	0.55		1007.55	1011.57	1.01			1009.6	7.4	
	2	15400	22300	631.7	222	575.0	Sand	4	997.74	1016.44	1015.44	1016.4	1017.4	19.7	6.0	0.17	0.55		1007.32	1011.36	1.01			1009.3	7.1	
	2	15300	22300	631.7	222	575.0	Sand	4	997.54	1015.94	1015.24	1015.9	1016.9	19.4	5.9	0.17	0.54		1007.09	1011.15	1.01			1009.1	6.8	
	2	15200	22300	631.7	222	575.0	Sand	4	997.34	1015.44	1015.04	1015.4	1016.4	19.1	5.8	0.16	0.54		1006.86	1010.94	1.02			1008.9	6.5	
	2	15100	22300	631.7	222	575.0	Sand	4	997.14	1014.84	1014.84	1014.8	1015.8	18.7	5.7	0.16	0.53		1006.62	1010.72	1.03			1008.7	6.2	
	2	15000	22300	631.7	222	575.0	Sand	4	996.94	1014.64	1014.64	1014.6	1015.6	18.7	5.7	0.16	0.53		1006.5	1010.56	1.01			1008.5	6.1	
	2	14900	22300	631.7	222	575.0	Sand	4	996.74	1014.44	1014.44	1014.4	1015.4	18.7	5.7	0.16	0.53		1006.4	1010.42	1.01			1008.4	6.0	
	2	14800	22300	631.7	222	575.0	Sand	4	996.54	1014.24	1014.24	1014.2	1015.2	18.7	5.7	0.16	0.53		1006.32	1010.31	1.00			1008.3	5.9	
	2	14719.18	22300	631.7	222	575.0	Sand	4	996.38	1014.08	1014.08	1014.1	1015.1	18.7	5.7	0.16	0.53		1006.32	1010.27	0.99			1008.3	5.8	
	2	14700	22300	631.7	222	575.0	Sand	4	996.34	1014.04	1014.04	1014.0	1015.0	18.7	5.7	0.16	0.53		1006.33	1010.26	0.98			1008.3	5.7	
	2	14669	22300	631.7	222	575.0	Sand	4	996.28	1013.98	1013.98	1014.0	1015.0	18.7	5.7	0.16	0.53		1006.33	1010.26	0.98			1008.3	5.7	
	2	14651	22300	631.7	222	575.0	Sand	4	996.24	1013.94	1013.94	1013.9	1014.9	18.7	5.7	0.16	0.53		1006.33	1010.25	0.98			1008.3	5.7	
	2	14633	22300	631.7	222	575.0	Sand	4	996.21	1013.91	1013.91	1013.9	1014.9	18.7	5.7	0.16	0.53		1006.34	1010.25	0.98			1008.3	5.6	
	2	14600	22300	631.7	222	575.0	Sand	4	996.14	1013.84	1013.84	1013.8	1014.8	18.7	5.7	0.16	0.53		1006.32	1010.22	0.97			1008.3	5.6	
	2	14500	22300	631.7	222	575.0	Sand	4	995.94	1013.64	1013.64	1013.6	1014.6	18.7	5.7	0.16	0.53		1006.26	1010.14	0.97			1008.2	5.4	
	2	14400	22300	631.7	222	575.0	Sand	4	995.74	1013.44	1013.44	1013.4	1014.4	18.7	5.7	0.16	0.53		1006.23	1010.07	0.96			1008.2	5.3	
	2	14300	22300	631.7	222	575.0	Sand	4	995.54	1013.24	1013.24	1013.2	1014.2	18.7	5.7	0.16	0.53		1006.18	1010	0.96			1008.1	5.2	
	2	14200	22300	631.7	222	575.0	Sand	4	995.34	1013.04	1013.04	1013.0	1014.0	18.7	5.7	0.16	0.53		1006.13	1009.93	0.95			1008.0	5.0	
	2	14100	22300	631.7	222	575.0	Sand	4	995.14	1012.84	1012.84	1012.8	1013.8	18.7	5.7	0.16	0.53		1006.07	1009.86	0.95			1008.0	4.9	
	2	14000	22300	631.7	222	575.0	Sand	4	994.95	1012.64	1012.64	1012.6	1013.6	18.7	5.7	0.16	0.53		1006.02	1009.8	0.94			1007.9	4.7	
	2	13900	22300	631.7	222	575.0	Sand	4	994.75	1012.44	1012.44	1012.4	1013.4	18.7	5.7	0.16	0.53		1005.97	1009.73	0.94			1007.9	4.6	
	2	13800	22300	631.7	222	575.0	Sand	4	994.54	1012.24	1012.24	1012.2	1013.2	18.7	5.7	0.16	0.53		1005.92	1009.67	0.94			1007.8	4.4	
	2	13700	22300	631.7	222	575.0	Sand	4	994.34	1013.04	1013.04	1013.0	1014.0	19.7	6.0	0.17	0.55		1005.88	1009.61	0.93			1007.7	5.3	
	2	13600	22300	631.7	222	575.0	Sand	4	994.14	1012.84	1012.84	1012.8	1013.8	19.7	6.0	0.17	0.55		1005.8	1009.53	0.93			1007.7	5.2	
	2	13500	22300	631.7	222	575.0	Sand	4	993.94	1012.64	1012.64	1012.6	1013.6	19.7	6.0	0.17	0.55		1005.72	1009.44	0.93			1007.6	5.1	
	2	13400	22300	631.7	222	575.0	Sand	4	993.74	1012.44	1012.44	1012.4	1013.4	19.7	6.0	0.17	0.55		1005.62	1009.35	0.93			1007.5	5.0	
	2	13300	22300	631.7	222	575.0	Sand	4	993.65	1012.24	1012.24	1012.2	1013.2	19.6	6.0	0.17	0.54		1005.51	1009.24	0.93			1007.4	4.9	
	2	13200	22300	631.7	222	575.0	Sand	4	993.79	1012.04	1012.04	1012.0	1013.0	19.3	5.9	0.16	0.54		1005.35	1009.11	0.94			1007.2	4.8	
	2	13100	22300	631.7	222	575.0	Sand	4	993.25	1011.84	1011.84	1011.8	1012.8	19.6	6.0	0.17	0.54		1005.25	1009	0.94			1007.1	4.7	
	2	13000	22300	631.7	222	575.0	Sand	4	992.94	1011.64	1011.64	1011.6	1012.6	19.7	6.0	0.17	0.55		1005.1	1008.86	0.94			1007.0	4.7	
	2	12900	22300	631.7	222	575.0	Sand	4	992.74	1011.44	1011.44	1011.4	1012.4	19.7	6.0	0.17	0.55		1004.92	1008.7	0.95			1006.8	4.6	
	2	12890	22300	631.7	222	575.0	Sand	4	992.72	1011.42	1011.42	1011.4	1012.4	19.7	6.0	0.17	0.55		1004.91	1008.68	0.94			1006.8	4.6	
	2	12800	22300	631.7	222	575.0	Sand	4	992.54	1011.24	1011.24	1011.2	1012.2	19.7	6.0	0.17	0.55		1004.84	1008.57	0.93			1006.7	4.5	
	2	12700	22300	631.7	222	575.0	Sand	4	992.34	1011.04	1011.04	1011.0	1012.0	19.7	6.0	0.17	0.55		1004.75	1008.46	0.93			1006.6	4.4	
	2	12600	22300	631.7	222	575.0	Sand	4	992.14	1010.84	1010.84	1010.8	1011.8	19.7	6.0	0.17	0.55		1004.67	1008.34	0.92			1006.5	4.3	
	2	12500	22300	631.7	222	575.0	Sand	4	991.94	1010.64	1010.64	1010.6	1011.6	19.7	6.0	0.17	0.55		1004.6	1008.23	0.91			1006.4	4.2	
	2	12400	22300	631.7	222	575.0	Sand	4	991.74	1010.44	1010.44	1010.4	1011.4	19.7	6.0	0.17	0.55		1004.52	1008.11	0.90			1006.3	4.1	
	2	12300	22300	631.7	222	575.0	Sand	4	991.54	1010.24	1010.24	1010.2	1011.2	19.7	6.0	0.17	0.55		1004.45	1008	0.89			1006.2	4.0	
	2	12200	22300	631.7	222	575.0	Sand	4	991.34	1010.04	1010.04	1010.0	1011.0	19.7	6.0	0.17	0.55		1004.38	1007.9	0.88			1006.1	3.9	
	2	12110	22300	631.7	222	575.0	Sand	4	991.16	1009.86	1009.86	1009.9	1010.9	19.7	6.0	0.17	0.55		1004.32	1007.8	0.87			1006.1	3.8	
	2	12100	22300	631.7	222	575.0	Sand	4	991.14	1009.84	1009.84	1009.8	1010.8	19.7	6.0	0.17	0.55		1004.31	1007.79	0.87			1006.1	3.8	
	2	12090	22300	631.7	222	575.0	Sand	4	991.12	1009.82	1009.82	1009.8	1010.8	19.7	6.0	0.17	0.55		1004.31	1007.78	0.87			1006.0	3.8	
	2	12000	22300	631.7	222	575.0	Sand	4	990.94	1009.64	1009.64	1009.6	1010.6	19.7	6.0	0.17	0.55		1004.25	1007.69	0.86			1006.0	3.7	
	2	11900	22300	631.7	222	575.0	Sand	4	990.74	1009.44	1009.44	1009.4	1010.4	19.7	6.0	0.17	0.55		1004.19	1007.59	0.85			1005.9	3.5	
	2	11800	22300	631.7	222	575.0	Sand	4	990.54	1009.24	1009.24	1009.2	1010.2	19.7	6.0	0.17	0.55		1004.13	1007.49	0.84			1005.8	3.4	
	2	11700	22300	631.7	222	575.0	Sand	4	990.34	1009.04	1009.04	1009.0	1010.0	19.7	6.0	0.17	0.55		1004.07	1007.39	0.83			1005.7	3.3	
	2	11660	22300	631.7	222	575.0	Sand	4	990.26	1008.96	1008.96	1009.0	1010.0	19.7	6.0	0.17	0.55		1004.05	1007.35	0.83			1005.7	3.3	
	2	11600	22300	631.7	222	575.0	Sand	4	990.14	1008.84	1008.84	1008.8	1009.8	19.7	6.0	0.17	0.55		1004.02	1007.3	0.82			1005.7	3.2	
	2	11500	22300	631.7	222	575.0	Sand	4	989.94	1008.64	1008.64	1008.6	1009.6	19.7	6.0	0.17	0.55		1004	1007.23	0.81			1005.6	3.0	
	2	11468.98	22300	631.7	222	575.0	Sand	4	989.88	1008.58	1008.58	1008.6	1009.6	19.7	6.0	0.17	0.55		1003.94	1007.18	0.81			1005.6	3.0	
	2	11418.98	22300	631.7	222	575.0	Sand	4	989.78	1008.48	1008.48	1008.5	1009.5	19.7	6.0	0.17	0.55		1003.92	1007.15	0.81			1005.5	2.9	
	2	11400	22300	631.7	222	575.0	Sand	4	989.74	1008.44	1008.44	1008.4	1009.4	19.7	6.0	0.17	0.55		1003.91	1007.14	0.81			1005.5	2.9	
stabilizer	2	11382.98 s	22300	631.7	222	575.0	Sand	4	989.71	1008.41	1008.41	1008.4	1009.4	19.7	6.0	0.17	0.55		1003.91	1007.14	0.81			1005.5	2.9	

				Snatural															Smodel				Stotal			
	Index Reach No.	Cross Section No.	100-year Discharge (ft^3/sec)	100-year Discharge (m^3/sec)	Drainage Area mi^2	Drainage Area (km^2)	Bottom Material	I_{Bed}	Channel Invert Elevation (ft NAVD)	Left Top of Levee Elevation (ft NAVD)	Right Top of Levee Elevation (ft NAVD)	Higher Top Elevation (ft NAVD)	Max. Possible Water Surface Elevation (ft NAVD)	H_{Range} (ft)	H_{Range} (m)	Natural Uncertainty S_n (m)	Natural Uncertainty S_n (ft)	Reach Average S_n (ft)	Minimum Water Surface Elevation Low N (ft) p61	Maximum Water Surface Elevation High N (ft) p60	Model Uncertainty *Smodel* (ft)	Reach Average *Smodel* (ft)	Total Uncertainty *Stotal* (ft)	Best Estimate Water Surface Elevation (ft NAVD)	Freeboard (ft)	Remarks
	2	11370.*	22300	631.7	222	575.0	Sand	4	989.68	1008.38	1008.38	1008.4	1009.4	19.7	6.0	0.17	0.55		1003.9	1007.12	0.81			1005.5	2.9	
	2	11350	22300	631.7	222	575.0	Sand	4	989.64	1008.34	1008.34	1008.3	1009.3	19.7	6.0	0.17	0.55		1003.9	1007.12	0.81			1005.5	2.8	Index Location
	2	11300	22300	631.7	222	575.0	Sand	4	990.58	1009.54	1009.54	1009.5	1010.5	20.0	6.1	0.17	0.55		1003.87	1007.09	0.81			1005.5	4.1	
	2	11200	22300	631.7	222	575.0	Sand	4	990.35	1009.34	1009.34	1009.3	1010.3	20.0	6.1	0.17	0.55		1003.71	1007.01	0.82			1005.4	4.0	
	2	11132	22300	631.7	222	575.0	Sand	4	990.2	1009.2	1009.2	1009.2	1010.2	20.0	6.1	0.17	0.55		1002.59	1006.97	1.10			1004.8	4.4	
	2	11102	22300	631.7	222	575.0	Sand	4	990.1	1009.14	1009.14	1009.1	1010.1	20.0	6.1	0.17	0.55		1002.46	1006.92	1.11			1004.7	4.4	
	2	11100	22300	631.7	222	575.0	Sand	4	990.13	1009.14	1009.14	1009.1	1010.1	20.0	6.1	0.17	0.55		1002.45	1006.92	1.12			1004.7	4.5	
	2	11000	22300	631.7	222	575.0	Sand	4	989.9	1008.94	1008.94	1008.9	1009.9	20.0	6.1	0.17	0.55		1002.37	1006.85	1.12			1004.6	4.3	
	2	10900	22300	631.7	222	575.0	Sand	4	989.67	1008.74	1008.74	1008.7	1009.7	20.1	6.1	0.17	0.55		1002.35	1006.78	1.11			1004.6	4.2	
	2	10875	22300	631.7	222	575.0	Sand	4	989.26	1008.69	1008.69	1008.7	1009.7	20.4	6.2	0.17	0.56		1002.38	1006.77	1.10			1004.6	4.1	
	2	10845	22300	631.7	222	575.0	Sand	4	988.77	1008.93	1008.93	1008.9	1009.9	21.2	6.5	0.17	0.57		1002.48	1006.81	1.08			1004.6	4.3	
Rancho-California Rd		10776.18 Rancho Calif Br																								
	2	10710	22300	631.7	222	575.0	Sand	4	988.41	1008.36	1008.36	1008.4	1009.4	21.0	6.4	0.17	0.57		1001.6	1006.28	1.17			1003.9	4.4	
	2	10695	22300	631.7	222	575.0	Sand	4	988.42	1008.33	1008.33	1008.3	1009.3	20.9	6.4	0.17	0.57		1001.43	1006.2	1.19			1003.8	4.5	
	2	10660	22300	631.7	222	575.0	Sand	4	988.28	1008.26	1008.26	1008.26	1009.3	21.0	6.4	0.17	0.57		1001.41	1006.17	1.19			1003.8	4.5	
	2	10600	22300	631.7	222	575.0	Sand	4	988.14	1008.14	1008.14	1008.1	1009.1	21.0	6.4	0.17	0.57		1001.33	1006.11	1.19			1003.7	4.4	
	2	10574	22300	631.7	222	575.0	Sand	4	988.09	1008.09	1008.09	1008.1	1009.1	21.0	6.4	0.17	0.57		1001.27	1006.08	1.20			1003.7	4.4	
	2	10500	22300	631.7	222	575.0	Sand	4	987.94	1007.94	1007.94	1007.9	1008.9	21.0	6.4	0.17	0.57		1001.22	1006	1.19			1003.6	4.3	
	2	10452	22300	631.7	222	575.0	Sand	4	987.84	1007.84	1007.84	1007.8	1008.8	21.0	6.4	0.17	0.57		1001.2	1005.95	1.19			1003.6	4.3	
	2	10417	22300	631.7	222	575.0	Sand	4	987.77	1007.77	1007.77	1007.8	1008.8	21.0	6.4	0.17	0.57		1001.18	1005.93	1.19			1003.6	4.2	
	2	10400	22300	631.7	222	575.0	Sand	4	987.74	1007.74	1007.74	1007.7	1008.7	21.0	6.4	0.17	0.57		1001.17	1005.92	1.19			1003.5	4.2	
	2	10350	22300	631.7	222	575.0	Sand	4	987.64	1007.64	1007.64	1007.6	1008.6	21.0	6.4	0.17	0.57		1001.14	1005.88	1.19			1003.5	4.1	
	2	10300	22300	631.7	222	575.0	Sand	4	987.54	1007.54	1007.54	1007.5	1008.5	21.0	6.4	0.17	0.57		1001.12	1005.84	1.18			1003.5	4.1	
	2	10250	22300	631.7	222	575.0	Sand	4	987.44	1007.44	1007.44	1007.4	1008.4	21.0	6.4	0.17	0.57		1001.09	1005.81	1.18			1003.5	4.0	
	2	10200	22300	631.7	222	575.0	Sand	4	987.34	1007.34	1007.34	1007.3	1008.3	21.0	6.4	0.17	0.57		1001.01	1005.75	1.19			1003.4	4.0	
	2	10100	22300	631.7	222	575.0	Sand	4	987.14	1007.14	1007.14	1007.1	1008.1	21.0	6.4	0.17	0.57		1000.88	1005.64	1.19			1003.3	3.9	
	2	10000	22300	631.7	222	575.0	Sand	4	986.94	1006.94	1006.94	1006.9	1007.9	21.0	6.4	0.17	0.57		1000.68	1005.5	1.21			1003.1	3.9	
	2	9900	22300	631.7	222	575.0	Sand	4	986.74	1006.74	1006.74	1006.7	1007.7	21.0	6.4	0.17	0.57		1000.37	1005.31	1.23			1002.8	3.9	
	2	9800	22300	631.7	222	575.0	Sand	4	986.54	1006.54	1006.54	1006.54	1007.5	21.0	6.4	0.17	0.57		1000.04	1005.14	1.28			1002.6	4.0	
	2	9700	22300	631.7	222	575.0	Sand	4	986.34	1006.54	1006.54	1006.5	1007.5	21.2	6.5	0.17	0.57		999.96	1005.03	1.27			1002.5	4.0	
	2	9600	22300	631.7	222	575.0	Sand	4	986.14	1006.44	1006.44	1006.4	1007.4	21.3	6.5	0.18	0.58		999.88	1004.92	1.26			1002.4	4.0	
	2	9500	22300	631.7	222	575.0	Sand	4	985.94	1006.44	1006.44	1006.4	1007.4	21.5	6.6	0.18	0.58		999.79	1004.79	1.25			1002.3	4.2	
	2	9400	22300	631.7	222	575.0	Sand	4	985.74	1006.24	1006.24	1006.2	1007.2	21.5	6.6	0.18	0.58		999.73	1004.71	1.25			1002.2	4.0	
	2	9300	22300	631.7	222	575.0	Sand	4	985.54	1006.04	1006.04	1006.0	1007.0	21.5	6.6	0.18	0.58		999.67	1004.63	1.24			1002.2	3.9	
	2	9200	22300	631.7	222	575.0	Sand	4	985.34	1005.84	1005.84	1005.8	1006.8	21.5	6.6	0.18	0.58		999.61	1004.56	1.24			1002.1	3.8	
	2	9100	22300	631.7	222	575.0	Sand	4	985.14	1005.64	1005.64	1005.6	1006.6	21.5	6.6	0.18	0.58		999.56	1004.48	1.23			1002.0	3.6	
	2	9020	22300	631.7	222	575.0	Sand	4	984.98	1005.48	1005.48	1005.5	1006.5	21.5	6.6	0.18	0.58		999.51	1004.42	1.23			1002.0	3.5	
	2	9000	22300	631.7	222	575.0	Sand	4	984.94	1005.44	1005.44	1005.4	1006.4	21.5	6.6	0.18	0.58		999.50	1004.41	1.23			1002.0	3.5	
	2	8900	22300	631.7	222	575.0	Sand	4	984.74	1005.24	1005.24	1005.2	1006.2	21.5	6.6	0.18	0.58		999.51	1004.39	1.22			1002.0	3.3	
	2	8810.82	22300	631.7	222	575.0	Sand	4	984.56	1005.95	1005.95	1006.0	1007.0	22.4	6.8	0.18	0.60		999.38	1004.27	1.22			1001.8	4.1	
	2	8800	22300	631.7	222	575.0	Sand	4	984.54	1006.04	1006.04	1006.0	1007.0	22.5	6.9	0.18	0.60		999.38	1004.26	1.22			1001.8	4.2	
	2	8760.82	22300	631.7	222	575.0	Sand	4	984.46	1005.96	1005.96	1006.0	1007.0	22.5	6.9	0.18	0.60		999.36	1004.23	1.22			1001.8	4.2	
	2	8742.82	22300	631.7	222	575.0	Sand	4	984.42	1005.92	1005.92	1005.9	1006.9	22.5	6.9	0.18	0.60		999.35	1004.22	1.22			1001.8	4.1	
	2	8724.82	22300	631.7	222	575.0	Sand	4	984.39	1005.89	1005.89	1005.9	1006.9	22.5	6.9	0.18	0.60		999.34	1004.21	1.22			1001.8	4.1	
	2	8700	22300	631.7	222	575.0	Sand	4	984.34	1005.84	1005.84	1005.8	1006.8	22.5	6.9	0.18	0.60		999.33	1004.19	1.22			1001.8	4.1	
	2	8600	22300	631.7	222	575.0	Sand	4	984.14	1005.64	1005.64	1005.6	1006.6	22.5	6.9	0.18	0.60		999.28	1004.13	1.21			1001.7	3.9	
	2	8500	22300	631.7	222	575.0	Sand	4	983.94	1005.44	1005.44	1005.4	1006.4	22.5	6.9	0.18	0.60		999.24	1004.06	1.20			1001.7	3.8	
	2	8400	22300	631.7	222	575.0	Sand	4	983.74	1005.24	1005.24	1005.2	1006.2	22.5	6.9	0.18	0.60		999.19	1004.00	1.20			1001.6	3.6	
	2	8350	22300	631.7	222	575.0	Sand	4	983.64	1005.27	1005.27	1005.3	1006.3	22.6	6.9	0.18	0.60		999.10	1003.93	1.21			1001.5	3.8	
	2	8300	22300	631.7	222	575.0	Sand	4	983.54	1005.34	1005.34	1005.3	1006.3	22.8	7.0	0.18	0.60		999.00	1003.86	1.22			1001.4	3.9	
	2	8200	22300	631.7	222	575.0	Sand	4	983.39	1005.39	1005.39	1005.4	1006.4	23.0	7.0	0.18	0.61		998.51	1003.56	1.26			1001.0	4.4	
	2	8100	22300	631.7	222	575.0	Sand	4	983.24	1005.24	1005.24	1005.2	1006.2	23.0	7.0	0.18	0.61		998.42	1003.46	1.26			1000.9	4.3	
	2	8050	22300	631.7	222	575.0	Sand	4	983.17	1005.17	1005.17	1005.2	1006.2	23.0	7.0	0.18	0.61		998.38	1003.40	1.26			1000.9	4.3	
Main Street Bridge		8007.01 Main St Br																								
	2	7970	22300	631.7	222	575.0	Sand	4	983.21	1005.05	1005.05	1005.1	1006.1	22.8	7.0	0.18	0.60		998.26	1003.31	1.26			1000.8	4.3	
	2	7900	22300	631.7	222	575.0	Sand	4	982.94	1004.94	1004.94	1004.9	1005.9	23.0	7.0	0.18	0.61		998.22	1003.24	1.26			1000.7	4.2	
	2	7800	22300	631.7	222	575.0	Sand	4	982.79	1004.79	1004.79	1004.8	1005.8	23.0	7.0	0.18	0.61		998.14	1003.14	1.25			1000.6	4.1	
	2	7700	22300	631.7	222	575.0	Sand	4	982.64	1004.64	1004.64	1004.6	1005.6	23.0	7.0	0.18	0.61		998.06	1003.04	1.25			1000.6	4.1	
	2	7600	22300	631.7	222	575.0	Sand	4	982.49	1004.49	1004.49	1004.5	1005.5	23.0	7.0	0.18	0.61		997.98	1002.94	1.24			1000.5	4.0	
	2	7500	22300	631.7	222	575.0	Sand	4	982.34	1004.34	1004.34	1004.3	1005.3	23.0	7.0	0.18	0.61		997.90	1002.84	1.24			1000.4	4.0	
	2	7400	22300	631.7	222	575.0	Sand	4	982.19	1004.19	1004.19	1004.2	1005.2	23.0	7.0	0.18	0.61		997.83	1002.75	1.23			1000.3	3.9	
	2	7300	22300	631.7	222	575.0	Sand	4	982.04	1004.04	1004.04	1004.0	1005.0	23.0	7.0	0.18	0.61		997.75	1002.65	1.22			1000.2	3.8	
	2	7200	22300	631.7	222	575.0	Sand	4	981.89	1003.89	1003.89	1003.9	1004.9	23.0	7.0	0.18	0.61		997.68	1002.56	1.22			1000.1	3.8	
	2	7136	22300	631.7	222	575.0	Sand	4	981.79	1003.79	1003.79	1003.8	1004.8	23.0	7.0	0.18	0.61		997.63	1002.50	1.22			1000.1	3.7	
	2	7116	22300	631.7	222	575.0	Sand	4	981.76	1003.76	1003.76	1003.8	1004.8	23.0	7.0	0.18	0.61		997.62	1002.48	1.22			1000.1	3.7	
	2	7100	22300	631.7	222	575.0	Sand	4	981.74	1003.74	1003.74	1003.7	1004.7	23.0	7.0	0.18	0.61		997.61	1002.47	1.22			1000.0	3.7	
	2	7000	22300	631.7	222	575.0	Sand	4	981.59	1003.59	1003.59	1003.6	1004.6	23.0	7.0	0.18	0.61		997.61	1002.45	1.21			1000.0	3.6	
	2	6975	22300	631.7	222	575.0	Sand	4	981.55	1003.55	1003.55	1003.6	1004.6	23.0	7.0	0.18	0.61		997.64	1002.45	1.20			1000.0	3.5	
	2	6955	22300	631.7	222	575.0	Sand	4	981.52	1003.52	1003.52	1003.5	1004.5	23.0	7.0	0.18	0.61		997.64	1002.44	1.20			1000.0	3.5	
1st Street Bridge		6907.92 First St Br																								

			Snatural														Smodel				Stotal			
Index Reach No.	Cross Section No.	100-year Discharge (ft^3/sec)	100-year Discharge (m^3/sec)	Drainage Area mi^2	Drainage Area (km^2)	Bottom Material	I_{Bed}	Channel Invert Elevation (ft NAVD)	Left Top of Levee Elevation (ft NAVD)	Right Top of Levee Elevation (ft NAVD)	Higher Top Elevation (ft NAVD)	Max. Possible Water Surface Elevation (ft NAVD)	H_{Range} (ft)	H_{Range} (m)	Natural Uncertainty S_n (m)	Natural Uncertainty S_n (ft)	Reach Average S_n (ft)	Minimum Water Surface Elevation Low N (ft) p61	Maximum Water Surface Elevation High N (ft) p60	Model Uncertainty *Smodel* (ft)	Reach Average *Smodel* (ft)	Total Uncertainty *Stotal* (ft)	Best Estimate Water Surface Elevation (ft NAVD)	Freeboard (ft)	Remarks
2	6850	22300	631.7	222	575.0	Sand	4	981.37	1003.37	1003.37	1003.4	1004.4	23.0	7.0	0.18	0.61		997.26	1002.13	1.22			999.7	3.7	
2	6825	22300	631.7	222	575.0	Sand	4	981.33	1003.33	1003.33	1003.3	1004.3	23.0	7.0	0.18	0.61		997.21	1002.09	1.22			999.7	3.7	
2	6800	22300	631.7	222	575.0	Sand	4	981.29	1003.29	1003.29	1003.3	1004.3	23.0	7.0	0.18	0.61		997.09	1002.04	1.24			999.6	3.7	
2	6700	22300	631.7	222	575.0	Sand	4	981.14	1003.14	1003.14	1003.1	1004.1	23.0	7.0	0.18	0.61		996.93	1001.84	1.23			999.4	3.8	
2	6696	22300	631.7	222	575.0	Sand	4	981.13	1003.13	1003.13	1003.1	1004.1	23.0	7.0	0.18	0.61		996.93	1001.84	1.23			999.4	3.7	
2	6671	22300	631.7	222	575.0	Sand	4	981.10	1003.1	1003.1	1003.1	1004.1	23.0	7.0	0.18	0.61		996.91	1001.81	1.22			999.4	3.7	
2	6600	22300	631.7	222	575.0	Sand	4	982.6	1002.99	1002.99	1003.0	1004.0	21.4	6.5	0.18	0.58		996.33	1001.56	1.31			998.9	4.0	
2	6550	22300	631.7	222	575.0	Sand	4	983.89	1002.92	1002.92	1002.9	1003.9	20.0	6.1	0.17	0.55		996.29	1001.56	1.32			998.9	4.0	
2	6545	22300	631.7	222	575.0	Sand	4	984.02	1002.91	1002.91	1002.9	1003.9	19.9	6.1	0.17	0.55		996.27	1001.56	1.32			998.9	4.0	
2	6500	22300	631.7	222	575.0	Sand	4	983.85	1002.94	1002.94	1002.9	1003.9	20.1	6.1	0.17	0.55		996.44	1001.6	1.29			999.0	3.9	
2	6450	22300	631.7	222	575.0	Sand	4	983.66	1003.07	1003.07	1003.1	1004.1	20.4	6.2	0.17	0.56		996.57	1001.63	1.26			999.1	4.0	
2	6400	22300	631.7	222	575.0	Sand	4	983.47	1003.09	1003.09	1003.1	1004.1	20.6	6.3	0.17	0.56		996.68	1001.65	1.24			999.2	3.9	
2	6350	22300	631.7	222	575.0	Sand	4	983.29	1003.12	1003.12	1003.1	1004.1	20.8	6.4	0.17	0.57		996.75	1001.67	1.23			999.2	3.9	
2	6300	22300	631.7	222	575.0	Sand	4	983.09	1003.04	1003.04	1003.0	1004.0	20.9	6.4	0.17	0.57		996.74	1001.64	1.22			999.2	3.8	
2	6200	22300	631.7	222	575.0	Sand	4	982.72	1002.89	1002.89	1002.9	1003.9	21.2	6.5	0.17	0.57		996.71	1001.59	1.22			999.2	3.7	
2	6100	22300	631.7	222	575.0	Sand	4	982.34	1002.74	1002.74	1002.7	1003.7	21.4	6.5	0.18	0.58		996.69	1001.54	1.21			999.1	3.6	
2	6090	22300	631.7	222	575.0	Sand	4	982.3	1002.68	1003.07	1003.1	1004.1	21.8	6.6	0.18	0.58		996.7	1001.55	1.21			999.1	3.9	
2	6080	22300	631.7	222	575.0	Sand	4	982.26	1002.63	1003.39	1003.4	1004.4	22.1	6.7	0.18	0.59		996.71	1001.55	1.21			999.1	4.3	
2	6070	22300	631.7	222	575.0	Sand	4	982.23	1002.58	1003.71	1003.7	1004.7	22.5	6.9	0.18	0.60		996.77	1001.58	1.20			999.2	4.5	
2	6060	22300	631.7	222	575.0	Sand	4	982.19	1002.52	1004.04	1004.0	1005.0	22.8	7.0	0.18	0.60		996.72	1001.55	1.21			999.1	4.9	
2	6050	22300	631.7	222	575.0	Sand	4	982.15	1002.46	1004.36	1004.4	1005.4	23.2	7.1	0.19	0.61		996.73	1001.56	1.21			999.1	5.2	
2	6040	22300	631.7	222	575.0	Sand	4	982.11	1002.41	1004.69	1004.7	1005.7	23.6	7.2	0.19	0.62		996.74	1001.56	1.20			999.2	5.5	
2	6030	22300	631.7	222	575.0	Sand	4	982.08	1002.35	1005.02	1005.0	1006.0	23.9	7.3	0.19	0.62		996.75	1001.56	1.20			999.2	5.9	
2	6020	22300	631.7	222	575.0	Sand	4	982.04	1002.3	1005.34	1005.3	1006.3	24.3	7.4	0.19	0.63		996.76	1001.57	1.20			999.2	6.2	
2	6010	22300	631.7	222	575.0	Sand	4	982	1002.24	1005.66	1005.7	1006.7	24.7	7.5	0.19	0.64		996.77	1001.57	1.20			999.2	6.5	
2	6000	22300	631.7	222	575.0	Sand	4	981.96	1002.19	1005.99	1006.0	1007.0	25.0	7.6	0.20	0.65		996.78	1001.57	1.20			999.2	6.8	
2	5990	22300	631.7	222	575.0	Sand	4	982.21	1002.27	1006.18	1006.2	1007.2	25.0	7.6	0.20	0.64		996.76	1001.57	1.20			999.2	7.0	
2	5980	22300	631.7	222	575.0	Sand	4	982.45	1002.34	1006.38	1006.4	1007.4	24.9	7.6	0.20	0.64		996.76	1001.56	1.20			999.2	7.2	
2	5970	22300	631.7	222	575.0	Sand	4	982.7	1002.41	1006.58	1006.6	1007.6	24.9	7.6	0.20	0.64		996.75	1001.56	1.20			999.2	7.4	
2	5960	22300	631.7	222	575.0	Sand	4	982.94	1002.49	1006.77	1006.8	1007.8	24.8	7.6	0.20	0.64		996.74	1001.56	1.20			999.2	7.6	
2	5950	22300	631.7	222	575.0	Sand	4	983.2	1002.57	1006.96	1007.0	1008.0	24.8	7.5	0.20	0.64		996.73	1001.55	1.20			999.1	7.8	
2	5940	22300	631.7	222	575.0	Sand	4	983.44	1002.64	1007.16	1007.2	1008.2	24.7	7.5	0.19	0.64		996.71	1001.55	1.21			999.1	8.0	
2	5930	22300	631.7	222	575.0	Sand	4	983.69	1002.72	1007.35	1007.4	1008.4	24.7	7.5	0.19	0.64		996.7	1001.54	1.21			999.1	8.2	
2	5920	22300	631.7	222	575.0	Sand	4	983.93	1002.79	1007.55	1007.6	1008.6	24.6	7.5	0.19	0.64		996.68	1001.53	1.21			999.1	8.4	
2	5910	22300	631.7	222	575.0	Sand	4	984.18	1002.86	1007.74	1007.7	1008.7	24.6	7.5	0.19	0.64		996.67	1001.53	1.22			999.1	8.6	
2	5900	22300	631.7	222	575.0	Sand	4	984.42	1002.94	1007.94	1007.9	1008.9	24.5	7.5	0.19	0.64		996.65	1001.52	1.22			999.1	8.9	End of Phase 2
1	5800	22300	631.7	222	575.0	Sand	4	983.61	1002.82	1013	1013.0	1014.0	30.4	9.3	0.23	0.75		996.62	1001.47	1.21			999.0	14.0	
1	5700	22300	631.7	222	575.0	Sand	4	983	1002.64	1012	1012.0	1013.0	30.0	9.1	0.23	0.74		996.59	1001.4	1.20			999.0	13.0	
1	5600	22300	631.7	222	575.0	Sand	4	982.39	1002.47	1009	1009.0	1010.0	27.6	8.4	0.21	0.70		996.56	1001.35	1.20			999.0	10.0	
1	5500	22300	631.7	222	575.0	Sand	4	981.78	1002.29	1007.5	1007.5	1008.5	26.7	8.1	0.21	0.68		996.54	1001.29	1.19			998.9	8.6	
1	5400	22300	631.7	222	575.0	Sand	4	981.17	1002.11	1007	1007.0	1008.0	26.8	8.2	0.21	0.68		996.52	1001.24	1.18			998.9	8.1	
1	5300	22300	631.7	222	575.0	Sand	4	981.37	1001.93	1006	1006.0	1007.0	25.6	7.8	0.20	0.66		996.47	1001.18	1.18			998.8	7.2	Start of levee'd sect
1	5200	22300	631.7	222	575.0	Sand	4	981.55	1001.76	1005	1005.0	1006.0	24.5	7.5	0.19	0.63		996.41	1001.12	1.18			998.8	6.2	
1	5100	22300	631.7	222	575.0	Sand	4	981.21	1001.58	1003.6	1003.6	1004.6	23.4	7.1	0.19	0.61		996.38	1001.07	1.17			998.7	4.9	
1	5000	22300	631.7	222	575.0	Sand	4	980.87	1001.4	1001.4	1001.4	1002.4	21.5	6.6	0.18	0.58		996.36	1001.02	1.16			998.7	2.7	
1	4930	22300	631.7	222	575.0	Sand	4	980.64	1001	1001	1001.0	1002.0	21.4	6.5	0.18	0.58		996.34	1000.98	1.16			998.7	2.34	Start of Phase 1A
1	4800	22300	631.7	222	575.0	Sand	4	980.47	1000.85	1000.85	1000.9	1001.9	21.4	6.5	0.18	0.58		996.31	1000.93	1.16			998.6	2.23	
1	4700	22300	631.7	222	575.0	Sand	4	980.34	1000.74	1000.74	1000.7	1001.7	21.4	6.5	0.18	0.58		996.26	1000.87	1.15			998.6	2.2	
1A	4600	22300	631.7	222	575.0	Sand	4	979.93	1000.63	1000.63	1000.6	1001.6	21.7	6.6	0.18	0.58		996.21	1000.8	1.15			998.5	2.1	Start of Floodwall
1A	4550	22300	631.7	222	575.0	Sand	4	979.65	1000.57	1000.57	1000.6	1001.6	21.9	6.7	0.18	0.59		996.2	1000.76	1.14			998.5	2.1	
1A	4400	22300	631.7	222	575.0	Sand	4	978.99	1000.4	1000.4	1000.4	1001.4	22.4	6.8	0.18	0.60		996.14	1000.67	1.13			998.4	2.0	
1A	4350	22300	631.7	222	575.0	Sand	4	978.66	1000.31	1000.31	1000.3	1001.3	22.7	6.9	0.18	0.60		996.12	1000.64	1.13			998.4	1.9	
1A	4300	22300	631.7	222	575.0	Sand	4	978.33	1000.29	1000.29	1000.3	1001.3	23.0	7.0	0.18	0.61		996.12	1000.63	1.13			998.4	1.9	
1A	4250	22300	631.7	222	575.0	Sand	4	978	1000.23	1000.23	1000.2	1001.2	23.2	7.1	0.19	0.61		996.03	1000.56	1.13			998.3	1.9	
1A	4200	22300	631.7	222	575.0	Sand	4	977.66	1000.17	1000.17	1000.2	1001.2	23.5	7.2	0.19	0.62		995.91	1000.47	1.14			998.2	2.0	
1A	4150	22300	631.7	222	575.0	Sand	4	977.33	1000.12	1000.12	1000.1	1001.1	23.8	7.3	0.19	0.62		995.9	1000.44	1.14			998.2	1.9	End of Floodwall
1A	4100	22300	631.7	222	575.0	Sand	4	977	1000.06	1000.06	1000.1	1001.1	24.1	7.3	0.19	0.63		995.89	1000.41	1.13			998.2	1.9	
1A	4050	22300	631.7	222	575.0	Sand	4	976.9	1000.01	1000.01	1000.0	1001.0	24.1	7.4	0.19	0.63		995.88	1000.39	1.13			998.1	1.9	End of levee'd sect
1A	4000	22300	631.7	222	575.0	Sand	4	976.82	999.95	999.95	1000.0	1001.0	24.1	7.4	0.19	0.63		995.87	1000.38	1.13			998.1	1.8	
1A	3950	22300	631.7	222	575.0	Sand	4	976.74	999.89	999.89	999.9	1000.9	24.2	7.4	0.19	0.63		995.83	1000.34	1.13			998.1	1.8	
1A	3900	22300	631.7	222	575.0	Sand	4	976.66	999.84	999.84	999.8	1000.8	24.2	7.4	0.19	0.63		995.74	1000.27	1.13			998.0	1.8	
1A	3850	22300	631.7	222	575.0	Sand	4	976.58	999.78	999.78	999.8	1000.8	24.2	7.4	0.19	0.63		995.71	1000.23	1.13			998.0	1.8	
1A	3800	22300	631.7	222	575.0	Sand	4	976.51	999.72	999.72	999.7	1000.7	24.2	7.4	0.19	0.63		995.67	1000.18	1.13			997.9	1.8	
1A	3750	22300	631.7	222	575.0	Sand	4	976.43	999.67	999.67	999.7	1000.7	24.2	7.4	0.19	0.63		995.62	1000.1	1.12			997.9	1.81	
1A	3700	22300	631.7	222	575.0	Sand	4	976.35	999.61	999.61	999.6	1000.6	24.3	7.4	0.19	0.63		995.61	1000.08	1.12			997.8	1.76	
1A	3650	22300	631.7	222	575.0	Sand	4	976.28	999.55	999.55	999.6	1000.6	24.3	7.4	0.19	0.63		995.58	1000.04	1.11			997.8	1.74	
1A	3600	22300	631.7	222	575.0	Sand	4	976.2	999.5	999.5	999.5	1000.5	24.3	7.4	0.19	0.63		995.57	1000	1.11			997.8	1.7	
1A	3550	22300	631.7	222	575.0	Sand	4	976.12	999.44	999.44	999.4	1000.4	24.3	7.4	0.19	0.63		995.55	999.97	1.11			997.8	1.7	
1A	3500	22300	631.7	222	575.0	Sand	4	976.04	999.38	999.38	999.4	1000.4	24.3	7.4	0.19	0.63		995.53	999.94	1.10			997.7	1.6	

Table 11: Risk & Uncertainty Reliability Analysis Results
(from HEC-FDA)

Stream Name	Reach	Long-Term Risk (years)			Conditional Non-Exceedance Probability (CNP) by Events						FB
		10	30	50	10%	4%	2%	***1%***	0.5%	0.2%	(ft)
Murrieta	2	0.0496	0.1414	0.2244	1.0000	0.9997	0.9838	***0.9202***	0.5158	0.1546	3.7
FB = freeboard (at damage reach index location)											

Table 12: Precipitation Frequency Estimates (inches)

ARI* (yrs)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.15	0.23	0.29	0.39	0.48	0.69	0.83	1.23	1.64	1.97	2.17	2.20	2.36	2.62	3.17	3.79	4.38	4.99
2	0.19	0.29	0.36	0.49	**0.61**	0.87	**1.05**	**1.55**	2.10	**2.55**	2.83	2.86	3.09	3.44	4.17	5.00	5.80	6.60
5	0.26	0.39	0.49	0.66	0.81	1.12	1.36	1.99	2.75	3.42	3.91	3.92	4.29	4.78	5.83	6.98	8.23	9.32
10	0.31	0.48	0.59	0.79	0.98	1.34	1.61	2.35	3.25	4.08	4.77	4.79	5.25	5.84	7.14	8.51	10.14	11.46
25	0.39	0.60	0.74	0.99	1.23	1.65	1.97	2.85	3.93	5.00	5.98	6.03	6.60	7.35	8.98	10.65	12.83	14.47
50	0.46	0.70	0.87	1.17	1.45	1.91	2.26	3.25	4.46	5.72	6.97	7.05	7.70	8.57	10.47	12.37	15.01	16.91
100	0.54	0.81	1.01	1.36	**1.68**	2.19	**2.58**	**3.67**	5.02	**6.48**	8.04	8.15	8.88	9.89	12.06	14.18	17.34	19.50
200	0.62	0.94	1.17	1.57	1.95	2.50	2.92	4.10	5.59	7.27	9.16	9.34	10.14	11.29	13.75	16.09	19.82	22.25
500	0.74	1.13	1.40	1.89	2.33	2.94	3.40	4.70	6.37	8.36	10.78	11.05	11.93	13.28	16.15	18.76	23.35	26.14
1000	0.85	1.29	1.60	2.15	2.66	3.31	3.78	5.18	6.98	9.22	12.10	12.46	13.40	14.91	18.10	20.91	26.20	29.28

Table 13: Subarea Design Discharge Data

Drainage Area Designation	Total Time of Concentration Tc (min)	Coefficient of Run-off C	Rainfall Intensity I (in/hr)	Area of the sub-basin A (acres)	Q_{100} (cfs)
C1	9.99	0.866	4.504	10.29	40.125
C2	**10.77**	0.736	4.32	1.92	6.1
C3	7.395	0.88	5.314	3.44	16.1
C4	15.67	0.882	3.563	59.5	187
C5	14.82	0.87	3.63	8.74	27.6
C6	**19.28**	**0.79**	3.17	51.53	146.10
C7	6.94	0.88	5.5	0.32	1.6
C8	9.19	0.874	4.714	2.47	10.2
C9	7.517	0.87	5.266	1.46	6.69
C10	7.735	0.87	5.184	0.73	3.29
C11	14.82	0.78	4.45	124.48	433
C12	5.032	0.89	6.566	0.31	1.8
C13	5.828	0.88	6.057	0.26	1.39
C14	5.428	0.88	5.428	0.85	4.08
C15	14.97	0.83	3.98	131.8	437.2
C16	11.48	0.89	4.219	8.96	33.7
C17	**Unit Hydrograph**			520.6	**860**
C18	5.91	**0.89**	**5.9**	12.3	51.6
C19	17.39	0.89	3.25	5.2	15.3
C20	19.83	0.88	3.05	77.9	239.1
C20A	25.94	0.88	2.65	22.93	57.4
C21	19.1	0.89	3.05	4	11.24
C22	22.77	0.88	3	8.4	21.1
C23	18.71	0.82	3.05	311.7	478.8
C24	19.35	0.88	3	19.5	55.3
C25	17.29	0.88	3.4	73.9	240.8
C26	14.71	0.88	3.6	94.2	341.6
D1	**Unit Hydrograph**			720.9	1296.2
D1A	14	0.88	3.75	2.2	7.3
D2	18.4	0.88	3.2	27.3	82.2
D2A	6.3	0.89	5.8	0.3	1.55
D2B	5.8	0.89	6.05	0.3	1.61
D2C	5.8	0.89	6.06	0.3	1.62
D2D	5.8	0.89	6.06	0.4	2.16
D2E	6.04	0.89	5.94	0.3	1.58
D2F	5.94	0.89	5.78	0.2	1.03
D2G	5	0.89	6.59	0.2	1.17
D3	17.63	0.88	3.4	37.9	127.8
D4	14.89	0.83	3.55	135.89	241
D5	23.15	0.83	2.85	56.42	138.9

Drainage Area Designation	Total Time of Concentration Tc (min)	Coefficient of Run-off C	Rainfall Intensity I (in/hr)	Area of the sub-basin A (acres)	Q_{100} (cfs)
D5A	19	0.76	3.17	2.03	4.9
D6	15.41	0.77	3.55	62.98	180.4
D6A	8.9	0.89	4.8	1.9	8.1
D6B	6.6	0.89	5.68	1.04	5.2
D6C	6.7	0.89	5.6	0.34	1.7
D6D	5.8	0.89	6.1	0.1	0.54
D6E	5.8	0.89	6.1	0.2	1.08
D6F	8.6	0.89	4.9	1.35	5.86
D6G	7.77	0.89	5.17	1.11	5.08
D6H	5.5	0.89	6.24	0.55	3.05
D6I	5.4	0.89	6.3	0.5	2.8
D7	9.78	0.86	4.5	28.04	115.56
D7A	10.1	0.88	4.48	0.62	2.45
D7B	5.82	0.89	6.06	1.03	5.54
D7C	7.05	0.89	5.46	0.73	3.54
D7D	7.78	0.89	5.17	0.62	2.84
D7E	7.53	0.89	5.26	0.8	3.72
E1	10.63	0.88	4.3	19.76	73.2
E1A	10.18	0.88	4.46	8.72	34.3
E2	10.2	0.88	4.45	9.31	36.7
E2A	19.61	0.88	3.1	19.83	57.79
E2B	14.9	0.88	3.9	11.7	38.2
E3	13.24	0.88	3.877	7.15	24.45
E3A	14.5	0.88	3.8	1.95	6.5
E3B	17.38	0.88	3.35	11.12	33.25
E3C	19.66	0.88	3.04	6.42	18.5
E3D	11.27	0.88	4.25	2.94	11
E3E	**Unit Hydrograph**			417.46	955
E3F	10.35	0.88	4.42	1.69	6.59
E3G	8.49	0.88	4.93	1.42	6.19
E3H	8.6	0.88	4.89	1.38	5.96
E3I	12.04	0.88	4.06	4.47	16.02
E4	15.3	0.88	3.5	9.27	29.8
E5	16.62	0.88	3.35	19.45	62.14
E6	16.14	0.88	3.4	35.34	116.9

Table 14: Existing Side Drains

RCFC Drainage Area	RCFC 100-yr Discharge (cfs)	Existing Pipe (s) Size/Type	Existing Pipe (s) Capacity (cfs)	Murrieta Creek CL Station	New Pipe (s) Size/Type	New Pipe Capacity (cfs)
C2/C3/C4	209.2	48" RCP	154.2	67+67.31	60" RCP	246.2
C5	27.6	30" RCP	43.4	69+44.92	NA	NA
C6	146.10	15" RCP	12.5	79+80.99	24" RCP	38.9
C7/C8	11.8	12" CMP	19.4	81+21.37	24" RCP	19.4
C9/C10	10.0	9" conc	2.65	84+70.70	24" RCP	29.4
C11	433	48" RCP/ 48" RCP	158.5	87+78.63/ 86+90.62	2-60" RCPs	460.1
C12	1.8	18" CMP	26.77	91+60.11	24" RCP	26.8
C13	1.39	18" CMP	14.15	92+26.94	24" RCP	14.2
C14	4.08	30" CMP	26.36	92+76.69	30" RCP	44
C15	437.2	72" RCP	565.1	97+72.03	NA	NA
C16	33.7	30" RCP	83.9	101+81.88	NA	NA
C17	1327.7	18"RCP/ 7'x14' RCB/ 24" RCP/ 8" RCP	1515.24	106+53.16/ 108+10.91/ 108+28.56/ 106+04.99	2-24" RCPs	1564.8
C18	51.6	18" RCP	16.4	120+39.36	36" RCP	82.7
C19	15.3	24" RCP	32.5	123+95.07	NA	NA
C20A	57.4	24" RCP	33.3	135+26.57	36" RCP	84.6
C21	11.2	18" RCP, 24" RCP	28.2	139+24.39/ 139+26.80	24" RCP	41.2
C22	21.1	42" RCP	139.8	144+29.28	48" RCP	139.8
C23	478.8	24" CMP, 24" CMP	42.7	152+74.21/ 152+75.54	2-54" RCPs	507.6
C24	55.3	24" CMP, 18" CMP	29.3	161+86.90/ 161+84.97	2-24" RCP	70.1
C25	240.8	48" RCP, 48' RCP	345.9	169+86.90/ 169+93.61	NA	NA
C26	341.6	48" RCP, 48' RCP	308.8	182+30.74/ 182+39.22	54" RCP	350.0
D4/D5A	245.9	48" RCP, 48" RCP	129.4	61+60.33/ 61+72.55	2-72" RCPs	256
D6/D6E	181.5	40" RCP	121.5	76+23.53	54" RCP	234.8

RCFC Drainage Area	RCFC 100-yr Discharge (cfs)	Existing Pipe (s) Size/Type	Existing Pipe (s) Capacity (cfs)	Murrieta Creek CL Station	New Pipe (s) Size/Type	New Pipe Capacity (cfs)
D6A/D5/D6 B/D6C/D6D	154.4	48" RCP	222.6	69+52.99	NA	NA
D6F	5.86	24" PVC	29.6	79+87.34	24" RCP	25.2
D6G/D6H	8.13	24" RCP	49.8	82+17	NA	NA
D6I/D7A	5.3	18" RCP	18.3	84+10.09	24" RCP	38.65
D7	115.56	40" RCP	146.8	91+34.77	48" RCP	220.2
D7B/D7C/D 7D	11.9	24" RCP	31.9	87+54.22	NA	NA
D7E	3.7	6" PVC	1.4	94+72.36	24" RCP	38
E1	73.2	NA	NA	XXX	42" RCP	77.4
E1A	34.3	24" RCP, 18" RCP	52.7	107+05.29/ 106+92.21	24" RCP	71.0
E2	36.7	24" CMP, 18" RCP	38.9	109.31.62/ 108+95.29	2-24" RCPs	74.7
E2A	57.8	48" CMP	112.5	117+34	48" RCP	168.5
E2B	38.2	24" CMP	10.9	123+39.29	48" RCP	86
E3/E3A	31.0	18" CMP, 18" CMP	18.3	137+98.42/ 139+40.69	2-24" RCPs	66.6
E3B	33.3	18" CMP	8.7	143+05.85	30" RCP	53.4
E3D/E3C	29.5	24" CMP	19.1	146+63.53	30" RCP	56.1
E3E	955	54" RCP, 54" RCP	411.8	150.43.5/ 150+53.57	7'x13.5'	955
E3F/E3G/E 3H/E3I	34.8	4" PVC	0.5	XXX	36" RCP	36.5
E4	29.8	24" CMP	8.7	XXX	36" RCP	36.5
E5	62.1	24" RCP	15.2	XXX	48" RCP	064.6
E6	116.9	48" RCP	138.5	183+35.25	NA	NA

FIGURES

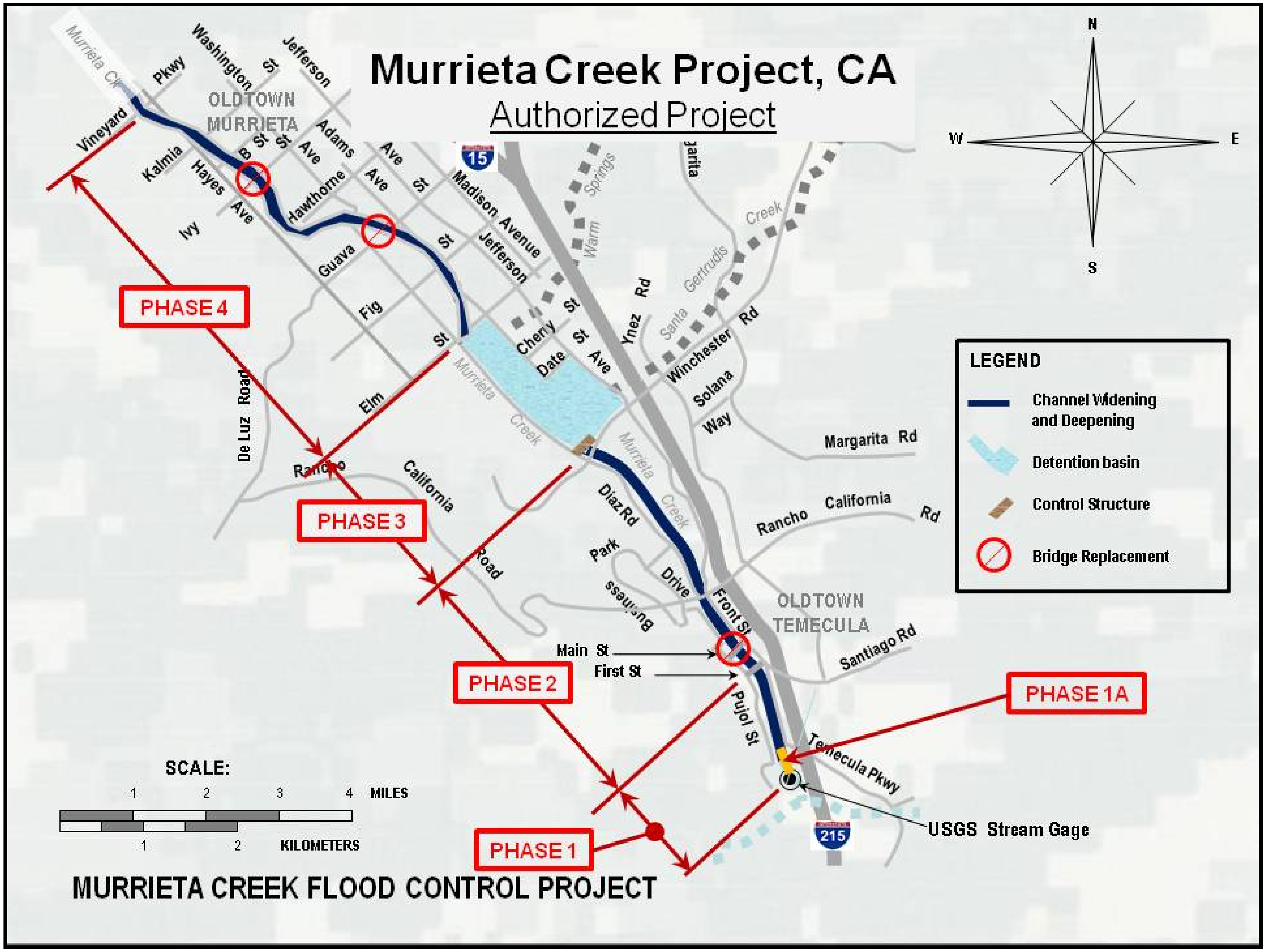


Figure 1: Project Location Map

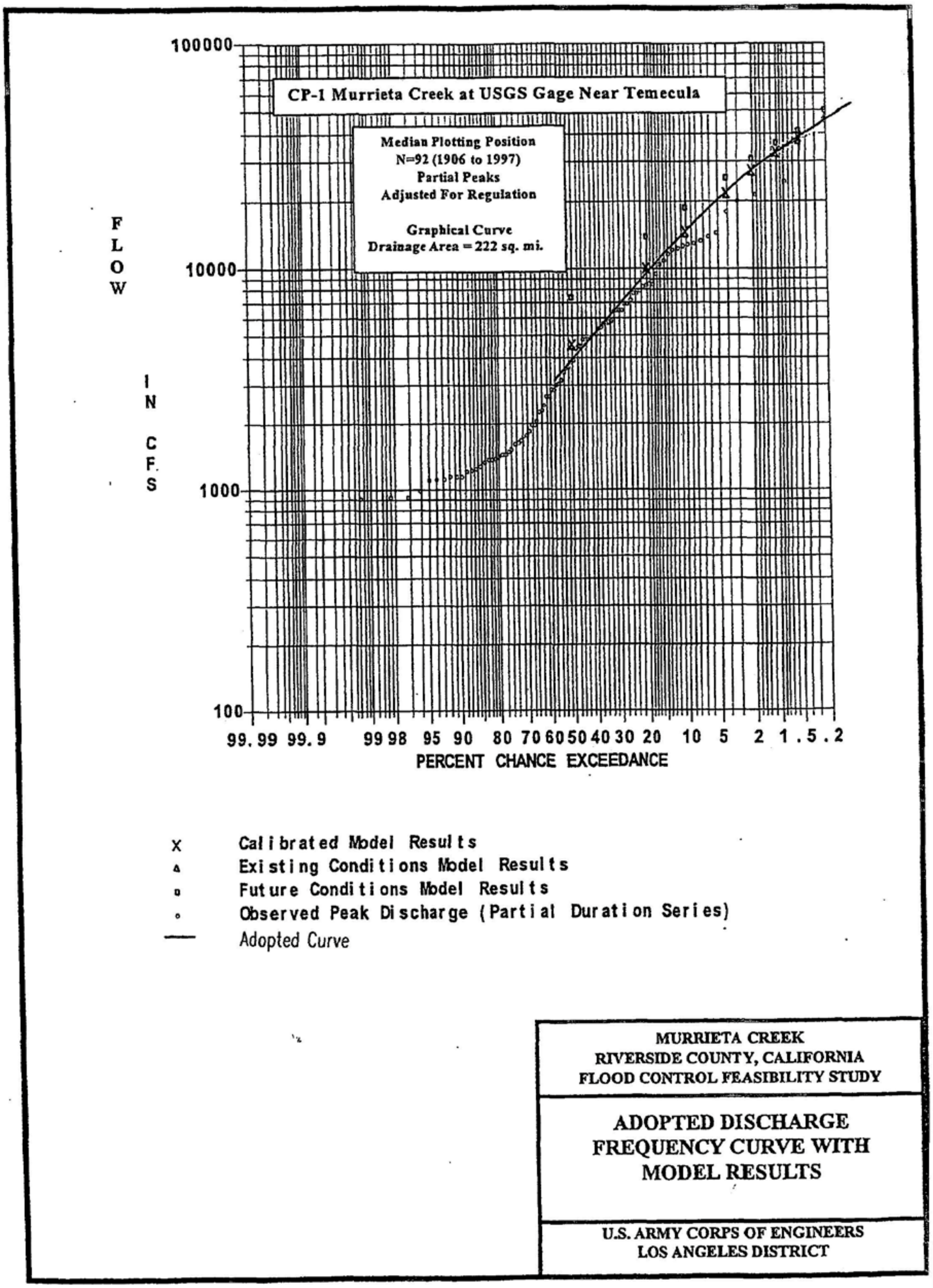
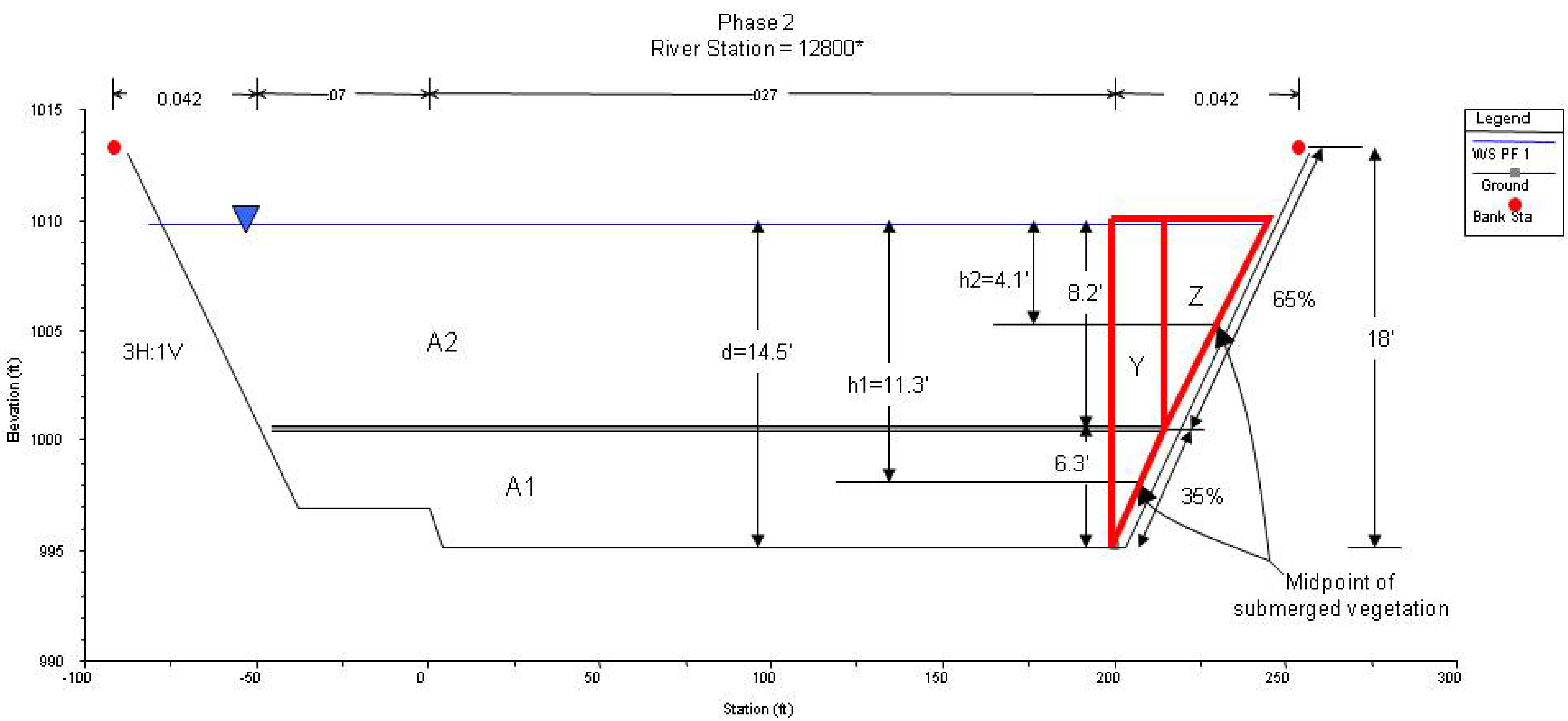


Figure 2: Adopted Discharge-Frequency Curve With Model Results



Notes:

A1 = the lower 35% side slope zone

A2 = the upper 65% side slope zone

h1 = ave depth in zone A1

h2 = ave depth in zone A2

d = depth of flow in channel

Figure 3: Typical Channel Cross-section Subdivisions

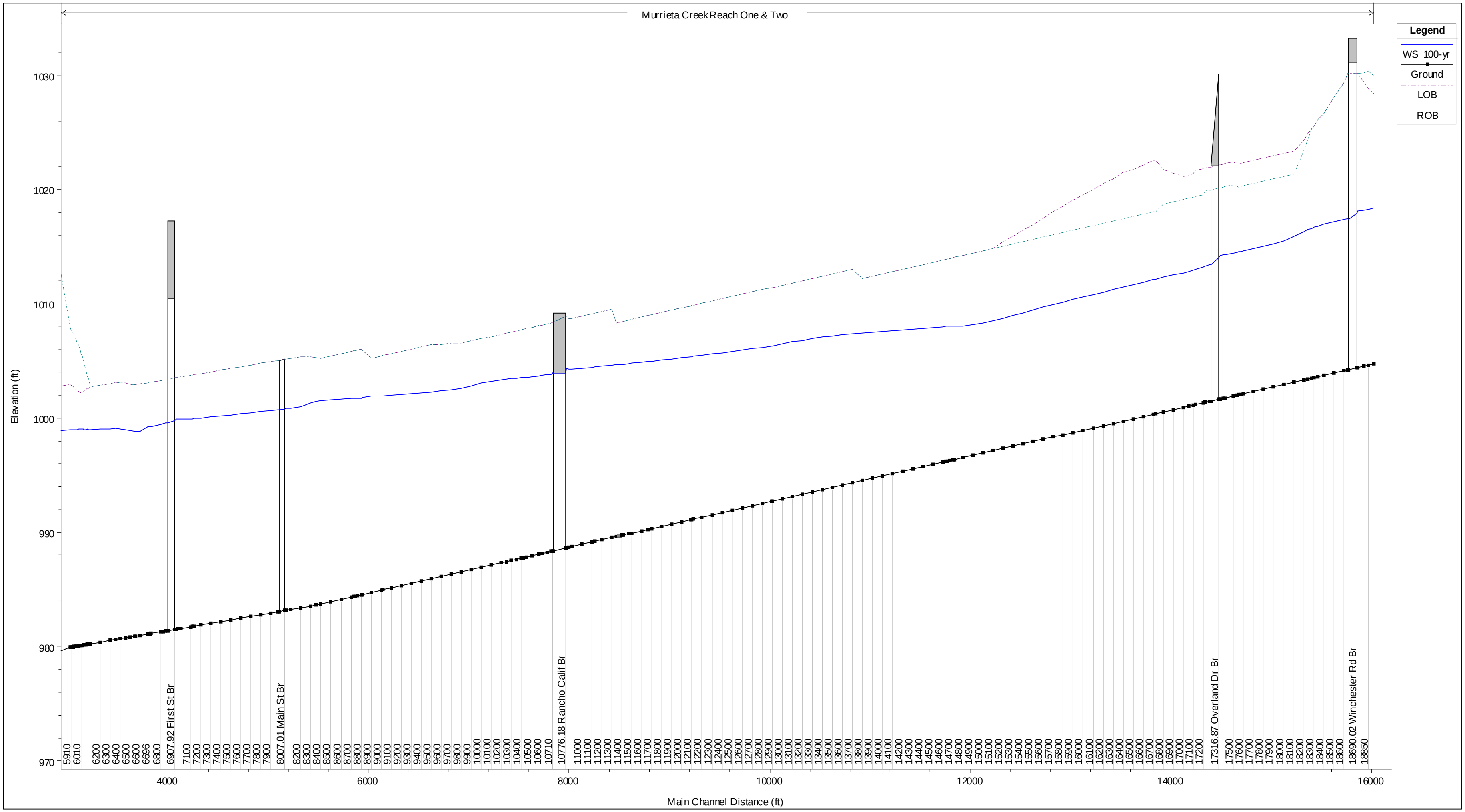


Figure 4: Water Surface Profile

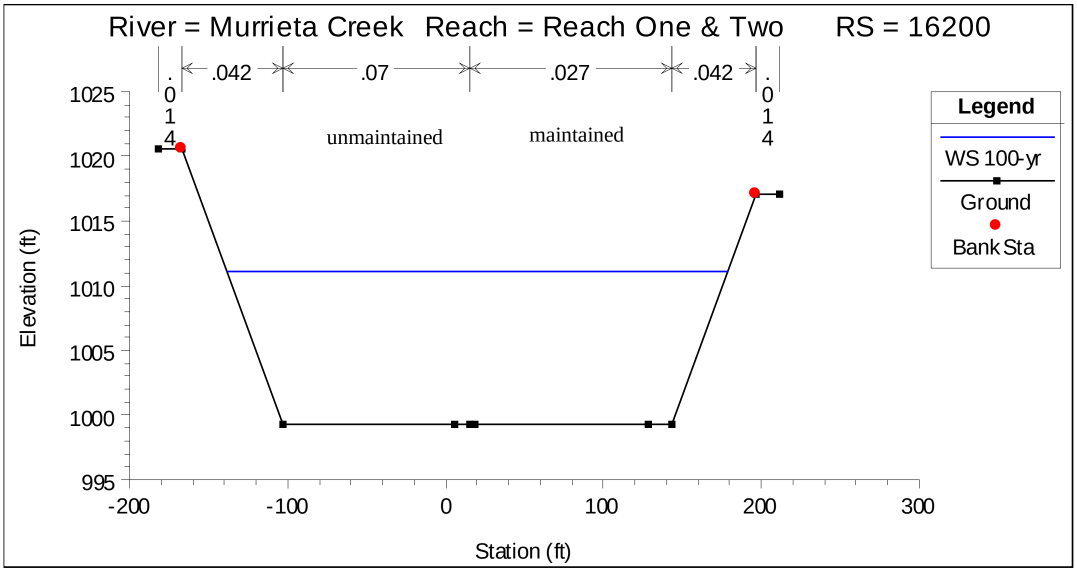


Figure 5: Typical Cross-sections (3H:1V side slopes)

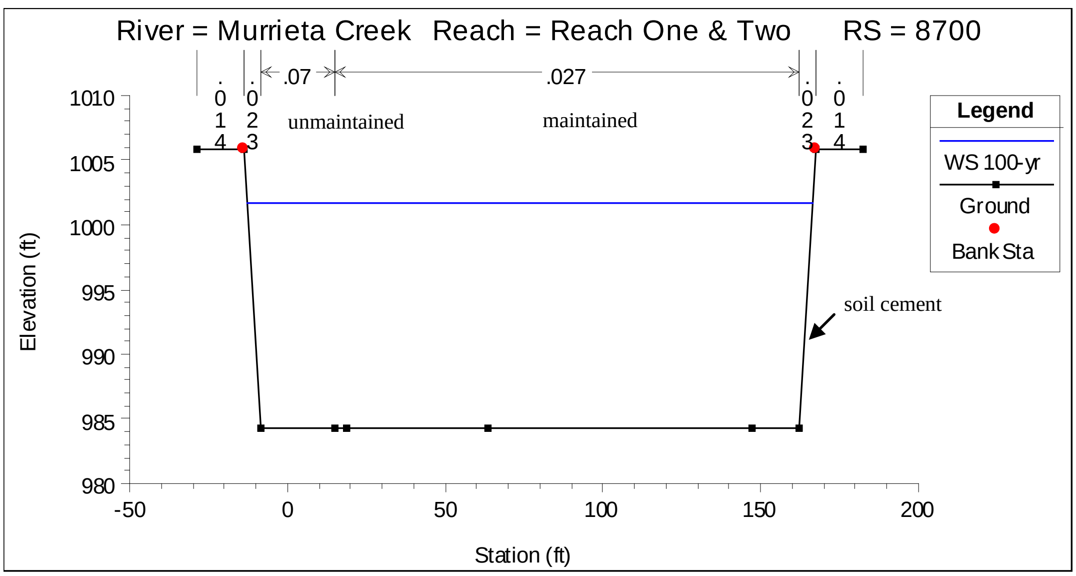


Figure 6: Typical Cross-sections (1H:4V side slopes)

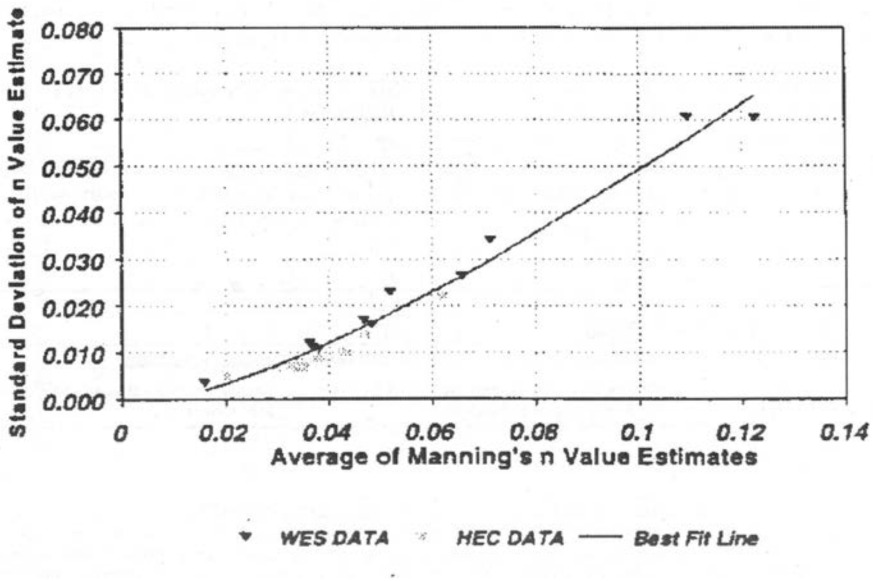


Figure 7: Uncertainty of Manning's N Value Estimates Based on Estimated Mean Values (EM 1110-2-1619)

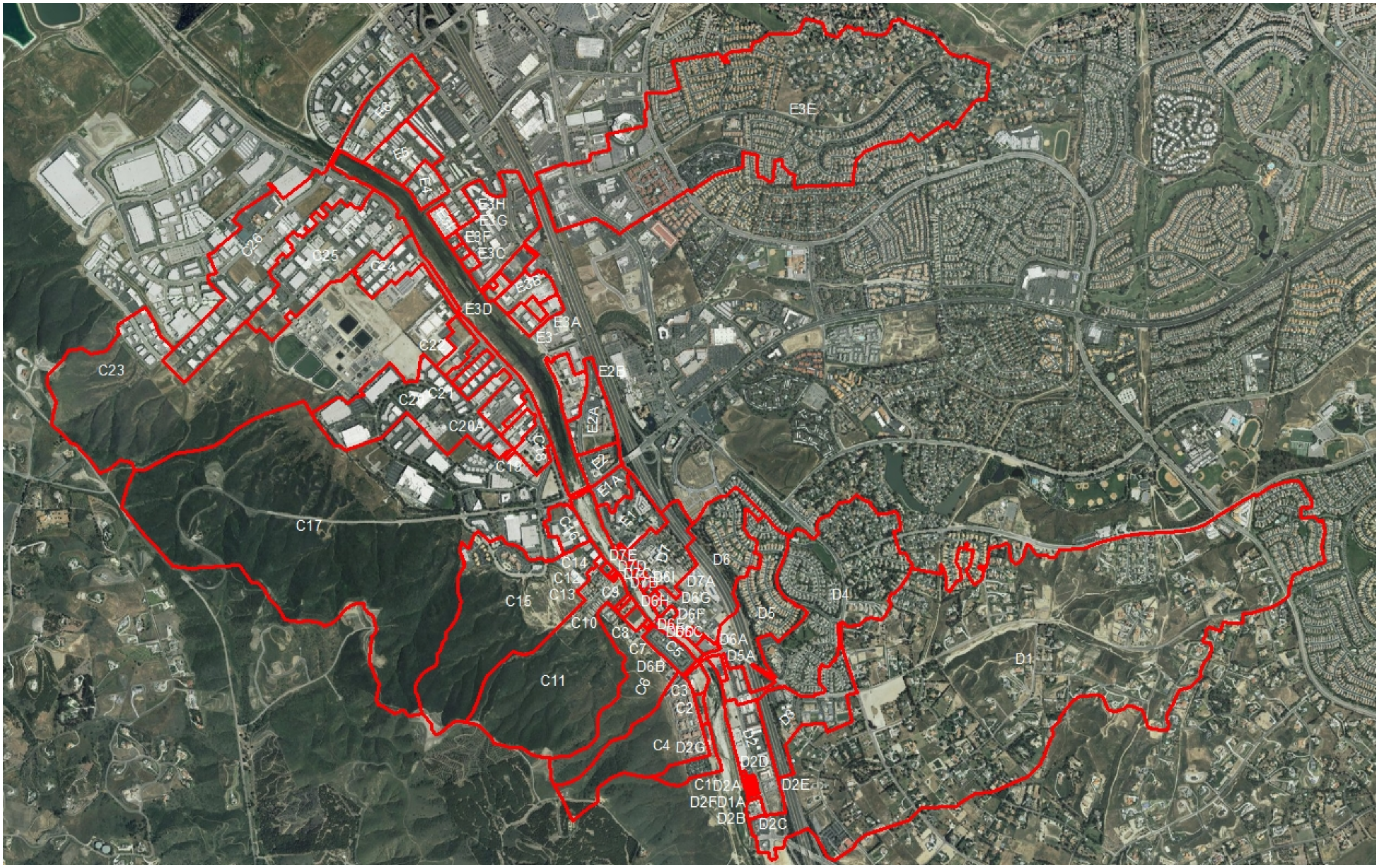


Figure 8: Drainage Area Locations

EXHIBITS

Exhibit A

Sedimentation Model Set-Up Report

Murrieta Creek Flood Control and Environmental Restoration Project

March 21, 2006

Prepared For

US Army Corps of Engineers
Los Angeles District

Prepared By

Michael A. Hrzic
MAHR WORKS

Revised 18 April 2006 DPC
Revised 01 October 2007 VC

Summary

The Murrieta Creek Sedimentation Model Set-Up Report was prepared for the United States Army Corps of Engineers-Los Angeles District (the Corps) in support of the Murrieta Creek Flood Control and Environmental Restoration Project. The purpose of the report is to summarize the information used and the steps taken in the development of the sediment mode.

With-Project Sediment Transport Analysis

A one dimensional sediment transport analysis was performed using the HEC-6T, *Sedimentation in Stream Networks,* program. The sediment transport model extends from the Slaughter Canyon to the USGS Gage Station near First Street in the City of Murrieta. The model network consists of the Murrieta Creek (main stem) and the Warm Spring and Santa Gertrudis tributaries (branches), Figure 3. Secondary flow sources (i.e. Carter Canyon, Long Canyon), project features (detention basin, channelization, new vegetation), and bridges are also accounted for in the model. The hydrologic routing of flows was completed in the feasibility phase using the HEC-1 program.

Previous studies for the without-project condition, WEST Consultants, “Murrieta Creek Flood Control and Environmental Restoration Project-Final Initial Sedimentation Analysis Report”, Ref. 11, hydraulic analysis for the with-project condition, completed by the Corps, and hydrologic analysis for the with-project condition, completed by the Corps, “Murrieta Creek Feasibility Study, Appendix C”, Ref. 8, contributed in the sediment model development. Information included into the model was sediment source locations, bed and bed material gradations, bed material load rating curves, geometry information for the with-project condition, and hydrographs for the with-project condition.

The objective of the sedimentation analysis was to determine the impact of the project on the hydraulic and sedimentation conditions along Murrieta Creek and the effect hydraulic and sedimentary changes would have on the flood control and environmental features of the project. Special attention was given to modeling the detention basin.

The sediment transport model was verified in a fixed-bed mode to an existing steady state hydraulic model for the with-project condition. A computational instability test was completed for the 100-year with-project hydrologic scenario. The 100-year event corresponded to the design discharge.

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Introduction

1.1. Purpose

The purpose of the Sedimentation Model Setup Report is to document the work completed for the Murrieta Creek Flood Control and Environmental Restoration Project with-project sediment model. The write up focuses on the development of the sediment model, with an emphasis on HEC-6T records and model features unique to modeling the detention basin and accounting for the total load (bed material and wash loads).

1.2. Study Area

Murrieta Creek begins near the City of Wildomar, in the South-East Corner of Riverside County in Southern California. The Creek flows approximately 12 miles south, through the Cities of Murrieta and Temecula eventually joining Temecula Creek to form the Santa Margarita River.

The Murrieta Creek watershed is a valley bounded by the Santa Rosa Mountains and the Santa Rosa Plateau to the west. Rugged, steep hills and canyons make up the southern border. The San Jacinto ranges make up the eastern border, and gently rolling terrain makes up the northern area. The Murrieta Creek watershed study area is 222 square miles at the USGS gage located near the City of Murrieta. The minimum elevation is approximately 970 feet (NGVD) at the downstream stream gage. The maximum elevation is 4,563 feet (NGVD) near the eastern boundary of the watershed. Most of the watershed consists of valley and mesa lands.

Murrieta Creek is supported by several significant tributaries (Santa Gertrudis Creek and Warm Spring Creek) and by some lesser ones (Empire Creek, Long Canyon, Kalmia Wash, Cole Canyon, and Slaughter Canyon). Two reservoirs are located within the watershed, Diamond Valley Reservoir on Warm Spring and Skinner Reservoir on Santa Gertrudis.

Historically, the Murrieta Valley and the Murrieta Creek floodplain have been used for farms and ranches, with the town sites of Murrieta and Temecula serving as the centers of local commerce and culture. Within the past two decades, the density of residential development and the amount of commercial and industrial development have been steadily increasing. The Murrieta Creek 100-year floodplain impacts 2,504 acres within the Cities of Murrieta and Temecula. Public facilities impacted by flooding include streets, bridges, utilities, and two wastewater treatment plants.

The project area extends from Tenaja Road downstream to the outlet at the gagging station below First Street. 15,000 ft of the Murrieta Creek would be channelized, a detention basin constructed at the confluence with the Warm Spring tributary, and vegetation established along the new river channel.

2. Pertinent Information

Setting up the sediment model was simplified by the availability of geometric, sedimentary, and hydrologic information from previous studies.

2.1. Geometry

The geometry information for the with-project features (channel, detention basin) were imported from the with-project hydraulic model[1]. The without-project sedimentation analysis completed by WEST Consultants, "Murrieta Creek Flood Control and Environmental Restoration Project-Final Initial Sedimentation Analysis Report", Ref. 11, was used to acquire the necessary information for coding the Murrieta Creek tributaries and bridges[2].

The detention basin geometry was based on design information developed by the Corps[3]. Information for the detention basin was extracted from the digital terrain model (dtm) to HEC-6T through geo-RAS and the ras2h6t executable which converts the RAS geometry file to the HEC-6T format. Irregularities in the digital terrain model for the detention basin were initially adjusted in the HEC-RAS with-project hydraulic model prior to exporting into HEC-6T. The dtm file used was preliminary and provided the outer extents and location of the cross section. Station-elevation points were coded using engineering judgment.

2.2. Hydrologic Data

All hydrographs used in this study were generated by the Corps for the feasibility study, Ref. 8. The hydrologic routing of flows through the detention basin was based on the feasibility study Alternative 6 HEC-1 results[4]. The fixed bed model ran the assumed 100-year and 10-year detention basin outlet peak discharges.

2.3. Sediment Transport Information

The sediment source locations, transport function, bed material and bed material load gradations, and bed material load rating curves were based on the without-project sediment model[2]. Wash load information and computation of the total load was based on a previous Corps study, "Murrieta Creek Sedimentation Model Progress Report, May, 2005", Ref. 7.

[1] USACE-SPL for the Murrieta Creek with-project hydraulic model, HEC-RAS file, project file Murrieta1_4.prj, geometry file Murrieta1_4.g04, flow data Murrieta1_4.f01.

[2] WEST HEC-6T file for the Murrieta Creek without-project sediment model, HEC-6T file, MCNET.t5, MCNET1.t5 (input files), MCNET.t6, MCNET1.t6 (output file). Refer to Dragoslav Stefanovic email to Michael Hrzic 11/5/2003.

[3] USACE-SPL, with-project design digital terrain model, R1and2.dtm and R3and4.dtm

[4] USACE-SPL, Murrieta Creek with-project hydrologic model 100-year event, HEC-1 file, fwp6_100.dat

3. Existing Without-project Sedimentation Analysis

The work completed for Ref. 11 consisted of a without-project sedimentation analysis[5]. The model network as proposed in the original sediment model was maintained for the with-project model. Sediment source locations and bed material transport information were all used based on the without-project sediment model.

3.1. Geometric Model

The without-project model for the Murrieta Creek accounted for Murrieta Creek from Slaughter Canyon to USGS Gage Station near First St. Slaughter Canyon is approximately 12,000 feet upstream of the project boundary, Tenaja Road. The two primary tributaries were included in the model network, Warm Spring Creek and Santa Gertrudis Creek. Both tributaries are modeled as branches and are subject to sediment transport and hydraulic computation routines. The branch geometry information was transferred over into the with-project sediment model in its entirety.

The HEC-RAS model had included sediment deposition into the geometry file. For the HEC-6T models all deposition reflected in the HEC-RAS model was removed.

3.2. Sediment Transport Function

Yang's 1973 sediment transport function was used. Yang's 1973 formula was developed for sand transport and accounts for only the bed material load. Yang's formula is suitable for sand and gravel bed streams such as Murrieta Creek.

3.3. Sediment Sources

The without-project sedimentation analysis accounts for the sediment inflow from four local point sources (Long Canyon, Line D, Cole Canyon, Kalmia Wash), two tributaries (Warm Spring Creek and Santa Gertrudis Creek), and the contributing watershed at the upstream boundary. Line D and Kalmia Wash were previously determined to not contribute sediment to the main stem[6]. The without-project did not account for the wash load contribution.

[5] WEST Consultants, "Murrieta Creek Flood Control and Environmental Restoration Project-Final Initial Sedimentation Analysis Report", November 2003. HEC-6T file, MCNET.t5 and MCNET1.t5. MCNET.t5 was used for the tributary geometry information, and MCNET1.t5 was used for the inflow/outflow location flow/sediment information.

[6] For Line D, e-mail dated 5 November 2003 from WEST Consultants indicated that the sediment load from this tributary was neglected during the preparation of Ref. 11. For Kalmia Wash, Ref. 11 indicates in paragraph 105 on page 40, the sediment inflow, specifically bed material load, from this tributary is relatively insignificant because of a small drainage area and channel dimensions, together with considerable vegetation impeding flow in the channel. E-mail dated 8/11/2005 with WEST Consultants stated that Kalmia Wash had an assumed negligible bed material load but not total load. Wash load has been accounted for.

3.4. Bed Gradations

The bed gradation for Murrieta Creek, Warm Spring Creek and Santa Gertrudis Creek were applied to the with-project sediment model. Refer to HEC-6T model file for gradations used. The bed material inflowing load gradation was also applied to the with-project sediment model, as shown in Tables B-1 to B-5.

3.5. Bed Material Load Rating Curves

The bed material load rating curve for all sediment sources (upstream boundaries and inflow/outflow locations) were applied to the with-project sediment model, Tables B-1 to B-5.

4. With-Project Hydraulic Analysis

The Corps created a one-dimensional steady state hydraulic model for Murrieta Creek using HEC-RAS. The HEC-RAS model[7] represented the with-project condition for Murrieta Creek from Tenaja Rd to First St. The discharges run corresponded to peak discharge outflows from the detention basin. In addition, an unsteady hydraulic model for Reach 3 was created to simulate the flow attenuation and determine the maximum water surface elevation during the design flood within the detention basin.

4.1. Geometric Data

The channel geometry information was based on the HEC-RAS with-project geometry file[8], project Segments 1 to 4, Segment 1 (River Station 32+00 to 59+00), Segment 2, (River Station 59+00 to 189+00) Segment 3 (River Station 189+00 to 251+00), and Segment 4 (River Station 251+00 to 446+00), Figure A-1. The geometry information included updated bridge information that was used to code the bridge in the sediment model.

The cross section information accounted for channel modifications, Figure A-8, and a preliminary detention basin design, Figure A-9. The geometry information was converted to the HEC-6T format using the ras2h6t.exe executable file.

[7] USACE-SPL for the Murrieta Creek with-project hydraulic model, HEC-RAS file, project file Murrieta1_4.prj, geometry file Murrieta1_4.g04, flow data Murrieta1_4.f01. Unsteady flow models: project file Reach3.prj, plan file Reach3.p20, geometry file Reach3.g14, unsteady flow data file Reach3.u11.

4.2. Boundary Conditions

The downstream boundary condition was set to critical depth. Murrieta Creek, at the downstream end, is confined to a steep river reach, with an underlying bed rock outcrop.

4.3. Manning's *n* Value

Values of Manning's roughness coefficient "*n*" were incorporated from the with-project HEC-RAS geometry file. Murrieta Creek is predominantly a sand channel with some gravel material. For the with-project condition, the new channel cross section consisted of a low flow channel, vegetated benches and vegetated side slopes. The low flow channel bed material was assumed to be predominantly sandy with no vegetation; the assumed roughness value was 0.027. The bench which will be sparsely vegetated and managed had an assumed roughness value of 0.07. The channel banks with the densest vegetation had the highest associated roughness value of 0.095. The detention basin will be minimally maintained. The main channel roughness was 0.07 and the overbank roughness value was 0.10.

The unchannelized segment of the creek below the downstream end of the project, between Stations 32+00 and 28+75, had an assumed main channel roughness value of 0.053 (cobble and partially obstructed) and an overbank roughness coefficient of 0.06.

4.4. Bridges

There are seven bridges located in the project area: Tenaja Road, centerline Station 444+00; Ivy Street, centerline Station 387+50; Washington Street, centerline Station 333+50; Winchester Road, centerline Station 186+98.5; Rancho-California Road, centerline Station 108+07; Main Street, centerline Station 80+27.5; and First Street, centerline Station 69+39. An allowance for debris loading was set to 2 feet on each side of each bridge pier for the full height of the pier. The width of the piers with the debris loading allowance width ranged from 5.25 to 7 feet, and the height ranged from 6 to 7 feet. The bridge loss calculation method was set to the energy equation for low and high flows.

The detention basin outlet will consist of four ungated 10-ft wide x 11.5-ft high reinforced concrete boxes (RCB's). The approach to the RCB's will be wingwalls flared 30 to 75 degrees. The RCB's will terminate in the existing streambed immediately downstream of the detention basin. The upstream invert elevation of the RCB's will be 1008.63 ft and the downstream invert elevation will be 1008.53 ft. The length of the RCB's will be 50 ft. A Manning's roughness coefficient of 0.012 was used for the analysis. An entrance loss coefficient of 0.3 and an exit loss coefficient of 1.0 were assumed for the RCB's. The RCB's will be separated by at least 10 ft to allow for compaction of fill between the culverts and to prevent debris from accumulating between the RCB's.

4.5. Peak Flow Values

The steady flow data runs were set to a series of flows corresponding to a range of peak discharges at the detention basin outlet, Table 1. The unsteady flow data was based on the design hydrographs (see the Hydrology Appendix).

Event	Q (cfs)
1	6,000
2	14,000
3	23,200

Table 1. Discharge Data for HEC-RAS steady state Model at Murrieta Creek.

5. With-Project Sediment Transport Analysis

The sediment transport analysis was completed using HEC-6T, *Sedimentation in Stream Networks*, Version 5.13.20. HEC-6T is a quasi unsteady, movable boundary sediment transport program for river networks. The purpose of the sedimentation analysis was to assess the impact of the project on Murrieta Creek sediment and hydraulic conditions and to evaluate the effect the river condition will have on the flood control and the environmental features. The input information was grouped into geometric data, hydrologic data, and sediment data.

The analysis was performed for the with-project condition for Murrieta Creek and its tributaries. The upstream boundary was set at Slaughter Canyon, approximately 2 miles upstream of the project inlet at Tenaja Road. The additional segment of river from Slaughter Canyon to Tenaja Rd. creates a sediment supply reach between the upstream model boundary and the project limit.

The sediment model accounts for major sediment sources, project features, bridges, the flow attenuation due to the detention basin, and the total sediment load flowing into Murrieta Creek. The general Murrieta Creek sediment model network is shown on Figure A-4.

To validate the model a fixed bed simulation for the peak discharges of the10-year and 100-year recurrence interval were run. An initial sediment transport simulation was performed for the 100-year future with-project hydrograph to debug and test the overall stability of the model.

5.1. Geometry Data

As stated earlier the geometry information for the with-project sediment model was based on a previous hydraulic analysis completed by the Corps[8]. Channel geometry and bridge information were based on this information. Tributary geometry information for Santa Gertrudis Creek and Warm Spring Creek were from the without-project sediment model[5]. For the HEC-6T geometry data, the cross section spacing was increased to roughly 300 to 400 ft, 2 times the channel width. At channel transitions or bridges the cross section spacing was decreased to approximately one half the bottom channel width (~100 ft).

The initial Murrieta Creek network consists of the main stem (Murrieta Creek) and two branches (Warm Spring Creek, and Santa Gertrudis Creek). The branches and main stem are broken up into 8 segments (a segment consists of two endpoints, such as external boundaries or junctions), 9 control points (external boundaries, junctions, and internal operating point), and 10 inflow/outflow locations, Figure A-5. The double ended arrows depicted in the figure indicate inflow/outflow points.

Secondary flow sources (i.e. Cole Canyon, Empire Creek) were modeled as local inflow/outflow points.

Special features of the sediment model are the closed loop used to simulate the hydraulic variability in the detention basin and the internal operating records used to model the outlet structure for the detention basin.

The following discussion will focus on the development of the main stem of the sediment model. For additional information concerning the tributary branches refer to Ref. 11.

5.1.1. Detention Basin Geometry

The detention basin is located in-line with Murrieta Creek, between the confluences of Warm Spring Creek and Santa Gertrudis Creek. Warm Spring Creek flows directly into the upstream end of the detention basin while the Santa Gertrudis confluence is located immediately downstream of the detention basin outlet. In the HEC-6T model the detention basin extends from Station 260+00 to Station 193+00.

The detention basin serves flood control, environmental, and recreation purposes. The environmental component consisted of new vegetation. The recreation features consisted of submergible athletic fields. Local sponsors required a controlled management plan for sediment removal. It had been assumed that certain areas within the detention basin would be set aside for sediment removal activities. Initial design plans, Figure A-2, identify a main channel, an environmental area separated by an earthen berm, and a recreational area. The outlet structure was based on the feasibility study Alternative 6, “Murrieta Creek Flood Control, Environmental Restoration and Recreation, Feasibility Report”, Ref. 6.

The detention basin geometry was based on the unsteady flow model(s). Three different basin geometries were simulated in the HEC-RAS models. Three alternatives for ecosystem restoration were analyzed to decrease the embankment height. Alternative 1 consists of full ecosystem restoration, i.e. constructing islands within the basin and a fully vegetated bottom. This alternative is based on a conceptual ecosystem restoration plan prepared by Aspen Environmental. Alternative 2 consists of no islands within the basin but with a fully vegetated bottom. Alternative 3 consists of lowering the entire bottom of the basin, no islands, and a fully vegetated bottom.

The complexity of the detention basin required a prioritization of functions that need to be simulated in the sediment model. Not all of the physical processes can be simulated in the model, but as long as the most critical are present the model should adequately represent the physical processes that are critical in simulating the detention basin. The detention basin model functions, in order of importance, that need to be simulated are as follows:

1) Simulating attenuation of flows.
2) Simulating deposition/erosion trends in the basin.
3) Accounting for the cohesive sediment transport.

Keeping these three points in mind, the geometric model was developed for the Murrieta Creek detention basin as discussed in the following paragraphs.

5.1.1.1 Simulating Attenuation of Flows

Simulating the attenuation of flows through the detention basin was the most critical task. HEC-6T is a quasi-unsteady model, that is, the hydraulic computation scheme treats the input hydrographs as a series of steady state discharges of specified durations for which the program performs a backwater calculation. Channel storage is not accounted for, so that flow attenuation is not addressed. The hydrologic routing of the flows must be accomplished externally and then imported into the model.

To simulate the flow attenuation, several discrete inflow/outflow locations that convey water but not sediment were added to the model. The HEC-6T program allows the user to assign discrete points which can contribute or divert flows completely out of the model network. These points are referred to local inflow/outflow points and are represented by the QT record.

To realistically simulate the attenuation of flows, the detention basin was broken up into six physically different areas: Area 1, dominated by the Murrieta Creek inflow; Area 2, dominated by the Warm Springs Creek inflow; Area 3, the Murrieta Creek – Warm Springs mixing area; Area 4, the main channel conveyance area; Area 5, the overflow area provided by the main part of the basin; and Area 6, the outlet area.

The discharge attenuation and the water surface elevations within the basin were determined from a HEC-RAS RAS unsteady flow hydraulic model, which has the capability of accounting for outlet control and a variable tailwater elevation that affects the outflow from the basin. The HEC-1 hydrographs were used for the remainder of Murrieta Creek. These hydrographs were imported into an Excel spreadsheet[8] to get them into the proper HEC-6T format.

The local inflow/outflow points (QT records) requires a discharge-sediment rating table with the corresponding gradations,

```
$LOCAL
   DB2  Segment 4 Detention Basin Adjustment Point
LQL    Q  -25000     -1.      1.    10000
LTL  t/d       0       0      .1       .1
LFL   CL   0.171   0.171   0.168    0.161
LFL VFSL   0.038   0.038   0.037    0.036
LFL  FSL   0.028   0.028   0.028    0.027
LFL  MSL   0.066   0.066   0.065    0.063
LFL  CSL   0.265   0.265   0.262    0.250
LFL  VFS   0.344   0.344   0.266    0.257
LFL   FS   0.213   0.213   0.226    0.198
```

HEC-6T Example 1. Local Inflowing sediment load rating curve.

The HEC-6T program requires a sediment discharge rating table prescribed by grain size fractions at each of the local inflow/outflow points designated on the QT records. Since the purpose of the artificial diversions is only to simulate the flow attenuation in the basin, and also since no sediment is physically transported into or out of the basin boundaries except at the upstream and downstream ends (Control Points 2, 3, 6, and 7), the values for the sediment discharge rating table must be set to zero. In addition, the required grain size fraction data for the rating table is irrelevant and is not used in the calculations.

5.1.1.2 Simulating Deposition/Erosion Trends in the Basin.

The basin was modeled one-dimensionally. The previous design plan separating the environmental feature from the main channel, Figure A-7, to reduce the deposition which would occur in the environmental area, was modified. The berm, which separated the main channel from the environmental area, was removed from the model. Instead, wide cross-sections that span the entire basin were utilized. Ineffective flow limits were used to limit the conveyance area. In cases where there are islands in the basin, vertical and horizontal ineffective flow limits were placed downstream of the islands to simulate the ineffective area caused by the islands. Deposition and erosion will be allowed throughout the entire cross-section.

[8] Detention Basin inflow/outflow hydrograph calculations and an in depth discussion can be found in the "DSStoHEC6tConv().xls" excel worksheet series. Each event requires a separate determination of the inflow/outflow hydrographs.

A sediment trap was added at the mouth of the Warm Springs tributary. The sediment trap was accounted for on two cross sections, Station 0.50 and 0.51, in the Warm Springs Creek branch, Segment 7. An artificial pilot channel was added to the sedimentation model to improve the program stability. The pilot channel is located at the center of the overflow spillway from the sediment trap to the environmental area on Segment 5. The channel is .4 ft wide and 1.4 ft deep, and the invert elevation is at the main channel elevation. The pilot channel is only located at the sections that represent the overflow spillway. The pilot channel improves the performance because at low flows, some small flow would flow into Segment 5, thus ensuring the cross sections are always wet.

The sediment material flowing into Segment 5 was eventually adjusted to allow clay, silt, and a limited amount of sand to pass. Refer to Section 5.2.2 for a more detailed discussion on this matter.

5.1.1.3 Accounting for the Cohesive Sediment Transport

At the time of this study, the only information dealing with the cohesive sediment available was sediment yield estimates for the Murrieta Creek watershed. The gradation for the material associated with sediment yield was determined using USDA soil survey data, *Soil Survey, Western Riverside Area, California*, Ref. 9. Utilizing this info and the hydrologic data from the with HEC-1 results, a wash load rating curve and gradation were developed. For the full explanation of this procedure refer to USACE-SPL document “Murrieta Creek Sedimentation Model Progress Report, May, 2005”, Ref. 7.

5.1.2. Inflow/Outflow Locations

Flow and sediment sources not modeled as tributaries were represented as inflow/outflow locations (QT records). The sediment model accounts for 4 sources modeled as local inflow/outflow locations, Table A-2. Locations QT EC, QT KW and QT CC contributed sediment laden flow. Location QT LD only contributed water.

5.1.3. Bridges

To code the bridges, three cross sections were used to represent an upstream, bridge and downstream section. Bridges which have decks that can be overtopped by flows less than the peak discharge for the 100-year event were coded with the deck and roadway using an S-type method specific to HEC-6T program, *Sedimentation in Stream Networks (HEC-6T), Users Manual*, Ref 2.

```
X1 10700        8 -119.98  216.24     400     400     400
GR  1009 -119.98  992.34     -70  992.34     -39  990.34     -35  990.34      -4
GR988.34        0  988.34     150 1010.42  216.24
HD 10700       10     -71     166

  BRIDGE FOR RANCHO CALIFORNIA WITH PIERS, Debris AND BRIDGE DECK
X1 10807       27  434.01  760.78     107     107     107
GE
  LEFT BANK
GR1012.4  406.61 1008.52  419.22  1003.3  434.01
  PIER
GR 991.8  467.25  1005.8  467.25  1005.8  475.25   990.0  475.25
GR989.76  486.20  988.58  488.56  988.58  628.75
  PIER
GR988.58  628.75  1005.8  628.75  1005.8  636.25  988.58  636.25
GR988.58  680.62  991.76  687.00  992.00  699.00
  PIER
GR995.69  709.75  1005.8  709.75  1005.8  717.25  997.84  717.25
  RIGHT BANK
GR1005.8   740.2
  BRIDGE DECK
GR1005.8  467.25  1003.3   434.0 1008.52  434.00 1010.60   632.5
GR1009.6   751.8
  TOP OF RIGHT BANK
GR1012.6  760.78
HD 10807       10     433   717.5

X1 10900        8    -130     237      93      93      93
GR1012.7     -130  992.74     -70  992.74     -39  990.74     -35  990.74      -4
GR988.74        0  988.74     165 1012.74     237
HD 10900       10     -71     166
```

HEC-6T Example 2. HEC-6T Bridge Code.

The debris loading allowance included in the HEC-RAS with-project geometric data was incorporated without modification.

5.1.4. Manning's *n* value

In the HEC-6T program, cross sections are typically subdivided into three subsections: the left overbank, the main channel, and the right overbank. However, the with-project HEC-RAS model disregarded flow in the overbanks because it is not necessary for the project design flood that is conveyed entirely within the channel. For that reason, the bank stations in the HEC-RAS model were set at the top of the channel side slopes and corresponded to the first and last coordinate points, respectively. For consistency, the HEC-6T cross sections were coded in the same manner. However, it is necessary to specify separate roughness coefficients for the channel and both overbanks, even if the overbanks are not included in the cross section geometry. This programming constraint was solved by using a single composite value of Manning's roughness coefficient *n* for the channel and both overbanks. The composite value of *n* was set at the value of the conveyance-weighted *n* computed by the HEC-RAS program, which has the capability to account for a variation in hydraulic roughness within the channel limits to properly reflect differences in flow characteristics across the channel boundary. In addition, the variation in *n* value with flow depth was accounted for by using the NV record in the HEC-6T program. Again, the single composite *n* values were taken from the HEC-RAS output for a range of discharges.

Data prescribing the hydraulic roughness for the HEC-6T program is entered on the NC and NV record for each cross section. To simplify the data entry, the hydraulic model was broken up into several reaches of relatively uniform hydraulic roughness, as shown on Figure A-12. The initial values of hydraulic roughness were then specified only at the downstream end of each reach, since the HEC-6T program will retain the NC and NV data for all upstream sections until new data is encountered at the next reach. It should be noted that these initial values of roughness were adjusted later during the model validation process.

The weighted Manning's *n* values in the channel ranged from 0.025 to 0.07. Since there will be minimal maintenance to the vegetation in the basin, a Manning's roughness coefficient of 0.10 was used for the area within the basin and 0.070 for the low flow channel.

Several locations do have overbank roughness values in excess of 0.1. These areas correspond to ineffective or low flow areas due to obstructions.

5.1.5. Ineffective flow limits

The configuration of the basin will limit conveyance to the main channel and portions of the environmental area. The recreational area will provide no conveyance.   To account for these ineffective flow regions, conveyance limit records (XL) were used. The XL records were also used for the overlapping portion of cross sections representing Segments 4 and 5. Later variations of the model removed the overlapping portion of the cross sections limiting the need for the ineffective flow limits to the recreational area.

5.1.6. Movable bed deposition and erosion limits

A typical cross section of the channel is displayed in Figure A-8. The entire channel bottom, including the vegetation terraces, was assumed subject to deposition and scour. However, the top of the banks were assumed fixed and not movable. Therefore, following the data coding requirements of the HEC-6T program, the movable bed limits were set at a point immediately outside of the toe of the outer bank, as shown in the figure.

5.1.7. Bed Sediment Reservoir

The bed material depth was set to the default value 10 ft for all cross sections except for Station 28+75, the furthest downstream cross section.   Station 28+75 had an assumed depth of 1 ft because of the bed rock outcrop located at the section. The bed sediment depth was set with the HD records only[9].

5.2. Control Points

Control points refer to junctions, external boundary conditions, and internal operating rule records. The with-project Murrieta Creek HEC-6T model has 10

[9] Note that the bed sediment depth for Warm Spring and Santa Gertrudis tributary segments were set to 20 ft. Refer to the without-project HEC-6T file, MCNET1.t5 for more details.

control points, 4 external boundary conditions, 4 junctions and 1 internal operating rule record, as indicated in Table A-1 and Figures A-3, A-4 and A-5.

5.2.1. External Boundaries

Each branch of the sediment network has an upstream boundary condition (CP 3, CP 7, CP 8) which requires a hydrograph; all hydrographs must have the same time step (Section 5.3.1).

At the network outlet (CP 1), the boundary condition was specified as a rating table ($Rating) based on the water surface elevation – discharge relationship from the HEC-RAS model. The table information was taken directly from the HEC-RAS with-project hydraulic model results for Station 28+75 for the range of discharges shown on Table B-13.

5.2.2. Junctions

Junctions are located at the intersection of two or more segments. The HEC-6T program inherently conserves energy and mass at all junctions. However, the program also allows the user the flexibility of prescribing a regulation of the sediment load by size class at the junction of a tributary or flow diversion.

5.2.3. Internal Operating Rule Record

The effect of the detention basin outlet structure on the detention basin water surface elevation was accounted for by an internal operating rule which sets the water surface elevation at the outlet structure, this then causes a backwater affect throughout the detention basin. An internal operating rule record (X5) allows the user to assign the water surface elevation at a location for each time step in the R record. The X5 record breaks the backwater calculation at the point of occurrence and routes the flow from the most immediate upstream to the next downstream. The X5 sequence consisted of two cross sections an arbitrarily small distance apart.

```
X119200.       8     -130      207      300      300      300
GR1032.1    -130  1012.06      -70  1012.06      -39  1010.06      -35  1010.06
GR1008.1       0  1008.06      135  1032.06      207
HD 19200      10     -71.      136

DETENTION BASIN DS BOUNDARY SET 19300 TO 19301
  Detention Basin Outlet Location
X119300.       8     -130      207      100      100      100
GR1048.1    -130  1012.06      -70  1012.06      -39   1008.5      -35  1008.50
GR1008.5       0  1008.50      135  1048.06      207
HD 19300      10     -71.      136

X119301.       8     -130      207     0.01     0.01     0.01
X5                               2
GR1048.1    -130  1012.06      -70  1012.06      -39   1008.5      -35  1008.50
GR1008.5       0  1008.50      135  1048.06      207
HD 19301      10     -71.      136

X119500.       9     -130      207      200      200      200
GR1048.7    -130  1012.66      -70  1012.66      -39   1009.5      -35  1009.00
GR1008.8     200  1008.75      235  1008.75      507   1048.0     540.
HD 19500      10      -71     136.
```

HEC-6T Example 4. Internal Operating Rule Record (X5).

Since the detention basin outflow is also a function of the tailwater elevation below the detention basin outlet structure, an unsteady flow hydraulic model using the HEC-RAS program was used to refine the calculation of the water surface elevation in the basin for the R records, as well as the reduction in discharge that is discussed in Section 5.3.1 below.

5.3. Hydrologic Data

The hydrographs used in HEC-6T were imported from the HEC-1 hydrologic routing program output file. Hydrographs for the 3 upstream boundary points and 5 inflow/outflow locations were generated from the future with-project 100-year HEC-1 file[14]. This was the assumed design event. The hydrographs within the basin were from the unsteady HEC-RAS model.

To convert the format of the HEC-1 and HEC-RAS hydrograph output data to the input format required by the HEC-6T program, the hydrographs were exported from HEC-1 to DSSVue. From DSSVue the hydrographs were transferred to an Excel spreadsheet[10] to write the hydrograph records (*,Q,R,T,W records).

All hydrologic information had a 10 minute duration time step.

5.3.1. Hydrographs

The 100-year with-project event hydrograph was used to test the overall stability of the sediment model. The HEC-6T program does not perform any kind of flood routing computations to calculate the attenuation in flow through a reservoir; rather, at each time step only a steady flow backwater calculation is completed. Flows are combined at junctions and local inflow/outflow locations but the flows are not routed. To maintain the timing of flows as they enter the detention basin, artificial flow diversions were set up with the QT record at the locations labeled DB4 and DB5. The resulting adjusted hydrograph are very nearly the same as the original HEC-1 computed hydrographs, Figures A-10 and A-11. The HEC-1 network model is shown in Figure A-6.

An antecedent flow hydrograph was also generated for the 100-year hydrograph. The antecedent condition was assumed to correspond to an event that is 30% of the 100-year event in terms of the peak discharge. The approach of arbitrarily reducing the inflowing and outflow hydrographs by 70% to represent the antecedent flow conditions was considered but not taken because it would not properly or accurately reflect the flow attenuation and hydrograph lagging caused by the detention basin. Instead, the antecedent flow hydrographs were generated by re-running the HEC-1 with-project model for rainfall depths 30% of the 100-year rainfall event. The computed hydrographs were roughly 70% less than the 100-

[10] Excel based hydrologic computing and exporting tool, DSStoHEC6tconv.xls.

year hydrographs, as desired, and the resulting hydrograph data was added before the design flood hydrograph data, as illustrated on Figure B-8.

The peak discharge of the design event was 20,000 c.f.s. at HEC-1 CP 8, 15,300 c.f.s. at HEC-1 F5-A6, detention basin outlet, and 23,200 c.f.s. at HEC-1 CP 1, USGS gage station location.

5.3.2. Detention Basin Routing

The inflow/outflow hydrograph records were based on hydrographs from unsteady flow computations with the HEC-RAS program.

The outlet structure was represented by the X5 record (Section 5.2.3).

5.3.3. Downstream Boundary Condition

The downstream boundary condition at Station 28+75 of Segment 1 was specified by using the rating curve record, Table B-13[11], refer to Section 5.2.1.

5.3.4. Computational Options

The computation time step was equal to the hydrograph time step, 0.0069 days, or 10 minutes.

HEC-6T allows the user two ways to modify the cross section shape, 1) adjusting the elevation of each point below the water surface elevation equally or 2) by varying the change in elevation of each point in proportion to the depth of flow at each point. By assigning the $GR record the program gives the user the option between the two methods, otherwise option 1 is default method. The initial runs used the default method.

To allow the user more flexibility in writing cross section coordinate records, the cross section coordinate editor record was activated (GE). This was found useful in organizing complicated cross section coordinates for the bridge and detention basin cross sections.

[11] Rating curve only applicable for msr_4 HEC-6T series. All remaining file use R records. There is no computational difference between the two.

5.4. Sediment Data

For the Murrieta Creek model both bed material load and wash load were accounted for. The detention basin would affect both coarse and fine material. The coarse material is normally accounted for in the bed material load, but the fine material (fine sands, silts, and clays) is associated with the wash load. By entering the total load, the full sediment load passing into the detention basin will be accounted for. This was essential in simulating the sedimentary processes occurring in the detention basin.

Sediment gradations and bed material and wash load rating curves were taken directly from previous studies[12].

Modeling both bed material load and wash load requires specifying the non-cohesive and cohesive sediment transport equation or methods.

5.4.1. Non-Cohesive Transport Equation

The traditional approach for selecting a transport function involves collecting field data, including both suspended sediment measurements and bed material gradations; processing and testing that data with a number of sediment transport functions; and then selecting the function that best matches the field measurements. Since sediment measurements of Murrieta Creek were not available, the transport functions used in the sediment budget analysis were selected using SAM.aid, which is a module of the SAM package that provides guidance in the selection of the most applicable sediment transport functions to use with a given river or stream. The transport functions selected by SAM.aid are summarized in Table A-9.

As shown in the table, the transport function that is recommended for Murrieta Creek is Yang (D50), which is Yang's original Unit Stream Power equation. This equation has been successfully used in sediment studies on sand bed rivers in the Western United States in general and in the Los Angeles District in particular.

Further basis for selecting Yang's equation is presented in a USDA report, *Selecting a Formula to Estimate Sediment Transport Capacity in Non-vegetated Channels* (Ref. 12). This report documents an investigation that was made into the sediment transport formula that best estimates the sediment transport capacity of non-vegetated channels. Of the many transport equations available, eight suitable sediment transport function theories were examined and tested against a range of available field and flume data. The notable conclusion of that study is reproduced as follows: "Of all the tested formulas, therefore, only the Yang formula can be used with confidence to predict sand-transport capacities over the range of flow conditions usually encountered in non-vegetated channels". Although Murrieta

[12] The bed material information was determined in the without-project sedimentation analysis (Ref 11). The wash load information and the total load information were completed by the Corps (Ref. 7).

Creek has vegetation within the channel during the periods of low flow, it is very likely the vegetation will wash out during the larger floods when the majority of the sediment is being transported.

The second best transport function recommended for Murrieta Creek is Yang's equation. As explained in the SAM User's Manual, this equation is a version of Yang (D50), which has been modified to calculate sediment transport capacity by grain size classes.

5.4.2. Cohesive Transport Equation

Silts and clays were accounted for in the initial Murrieta Creek sedimentation model. Two cohesive transport equations are available; one accounts only for the deposition of cohesive sediment based on settling velocities. The other computes deposition and erosion of cohesive sediments based on Krones equation and the Ariathurai method respectively, HEC-*6 Scour and Deposition in Rivers and Reservoirs*, Ref. 4. For the Murrieta Creek sediment model, only deposition of silts and clay was accounted for, since significant scour or re-entrainment of these fine particles from the detention basin bottom is not expected. However, during the sensitivity testing of the model, the re-entrainment of the fines from the bottom of the basin should be evaluated by comparing the calculated bottom shear stress at selected locations throughout the hydrograph against the default and example values provided in the HEC-6 user's manual. This topic may be important if re-entrainment is likely to reduce the net deposition of sediment within the detention basin.

The cohesive sediment transport equation is defined on I2 and I3 records. Particle size, settling, and erosion variables are assigned here. The default values for the required deposition parameters were used due to a lack of field information.

5.4.3. Sediment Gradation

The sediment load gradation at each of the boundaries and inflow/outflow locations account for both the wash load and the bed material load, or the total load. For an in-depth discussion of each of the contributing sediment loads refer to the previous studies.

The sediment gradation ranges from fine clay to very coarse gravel, but is predominately sand. The gradations for each upstream boundary and inflow/outflow location which contribute sediment varied with discharge, Table A-3 to A-8. The gradation and rating curves for the wash load and bed material load are found in Appendix B. In addition, an example for total load calculation is provided in Appendix B.

5.4.4. Sediment Load

The sediment load at each of the boundaries and inflow/outflow locations account for the total load. Not all inflow/outflow locations transport sediment. The inflow/outflow locations assigned to the detention basin (DB series) have no assumed sediment transport capacity. Line D was assumed not to transport sediment and Kalmia Wash only wash load.

The largest contribution of sediment is attributed to upstream boundary followed by Santa Gertrudis Creek, Table A-3 to A-8.

5.5. Fixed Bed Model

To verify the hydraulic component of the sedimentation model, the model was run for fixed bed conditions for 23,200 cfs. and 6,000 cfs. Results were compared to the hydraulic analysis results for the future with-project condition to verify hydraulically the setup of the sedimentation model.

The fixed bed model is initiated by commenting out all the sediment data records and inflow/outflow locations[13]. The inflow/outflow locations are commented out because the with-project hydraulic model did not account for local inflow/outflow locations. The peak discharges used were based on the peak discharge at the gage station near First St. These discharges were applied for the entire stretch of Murrieta Creek. To leave the branch geometry data in the model, arbitrarily small flow values were used for Warm Spring Creek and Santa Gertrudis Creek upstream boundaries.

The internal operating rule record was also commented out to disable the detention basin.

The fixed bed model was used to verify the hydraulic component of the sediment transport model.

5.5.1. Steady Flow Data

Two discharges, 23,200 c.f.s. and 6,000 c.f.s., were run at all the cross section locations.

5.5.2. Water Surface Profiles

The water surface profile comparison showed a good comparison between the HEC-6T and HEC-RAS results for flows tested, Figures B-1 and B-2. The median difference between HEC-6T and HEC-1 water surface elevations was 0.08 and -0.07 respectively. Differences at the detention basin are attributed to the

[13] Fixed bed model files Murfb.t5

difference in the cross section geometry information used between the HEC-6T file and the HEC-RAS file.

Based on the water surface profile comparison it was assumed that the hydraulic component of the sedimentation model was acceptable.

5.6. Movable Bed Analysis

The sedimentation analysis was completed for the future with-project condition for the Murrieta Creek Flood Control and Environmental Restoration Project. The model has been tested for the future with-project 100-Year event. The simulated detention basin attenuation is based on the results from the HEC-1 file, fwp6_100.dat.

The initial model for this study was subsequently modified to develop the most appropriate model for the with-project condition. Five movable bed models were developed in all:

Model 1 – This model is the initial movable bed model as described in Section 5. The model accounts for a split flow condition in the detention basin which was modeled with two segments and five inflow/outflow points to adjust the flow. The detention basin sediment trap was placed on Segment 7, between Stations 0.5 and 0.51. A schematic diagram is provided in Figure A-13. The HEC-6T input file name MSR_1a.dat.

Model 2 – The initial results from Model 1 indicated depths of deposition along Segments 3, 4 and 5 that may be unrealistically high. To reduce the deposition, the inflow/outflow points in the detention basin were repositioned such that two points were located on Segment 5, one point on Segment 4, the points on Segment 3 were removed, and one point was added to Segments 7 and each. In addition, the amount of water diverted from inflow/outflow points on Segments 7 and 8 was increased. All other features remained the same. The HEC-6T input file name is MSR_2a.dat.

Model 3 – The large depths of deposition along Segment 4 still remained in the Model 2 results. The deposition at the upstream portion of Segment 4 forced the main channel over to Segment 5.

In an attempt to reduce the amount of deposition occurring in Segment 4, the inflow/outflow sediment rating table for the Segment 4 diversion point was modified to transport sediment from Segment 4 to Segment 5 when the detention basin water level exceeded the top of the berm, 1021 ft. This modification was made to simulate the overflow which would occur physically between Segment 4 to 5. To account for the diverted sediment, a third inflow/outflow point was assigned to Segment 5. The sediment rating table for the new point was based on sediment outflow data from the Segment 4 diversion point. The HEC-6T input file name is MSR_3a.dat.

Model 4 – A review of the results from Model 3 revealed that the attenuation in the detention basin was also accounting for the attenuation occurring upstream of the detention basin along Segment 8. The amount of attenuation turned out to be a significant reason for the large deposition amounts occurring in the detention basin.

To correct this inaccuracy, multiple inflow/outflow points were placed along Segment 8. The flow attenuation along Segment 1 was also corrected by the addition of multiple inflow/outflow points. In particular, one inflow/outflow point was placed on Segment 3, two points were placed on Segment 5, and one point was added to Segments 4 and 7. A schematic diagram is provided in Figure A-14. The HEC-6T input file name is MSR_4a.dat. Model 4 was selected as the preferred model.

Numerous variations of the preferred alternative model were made for the sensitivity tests (roughness, inflowing sediment load, and computational time interval), to perform model runs with antecedent flow conditions, and to account for sediment load modifications. These additional models are listed in Table B-14.

Model 5 – Models 1 through 4 all modeled the detention basin with a split flow condition. This model simulates the detention basin in a considerably simplified manner as a single segment with three inflow/outflow points along Segment 3, formerly Segments 3, 4 and 6. The HEC-6T input file name is MSR_5a.dat.

Model 6 – This is a copy of Model 4 except that the detention basin is modeled as a single segment. This more closely simulates the current configuration of the detention basin. This model simulates Alternative 1 and contains the environmental features. The HEC-6T input file name is MSR_4C14.T5.

Model 7 – This is a copy of Model 6 except that the detention basin is modeled without the environmental features. This model simulates Alternative 2. The HEC-6T input file name is MSR_4C16.T5.

Model 8 – This is a copy of Model 6 except that the detention basin and Reach 2 was lowered. This model simulates Alternative 3. The HEC-6T input file name is MSR_4C17.T5. Not yet complete – waiting for channel and detention basin geometry.

The evaluation to determine the most effective approach consisted of reviewing scour/deposition amounts along Murrieta Creek and within the detention basin. The model that adequately represented the general deposition trends that would be expected in the basin, act computationally stable, and provide reasonable scour/deposition estimates, was deemed the most effective. A list of all model runs is found on Table B-14.

5.6.1. Results

Overall, the models were stable, and the results were generally as expected. The detention basin traps almost all the sand, some silt, and very little clay. Segment 1 and 8 showed signs of degradation. Most of the degradation on Segment 8 occurs in the sediment supply reach upstream of the project inlet. The degradation may be an indicator that the inflowing sediment load should be increased to achieve the assumed condition of sediment transport equilibrium at the upstream end of the project.

The longitudinal bed change profile for each model, Figure A-15 and A-16, show similar bed change patterns. The channel reach from Station 540+00, the upstream boundary, to Station 300+00, upstream of the detention basin, appears to be degrading. As expected, aggradation occurs in the detention basin. Immediately downstream of the detention basin is some minor scouring, followed with substantial scouring in the downstream most sections, from Station 28+75 to 34+50. This apparently excessive scour could possibly be caused by an inaccurate downstream boundary condition in terms of the tailwater rating curve or the need to shift the curve periodically throughout the flood to reflect the effect of computed deposition. The trap efficiency results shown in Table B-15 indicate that Segment 5 has the highest overall value, followed by Segment 4 and Segment 7.

Although the different models indicate the same general trends of aggradation and degradation, the computed changes in bed elevations varied considerably. For example, Figure A-15 shows a relatively large difference in the maximum computed positive and negative bed elevation changes for both Models 1 and 2; Model 2 resulted in as much as 8.6 ft of deposition and 5.9 ft of scour, and Model 2 resulted in values 6.3 and 7.7 ft, respectively. Therefore, the results from Models 1 and 2 were judged not as plausible or as sensible as the results from Models 3, 4, and 5, especially in terms of the spatial distribution of the changes in bed elevation. In particular, Models 1 and 2 indicated relatively large and localized changes that would not be expected in the detention basin.

The detention basin for Model 5 was set up as a single segment. The major benefit of this model is that the simulation and therefore the HEC-6T program data coding for the detention basin is greatly simplified and thus much easier to apply to design refinements. However, the major disadvantage is that the simulation of the basin with only a single segment may unduly oversimplify the flow attenuation and sediment transport processes, and therefore could seriously underestimate the deposition of sediment within the basin. In particular, the conveyance is defined by one continuous strip extending across the main channel and the environmental area. As a result, the sediment transport capacity is based on average hydraulic variables for the entire width of the active area of conveyance. The computed sediment depth change is averaged over the whole width, resulting in higher rates of deposition within the environmental area and lower rates in the main channel area.

Models 3 and 4 showed similar trends but Model 4 had more deposition in Segment 5 and less in Segment 4, and Model 4 was more stable to run. Model 4 was the preferred model because it satisfied the three major requirements; adequate representation of scour/deposition trends, stability, and plausibility of results. The results for Model 4 are discussed below. However, due to the changes in the detention basin configuration and environmental features, Model 4 is no longer the preferred model. The results will still be discussed below since only the geometry within the basin was changed; the rest of the model is the same.

The bed change profiles for Segment 5, Figure A-16, shows aggradation, predominately fine and medium sand with some silt and clay. The limited amount of fine deposits along Segment 5 can be attributed to the short detention time. Even though the flow peaks and channel velocities were reduced, the lessened velocities coupled with the relatively short detention time are still not sufficient to cause more fine material to deposit.

Certain locations within the detention basin were deemed critical for ensuring a stable model: Station 248+00 in Segment 4; Station 197+00 in Segment 3; and all of Segment 5. Station 248+00 was located immediately downstream from a flow split and served as the primary segment for conveyance. The model computationally would deposit extreme amounts of sediment to compensate for the reduction in flow. In some cases this would prevent water from flowing into Segment 4. The user should consider this model tendency when evaluating the model results.

The hydrologic input data also caused problems when an inflow/outflow point diverts more or equal to the computed segment discharge such that the resulting flow is negative or zero. The HEC-6T program documentation refers to this condition as reverse flow. This problem occurred more frequently during low flows and on Segment 5 or Segment 4. The erroneous computed flow reversals are caused by a limitation in the input format for the HEC-6T program, which requires values of inflow or outflow discharge, rather than a fixed percentage or fraction of the hydrograph being modified. To correct this problem, the diverted flows need to be adjusted by the user to eliminate the flow reversals. The reverse flows do not reflect an intrinsic instability in the model, but rather an external variable that requires an iterative approach to prevent too much flow from being diverted at a single point. The following is an example of a typical HEC-6T warning message regarding flow reversals:

```
WARNING.. A CLOSED LOOP WITH A LOCAL INFLOW HAS A FLOW REVERSAL.  THATS NOT
PERMITTED.
 SEGMENT #, LOCAL INFLOW POINT #:   1   4
 QMAIN1, QMAIN2, QLOCAL()=       11.70        0.00      -11.70
 SUBROUTINE BWMOD4
 HEC6T PROGRAM:  WARNING MESSAGE     24001
```

HEC-6T Example 6. Output Warning Message for a Reverse Loop.

The flow reversal errors were eliminated in Models 6, 7 and 8 since the detention basin was not modeled as a closed loop in these models.

During the sedimentation model development, a computational error was discovered in the wash load inflow spreadsheet, and the wash load inflow and total sediment inflow rating curves had to be recomputed. However, the revised inflowing load data was applied only to the recommended model, which is Model 4. The updated HEC-6T file is msr_4c.dat. The files created for the sensitivity tests and the expanded hydrograph for antecedent flow were all based on the revised Model 4 file.

As expected, Models 6 and 7 showed similar trends to Model 4. Only the results within the detention basin will be discussed in the following paragraphs since the channel geometries of Models 6 and 7 are copies of Model 4.

The detention basin traps almost all the sand, some silt, and very little clay. The sediment analysis results show aggradation, predominately fine and medium sand with some silt and clay. The limited amount of fine deposits along the basin can be attributed to the short detention time. Even though the flow peaks and channel velocities were reduced, the lessened velocities coupled with the relatively short detention time are still not sufficient to cause more fine material to deposit.

For Model 6, the sediment analysis results are as follows. During the peak of the design hydrograph, the upstream half of the detention basin would experience an average bed scour of 1.2 ft. The low flow channel would undergo scour while the overbanks would undergo deposition. The downstream half of the detention basin would experience an average bed deposition of 2.2 ft. Sediment would deposit in both the low flow channel and the overbanks.

At the end of the design hydrograph, the upstream half of the detention basin would experience an average bed scour of 0.7 ft. The low flow channel would undergo scour while the overbanks would undergo deposition, except at the Warm Springs confluence with Murrieta Creek where up to 4.4 ft of deposition would occur. The downstream half of the detention basin would experience an average bed deposition of 1.7 ft. Sediment would deposit in both the low flow channel and the overbanks.

Similarly, for Model 7, the sediment analysis results are as follows. During the peak of the design hydrograph, the upstream half of the detention basin would experience an average bed scour of 1.0 ft. The low flow channel would undergo scour while the overbanks would undergo deposition. The downstream half of the detention basin would experience an average bed deposition of 2.2 ft. Sediment would deposit in both the low flow channel and the overbanks.

At the end of the design hydrograph, the upstream half of the detention basin would experience an average bed scour of 0.4 ft. The low flow channel would undergo scour while the overbanks would undergo deposition, except at the Warm Springs confluence with Murrieta Creek where up to 3.5 ft of deposition would occur. The downstream half of the detention basin would experience an average bed deposition of 2.1 ft. Sediment would deposit in both the low flow channel and the overbanks.

Model 8 not yet complete -- waiting for channel and detention basin geometry.

The following sensitivity analysis was performed using Model 4 as the basis[14].

5.6.2. Sensitivity Analysis – Sediment Load

The sediment inflow load rate at the upstream boundary of the model as well as for the tributary locations was increased and decreased by 30% to test the sensitivity of sediment load on the computed change in channel bed elevations. The input gradation information was not changed.

Based on the longitudinal bed profile, Figure A-17, the model did not appear to be sensitive to the changes in sediment load. There were some locations within the detention basin, Segment 4 Station 248+00, that responded to the change. Overall the influence of sediment load appeared minimal[15].

As stated in Section 5.6.1, the degradation on Segment 8 may be an indicator that the inflowing sediment load should be increased to achieve the assumed condition of sediment transport equilibrium at the upstream end of the project. The inflowing sediment load was increased by 50% to determine if the equilibrium assumption could be achieved. This was not the case, however, in that degradation still occurred in Segment 8. Nevertheless, since the upstream end of the model is located a long distance upstream of the project reach, any adjustments required for the sediment load should not significantly affect the results within the project reach.

[14] At the time of the determination of the preferred model the sediment load information was revised to account for changes in the sediment load information. The new file was msr_4c.dat, all remaining models reflect the new information. Applicable to HEC-6T input files msr_4c.dat to msr_4j.dat.

[15] The tabular information for the HEC-6T bed results are found in the excel file "HEC 6T Results.xls".

5.6.3. Sensitivity Analysis – Manning's n Value

The Manning's *n* values for all cross sections were increased and decreased by 30% to test the sensitivity of the roughness on the computed change in channel bed elevations.

Based on the longitudinal bed profile, Figure A-18, the model appeared to be sensitive to roughness changes. The decrease in roughness caused scouring from Station 560+00 to 510+00, and to a lesser degree throughout the remainder of Segment 8. The material transported downstream from the scouring caused increased deposition in the detention basin, which in turn resulted in further erosion immediately downstream of the detention basin. The increase in roughness had less of an effect on the computed change in bed elevation.

5.6.4. Sensitivity Analysis – Computation Time Interval

The computational time interval is equal to the hydrograph time step, 10 minutes or 0.0061 days. To test the computational time interval the duration was increased to 1 hour, 0.042 days.

The results showed that the model remained stable and the results were similar to the results of the 10 minute computation time interval, Figure A-17. These results lead to the conclusion that the HEC-6T model can be run at a longer computational time interval than originally performed. As long as the volume, duration and peak are preserved, the hydrologic simulation of the event would be compromised. Comparison of the two hydrographs is shown in Figure B-4. Only a slight reduction in runoff volume is observed for the 1 hour duration hydrograph.

5.6.5. Antecedent Hydrograph

To test the HEC-6T model response to a longer, more typical event, an antecedent hydrograph was attached to the design discharge hydrograph. The antecedent condition was assumed to be equivalent to 30% of the design event. Two cases were run, one case with the antecedent hydrograph preceding the design hydrograph, Figure B-8, msr_4d1.dat and a second case with antecedent hydrograph before and after the design hydrograph, msr_4d2.dat.

The duration of the design hydrograph is 1.48 days, the design and preceding antecedent hydrograph is 2.78 days, and the antecedent hydrographs before and after the design hydrograph is 4.2 days. Results show that the additional flow, albeit lower than the design event, increases deposition within the detention basin, decreases the scouring along Segment 1, and increase scouring along the supply reach, Figure B-9. The supply reach had scour depths up to 10 feet, which leads to the conclusion that the sediment loading entering through the upstream boundary is less than what is necessary to satisfy the assumption of sediment transport equilibrium and a stable reach.

6. Summary

The preferred HEC-6T models, Models 6, 7 and 8, appeared to adequately represent the deposition variation that would occur in the basin, act computationally stable under various conditions (i.e. change in sediment load, roughness and computation time interval), and provide reasonable scour/deposition estimates (deposition/scouring no greater than 6 feet[16]).

The results from the models are best evaluated in a comparative analysis for which the results are averaged over a reach of cross sections with similar hydraulic and sedimentary characteristics. By evaluating reaches rather than cross sections, the results are more meaningful, because uncertainties in the input information and irregularities in the results are dampened over a larger area. The model should be grouped into reaches that are roughly two to three thousand feet in length.

Application of one-dimensional model such as HEC-6T to the hydraulic and sedimentation characteristics of the detention basin that are at least somewhat two-dimensional is questionable. However, most of the two-dimensional nature of the basin is relatively limited to localized areas at the inlet and outlet. In addition, the HEC-6T sedimentation model has been set up to provide essentially a quasi-two dimensional simulation of sedimentation trends by separating the channel and environmental restoration / flood control storage area with two different model segments. For those reasons, a one-dimensional model is considered adequate for the objective of estimating the general trends of aggradation expected within the basin, and assessing the impact of the resulting loss of flood control storage on the flow attenuation performance of the basin.

6.1. General Comments and Recommendations for Further Work

The various sediment inflow tables for high flows are exceeded; however, the tables were not extended for the initial model setup, because the model extrapolates up or down if the value is not within the limits of the table. Nevertheless, it would be prudent to externally extend the tables to ensure a reasonable inflowing sediment load relationship over the full range of flows being simulated.

It is recommended that a mass balance analysis be performed to ensure that all sediment material has been accounted for.

For the low flow conditions the model warns of movable bed limits above the water surface elevation. This condition does not appear to have any impact on the model performance, although it would be prudent to verify this presumption with a careful review of the detail hydraulic and sedimentation output, at least at selected locations for selected points throughout the hydrograph.

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[16] Scour depths in excess of 5 feet were observed from Stations 28+00 to 33+00 assumedly caused by the downstream boundary condition.

The bed shear stress analysis for fine particle entrainment was not performed. However, as indicated previously, significant re-entrainment of silts from the bottom of the detention basin is not expected, except possibly near the entrance to the outlet structure where the local flow velocities are expected to increase.

To run longer events the computation time interval may be increased. However the attenuation flow distribution variables may need to be adjusted to ensure that reverse or negative flows do not occur along Segments 4 or 5. This requirement also holds true for any changes to the current Model 4 version.

To confirm deposition trends along Segment 5, the fine material settling velocity should be specified in the program output and utilized to prepare a separate manual assessment of the required settling time and distance. A good example to follow is the settling analysis of the detention basins prepared for the sedimentation analysis of the Arizona Canal Diversion Channel (ACDC) project in Phoenix.

There appeared to be a pair of unstable time steps in the antecedent hydrograph. They were commented out at the time of the study. It is uncertain why the time steps created instability.

Additional insight into the sedimentation model performance and the plausibility of the results can be gained by comparison to the without-project sedimentation model prepared by WEST Consultants. In addition, the comparison will also reveal a qualitative estimate of the impacts of the project on the sedimentation characteristics of the stream.

7. References

1) Julien, Pierre, *Erosion and Sedimentation*, 1998.
2) MBH Software Inc., *Sedimentation in Stream Networks (HEC-6T), Users Manual*, January 2002.
3) USACE HEC, *Application of Methods and Models for Prediction of Land Surface Erosion and Yield*, Training Document No. 36, March 1995
4) USACE HEC, *HEC-6 Scour and Deposition in Rivers and Reservoirs*, June 1991.
5) USACE HEC, "Sediment Transport", Volume 12, June 1977.
6) USACE-SPL-ED-HH, "Murrieta Creek Flood Control, Environmental Restoration and Recreation, Feasibility Report", September 2000.
7) USACE-SPL-ED-HH, "Murrieta Creek Sedimentation Model Progress Report, May, 2005."
8) USACE-SPL-ED-HH, "Murrieta Creek Feasibility Study, Appendix C", September 2000.
9) USACE, "Sedimentation Investigation of Rivers and Reservoirs", EM-1110-2-4000, October 1995.
10) USDA, *Soil Survey, Western Riverside Area California*, November 1971.WEST Consultants, "Murrieta Creek Flood Control and Environmental Restoration Project-Final Initial Sedimentation Analysis Report", November 2003.
11) WEST Consultants, "Murrieta Creek Flood Control and Environmental Restoration Project-Final Initial Sedimentation Analysis Report", November 2003.
12) USDA, *Selecting a Formula to Estimate Sediment Transport Capacity in Non-vegetated Channels*, USDA Conservation Report No. 26, 1980.

Appendix A

Tables and Figures

Point	Location	Description
CP 1	N/A	Downstream Boundary for Murrieta Creek
CP 2	Seg. 1 St. 18800	Junction, Santa Gertrudis & Murrieta Creek
CP 3	Seg. 2 St. 133.2	Upstream Boundary Santa Gertrudis
CP 4	Seg. 3 St. 19701	DS Junction, Detention Basin Flow Split
CP 5	Seg. 4 St. 24800	US Junction, Detention Basin Flow Split
CP 6	Seg. 6 St. 25200	Junction, Warm Spring & Murrieta Creek
CP 7	Seg. 7 St. 33	Upstream Boundary Warm Spring
CP 8	Seg. 8 St. 56030	Upstream Boundary Murrieta Creek
X5	Seg. 3 St. 19301	Internal Operating Rule, Detention Basin Outlet

Table A-1. Murrieta Creek Control Points for HEC-6T With-project Sedimentation Model.

Point	Location	Description
QT CC	Seg. 8 St. 47280	Cole Canyon & Line G
QT KW	Seg. 8 St. 41600	Kalmia Wash & Miller Canyon
QT LD	Seg. 8 St. 32000	Line D
QT EC	Seg. 1 St. 13400	Empire Creek & Long Canyon
QT DB5	Seg. 8 St. 25400	Hydrograph Adjustment
QT DB4	Seg. 7 St. 0.5	Detention Flow Adjustment
QT DB 3	Seg. 5 St. 22200	Detention Flow Adjustment
QT DB 2	Seg. 4 St. 22200	Detention Flow Adjustment
QT DB 1	Seg. 3 St. 19500	Detention Flow Adjustment

Table A-2. Murrieta Creek Local Inflow/Outflow Locations for HEC-6T With-project Sedimentation Model .

Total Load (tons/day)		0	319,578
Q (ft³/s)		0	5,000
Mean (mm)	Class	Load Fraction	Load Fraction
0.001	FCL	0.00	0.00
0.003	CL	0.13	0.13
0.006	VFSL	0.03	0.03
0.011	FSL	0.03	0.03
0.023	MSL	0.08	0.08
0.045	CSL	0.14	0.14
0.088	VFS	0.30	0.30
0.177	FS	0.15	0.15
0.354	MS	0.03	0.03
0.707	CS	0.04	0.04
1.414	VCS	0.03	0.03
2.828	VFG	0.02	0.02
5.657	FG	0.01	0.01
11.314	MG	0.00	0.00
22.627	CG	0.00	0.00

Table A-3. Source QT EC Total Load Gradation Information.

Total Load (tons/day)		0	1,296	13,656	71,781	645,616	1,587,398
Q (ft³/s)		0	10	100	500	4,000	8,900
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.001	FCL	0.00	0.00	0.00	0.00	0.00	0.00
0.003	CL	0.13	0.13	0.13	0.12	0.11	0.10
0.006	VFSL	0.03	0.03	0.03	0.02	0.02	0.02
0.011	FSL	0.04	0.04	0.03	0.03	0.03	0.03
0.023	MSL	0.08	0.08	0.08	0.07	0.06	0.06
0.045	CSL	0.15	0.15	0.15	0.14	0.12	0.11
0.088	VFS	0.37	0.37	0.38	0.36	0.33	0.26
0.177	FS	0.16	0.16	0.16	0.17	0.19	0.23
0.354	MS	0.02	0.02	0.02	0.03	0.06	0.08
0.707	CS	0.01	0.01	0.02	0.02	0.04	0.07
1.414	VCS	0.01	0.01	0.01	0.02	0.03	0.05
2.828	VFG	0.00	0.00	0.00	0.00	0.00	0.00
5.657	FG	0.00	0.00	0.00	0.00	0.00	0.00
11.314	MG	0.00	0.00	0.00	0.00	0.00	0.00
22.627	CG	0.00	0.00	0.00	0.00	0.00	0.00

Table A-4. Source QT SG Total Load Gradation Information.

Total Load (tons/day)		0	1,272	12,921	68,205	678,054	1,790,312
Q (ft^3/s)		0	10	100	500	5,000	13,200
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.001	FCL	0.00	0.00	0.00	0.00	0.00	0.00
0.003	CL	0.13	0.13	0.13	0.13	0.13	0.13
0.006	VFSL	0.03	0.03	0.03	0.03	0.03	0.03
0.011	FSL	0.04	0.04	0.04	0.04	0.04	0.04
0.023	MSL	0.08	0.08	0.08	0.08	0.08	0.08
0.045	CSL	0.15	0.15	0.15	0.15	0.15	0.15
0.088	VFS	0.37	0.37	0.37	0.37	0.37	0.37
0.177	FS	0.16	0.16	0.16	0.16	0.16	0.16
0.354	MS	0.02	0.02	0.02	0.02	0.02	0.02
0.707	CS	0.01	0.01	0.01	0.01	0.01	0.01
1.414	VCS	0.01	0.01	0.01	0.01	0.01	0.01
2.828	VFG	0.00	0.00	0.00	0.00	0.00	0.00
5.657	FG	0.00	0.00	0.00	0.00	0.00	0.00
11.314	MG	0.00	0.00	0.00	0.00	0.00	0.00
22.627	CG	0.00	0.00	0.00	0.00	0.00	0.00

Table A-5. Source QT WS Total Load Gradation Information.

Total Load (tons/day)		0	1,271,317
Q (ft^3/s)		0	5,000
Mean (mm)	Class	Load Fraction	Load Fraction
0.001	FCL	0.00	0.00
0.003	CL	0.20	0.20
0.006	VFSL	0.03	0.03
0.011	FSL	0.04	0.04
0.023	MSL	0.08	0.08
0.045	CSL	0.27	0.27
0.088	VFS	0.29	0.29
0.177	FS	0.06	0.06
0.354	MS	0.01	0.01
0.707	CS	0.01	0.01
1.414	VCS	0.01	0.01
2.828	VFG	0.01	0.01
5.657	FG	0.00	0.00
11.314	MG	0.00	0.00
22.627	CG	0.00	0.00

Table A-6. Source QT CC Total Load Gradation Information.

Total Load (tons/day)		0	2,329	24,492	111,658	1,479,576	3,441,060
Q (ft^3/s)		0	10	100	500	5,000	11,100
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.001	FCL	0.00	0.00	0.00	0.00	0.00	0.00
0.003	CL	0.21	0.21	0.20	0.22	0.16	0.16
0.006	VFSL	0.03	0.03	0.03	0.03	0.02	0.02
0.011	FSL	0.05	0.05	0.04	0.05	0.04	0.04
0.023	MSL	0.07	0.07	0.06	0.07	0.05	0.05
0.045	CSL	0.31	0.31	0.30	0.32	0.25	0.23
0.088	VFS	0.31	0.31	0.32	0.30	0.30	0.30
0.177	FS	0.01	0.01	0.02	0.00	0.07	0.09
0.354	MS	0.01	0.01	0.02	0.00	0.06	0.07
0.707	CS	0.00	0.00	0.01	0.00	0.03	0.03
1.414	VCS	0.00	0.00	0.00	0.00	0.01	0.01
2.828	VFG	0.00	0.00	0.00	0.00	0.00	0.00
5.657	FG	0.00	0.00	0.00	0.00	0.00	0.00
11.314	MG	0.00	0.00	0.00	0.00	0.00	0.00
22.627	CG	0.00	0.00	0.00	0.00	0.00	0.00

Table A-7. Source CP 8 Total Load Gradation Information.

Total Load (tons/day)		0	1,535	15,346	76,731	767,310	2,301,929
Q (ft^3/s)		0	10	100	500	5,000	15,000
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.001	FCL	0.00	0.00	0.00	0.00	0.00	0.00
0.003	CL	0.19	0.19	0.19	0.19	0.19	0.19
0.006	VFSL	0.03	0.03	0.03	0.03	0.03	0.03
0.011	FSL	0.04	0.04	0.04	0.04	0.04	0.04
0.023	MSL	0.07	0.07	0.07	0.07	0.07	0.07
0.045	CSL	0.31	0.31	0.31	0.31	0.31	0.31
0.088	VFS	0.28	0.28	0.28	0.28	0.28	0.28
0.177	FS	0.08	0.08	0.08	0.08	0.08	0.08
0.354	MS	0.00	0.00	0.00	0.00	0.00	0.00
0.707	CS	0.00	0.00	0.00	0.00	0.00	0.00
1.414	VCS	0.00	0.00	0.00	0.00	0.00	0.00
2.828	VFG	0.00	0.00	0.00	0.00	0.00	0.00
5.657	FG	0.00	0.00	0.00	0.00	0.00	0.00
11.314	MG	0.00	0.00	0.00	0.00	0.00	0.00
22.627	CG	0.00	0.00	0.00	0.00	0.00	0.00

Table A-8 Source QT KW Total Load Gradation Information.

System	Reach	Recommended Transport Function	Second Best Transport Function
Murrieta Creek	1	Yang d50	Yang
	1 (finer)	Laursen (Madden)	Toffaletti
	2	Yang d50	Yang
	3	Yang d50	Laursen (Madden)
	4	Yang d50	MPM
	5	Yang d50	Yang
	6	Yang d50	Yang
	7	Yang d50	Yang
	8	Yang d50	Yang
	9	Yang d50	Yang
	10	Toffaletti-Schoklitsch	Yang
	10 (Coarser)	Yang d50	Brownlie, d50
	11	Yang d50	Yang
	12 through 14	Yang d50	Yang
Long Canyon	-	Yang d50	Yang
Line D	-	Yang d50	Yang
Line G	-	Yang d50	Yang
Cole Canyon	-	Yang d50	Yang
Coarser Material	-	Toffaletti-Schoklitsch	Brownlie, d50
Slaughter Canyon	-	Yang d50	Yang
Coarser Material	-	Toffaletti-Schoklitsch	Brownlie, d50
Santa Gertrudis	-	Yang d50	Laursen (Madden)
Warm Springs	-	Yang d50	Yang

Table A-9 Transport Functions Recommended by SAM.

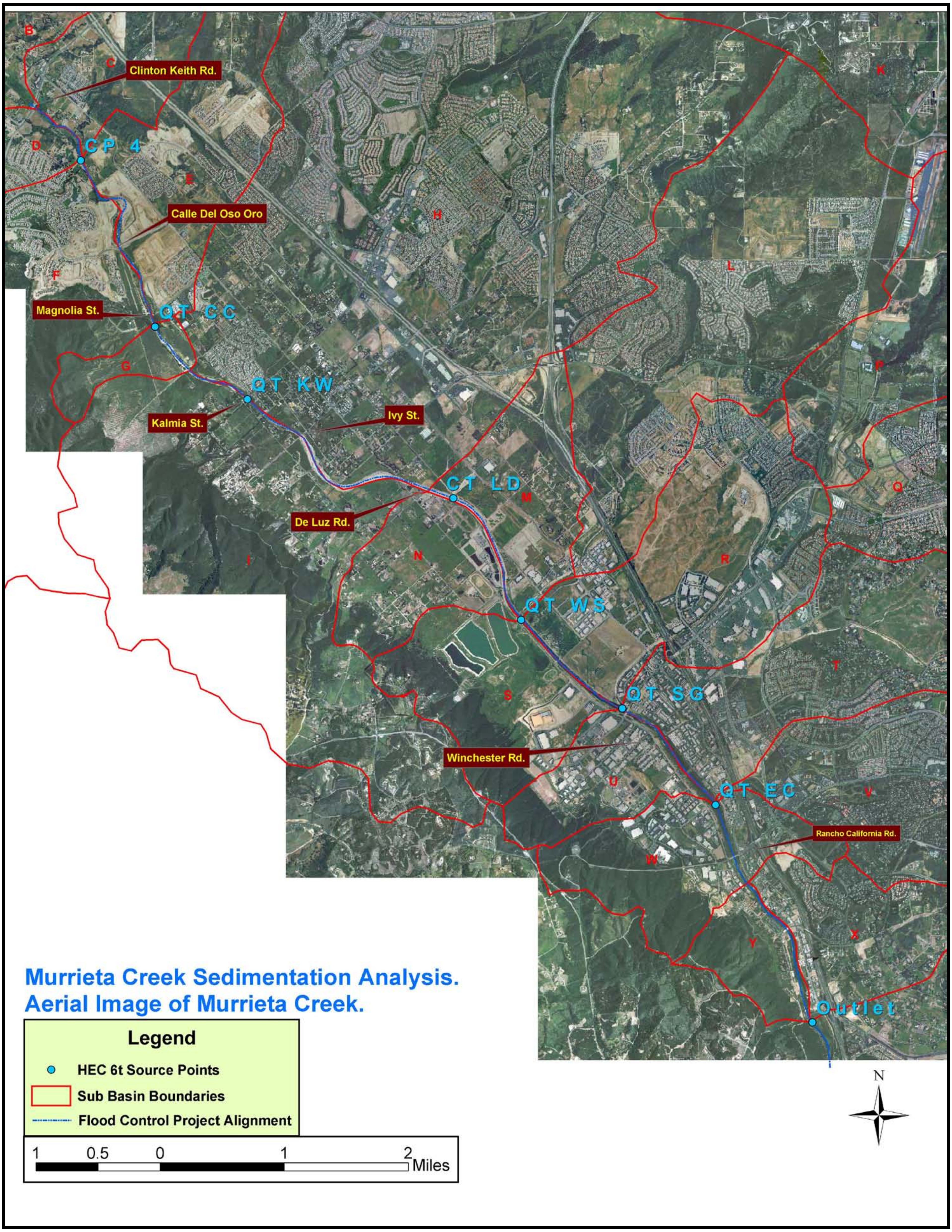

Figure A-1. Murrieta Creek Sediment Model Location Map.

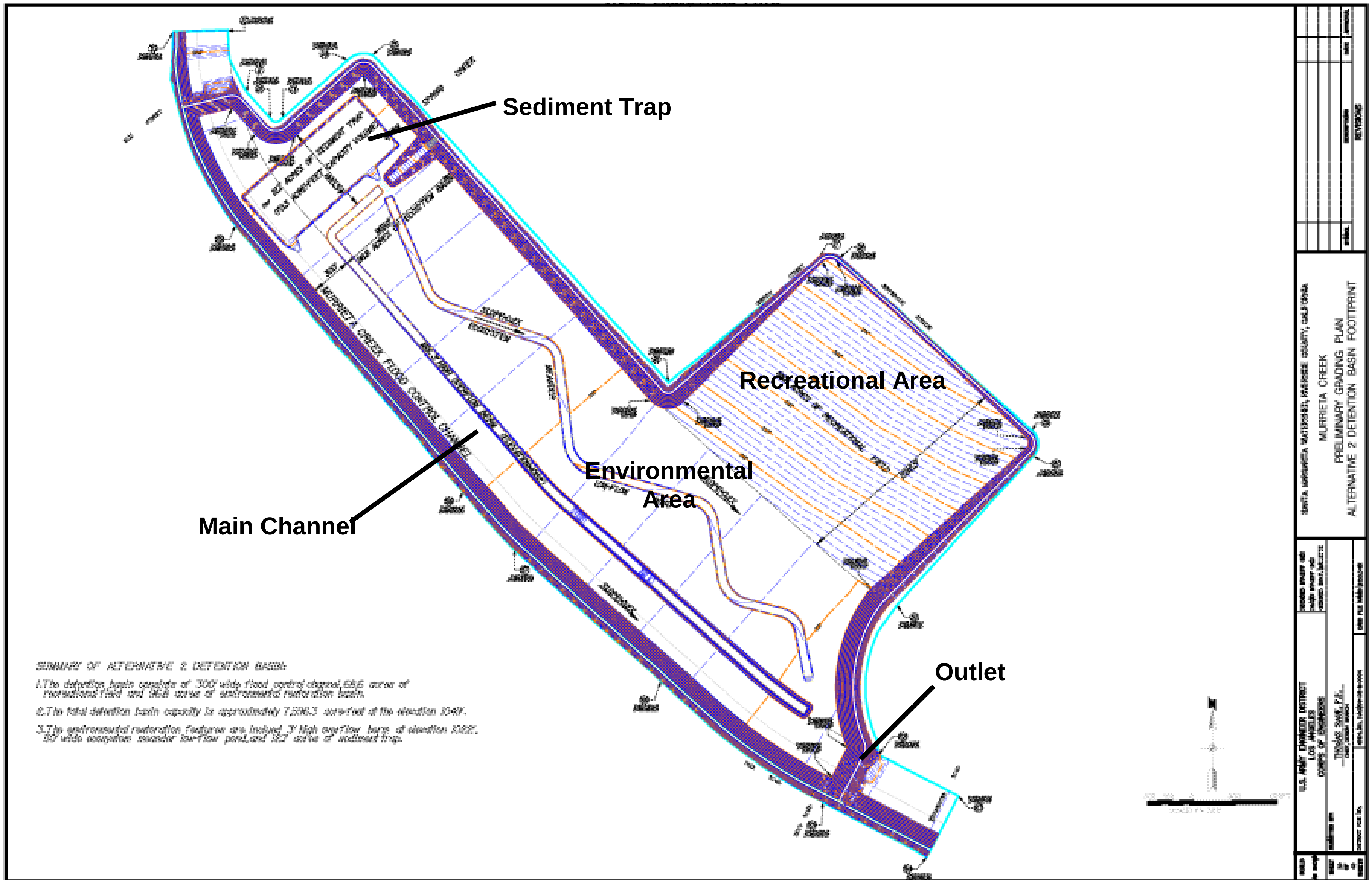

Figure A-2. Preliminary Plan for the Detention Basin.

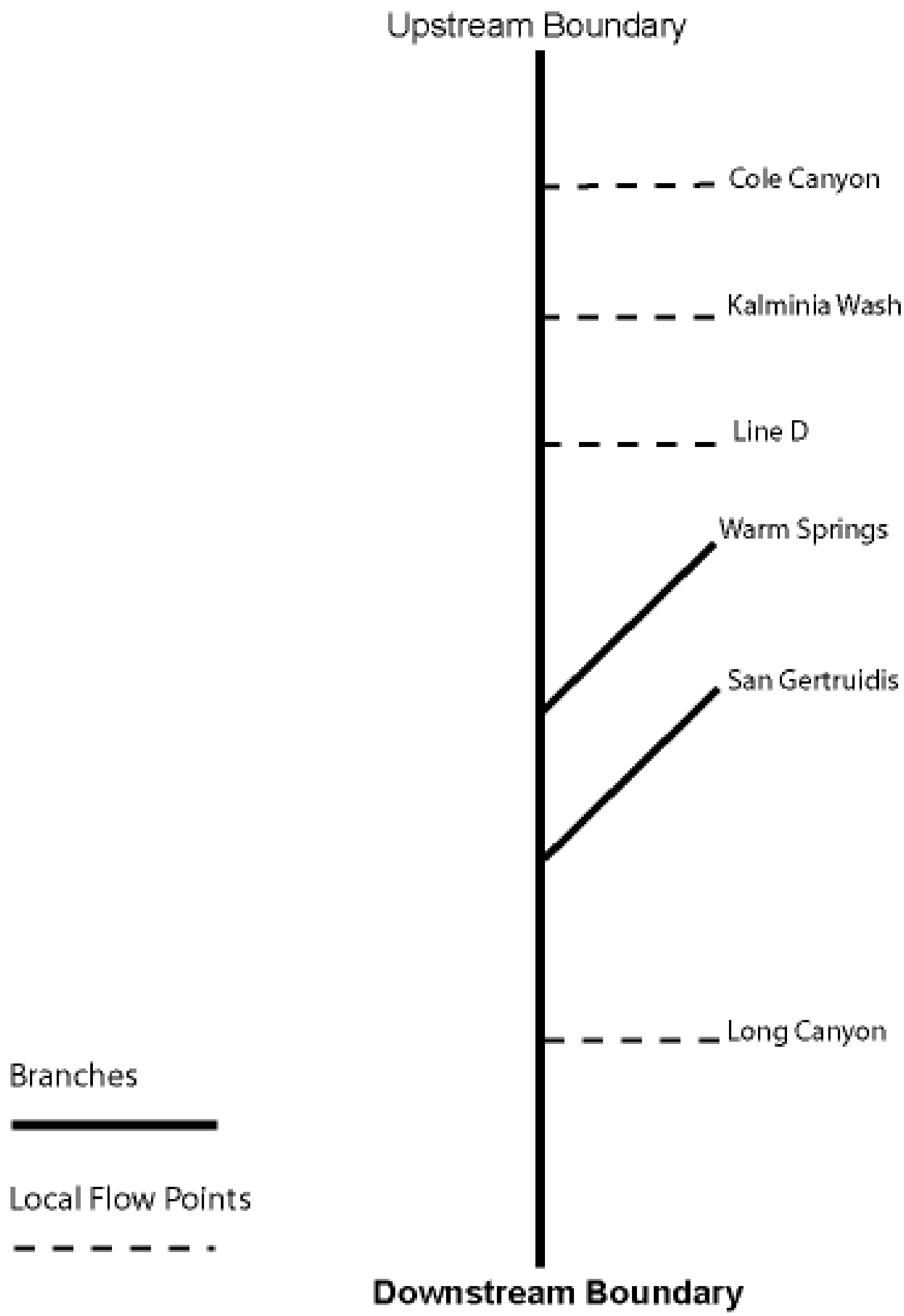

Figure A-3. Murrieta Creek Flow System.

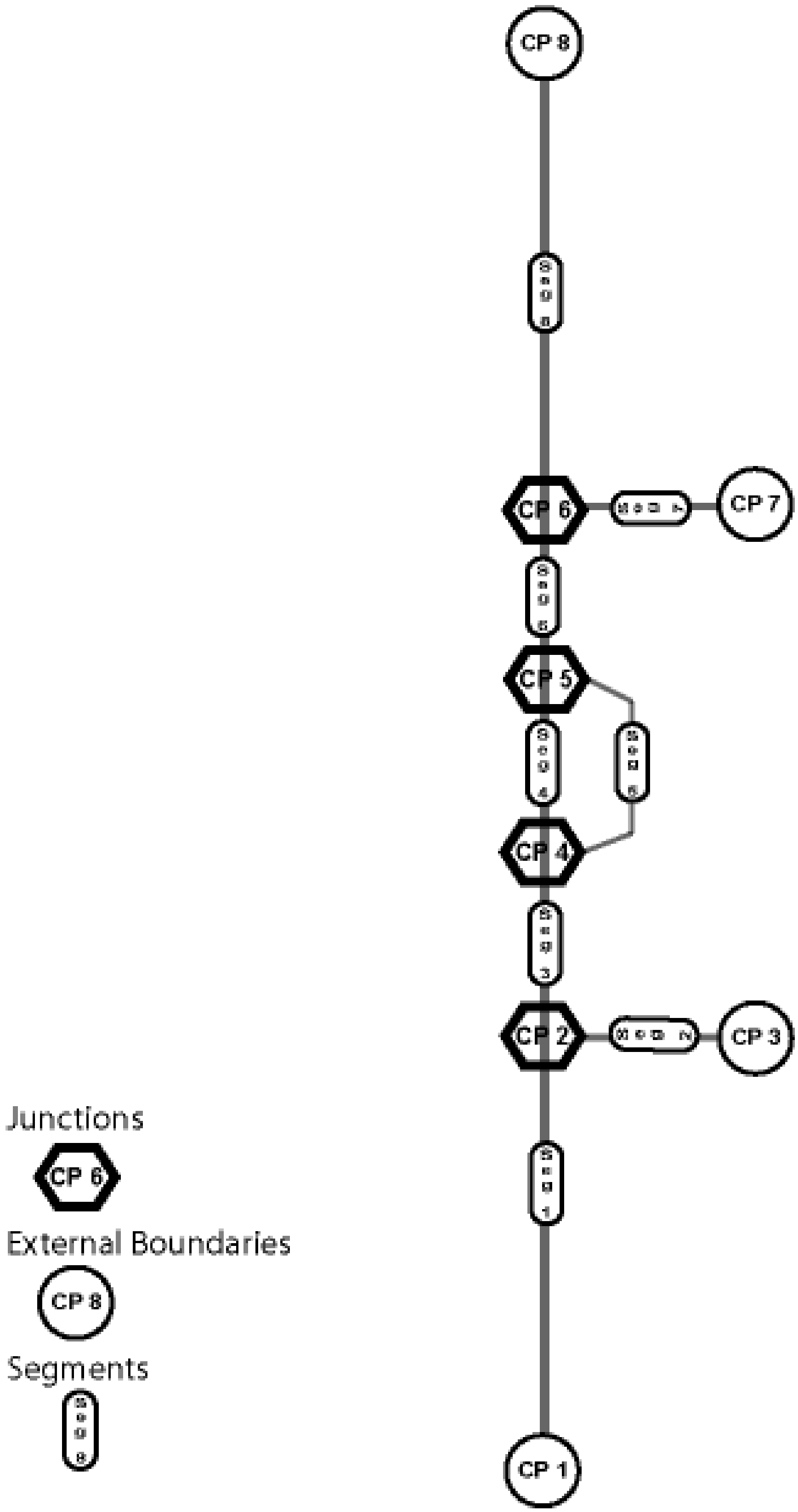

Figure A-4. Murrieta Creek Sediment Model Network HEC-6T.

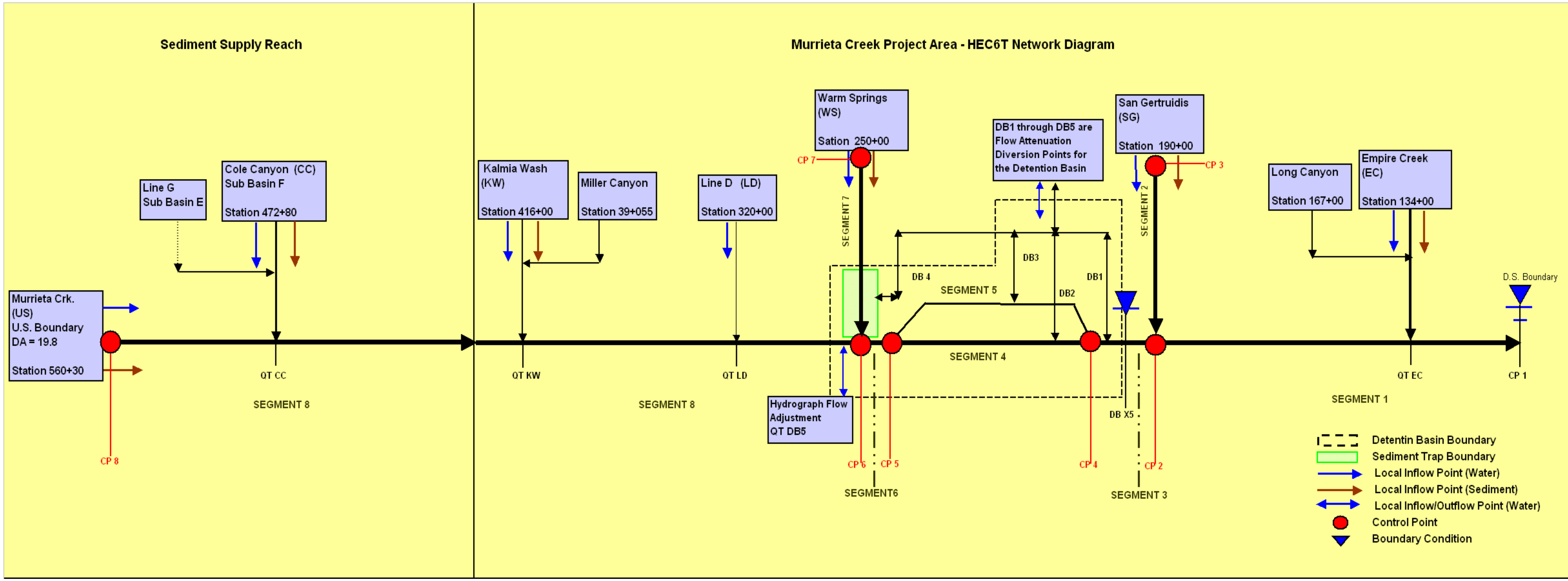

Figure A-5 Murrieta Creek HEC-6 Model Diagram.

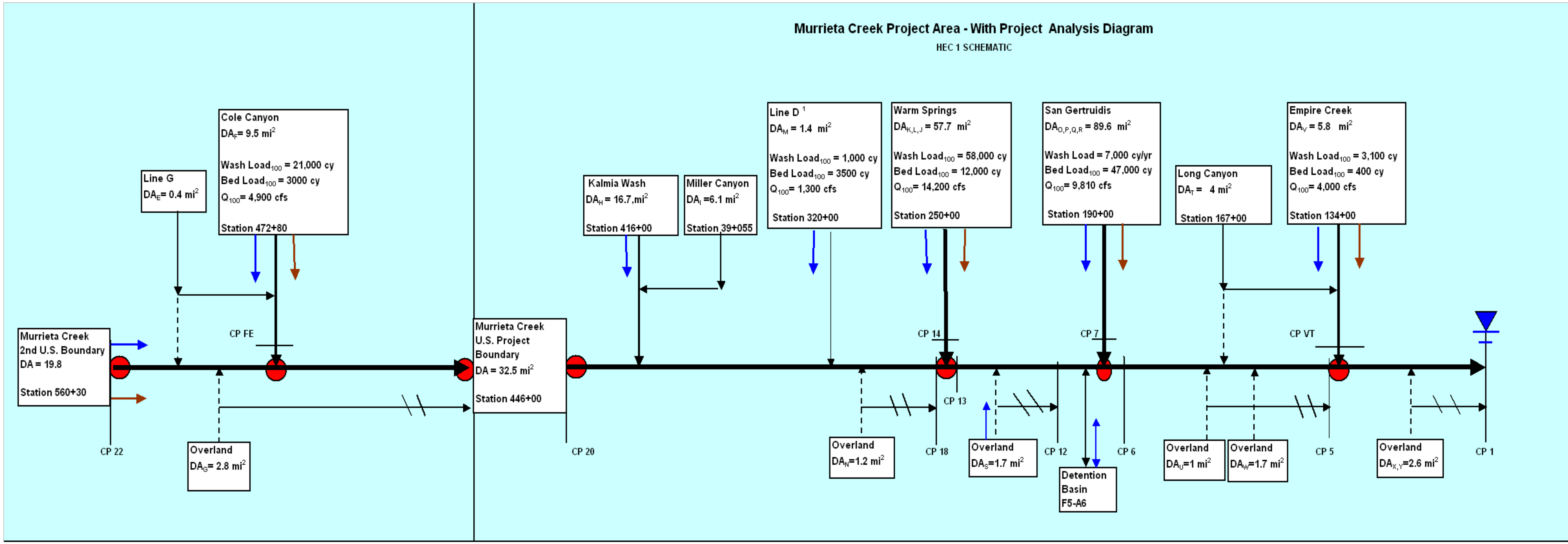

Figure A-6 Murrieta Creek HEC-1 Model Diagram.

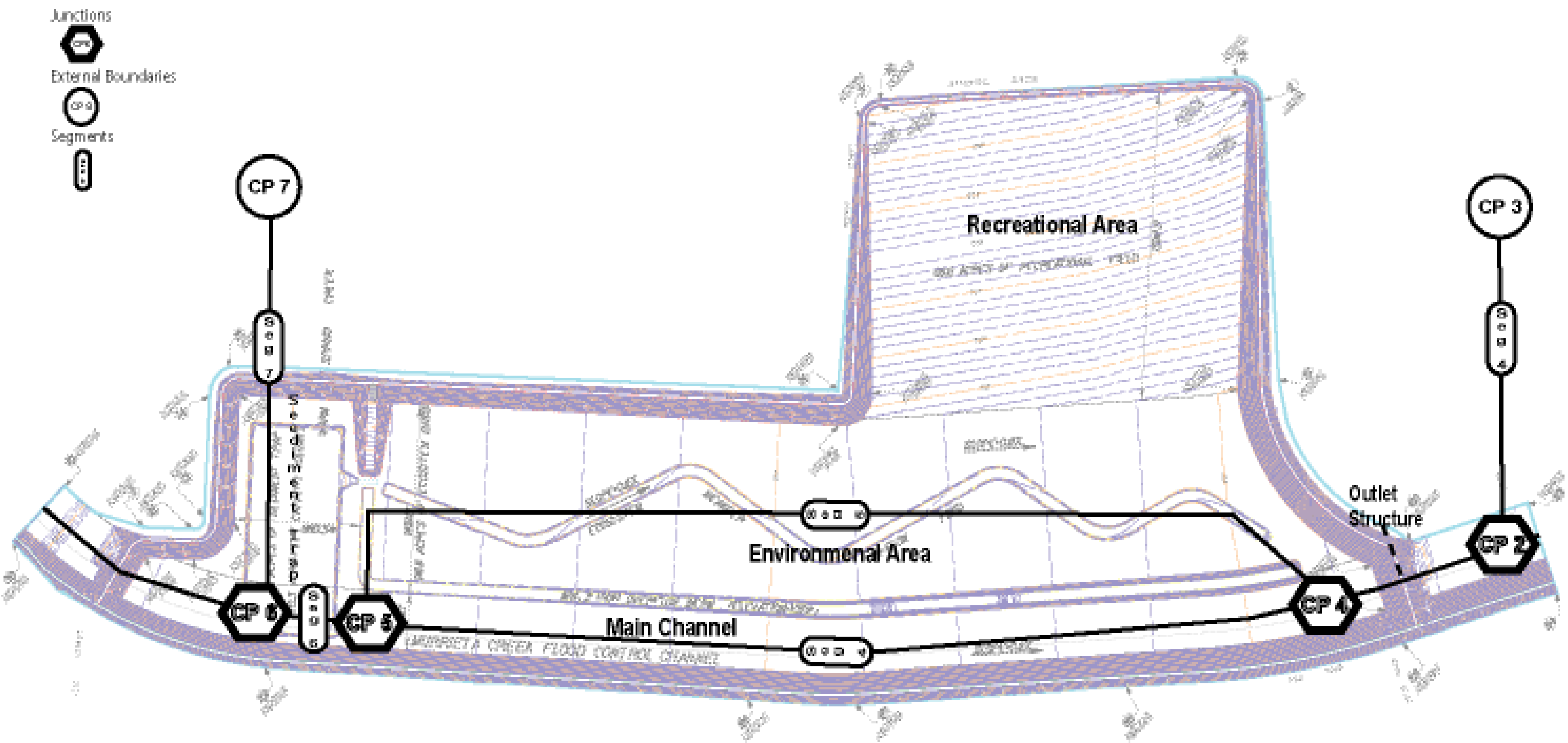

Figure A-7 HEC-6T Detention Basin Network.

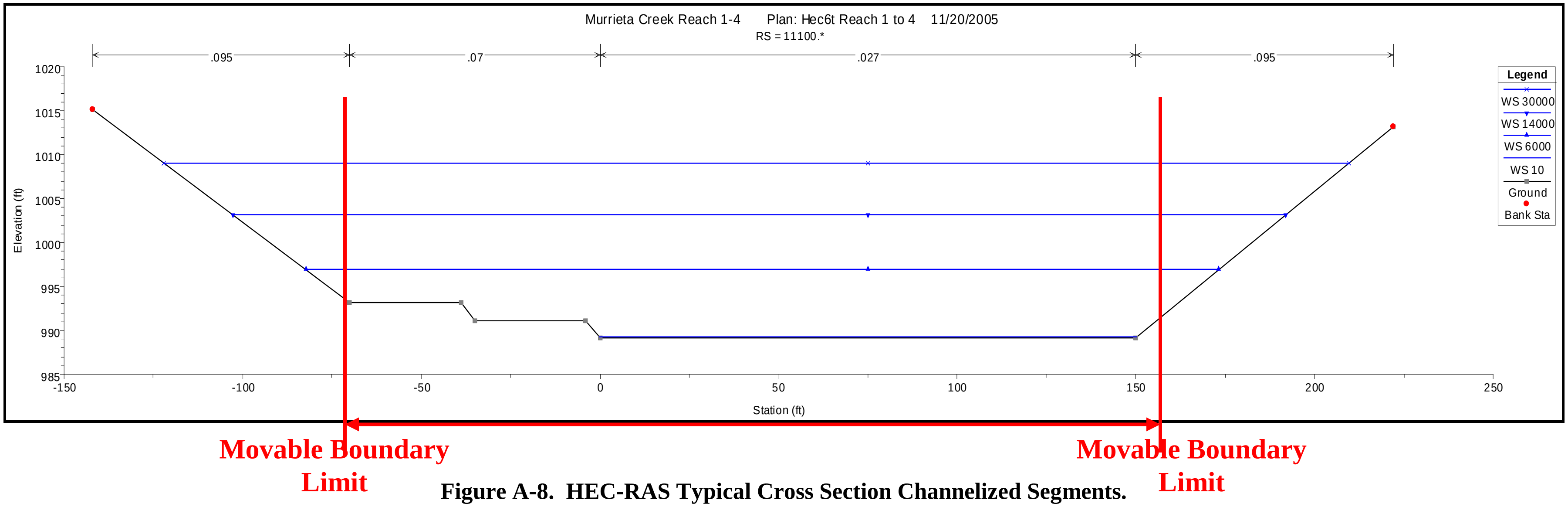

Figure A-8. HEC-RAS Typical Cross Section Channelized Segments.

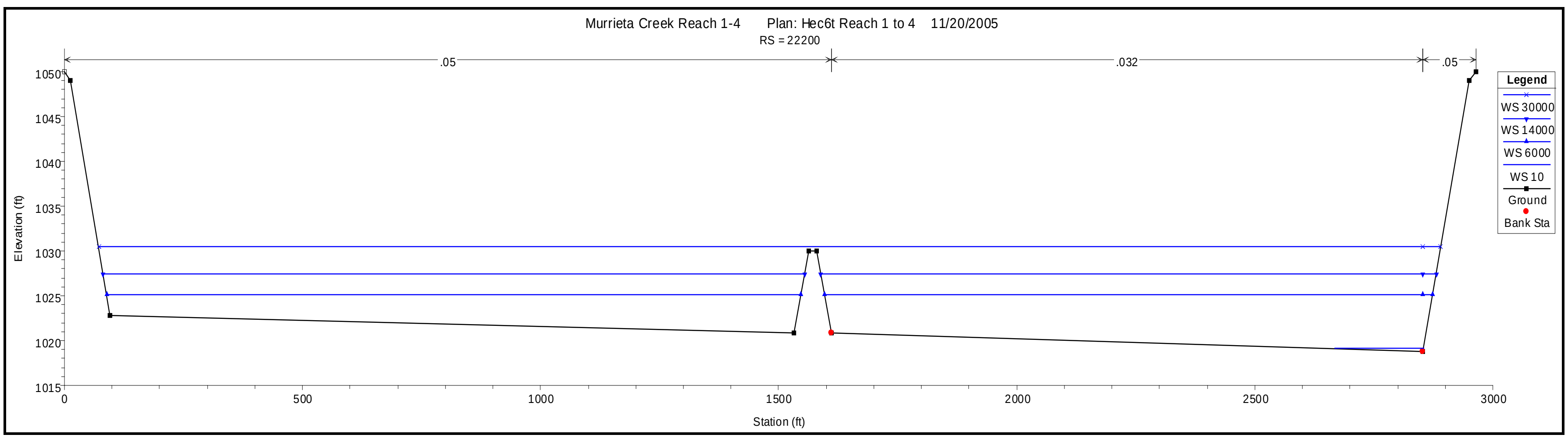

Figure A-9. HEC-RAS Typical Cross Section Detention Basin

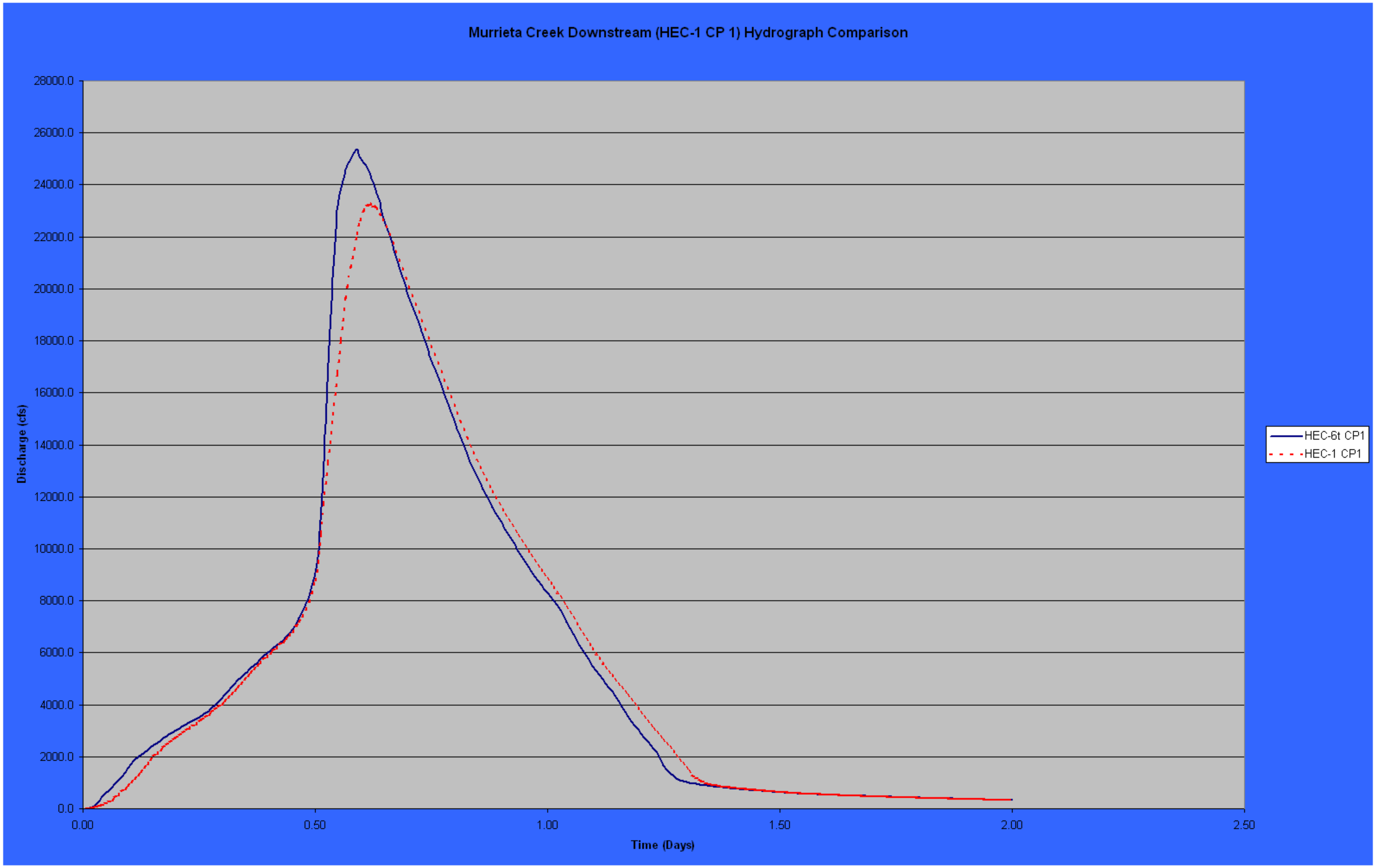

Figure A-10. Murrieta Creek Downstream Hydrograph for HEC-6T Model 1 and HEC-1 results.

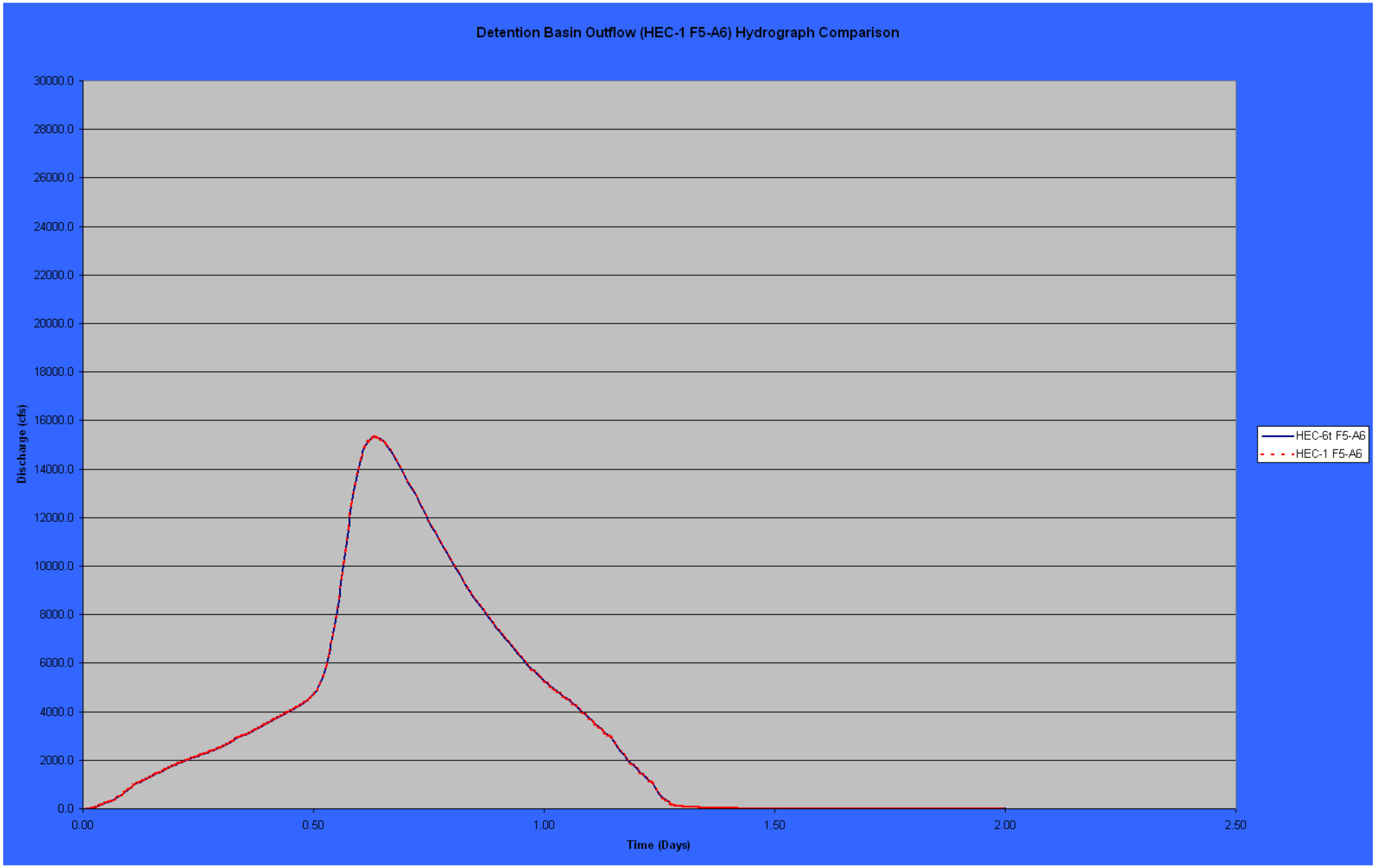

Figure A-11. Detention Basin Outlet Hydrograph for HEC-6T Model Msr_1a and HEC-1 Model.

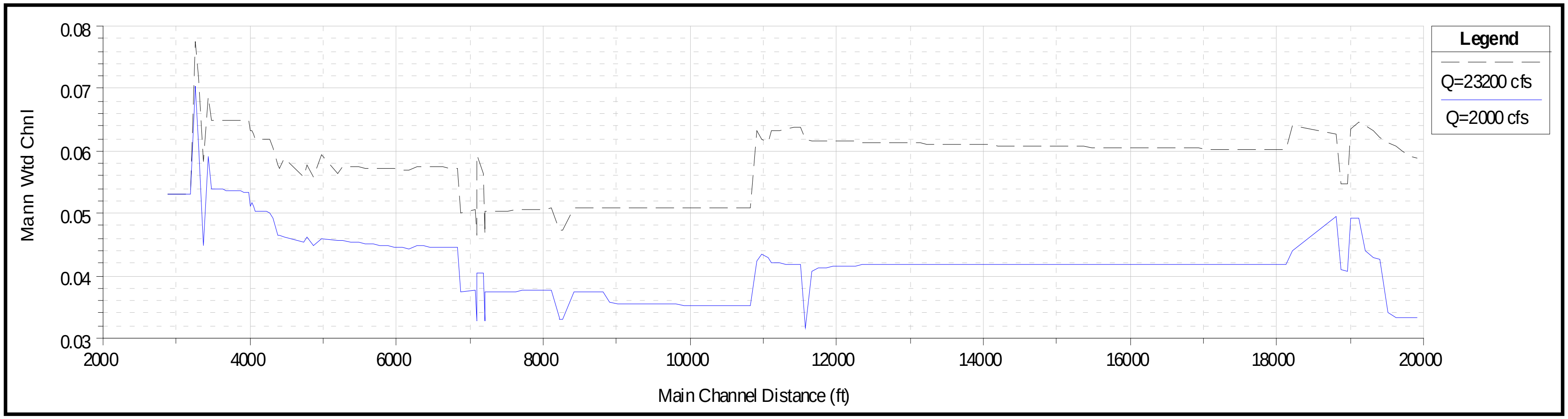

Figure A-12. Longitudinal Profile of Conveyance Weighted Roughness Values, HEC-RAS With-Project Results.

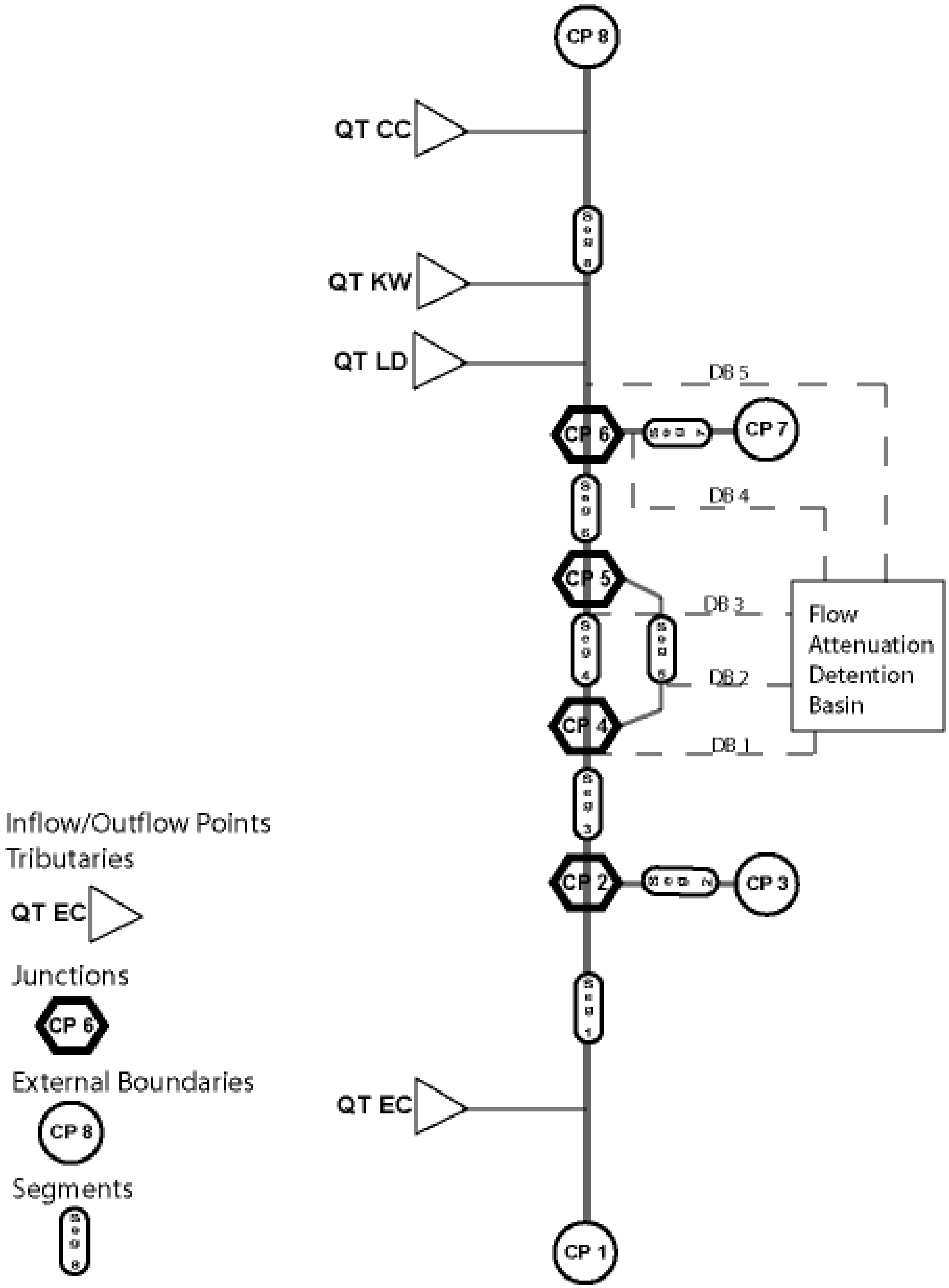

Figure A-13. HEC-6T Model Schematic for MSR_1a.dat.

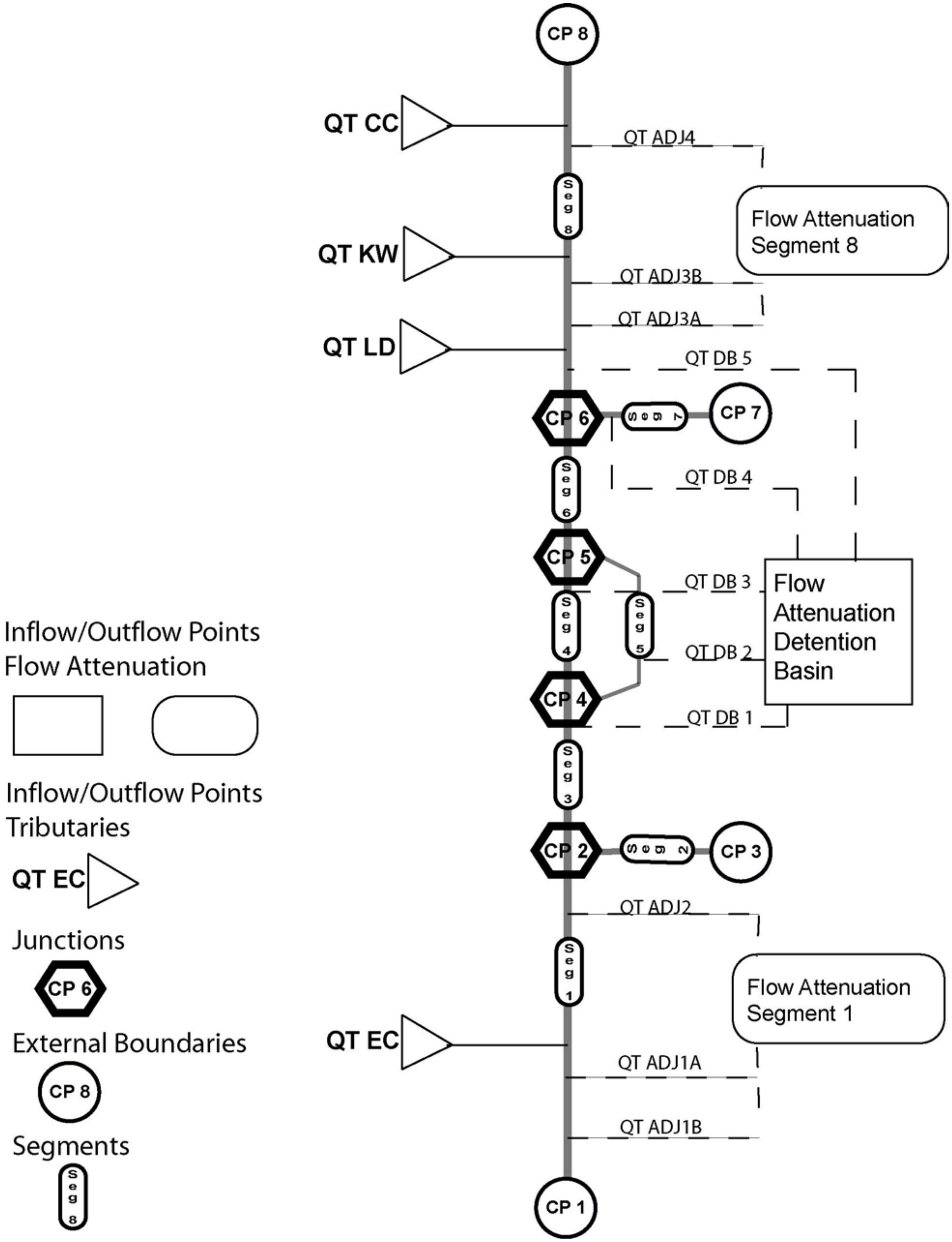

Figure A-14. HEC-6T Model Schematic for MSR_4a.dat.

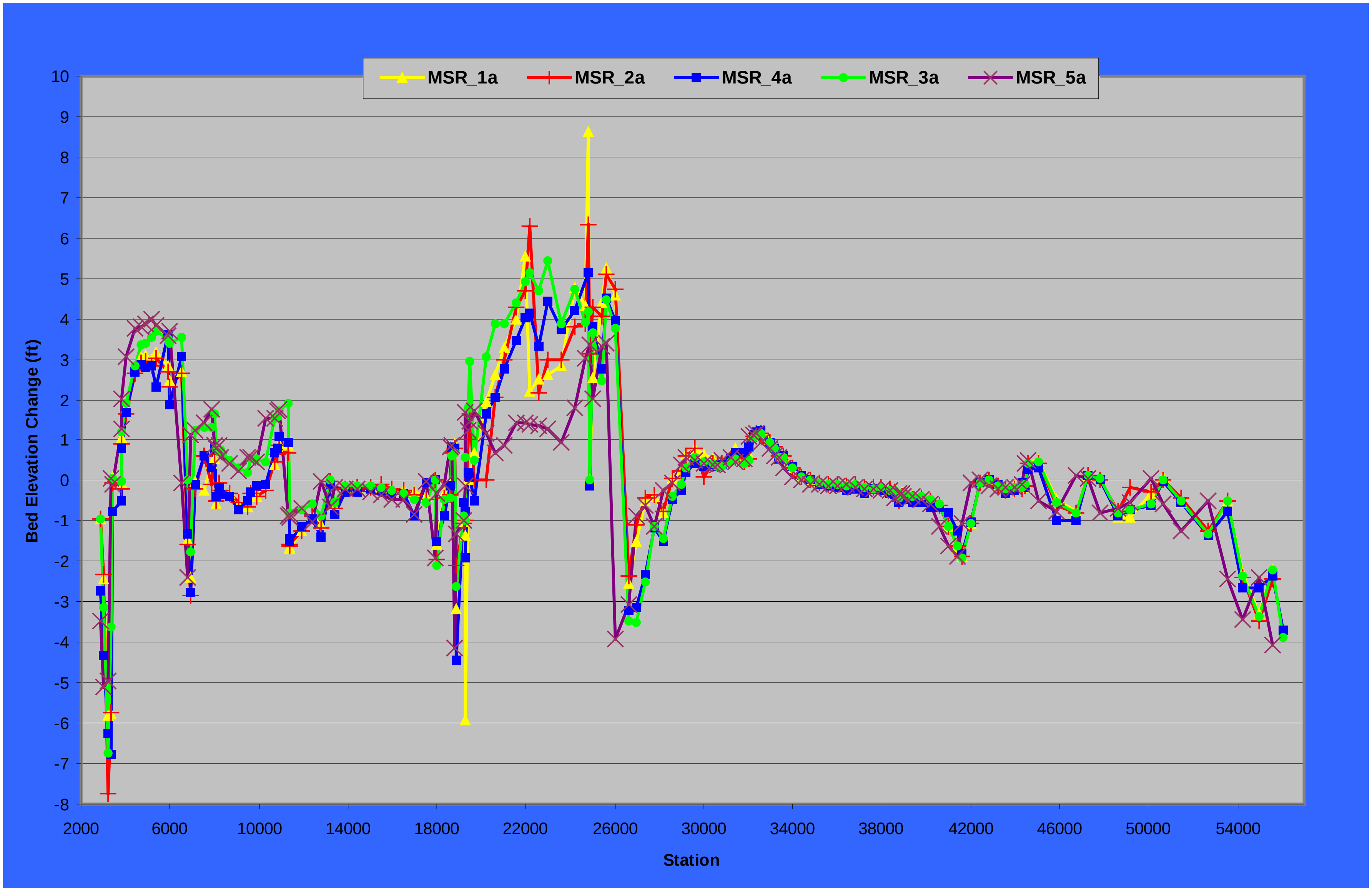

Figure A-15. Bed Elevation Change from Time t=0 to t=1.43 Days for Murrieta Creek Main Channel, Model Results MSR_1a to 5a.

Figure A-16. Bed Elevation Change from Time t=0 to t=1.43 Days for Segment 5, Model Results MSR_1a to 4a.

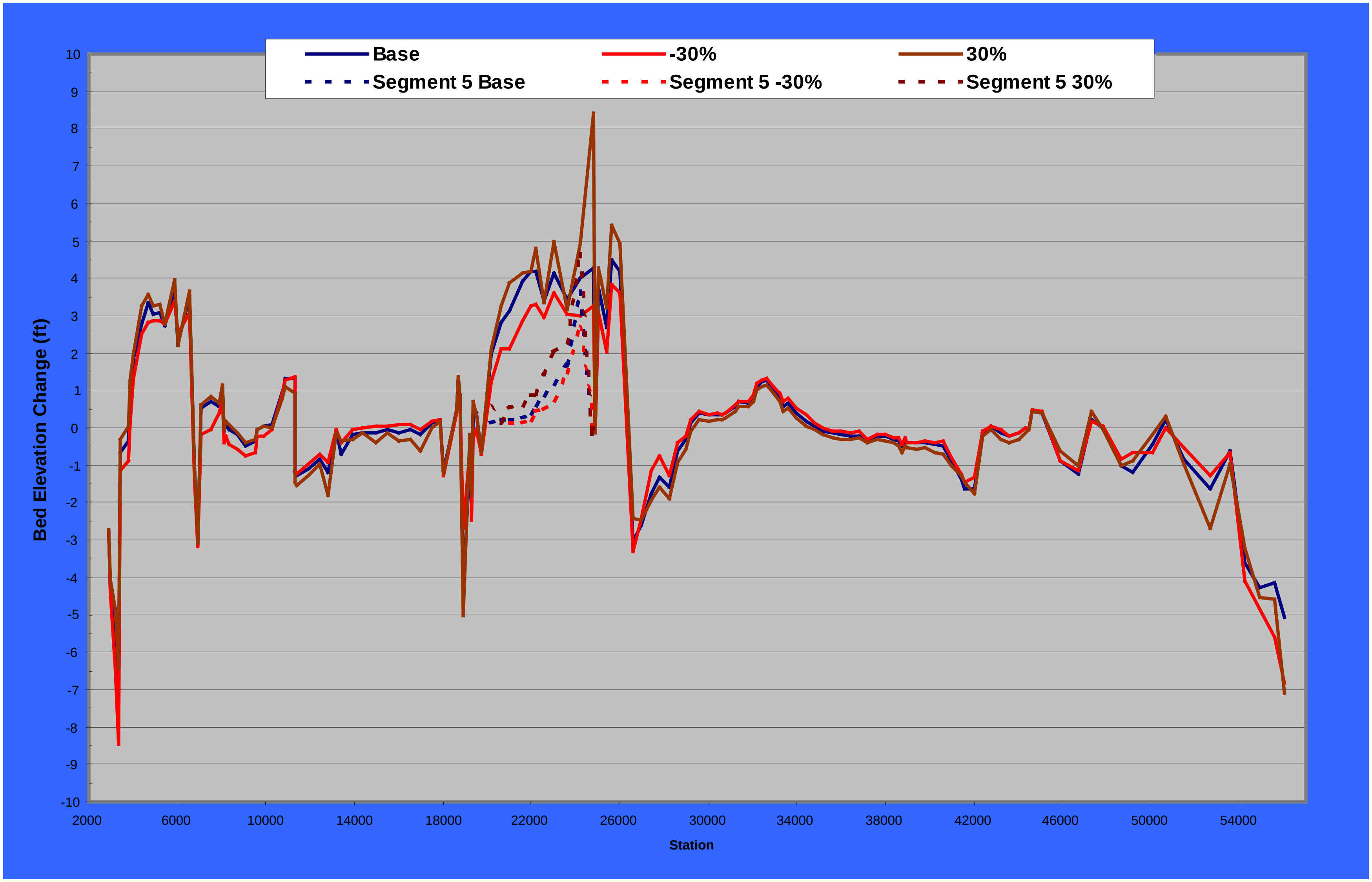

Figure A-17. Bed Elevation Change from Time t=0 to t=1.43 Days for Sediment Sensitivity Analysis.

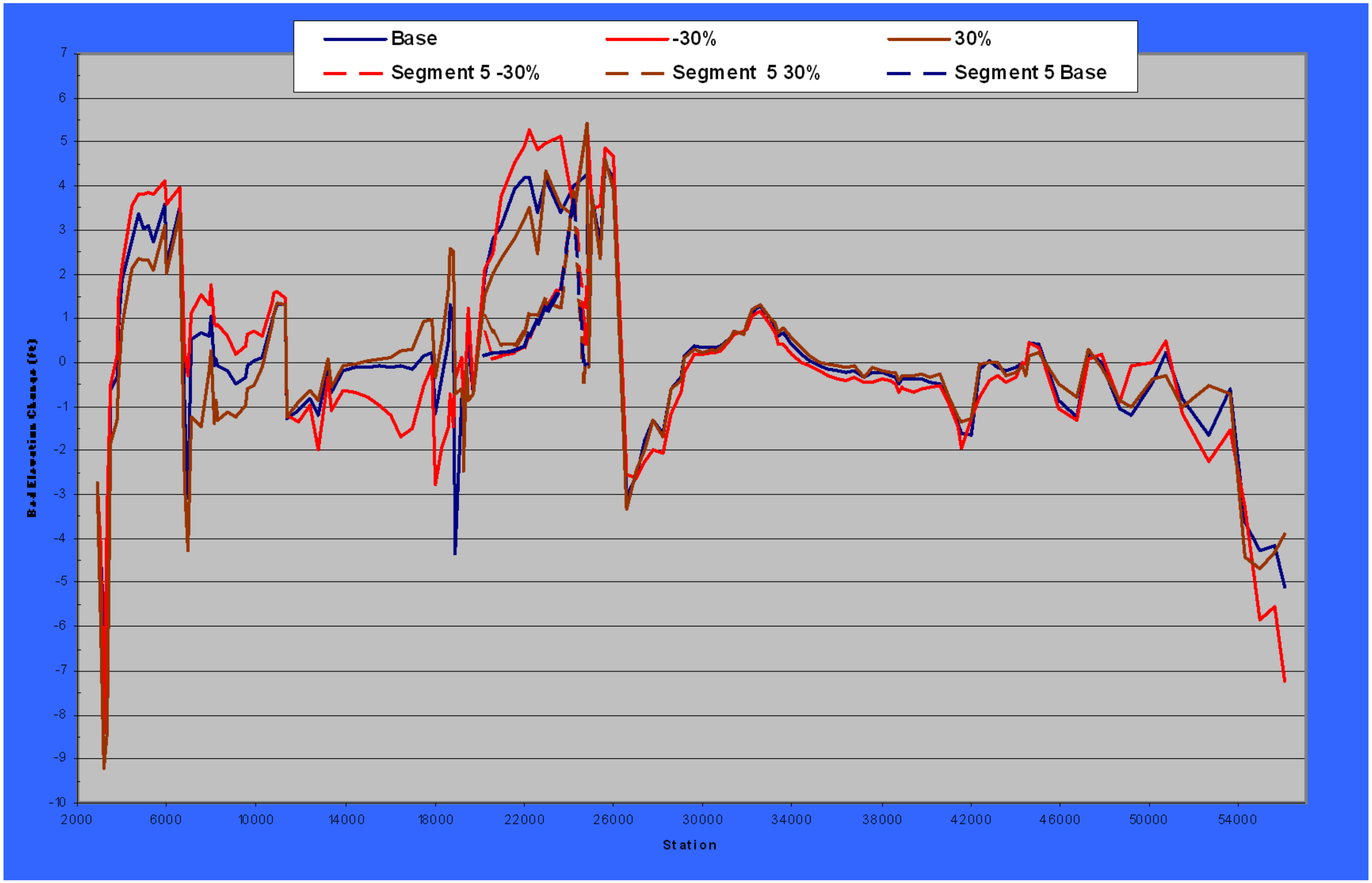

Figure A-18. Bed Elevation Change from Time t=0 to t=1.43 Days for Roughness Coefficient Sensitivity Analysis.

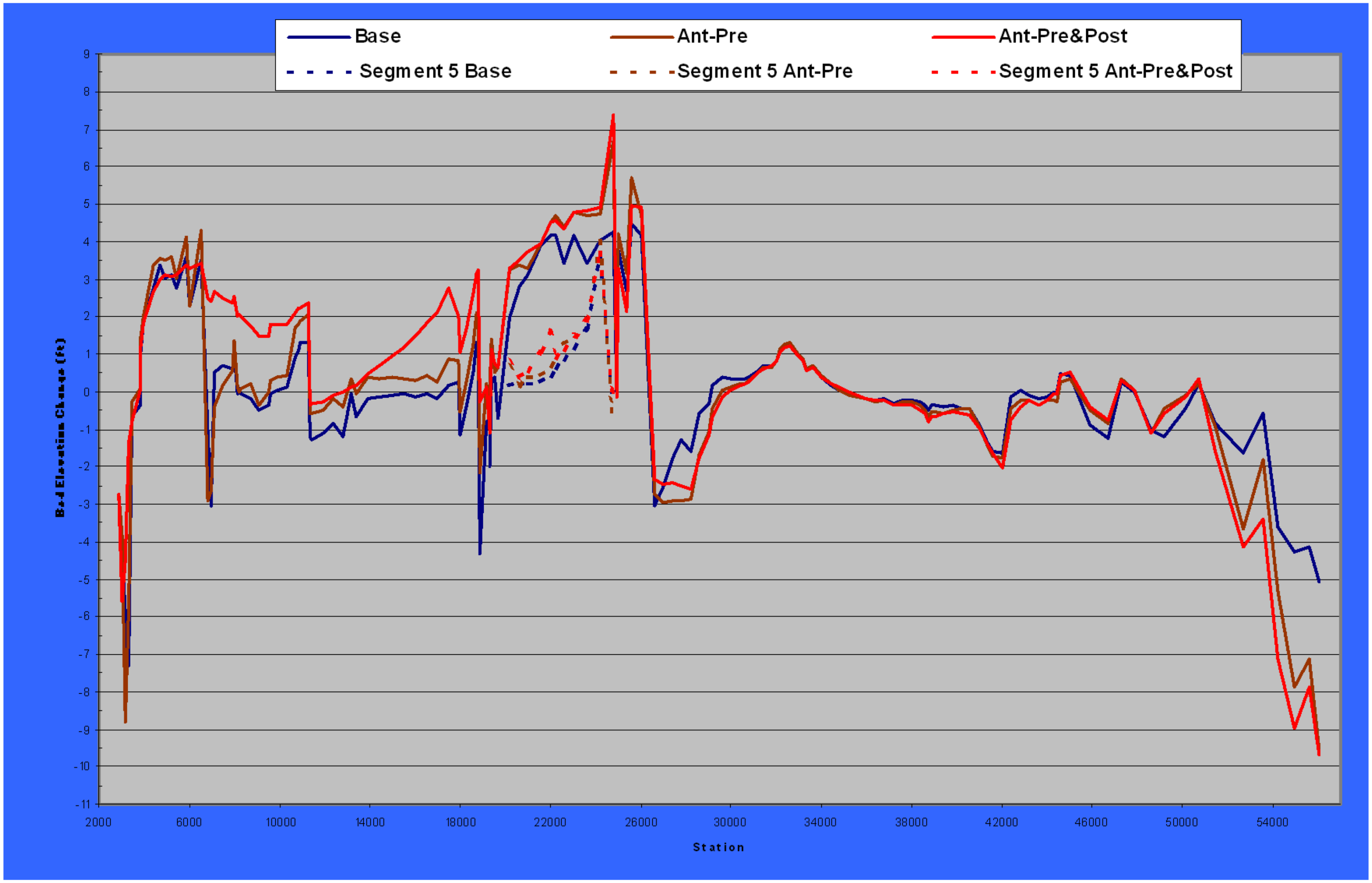

Figure A-19. Bed Elevation Change from Time t=0 to t=1.45 Days for Computation Time Interval Sensitivity Analysis.

Appendix B

Supplemental Information

Bed Load (tons/day)		0	50,000
Q (ft³/s)		0	5,000
Mean (mm)	Class	Load Fraction	Load Fraction
0.001	FCL	0	0
0.003	CL	0	0
0.006	VFSL	0	0
0.011	FSL	0	0
0.023	MSL	0	0
0.045	CSL	0	0
0.088	VFS	0	0
0.177	FS	0.128	0.128
0.354	MS	0.175	0.175
0.707	CS	0.252	0.252
1.414	VCS	0.22	0.22
2.828	VFG	0.131	0.131
5.657	FG	0.05	0.05
11.314	MG	0.029	0.029
22.627	CG	0.011	0.011

Table B-1. Source QT EC Bed Material Load Gradation Information (Ref. 11).

Bed Load (tons/day)		0	130	2,000	13,500	179,370	550,000
Q (ft³/s)		0	10	100	500	4,000	8,900
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.001	FCL	0	0	0	0	0	0
0.003	CL	0	0	0	0	0	0
0.006	VFSL	0	0	0	0	0	0
0.011	FSL	0	0	0	0	0	0
0.023	MSL	0	0	0	0	0	0
0.045	CSL	0	0	0	0	0	0
0.088	VFS	0.47	0.47	0.47	0.368	0.248	0.061
0.177	FS	0.163	0.163	0.163	0.21	0.268	0.355
0.354	MS	0.159	0.159	0.159	0.185	0.208	0.241
0.707	CS	0.107	0.107	0.107	0.132	0.16	0.201
1.414	VCS	0.068	0.068	0.068	0.086	0.108	0.14
2.828	VFG	0.022	0.022	0.022	0.012	0.005	0.001
5.657	FG	0.007	0.007	0.007	0.004	0.002	0
11.314	MG	0.003	0.003	0.003	0.002	0.001	0
22.627	CG	0.001	0.001	0.001	0	0	0

Table B-2. Source QT SG Bed Material Load Gradation Information (Ref. 11).

Bed Load (tons/day)		0	80	1,000	8,600	82,000	216,729
Q (ft^3/s)		0	10	100	500	5,000	13,200
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.001	FCL	0	0	0	0	0	0
0.003	CL	0	0	0	0	0	0
0.006	VFSL	0	0	0	0	0	0
0.011	FSL	0	0	0	0	0	0
0.023	MSL	0	0	0	0	0	0
0.045	CSL	0	0	0	0	0	0
0.088	VFS	0.344	0.344	0.344	0.266	0.257	0.243
0.177	FS	0.213	0.213	0.213	0.226	0.198	0.154
0.354	MS	0.2	0.2	0.2	0.22	0.22	0.22
0.707	CS	0.143	0.143	0.143	0.168	0.186	0.213
1.414	VCS	0.086	0.086	0.086	0.106	0.131	0.168
2.828	VFG	0.012	0.012	0.012	0.008	0.004	0.002
5.657	FG	0.002	0.002	0.002	0.004	0.002	0.001
11.314	MG	0	0	0	0.002	0.001	0
22.627	CG	0	0	0	0	0.001	0

Table B-3. Source QT WS Bed Material Load Gradation Information (Ref. 11)

Bed Load (tons/day)		0	57,000
Q (ft^3/s)		0	5,000
Mean (mm)	Class	Load Fraction	Load Fraction
0.001	FCL	0	0
0.003	CL	0	0
0.006	VFSL	0	0
0.011	FSL	0	0
0.023	MSL	0	0
0.045	CSL	0	0
0.088	VFS	0.032	0.032
0.177	FS	0.1	0.1
0.354	MS	0.175	0.175
0.707	CS	0.252	0.252
1.414	VCS	0.22	0.22
2.828	VFG	0.131	0.131
5.657	FG	0.05	0.05
11.314	MG	0.029	0.029
22.627	CG	0.011	0.011

Table B-4. Source QT CC Bed Material Load Gradation Information (Ref. 11).

Bed Load (tons/day)		0	130	2,500	17,000	380,000	1,000,000
Q (ft^3/s)		0	10	100	500	5,000	11,100
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.001	FCL	0	0	0	0	0	0
0.003	CL	0	0	0	0	0	0
0.006	VFSL	0	0	0	0	0	0
0.011	FSL	0	0	0	0	0	0
0.023	MSL	0	0	0	0	0	0
0.045	CSL	0	0	0	0	0	0
0.088	VFS	0.477	0.477	0.477	0.327	0.316	0.299
0.177	FS	0.228	0.228	0.228	0.265	0.285	0.316
0.354	MS	0.158	0.158	0.158	0.215	0.221	0.23
0.707	CS	0.088	0.088	0.088	0.124	0.119	0.11
1.414	VCS	0.047	0.047	0.047	0.067	0.058	0.044
2.828	VFG	0.001	0.001	0.001	0.001	0.001	0
5.657	FG	0.001	0.001	0.001	0.001	0.001	0
11.314	MG	0.477	0.477	0.477	0.327	0.316	0.299
22.627	CG	0	0	0	0	0.001	0

Table B-5. Source CP 8 Bed Material Load Gradation Information (Ref. 11).

Wash Load (tons/day)		0	269,578
Q (ft^3/s)		0	5,000
Mean (mm)	Class	Load Fraction	Load Fraction
0.003	CL	0.15	0.15
0.006	VFSL	0.03	0.03
0.011	FSL	0.04	0.04
0.023	MSL	0.09	0.09
0.045	CSL	0.17	0.17
0.088	VFS	0.36	0.36
0.177	FS	0.16	0.16
0.354	MS	0	0
0.707	CS	0	0
1.414	VCS	0	0
2.828	VFG	0	0
5.657	FG	0	0
11.314	MG	0	0
22.627	CG	0	0

Table B-6. Source QT EC Wash Load Gradation Information.

Wash Load (tons/day)		0	1,166	11,656	58,281	466,246	1,037,398
Q (ft^3/s)		0	10	100	500	4,000	8,900
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.003	CL	0.15	0.15	0.15	0.15	0.15	0.15
0.006	VFSL	0.03	0.03	0.03	0.03	0.03	0.03
0.011	FSL	0.04	0.04	0.04	0.04	0.04	0.04
0.023	MSL	0.09	0.09	0.09	0.09	0.09	0.09
0.045	CSL	0.17	0.17	0.17	0.17	0.17	0.17
0.088	VFS	0.36	0.36	0.36	0.36	0.36	0.36
0.177	FS	0.16	0.16	0.16	0.16	0.16	0.16
0.354	MS	0	0	0	0	0	0
0.707	CS	0.15	0.15	0.15	0.15	0.15	0.15
1.414	VCS	0.03	0.03	0.03	0.03	0.03	0.03
2.828	VFG	0	0	0	0	0	0
5.657	FG	0	0	0	0	0	0
11.314	MG	0	0	0	0	0	0
22.627	CG	0	0	0	0	0	0

Table B-7. Source QT SG Wash Load Gradation Information.

Wash Load (tons/day)		0	1,192	11,921	59,605	596,054	1,573,583
Q (ft^3/s)		0	10	100	500	5,000	13,200
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.003	CL	0.18	0.18	0.18	0.18	0.18	0.18
0.006	VFSL	0.04	0.04	0.04	0.04	0.04	0.04
0.011	FSL	0.03	0.03	0.03	0.03	0.03	0.03
0.023	MSL	0.07	0.07	0.07	0.07	0.07	0.07
0.045	CSL	0.28	0.28	0.28	0.28	0.28	0.28
0.088	VFS	0.31	0.31	0.31	0.31	0.31	0.31
0.177	FS	0.09	0.09	0.09	0.09	0.09	0.09
0.354	MS	0	0	0	0	0	0
0.707	CS	0	0	0	0	0	0
1.414	VCS	0	0	0	0	0	0
2.828	VFG	0	0	0	0	0	0
5.657	FG	0	0	0	0	0	0
11.314	MG	0	0	0	0	0	0
22.627	CG	0	0	0	0	0	0

Table B-8. Source QT WS Wash Load Gradation Information.

Wash Load (tons/day)		0	1,214,317
Q (ft^3/s)		0	5,000
Mean (mm)	Class	Load Fraction	Load Fraction
0.003	CL	0.21	0.21
0.006	VFSL	0.03	0.03
0.011	FSL	0.04	0.04
0.023	MSL	0.08	0.08
0.045	CSL	0.28	0.28
0.088	VFS	0.3	0.3
0.177	FS	0.06	0.06
0.354	MS	0	0
0.707	CS	0	0
1.414	VCS	0	0
2.828	VFG	0	0
5.657	FG	0	0
11.314	MG	0	0
22.627	CG	0	0

Table B-9. Source QT CC Wash Load Gradation Information.

Wash Load (tons/day)		0	1,535	15,346	76,731	767,310	2,301,929
Q (ft^3/s)		0	10	100	500	5,000	15,000
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.003	CL	0.19	0.19	0.19	0.19	0.19	0.19
0.006	VFSL	0.03	0.03	0.03	0.03	0.03	0.03
0.011	FSL	0.04	0.04	0.04	0.04	0.04	0.04
0.023	MSL	0.07	0.07	0.07	0.07	0.07	0.07
0.045	CSL	0.31	0.31	0.31	0.31	0.31	0.31
0.088	VFS	0.28	0.28	0.28	0.28	0.28	0.28
0.177	FS	0.08	0.08	0.08	0.08	0.08	0.08
0.354	MS	0	0	0	0	0	0
0.707	CS	0	0	0	0	0	0
1.414	VCS	0	0	0	0	0	0
2.828	VFG	0	0	0	0	0	0
5.657	FG	0	0	0	0	0	0
11.314	MG	0	0	0	0	0	0
22.627	CG	0	0	0	0	0	0

Table B-10. Source CP KW Wash Load Gradation Information.

Wash Load (tons/day)		0	2,199	21,992	109,958	1,099,576	2,441,060
Q (ft^3/s)		0	10	100	500	5,000	11,100
Mean (mm)	Class	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction	Load Fraction
0.003	CL	0.22	0.22	0.22	0.22	0.22	0.22
0.006	VFSL	0.03	0.03	0.03	0.03	0.03	0.03
0.011	FSL	0.05	0.05	0.05	0.05	0.05	0.05
0.023	MSL	0.07	0.07	0.07	0.07	0.07	0.07
0.045	CSL	0.33	0.33	0.33	0.33	0.33	0.33
0.088	VFS	0.3	0.3	0.3	0.3	0.3	0.3
0.177	FS	0	0	0	0	0	0
0.354	MS	0	0	0	0	0	0
0.707	CS	0	0	0	0	0	0
1.414	VCS	0	0	0	0	0	0
2.828	VFG	0	0	0	0	0	0
5.657	FG	0	0	0	0	0	0
11.314	MG	0	0	0	0	0	0
22.627	CG	0	0	0	0	0	0

Table B-11. Source CP 8 Wash Load Gradation Information.

Grain Size Classification	Minimum Grain Diameter (mm)	Maximum Grain Diameter (mm)	Fraction of Wash Load in Size Class	Amount of Wash Load For Flow (tons/day)	Fraction of Bed Material Load in Size Class	Amount of Bed Material Load For Flow (tons/day)	Amount of Total Load For Flow (tons/day)	Fraction of Total Load in Size
Fine Clay	0	0.002	0	0	0	0	0	0.000
Clay	0.002	0.004	0.15	2,018	0	0	2,018	0.131
Very Fine Silt	0.004	0.008	0.03	404	0	0	404	0.026
Fine Silt	0.008	0.016	0.04	538	0	0	538	0.035
Medium Silt	0.016	0.032	0.09	1,211	0	0	1,211	0.078
Coarse Silt	0.032	0.0625	0.17	2,287	0	0	2,287	0.148
Very Fine Sand	0.0625	0.125	0.36	4,843	0.47	940	5,783	0.374
Fine Sand	0.125	0.25	0.16	2,152	0.163	326	2,478	0.160
Medium Sand	0.25	0.5	0	0	0.159	318	318	0.021
Coarse Sand	0.5	1	0	0	0.107	214	214	0.014
Very Coarse Sand	1	2	0	0	0.068	136	136	0.009
Very Fine Gravel	2	4	0	0	0.022	44	44	0.003
Fine Gravel	4	8	0	0	0.007	14	14	0.001
Medium Gravel	8	16	0	0	0.003	6	6	0.000
Coarse Gravel	16		0	0	0.001	2	2	0.000
Total			1	13,453	1	2,000	15,453	1

Table B-12. Sample Calculation for The Weighted Composite Gradation of Total Inflowing Sediment Load by Sediment Class For Source QT SG, Q = 100 ft^3/s.

Discharge	W.S.E (ft)
0.0	975.41
5000.0	981.22
10000.0	983.78
15000.0	986.06
20000.0	987.65
25000.0	989.24
30000.0	990.36

Table B-13. Downstream Boundary Condition.

HEC 6t File Name	Description
msr_FB.t5	Fixed Bed model
msr_1a.t5	Model 1, Initial HEC-6T model.
msr_2a.t5	Model 2
msr_3a.t5	Model 3
msr_4a.t5	Model 4
msr_4b.t5	Model 4, inflow/outflow diversion flows set to 0.
msr_4c.t5	Model 4, preferred model with revised sediment rating curves.
msr_4d1.t5	Model 4, msr_4c with antecedent hydrograph before the design hydrograph.
msr_4d2.t5	Model 4, msr_4c with antecedent hydrograph before the design hydrograph.
msr_4e.t5	Model 4, sediment inflow sensitivity test, 30% increase.
msr_4f.t5	Model 4, sediment inflow sensitivity test, 30% decrease.
msr_4g.t5	Model 4, roughness coefficient sensitivity test, 30% increase.
msr_4h.t5	Model 4, roughness coefficient sensitivity test, 30% decrease.
msr_4i.t5	Model 4, computational time interval test, 1 hour.
msr_5a.t5	Model 5
msr_4c14.t5	Model 6. Alternative 1 for detention basin.
msr_4c16.t5	Model 7. Alternative 2 for detention basin.
msr_4cXX.t5	Model 8. Alternative 3 for detention basin. (Not yet complete)

Table B-14. List of files for HEC-6T.

	Clay			Silt			Sand		
Segment	**Inflow (Acre-ft)**	**Outflow (Acre-ft)**	**Trapp Eff. %**	**Inflow (Acre-ft)**	**Outflow (Acre-ft)**	**Trapp Eff. %**	**Inflow (Acre-ft)**	**Outflow (Acre-ft)**	**Trapp Eff. %**
1	427.1	427.1	0	363.7	363.7	0	178	156.6	12
2	137.6	137.6	0	148.1	148	0	127.3	152.7	-20
3	283.1	283	0	214.9	209.9	3	15.5	16.3	-5
4	182	181.9	0	191.6	176.1	8	146.4	15.4	89
5	102.8	101.2	2	108.9	38.9	64	57.7	0.1	100
6	284.8	284.8	0	300.6	300.5	0	215.8	204.1	5
7	105.8	105.8	0	113.9	113.5	0	98.5	61.8	37
8	179.2	179	0	187.1	187.1	0	124.1	153.9	-24

Table B-15. Trapping Efficiency Results for HEC-6T MSR_4a.dat.

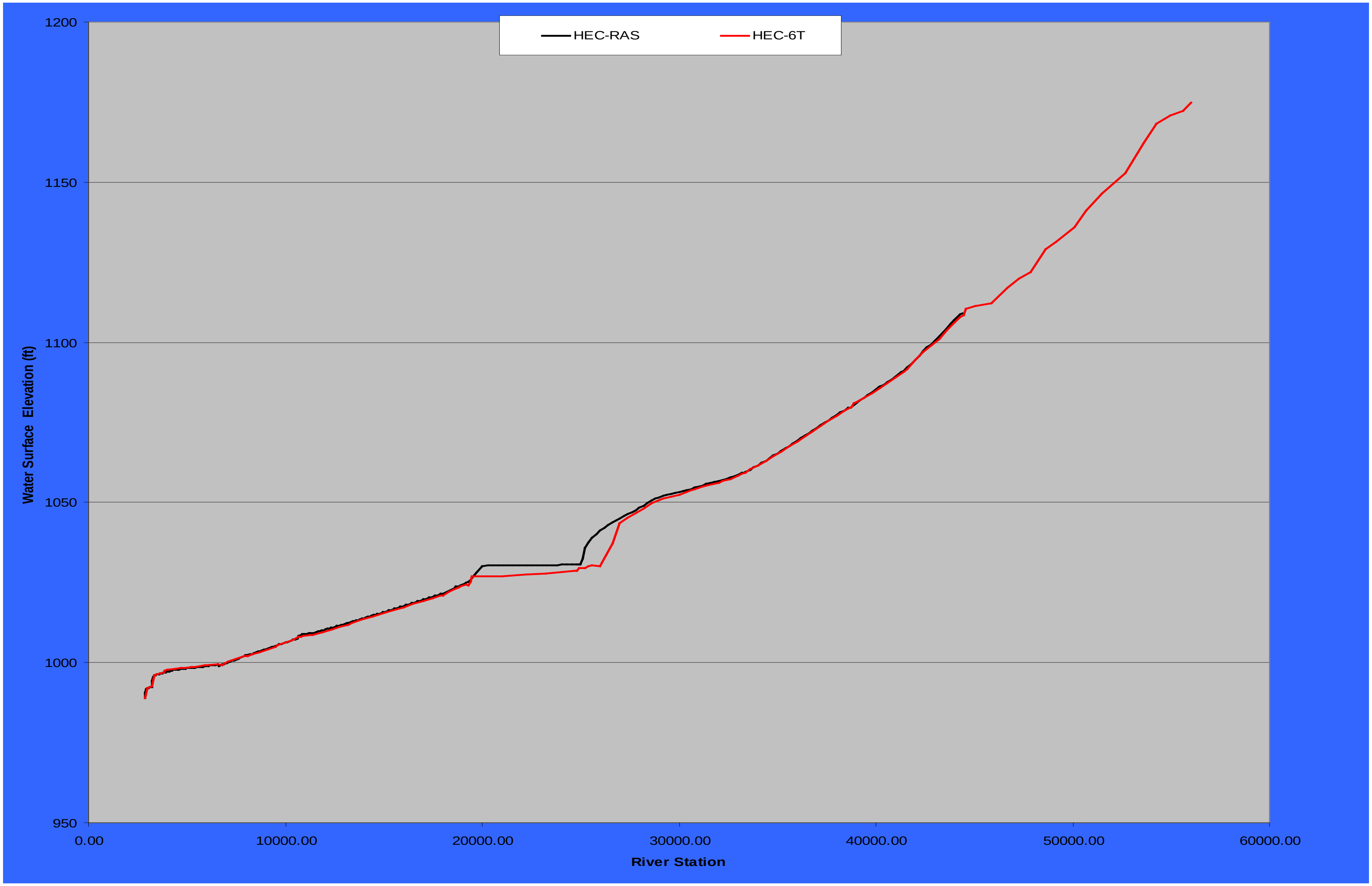

Figure B-1. Water Surface Profiles for HEC-6T Fixed Bed Model and HEC-RAS Results, Q=23,200 c..f.s..

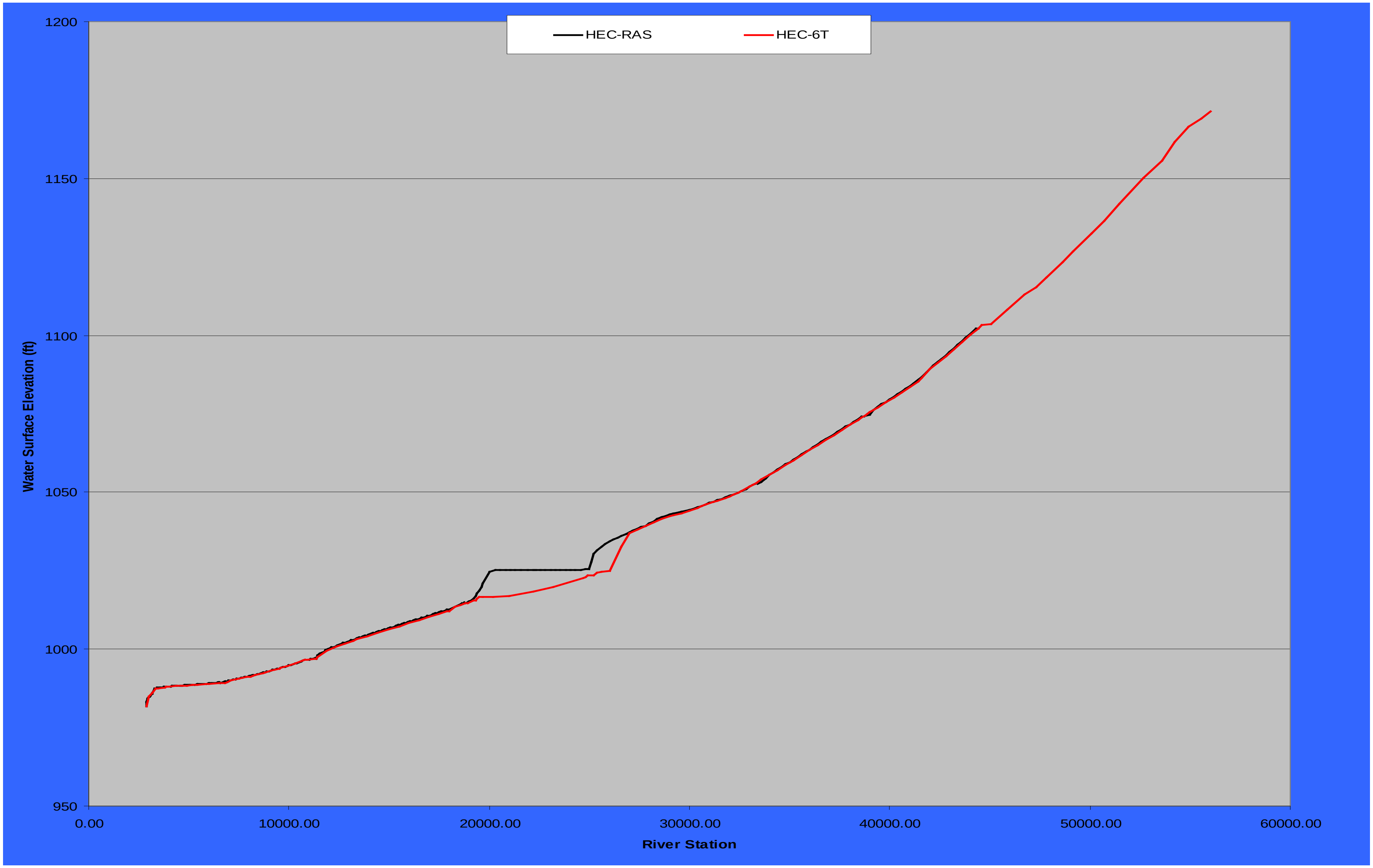

Figure B-2. Water Surface Profiles for HEC-6T Fixed Bed Model and HEC-RAS Results, 6,000 c.f.s.

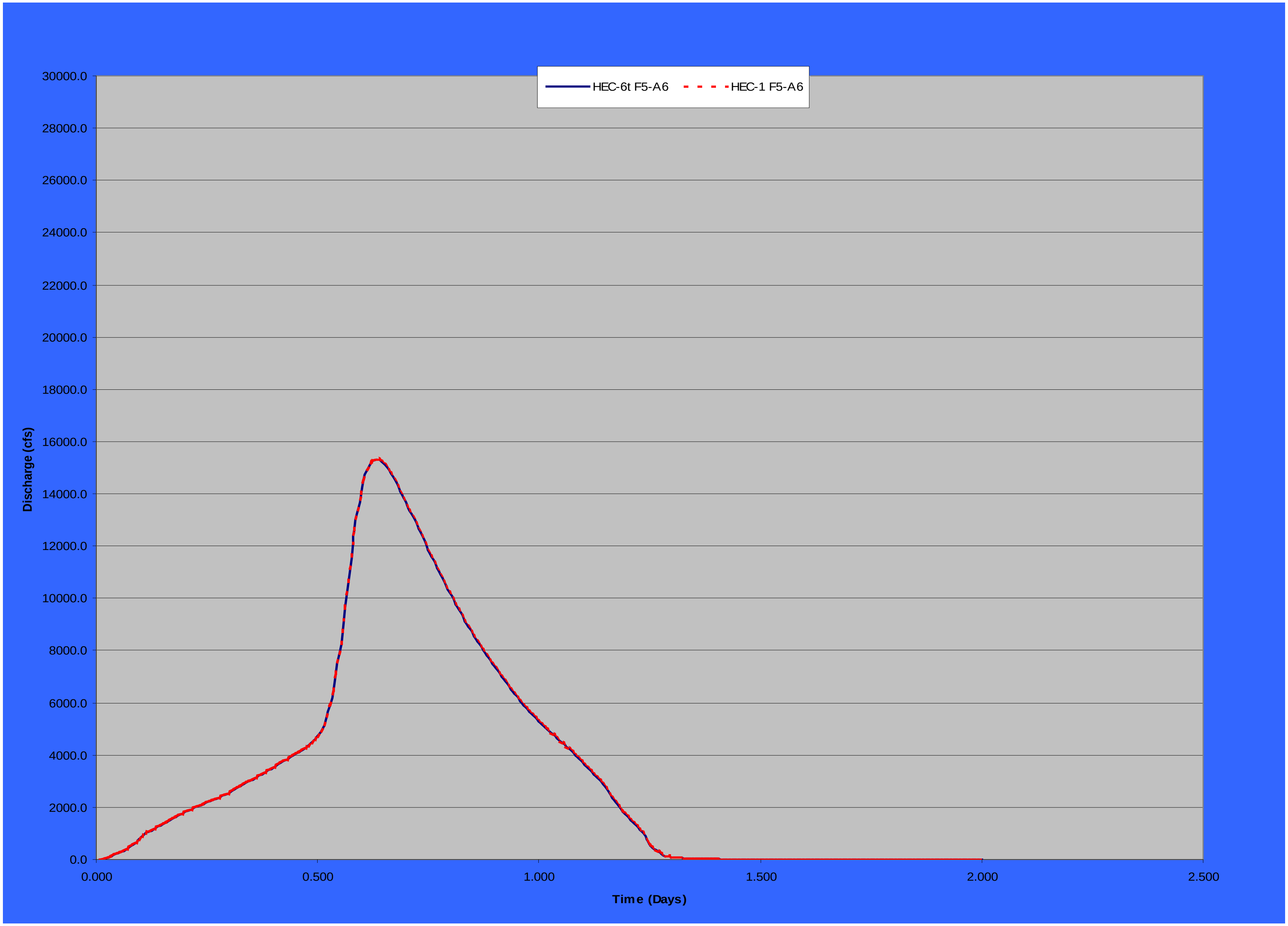

Figure B-3. Hydrograph at the Detention Basin Outlet for HEC-6T Model 4 and HEC-1, 100-Year Event.

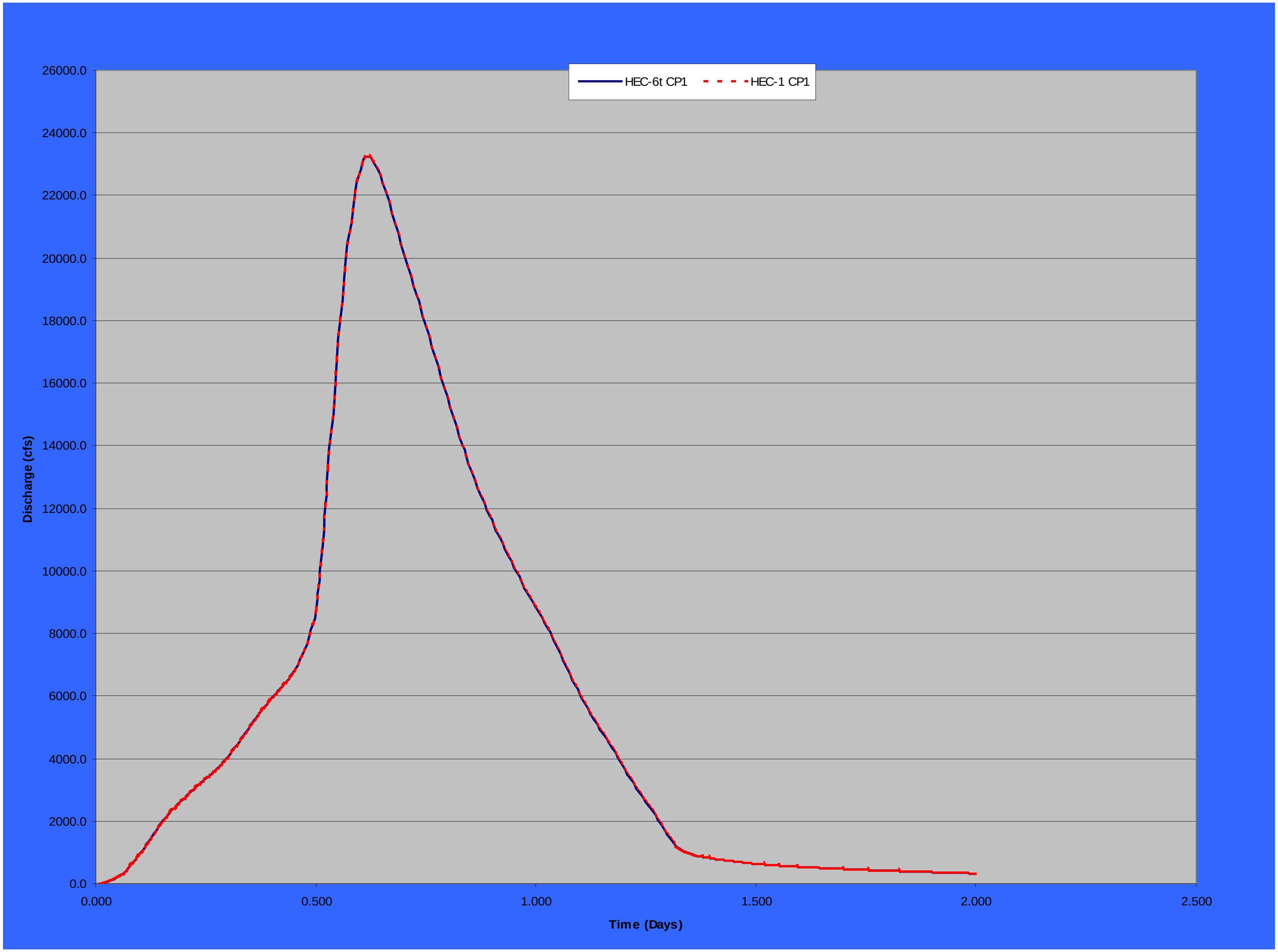

Figure B-4. Hydrograph Upstream of the USGS Gage Station for HEC-6T Model 4 and HEC-1, 100-Year Event.

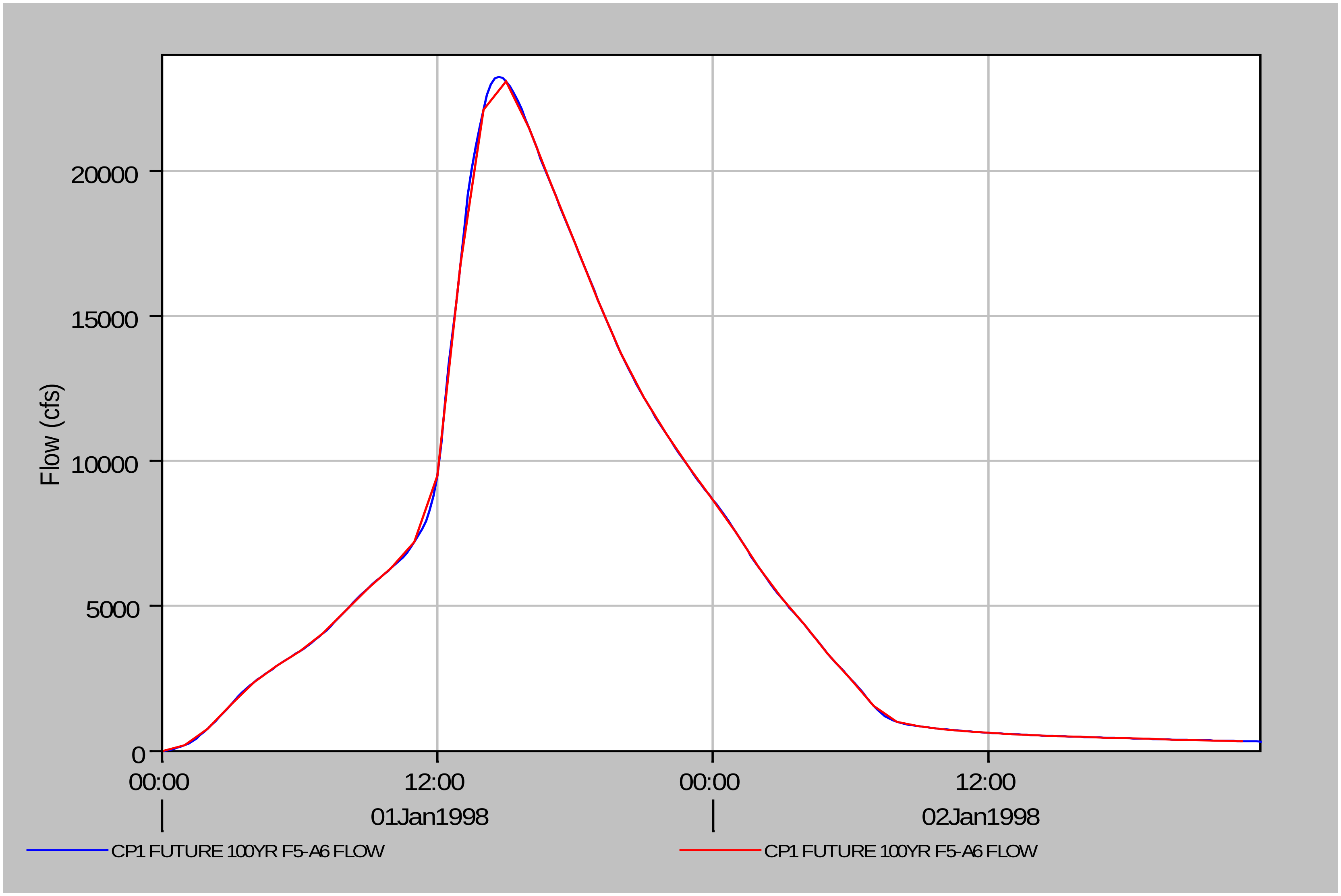

Figure B-5. Flow Comparison of the 10 Minute and 1 Hour Duration Hydrographs at CP 1, Downstream Boundary. Blue is the 10 minute and Red the 1Hour.

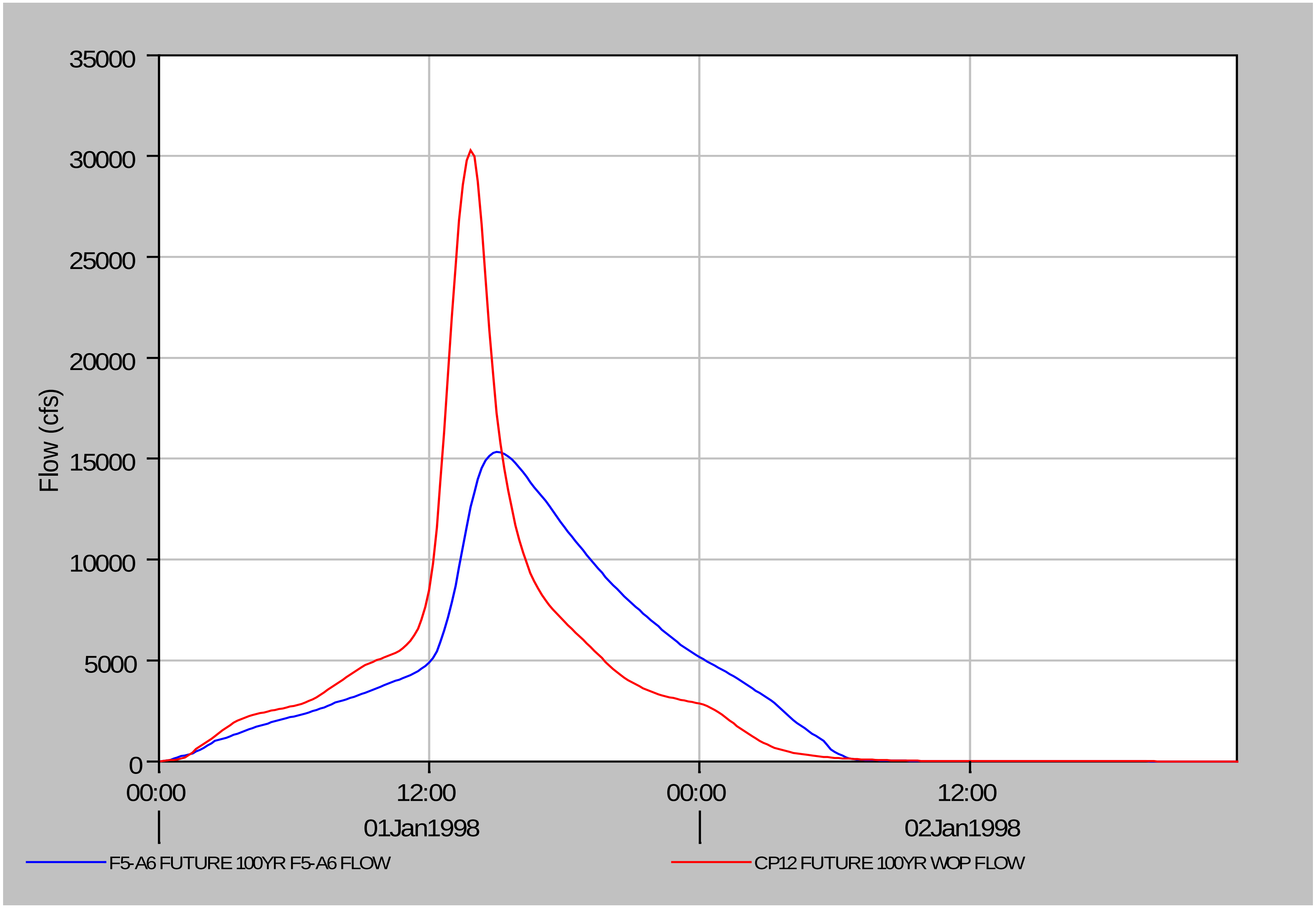

Figure B-6. Flow hydrograph Comparison for the With and With Out Project at the Detention Basin Location. Red Depicts With Out Project and Bue With.

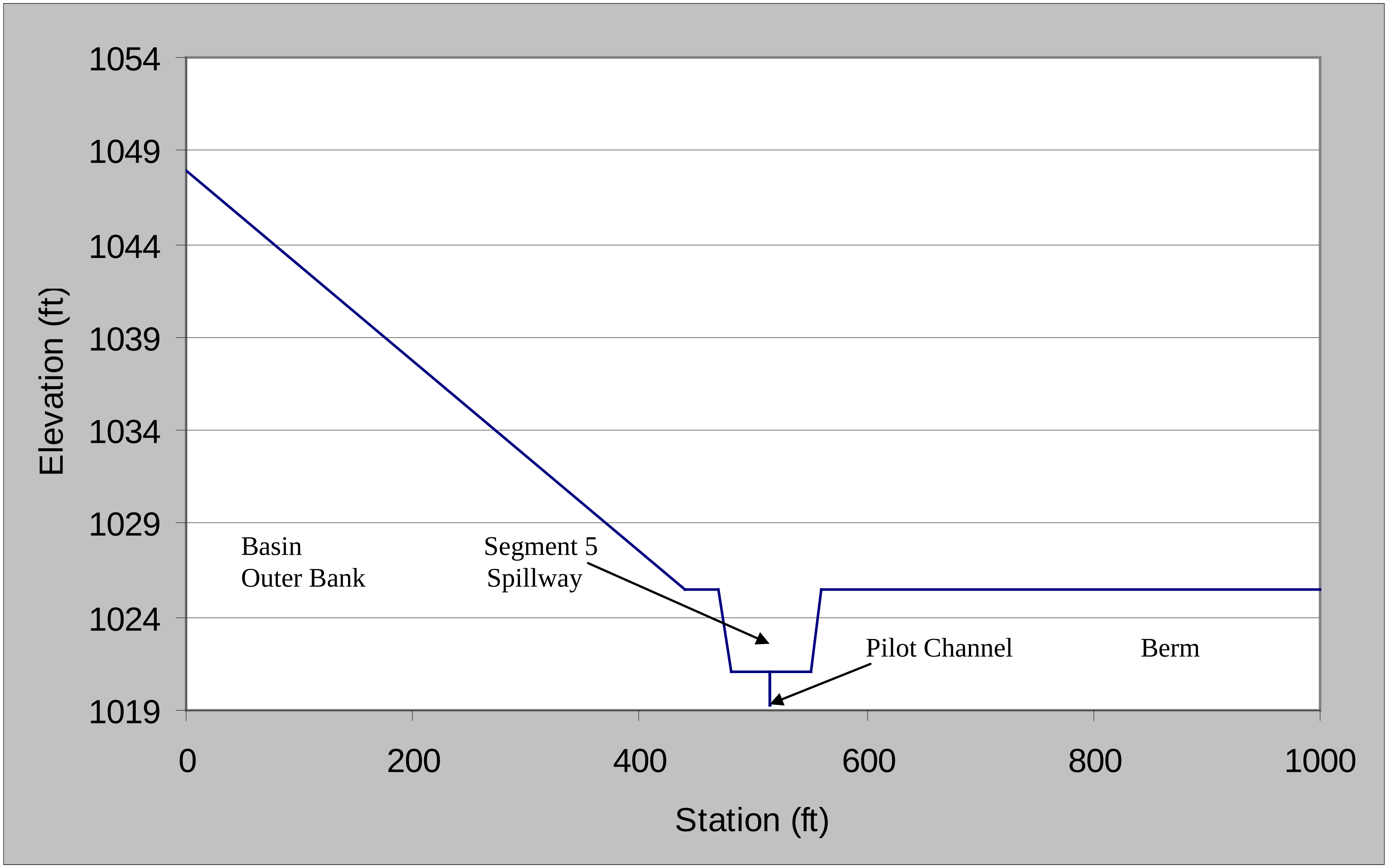

Figure B-7. HEC-6T Cross Section Profile for Station 248+00 Segment 5, MSR_4a.dat.

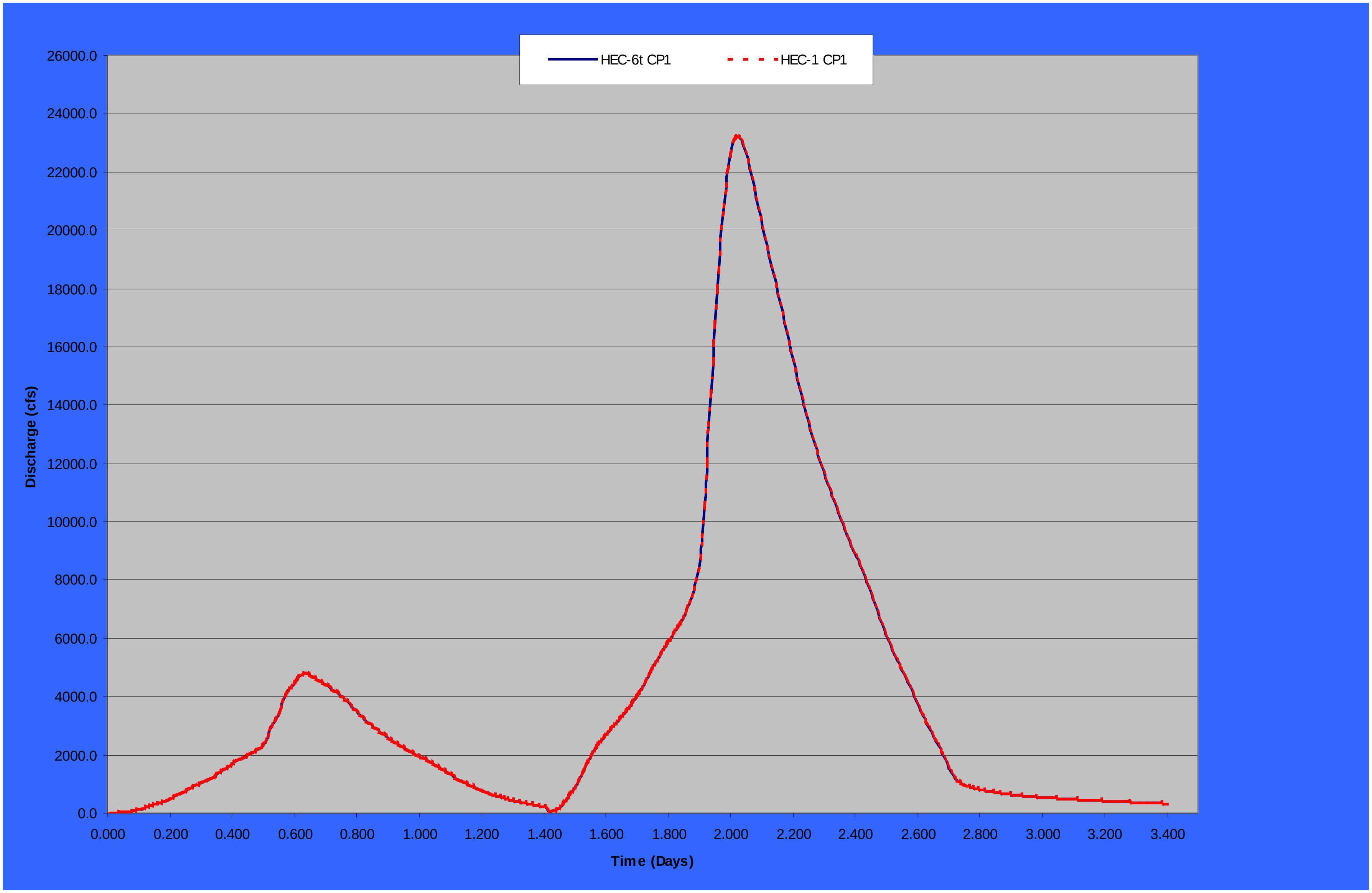

Figure B-8. Antecedent and Design Hydrograph at HEC-1 CP 1,Used in HEC-6T file msr_4d1.dat.

Appendix C

HEC-6T Output
msr_4c.dat

18:06:16.45   03/15/06

```
*************************************************************
*       SEDIMENTATION IN STREAM NETWORKS (HEC-6T)       *
*                   BY                    *
*              William A. Thomas                 *
*                                    *
*                                    *
*                                    *
* VERSION 5.13.20                February 05, 2003 *
* A MODIFICATION OF                              *
* VERSION 4.00.00                January 01, 1994 *
*                                    *
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* e-mail mbh2o@aol.com                           *
*************************************************************



*************************************************************
* Disclaimer:                                *
* This computer program was written for use by engineers    *
* and scientist who are competent in the field of Sedimen-  *
* tation Engineering.  It provides a framework for perform- *
* ing Sedimentation Computations.                   *
*                                    *
*                                    *
* This Program and Documentation are provided "AS IS," with-*
* out warranty of any kind, either express or implied.  All *
* warranties of any type respecting this program and/or the *
* documentation are hereby disclaimed by the author.       *
*                                    *
*                        William A. Thomas *
*************************************************************

THIS PROGRAM IS DIMENSIONED FOR:
MAXIMUM NUMBER OF CROSS SECTIONS              =  1200
MAXIMUM NUMBER OF CONTROL POINTS               =   51
MAXIMUM NUMBER OF SEGMENTS                 =   50
MAXIMUM NUMBER OF SEGMENTS JOINING A CONTROL POINT=     3
MAXIMUM NUMBER OF LOCAL INFLOW POINTS PER SEGMENT =    50
MAXIMUM NUMBER OF CROSS SECTION (STA,ELEV) POINTS =   600
MAXIMUM NUMBER OF DREDGING SITES              =  500
MAXIMUM NUMBER OF GRAIN SIZES               =   20

 MAHR Works
 Murrieta Creek Sedimentation Report
 2/15/06
 Michael Hrzic
 File: msr_4c.t5
 File Represents altered detention basin network:

      Plan: Sed Model 4
      MURRIETA CREEK SEDIMENTATION MODEL
      DEVELOPED BY MICHAEL HRZIC USACE-SPL-ED-HH
      Reach: Murrieta Creek,Reach 1 to 4
      Model Predecessor:msr_4a.t5
```

Model Notes:

Using 6 point DB method with local point diversion for seg 4 with
inflow/outflow point on segment 3, 1 point on segment 4 and 2 on segme
Revised detention basin geometry by removing overlapping area
and adjusting ineffective areas and HD records.
Added more inflow/outflow point on segment 8 and 1 to adjust flow.

Revised sediment transport capacity for segment 5 increased passing gr
Increased overflow into floodway

Revised Sediment Transort Rating Curves for tributary flows

TABLE GEO-1. GEOMETRIC MODEL FOR SEGMENT 1
T1 Murrietta Creek Project
T2 generated HEC6T export, creator hrzic
T3 River=Murrieta Creek,Reach=Reach One & Two

SEGMENT NUMBER = 1

*** CRITICAL DEPTH SECTION**

SECTION NO. 1 RIVER MILE= 2875.000

SECTION NO. 2 RIVER MILE= 3000.000

SECTION NO. 3 RIVER MILE= 3200.000

SECTION NO. 4 RIVER MILE= 3350.000

SECTION NO. 5 RIVER MILE= 3450.000

SECTION NO. 6 RIVER MILE= 3800.000

SECTION NO. 7 RIVER MILE= 3850.000

SECTION NO. 8 RIVER MILE= 4000.000

SECTION NO. 9 RIVER MILE= 4400.000
HE4400.

SECTION NO. 10 RIVER MILE= 4700.000
HE4700.

SECTION NO. 11 RIVER MILE= 4930.000

SECTION NO. 12 RIVER MILE= 5200.000

SECTION NO. 13 RIVER MILE= 5400.000

SECTION NO. 14 RIVER MILE= 5900.000

QT ADJ1A HYDROGRAPH ADJUSTMENT LOCATION

SEGMENT NO 1 LOCAL INFLOW POINT 1 OCCURS DOWNSTREAM FROM X-SECTION NO. 15
Q IS PRESCRIBED

SECTION NO. 15 RIVER MILE= 6000.000

SECTION NO. 16 RIVER MILE= 6545.000

SECTION NO. 17 RIVER MILE= 6800.000

BRIDGE SECTION 1ST STREET With Bridge, Piers and debris, deck not needed.

SECTION NO. 18 RIVER MILE= 6939.000
LEFT BANK
PIER
RIGHT BANK
...
…

…
…

SEGMENT 3 SECTION 19700.000 EVENT # 207 Q = 13.60 TRIAL # 2
SEVERE WARNING, MOVABLE BED, X(1) TO X(7) IS ABOVE WATER SURFACE
LIMITS ARE REDEFINED FROM X(1) TO X(7) RERUN IF ERROR PERSISTS.
WS= 1010.605 (X,Y) COORDINATES = 380.0 1048.00 480.0 1015.75
500.0 1009.30 672.4 1011.26 840.0 1011.26 900.0 1028.95
960.0 1048.60

SEGMENT 6 SECTION 24900.000 EVENT # 207 Q = 13.40 TRIAL # 1
SEVERE WARNING, MOVABLE BED, X(3) TO X(7) IS ABOVE WATER SURFACE
LIMITS ARE REDEFINED FROM X(1) TO X(10) RERUN IF ERROR PERSISTS.
WS= 1022.074 (X,Y) COORDINATES = 220.0 1023.85 1000.0 1028.30
1040.0 1023.85 1080.0 1023.85 1221.6 1023.85

SEGMENT 8 SECTION 44450.000 EVENT # 207 Q = 0.00 TRIAL # 1
SEVERE WARNING, MOVABLE BED, X(6) TO X(13) IS ABOVE WATER SURFACE
LIMITS ARE REDEFINED FROM X(1) TO X(19) RERUN IF ERROR PERSISTS.
WS= 1097.195 (X,Y) COORDINATES = 261.8 1097.30 261.8 1097.27
345.5 1097.27 366.0 1097.27 366.0 1121.00 370.0 1121.00
373.0 1121.00 373.0 1097.27
1

TABLE SA-1. Murrieta Creek
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 8
(Multiply by 1233.48 to get Cubic Meters)

****
*

TIME DAYS	ENTRY POINT	CLAY INFLOW	CLAY OUTFLOW	CLAY TRAP EFF	SILT INFLOW	SILT OUTFLOW	SILT TRAP EFF	SAND INFLOW	SAND OUTFLOW	SAND TRAP EFF
1.43	56030.000*	94.96		*	95.27		*	64.91		*
	47845.000*	21.68		*	21.08		*	13.68		*
	46710.000*	0.00		*	0.00		*	0.00		*
	42000.000*	94.71		*	103.53		*	57.88		*
	38000.000*	0.00		*	0.00		*	0.00		*
	34000.000*	0.00		*	0.00		*	0.00		*
	32200.000*	0.00		*	0.00		*	0.00		*
	25600.000*	0.00		*	0.00		*	0.00		*
TOTAL=	25400.000*	211.35	211.34	0.00*	219.88	219.88	0.00*	136.47	164.82	-0.21*

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*

TABLE SB-1. TOTAL: LOAD BY SIZE CLASS IN TONS/DAY
FINEST TO COARSEST PARTICLE SIZES
SEDIMENT INFLOW: CP= 8
CLAY= 0. 0.0

SILT= 0. 0.0 0.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 0.

SEDIMENT OUTFLOW:CP= 6
CLAY= 0. 0.0
SILT= 0. 0.0 0.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 0.

TABLE SB-2: SEGMENT 8 STATUS OF THE BED PROFILE AT TIME = 1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
56030.000	-1.67	1154.96	1154.94	0.	0.	0.	0.
55580.000	-0.48	1154.41	1154.38	0.	0.	0.	0.
54945.000	-0.89	1152.78	1152.76	0.	0.	0.	0.
54255.000	-2.14	1150.43	1150.40	0.	0.	0.	0.
53585.000	-0.58	1149.45	1149.42	0.	0.	0.	0.
52655.000	-1.10	1145.40	1145.38	0.	0.	0.	0.
51485.000	-0.21	1138.21	1138.19	0.	0.	0.	0.
50690.000	0.21	1133.27	1133.25	0.	0.	0.	0.
50100.000	-0.34	1128.10	1128.08	0.	0.	0.	0.
49160.000	-1.14	1119.86	1119.84	0.	0.	0.	0.
48630.000	-0.85	1117.02	1116.99	0.	0.	0.	0.
47845.000	0.02	1113.44	1113.41	0.	0.	0.	0.
47280.000	0.17	1110.29	1110.26	0.	0.	0.	0.
46710.000	-0.75	1106.62	1106.60	0.	0.	0.	0.
45890.000	-0.58	1103.17	1103.15	0.	0.	0.	0.
45050.000	0.39	1099.47	1099.44	0.	0.	0.	0.
44600.000	0.32	1098.20	1098.17	0.	0.	0.	0.
44450.000	0.04	1097.20	1097.17	0.	0.	0.	0.
44300.000	0.02	1096.16	1096.13	0.	0.	0.	0.
44000.000	-0.10	1094.50	1094.47	0.	0.	0.	0.
43600.000	-0.12	1092.40	1092.38	0.	0.	0.	0.
43200.000	-0.11	1090.48	1090.46	0.	0.	0.	0.
42800.000	0.01	1088.62	1088.60	0.	0.	0.	0.
42400.000	-0.09	1086.45	1086.43	0.	0.	0.	0.
42000.000	-1.02	1082.96	1082.94	0.	0.	0.	0.
41600.000	-1.15	1080.99	1080.97	0.	0.	0.	0.
41400.000	-1.00	1080.22	1080.20	0.	0.	0.	0.
41000.000	-0.65	1078.73	1078.70	0.	0.	0.	0.
40600.000	-0.32	1077.13	1077.10	0.	0.	0.	0.
40200.000	-0.36	1075.54	1075.52	0.	0.	0.	0.
39800.000	-0.29	1073.97	1073.95	0.	0.	0.	0.
39400.000	-0.31	1072.41	1072.38	0.	0.	0.	0.
39000.000	-0.28	1070.82	1070.79	0.	0.	0.	0.
38900.000	-0.27	1070.42	1070.40	0.	0.	0.	0.
38750.000	-0.37	1069.85	1069.83	0.	0.	0.	0.
38600.000	-0.26	1069.26	1069.23	0.	0.	0.	0.
38400.000	-0.23	1068.51	1068.49	0.	0.	0.	0.
38000.000	-0.19	1066.96	1066.94	0.	0.	0.	0.
37600.000	-0.16	1065.38	1065.36	0.	0.	0.	0.

37200.000	**-0.27**	**1063.67**	**1063.64**	**0.**	**0.**	**0.**	**0.**
36800.000	**-0.15**	**1062.15**	**1062.13**	**0.**	**0.**	**0.**	**0.**
36400.000	**-0.18**	**1060.57**	**1060.54**	**0.**	**0.**	**0.**	**0.**
36000.000	**-0.13**	**1059.03**	**1059.00**	**0.**	**0.**	**0.**	**0.**
35600.000	**-0.09**	**1057.46**	**1057.44**	**0.**	**0.**	**0.**	**0.**
35200.000	**-0.06**	**1055.91**	**1055.89**	**0.**	**0.**	**0.**	**0.**
34800.000	**0.03**	**1054.38**	**1054.35**	**0.**	**0.**	**0.**	**0.**
34400.000	**0.15**	**1052.97**	**1052.94**	**0.**	**0.**	**0.**	**0.**
34000.000	**0.34**	**1051.60**	**1051.57**	**0.**	**0.**	**0.**	**0.**
33600.000	**0.54**	**1050.26**	**1050.24**	**0.**	**0.**	**0.**	**0.**
33350.000	**0.34**	**1049.39**	**1049.36**	**0.**	**0.**	**0.**	**0.**
33200.000	**0.69**	**1048.84**	**1048.81**	**0.**	**0.**	**0.**	**0.**
33000.000	**0.79**	**1048.19**	**1048.17**	**0.**	**0.**	**0.**	**0.**
32600.000	**1.01**	**1046.86**	**1046.84**	**0.**	**0.**	**0.**	**0.**
32400.000	**1.00**	**1046.23**	**1046.21**	**0.**	**0.**	**0.**	**0.**
32200.000	**0.93**	**1045.47**	**1045.44**	**0.**	**0.**	**0.**	**0.**
32000.000	**0.70**	**1044.62**	**1044.60**	**0.**	**0.**	**0.**	**0.**
31800.000	**0.53**	**1043.88**	**1043.85**	**0.**	**0.**	**0.**	**0.**
31400.000	**0.56**	**1042.69**	**1042.66**	**0.**	**0.**	**0.**	**0.**
31200.000	**0.46**	**1041.93**	**1041.90**	**0.**	**0.**	**0.**	**0.**
30800.000	**0.32**	**1040.59**	**1040.56**	**0.**	**0.**	**0.**	**0.**
30600.000	**0.28**	**1039.95**	**1039.92**	**0.**	**0.**	**0.**	**0.**
30400.000	**0.28**	**1039.35**	**1039.33**	**0.**	**0.**	**0.**	**0.**
30000.000	**0.25**	**1038.14**	**1038.11**	**0.**	**0.**	**0.**	**0.**
29600.000	**0.26**	**1036.98**	**1036.95**	**0.**	**0.**	**0.**	**0.**
29200.000	**0.11**	**1035.69**	**1035.67**	**0.**	**0.**	**0.**	**0.**
29000.000	**-0.25**	**1034.73**	**1034.70**	**0.**	**0.**	**0.**	**0.**
28600.000	**-0.40**	**1033.45**	**1033.42**	**0.**	**0.**	**0.**	**0.**
28200.000	**-1.12**	**1031.45**	**1031.42**	**0.**	**0.**	**0.**	**0.**
27800.000	**-0.83**	**1030.74**	**1030.72**	**0.**	**0.**	**0.**	**0.**
27400.000	**-1.15**	**1029.29**	**1029.27**	**0.**	**0.**	**0.**	**0.**
27000.000	**-1.81**	**1027.47**	**1027.45**	**0.**	**0.**	**0.**	**0.**
26600.000	**-1.58**	**1026.02**	**1025.99**	**0.**	**0.**	**0.**	**0.**
26000.000	**3.37**	**1025.74**	**1025.71**	**0.**	**0.**	**0.**	**0.**
25600.000	**3.76**	**1025.04**	**1025.02**	**0.**	**0.**	**0.**	**0.**
25400.000	**2.49**	**1023.25**	**1023.22**	**1.**	**0.**	**0.**	**0.**

TABLE SB-3. NETWORK SEGMENT NO 8
Murrieta Creek
ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 8 LOCAL #1 LOCAL #2 LOCAL #3 LOCAL #4 LOCAL #5
LOCAL # 6 LOCAL # 7

2544.60 -78.9531 573.133 -197.292 -197.292 4249.88
-78.5335 1430.34

TABLE SA-1. Warm Springs Tributary
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 7
(Multiply by 1233.48 to get Cubic Meters)

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    TIME          ENTRY *          CLAY          *          SILT          *          SAND          *
    DAYS          POINT *    INFLOW   OUTFLOW  TRAP EFF*    INFLOW   OUTFLOW  TRAP EFF*
INFLOW   OUTFLOW  TRAP EFF*
    1.43          33.000*    93.40                *    101.12                *    88.89                *
                1.000*     0.00                *     0.00                *     0.00                *
      TOTAL=       0.500*    93.40    93.40     0.00*    101.12   100.76     0.00*    88.89    53.21     0.40*
                  *                  *                  *                  *

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TABLE SB-1.           TOTAL:    LOAD BY SIZE CLASS IN TONS/DAY
                    FINEST TO COARSEST PARTICLE SIZES
SEDIMENT INFLOW: CP= 7
        CLAY=       260.    259.8
        SILT=       610.    61.1     45.8    105.7   397.4
SAND AND/OR GRAVEL=       673.   473.8   152.8     16.1    15.3    15.3
                      0.0      0.0      0.0     0.0
            ------------
      TOTAL LOAD      1543.

SEDIMENT OUTFLOW:CP= 6
        CLAY=       248.    248.1
        SILT=        71.     50.4     19.9      0.7     0.0
SAND AND/OR GRAVEL=       150.   120.8    19.8      7.5     1.9     0.0
                      0.0      0.0      0.0     0.0
            ------------
      TOTAL LOAD      469.
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TABLE SB-2: SEGMENT 7 STATUS OF THE BED PROFILE AT TIME =   1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
33.000	-2.53	1067.91	1067.62	12.	260.	610.	176.
32.000	-0.59	1062.96	1062.79	12.	260.	610.	102.
31.000	-0.84	1057.01	1056.79	12.	260.	610.	95.
30.000	-0.46	1049.89	1049.79	12.	260.	610.	207.
29.000	-0.41	1046.72	1046.17	12.	260.	610.	180.
22.000	-0.08	1044.08	1043.93	12.	260.	610.	187.
20.000	0.24	1043.06	1042.70	12.	260.	610.	125.
19.000	0.20	1041.05	1040.70	12.	260.	610.	267.
18.000	1.24	1038.50	1037.71	12.	260.	610.	223.
17.000	0.00	1036.68	1036.50	12.	260.	610.	220.
14.000	0.00	1034.56	1034.40	12.	260.	610.	219.
11.000	0.00	1031.00	1030.80	12.	260.	610.	222.
10.000	0.02	1028.19	1027.47	12.	260.	610.	184.
9.000	0.41	1026.82	1026.50	12.	260.	610.	136.
8.000	0.84	1025.49	1024.78	12.	260.	610.	221.
4.000	0.61	1024.90	1024.16	12.	260.	610.	284.
3.000	2.82	1023.38	1022.22	12.	260.	610.	129.
2.000	1.39	1023.20	1021.59	12.	258.	207.	3.
1.000	1.82	1023.18	1021.09	12.	256.	127.	0.
0.510	5.46	1023.18	1019.40	13.	248.	71.	0.
0.500	3.54	1023.17	1023.07	13.	248.	71.	150.

TABLE SB-3. NETWORK SEGMENT NO 7
Warm Springs Tributary
ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 7 LOCAL #1

5608.90 -78.9531

TABLE SA-1. Murrieta Creek
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 6
(Multiply by 1233.48 to get Cubic Meters)

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TIME DAYS	ENTRY POINT *	CLAY INFLOW	CLAY OUTFLOW	CLAY TRAP EFF*	SILT INFLOW	SILT OUTFLOW	SILT TRAP EFF*	SAND INFLOW	SAND OUTFLOW	SAND TRAP EFF*
1.43	25000.000*	304.74		*	320.63		*	218.03		*
TOTAL=	24900.000*	304.74	304.73	0.00*	320.63	320.56	0.00*	218.03	205.66	0.06*

****

TABLE SB-1. TOTAL: LOAD BY SIZE CLASS IN TONS/DAY
FINEST TO COARSEST PARTICLE SIZES

SEDIMENT INFLOW: CP= 6
CLAY= 248. 248.1
SILT= 71. 50.4 19.9 0.7 0.0
SAND AND/OR GRAVEL= 150. 120.8 19.8 7.5 1.9 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 469.

SEDIMENT OUTFLOW:CP= 5
CLAY= 213. 212.7
SILT= 25. 23.7 1.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 237.

TABLE SB-2: SEGMENT 6 STATUS OF THE BED PROFILE AT TIME = 1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
25000.000	3.49	1023.17	1023.08	13.	248.	71.	490.
24900.000	3.15	1022.07	1019.20	13.	213.	25.	0.

TABLE SB-3. NETWORK SEGMENT NO 6
Murrieta Creek

ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 5

13775.8

TABLE SA-1. Murrieta Creek
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 5
(Multiply by 1233.48 to get Cubic Meters)

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TIME DAYS	ENTRY POINT	CLAY INFLOW	CLAY OUTFLOW	CLAY TRAP EFF	SILT INFLOW	SILT OUTFLOW	SILT TRAP EFF	SAND INFLOW	SAND OUTFLOW	SAND TRAP EFF
1.43	24800.000*	97.16		*	102.76		*	53.02		*
	23600.000*	0.00		*	0.00		*	0.00		*
	21600.000*	0.00		*	0.00		*	0.00		*
TOTAL=	20200.000*	97.16	95.50	0.02*	102.76	35.75	0.65*	53.02	0.00	1.00*

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TABLE SB-1. TOTAL: LOAD BY SIZE CLASS IN TONS/DAY
FINEST TO COARSEST PARTICLE SIZES

SEDIMENT INFLOW: CP= 5
CLAY= 213. 212.7
SILT= 25. 23.7 1.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 237.

SEDIMENT OUTFLOW:CP= 4
CLAY= 57. 56.8
SILT= 0. 0.0 0.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 57.

TABLE SB-2: SEGMENT 5 STATUS OF THE BED PROFILE AT TIME = 1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
24800.000	-0.15	1022.07	1019.30	13.	212.	25.	0.
24760.000	0.00	1022.07	1019.30	13.	212.	24.	0.
24700.000	0.00	1022.07	1019.22	13.	175.	9.	0.
24200.000	3.67	1022.06	1021.89	13.	175.	9.	10.
23600.000	1.65	1019.12	1018.78	13.	175.	9.	12.
23000.000	1.32	1017.42	1017.20	13.	162.	6.	147.

22600.000	1.02	1016.64	1016.11	13.	122.	0.	5.
22200.000	0.74	1015.17	1014.96	13.	122.	0.	204.
22000.000	0.39	1014.13	1013.99	13.	91.	0.	1.
21600.000	0.28	1013.63	1013.58	13.	91.	0.	0.
21000.000	0.23	1012.82	1012.73	13.	91.	0.	0.
20600.000	0.26	1011.72	1011.53	13.	75.	0.	7.
20200.000	0.17	1010.61	1010.17	13.	57.	0.	0.

TABLE SB-3. NETWORK SEGMENT NO 5
Murrieta Creek
ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 5 LOCAL #1 LOCAL #2

5611.72 -24.3989 -24.3989

TABLE SA-1. Murrieta Creek
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 4
(Multiply by 1233.48 to get Cubic Meters)

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TIME DAYS		ENTRY POINT *	CLAY INFLOW	OUTFLOW	TRAP EFF*	SILT INFLOW	OUTFLOW	TRAP EFF*	SAND INFLOW	OUTFLOW	TRAP EFF*
1.43		24800.000*	207.57		*	217.80		*	152.64		*
		23600.000*	0.00		*	0.00		*	0.00		*
	TOTAL=	20200.000*	207.57	207.49	0.00*	217.80	205.36	0.06*	152.64	17.15	0.89*

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TABLE SB-1. TOTAL: LOAD BY SIZE CLASS IN TONS/DAY
FINEST TO COARSEST PARTICLE SIZES

SEDIMENT INFLOW: CP= 5
CLAY= 0. 0.0
SILT= 0. 0.0 0.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 0.

SEDIMENT OUTFLOW:CP= 4
CLAY= 0. 0.0
SILT= 0. 0.0 0.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 0.

TABLE SB-2: SEGMENT 4 STATUS OF THE BED PROFILE AT TIME =   1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
24800.000	4.28	1022.07	1023.58	0.	0.	0.	0.
24200.000	4.05	1022.07	1022.05	0.	0.	0.	0.
23600.000	3.44	1020.37	1020.34	0.	0.	0.	0.
23000.000	4.19	1019.97	1019.89	0.	0.	0.	0.
22600.000	3.44	1018.41	1018.34	0.	0.	0.	0.
22200.000	4.21	1018.29	1018.21	0.	0.	0.	0.
22000.000	4.21	1017.89	1017.81	0.	0.	0.	0.
21600.000	3.94	1017.32	1017.24	0.	0.	0.	0.
21000.000	3.15	1015.72	1015.65	0.	0.	0.	0.
20600.000	2.83	1014.20	1014.13	0.	0.	0.	0.
20200.000	2.02	1012.06	1012.02	0.	0.	0.	0.

TABLE SB-3. NETWORK SEGMENT NO   4
Murrieta Creek
ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 4 LOCAL #1

8164.04   -29.5291

TABLE SA-1.   Murrieta Creek
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 3
(Multiply by 1233.48 to get Cubic Meters)

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             *               *               *               *
  TIME       ENTRY *      CLAY        *       SILT       *       SAND        *
  DAYS       POINT *  INFLOW  OUTFLOW  TRAP EFF*  INFLOW  OUTFLOW  TRAP EFF*
INFLOW  OUTFLOW  TRAP EFF*
  1.43     19700.000*  302.98          *  241.10           *  17.15           *
          19500.000*   0.00          *   0.00           *   0.00           *
    TOTAL=  18900.000*  302.98  302.90   0.00*  241.10  234.23   0.03*  17.15  17.37  -0.01*
             *               *               *               *

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TABLE SB-1.   TOTAL: LOAD BY SIZE CLASS IN TONS/DAY
FINEST TO COARSEST PARTICLE SIZES
SEDIMENT INFLOW: CP= 4
CLAY=   57.   56.8
SILT=   0.   0.0   0.0   0.0   0.0
SAND AND/OR GRAVEL=   0.   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0

TOTAL LOAD   57.

SEDIMENT OUTFLOW:CP= 2

CLAY= 45. 44.6
SILT= 0. 0.0 0.0 0.0 0.0
SAND AND/OR GRAVEL= 0. 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

TOTAL LOAD 45.

TABLE SB-2: SEGMENT 3 STATUS OF THE BED PROFILE AT TIME = 1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
19700.000	1.33	1010.61	1009.30	14.	56.	0.	0.
19500.000	1.48	1010.57	1010.40	14.	49.	0.	0.
19400.000	1.56	1010.39	1010.25	14.	49.	0.	225.
19301.000	-0.48	1010.16	1007.99	14.	49.	0.	0.
19300.000	-0.55	1010.16	1007.76	14.	49.	0.	0.
19200.000	-0.42	1010.16	1007.26	14.	47.	0.	0.
18900.000	-3.45	1010.16	1003.15	14.	45.	0.	0.

TABLE SB-3. NETWORK SEGMENT NO 3
Murrieta Creek
ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 3 LOCAL #1

13697.4 -59.0581

TABLE SA-1. Santa Gertrudis Tributary
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 2
(Multiply by 1233.48 to get Cubic Meters)

****

TIME DAYS	ENTRY POINT	CLAY INFLOW	CLAY OUTFLOW	CLAY TRAP EFF	SILT INFLOW	SILT OUTFLOW	SILT TRAP EFF	SAND INFLOW	SAND OUTFLOW	SAND TRAP EFF
1.43	133.200*	95.82		*	94.55		*	186.33		*
TOTAL=	5.000*	95.82	95.81	0.00*	94.55	94.51	0.00*	186.33	170.53	0.08*

****

TABLE SB-1. TOTAL: LOAD BY SIZE CLASS IN TONS/DAY
FINEST TO COARSEST PARTICLE SIZES
SEDIMENT INFLOW: CP= 3
CLAY= 12069. 12069.0
SILT= 25994. 2039.7 3059.5 6965.1 13930.1
SAND AND/OR GRAVEL= 61728. 36207.0 17648.3 3418.1 2278.7 2176.3
0.0 0.0 0.0 0.0

TOTAL LOAD 99792.

SEDIMENT OUTFLOW:CP= 2
CLAY= 12069. 12069.0
SILT= 25994. 2039.7 3059.5 6965.1 13930.1
SAND AND/OR GRAVEL= 55125. 32959.7 12846.8 4547.6 2871.2 1851.8
14.4 13.0 11.6 9.3

TOTAL LOAD 93189.

TABLE SB-2: SEGMENT 2 STATUS OF THE BED PROFILE AT TIME = 1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
133.200	-0.05	1076.74	1073.84	697.	12069.	25994.	62365.
129.200	-1.01	1075.51	1072.53	697.	12069.	25994.	61844.
125.200	0.39	1073.90	1071.92	697.	12069.	25994.	64720.
121.200	0.84	1072.20	1070.32	697.	12069.	25994.	64909.
117.200	-1.57	1070.52	1067.35	697.	12069.	25994.	66783.
113.200	-1.37	1068.85	1065.28	697.	12069.	25994.	67901.
109.200	-1.30	1066.99	1064.19	697.	12069.	25994.	70625.
105.200	-0.24	1064.62	1062.35	697.	12069.	25994.	75445.
101.200	0.70	1062.35	1060.00	697.	12069.	25994.	70778.
97.200	-0.20	1060.37	1056.68	697.	12069.	25994.	70844.
93.200	-0.33	1059.01	1055.89	697.	12069.	25994.	68243.
90.700	-1.35	1058.12	1056.75	697.	12069.	25994.	68726.
89.400	-1.42	1057.79	1054.04	697.	12069.	25994.	65539.
84.600	-2.32	1056.28	1052.39	697.	12069.	25994.	64180.
80.600	-1.29	1054.91	1051.68	697.	12069.	25994.	63339.
76.600	1.82	1053.33	1050.00	697.	12069.	25994.	62886.
72.600	0.97	1051.88	1049.50	697.	12069.	25994.	61164.
68.600	0.12	1050.36	1048.41	697.	12069.	25994.	61418.
64.600	-0.26	1048.84	1046.53	697.	12069.	25994.	60281.
60.600	-0.54	1047.26	1044.68	697.	12069.	25994.	61638.
56.600	-0.85	1045.78	1042.85	697.	12069.	25994.	60340.
55.000	-0.43	1044.29	1041.42	697.	12069.	25994.	61189.
52.600	-0.74	1043.47	1040.16	697.	12069.	25994.	62548.
51.500	-0.75	1043.25	1040.17	697.	12069.	25994.	61083.
48.600	-1.28	1042.25	1039.50	697.	12069.	25994.	60945.
42.200	-0.42	1040.82	1039.52	697.	12069.	25994.	60175.
40.100	0.00	1040.27	1039.40	697.	12069.	25994.	59961.
39.600	0.00	1032.00	1031.00	697.	12069.	25994.	59964.
35.800	0.00	1029.16	1027.50	697.	12069.	25994.	59975.
32.000	0.00	1027.95	1026.30	697.	12069.	25994.	59992.
28.000	0.00	1023.55	1021.70	697.	12069.	25994.	60018.
24.000	0.14	1022.01	1019.78	697.	12069.	25994.	59558.
22.000	0.81	1021.47	1019.60	697.	12069.	25994.	62261.
18.000	1.74	1020.40	1018.64	697.	12069.	25994.	61361.
16.000	2.49	1020.01	1018.22	697.	12069.	25994.	57318.
10.000	3.81	1018.84	1017.05	697.	12069.	25994.	55387.
5.000	3.97	1017.85	1016.04	697.	12069.	25994.	55125.

TABLE SB-3. NETWORK SEGMENT NO 2
Santa Gertrudis Tributary
ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 2

7067.58

TABLE SA-1. Murrietta Creek Project
ACCUMULATED ACRE-FEET ENTERING AND LEAVING SEGMENT # 1
(Multiply by 1233.48 to get Cubic Meters)

```
*****************************************************************************************************************************
*
               *                 *                 *                 *
  TIME        ENTRY *        CLAY         *        SILT        *        SAND        *
  DAYS        POINT *   INFLOW   OUTFLOW  TRAP EFF*   INFLOW   OUTFLOW  TRAP EFF*
INFLOW   OUTFLOW  TRAP EFF*
  1.43      18800.000*   398.71            *   328.74            *   187.90            *
            17900.000*     0.00            *     0.00            *     0.00            *
            13400.000*     4.48            *     4.48            *     6.43            *
             9600.000*     0.00            *     0.00            *     0.00            *
             6000.000*     0.00            *     0.00            *     0.00            *
     TOTAL=   2875.000*   403.19   403.18    0.00*   333.22   333.22    0.00*   194.33   147.29    0.24*
               *                 *                 *                 *

*****************************************************************************************************************************
*
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TABLE SB-1.          TOTAL:    LOAD BY SIZE CLASS IN TONS/DAY
                   FINEST TO COARSEST PARTICLE SIZES
SEDIMENT INFLOW: CP= 2
        CLAY=     12114.   12113.6
        SILT=    25994.   2039.7   3059.5   6965.1  13930.1
SANDS AND/OR GRAVEL=    55125.  32959.7  12846.8   4547.6   2871.2   1851.8
                      14.4     13.0     11.6     9.3
            ------------
     TOTAL LOAD     93233.

SEDIMENT OUTFLOW:CP= 1
        CLAY=     12114.   12113.6
        SILT=    25995.   2039.7   3059.5   6965.1  13930.2
SAND AND/OR GRAVEL=     5757.   5169.1    533.2     28.7     15.6     8.5
                       1.5      0.5      0.0      0.0
            ------------
     TOTAL LOAD     43865.
```

TABLE SB-2: SEGMENT 1 STATUS OF THE BED PROFILE AT TIME = 1.42830 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
18800.000	0.51	1010.00	1008.37	711.	12114.	25994.	54678.
18698.000	0.74	1009.52	1008.45	711.	12114.	25994.	54654.
18600.000	0.21	1009.11	1007.38	711.	12114.	25994.	50879.
18300.000	0.06	1008.27	1006.54	711.	12114.	25994.	43323.
18000.000	-0.80	1007.58	1005.72	711.	12114.	25994.	37807.
17900.000	0.15	1007.39	1005.72	711.	12114.	25994.	33930.

17500.000	0.08	1006.32	1004.84	673.	12114.	25994.	34231.
17000.000	-0.16	1005.20	1003.52	673.	12114.	25994.	28753.
16500.000	-0.05	1004.24	1002.62	673.	12114.	25994.	24250.
16000.000	-0.10	1003.26	1001.56	673.	12114.	25994.	24009.
15500.000	-0.03	1002.24	1000.62	673.	12114.	25994.	22833.
15000.000	-0.08	1001.21	999.57	673.	12114.	25994.	22007.
14400.000	-0.09	1000.01	998.35	673.	12114.	25994.	21718.
13900.000	-0.12	998.82	997.31	673.	12114.	25994.	21770.
13400.000	-0.55	997.88	995.80	673.	12114.	25994.	21453.
13200.000	0.00	997.06	996.01	673.	12114.	25994.	21105.
12800.000	-0.95	995.98	994.09	673.	12114.	25994.	18432.
12400.000	-0.63	995.18	993.66	673.	12114.	25994.	20427.
11900.000	-0.75	993.90	992.39	673.	12114.	25994.	19157.
11400.000	-0.67	992.78	991.21	673.	12114.	25994.	18221.
11350.000	-0.62	992.65	991.18	673.	12114.	25994.	18098.
11300.000	0.99	992.56	990.87	673.	12114.	25994.	17252.
10900.000	1.03	991.39	990.07	673.	12114.	25994.	20831.
10807.000	0.82	991.11	989.67	673.	12114.	25994.	21768.
10700.000	0.85	990.72	989.29	673.	12114.	25994.	22945.
10300.000	0.07	989.55	987.67	673.	12114.	25994.	21470.
9900.000	0.04	988.64	986.80	673.	12114.	25994.	19283.
9600.000	-0.04	988.03	986.10	673.	12114.	25994.	18106.
9500.000	-0.32	987.83	985.61	701.	12114.	25994.	16947.
9100.000	-0.43	987.24	984.67	701.	12114.	25994.	13864.
8700.000	-0.16	986.78	984.18	701.	12114.	25994.	10514.
8300.000	-0.05	986.43	983.50	701.	12114.	25994.	7796.
8200.000	0.09	986.35	983.50	701.	12114.	25994.	7182.
8100.000	-0.05	986.28	983.19	701.	12114.	25994.	6513.
8007.000	1.07	986.19	984.08	701.	12114.	25994.	6633.
7900.000	0.55	986.11	983.55	701.	12114.	25994.	5306.
7500.000	0.65	985.91	983.05	701.	12114.	25994.	2277.
7100.000	0.53	985.80	982.30	701.	12114.	25994.	496.
6939.000	-2.09	985.80	978.36	701.	12114.	25994.	231.
6800.000	-0.96	985.80	980.24	701.	12114.	25994.	182.
6545.000	3.05	985.47	984.46	701.	12114.	25994.	5068.
6000.000	1.97	985.11	982.37	701.	12114.	25994.	1979.
5900.000	3.16	984.90	983.56	728.	12114.	25994.	3093.
5400.000	2.36	984.15	981.88	728.	12114.	25995.	4756.
5200.000	2.69	983.66	981.90	728.	12114.	25995.	6393.
4930.000	2.71	983.27	981.32	728.	12114.	25995.	8062.
4700.000	3.00	982.69	981.28	728.	12114.	25995.	12553.
4400.000	2.58	981.75	980.22	728.	12114.	25995.	14528.
4000.000	1.62	980.61	978.70	728.	12114.	25995.	15183.
3850.000	0.89	980.17	977.70	728.	12114.	25995.	14157.
3800.000	-0.05	979.25	976.46	728.	12114.	25995.	14379.
3450.000	0.16	978.31	976.15	728.	12114.	25995.	15105.
3350.000	-4.97	978.37	969.49	728.	12114.	25995.	6898.
3200.000	-2.87	978.28	970.90	728.	12114.	25995.	5742.
3000.000	-1.97	978.12	972.46	728.	12114.	25995.	5757.
2875.000	-0.30	976.73	974.05	728.	12114.	25995.	5757.

TABLE SB-3. NETWORK SEGMENT NO 1
Murrietta Creek Project
ACCUMULATED INFLOWING WATER DISCHARGE FROM DAY ZERO (ACRE FEET)

SEGMENT # 1 LOCAL #1 LOCAL #2 LOCAL #3 LOCAL #4

```
 20706.0      288.149      288.153      1965.37     -783.331

EVENT DURATION(DAYS) = 0.6900E-02
RESIDENT TIME BY SEGMENT.
 SEGMENT
 NUMBER  TIME(DAYS)

    8    0.3384E+05
    7    0.1662
    6    0.7694E-02
    5    0.7020
    4     1202.
    3    0.2719
    2    0.2405E-01
    1    0.8297E-01

$PLOTP      8,9
  8.  WATER SURFACE ELEVATION
  9.  BED SURFACE ELEVATION

EXCESSIVE DEPOSITS (IE END AREA EXCEEDED FLOW AREA IN      7  EVENTS.
     CROSS SECTION       PERCENT      WATER DISCHARGE RANGE
    SEQUENCE   RIVER     OF TIME      Q MAX      Q MIN
     NUMBER     MILE
SEGMENT   3   Murrieta Creek
        3    19300.000     0.483      30.00      30.00
SEGMENT   5 Murrieta Creek
       13    24800.000     0.483     127.96    127.96
SEGMENT   6 Murrieta Creek
        1    24900.000     0.483   11996.80  11996.80
        2    25000.000     0.966   11996.80   7666.80
SEGMENT   8 Murrieta Creek
        1    25400.000     0.966    7132.60   4545.20

WARNING: SILT+CLAY CONCENTRATIONS IN EXCESS OF    48535. MGL
       WERE DETECTED     4628  TIMES IN SUBROUTINE SRMOD5.

       MUDFLOW CONCENTRATIONS (SILT+CLAY IN EXCESS OF  1325000. MGL
       WERE DETECTED        6  TIMES.

WARNING.. EXCESSIVE RESIDUALS IN BED SEDIMENT RESERVOIR
SEGMENT  NO. OF      % WITH         MAX.
       X-SECs     RESIDUAL      RESIDUAL
       On SEG   DEPTH > 0.1      DEPTH
    8      75         26.67          1.63

READING INPUT DATA FROM file_name       = MSR_4C.T5
PRINTOUT WRITTEN TO file_name          = MSR_4C.T6
PLOT FILE WRITTEN TO file_name         = MSR_4C.T98

    0 FATAL DATA ERRORS DETECTED.
  144 NON-FATAL ERRORS/WARNINGS DETECTED.
  230 INFORMATION MESSAGES DETECTED.


TOTAL NO. OF EVENTS READ=     207
TOTAL NO. OF WS PROFILES=     207
ITERATIONS IN EXNER EQ  = 2297700
```

END OF JOB
18:06:29.96   03/15/06

WRITE END OF RUN GEOMETRY DATA SET TO file_name = MSR_4C.T12
DO NOT ADD SEDIMENT DATA SET   (OPTION = OFF)
DO NOT ADD HYDROLOGIC DATA SET (OPTION = OFF)

Exhibit B

TABLE SB-2: SEGMENT 1 STATUS OF THE BED PROFILE AT TIME = 0.62790 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
18800.000	0.01	1021.93	1007.48	20727.	462210.	1007024.	602844.
18698.000	0.02	1021.61	1007.13	20727.	462210.	1007024.	602722.
18600.000	-0.57	1021.39	1006.14	20727.	462210.	1007024.	602274.
18300.000	-0.74	1020.77	1005.32	20727.	462210.	1007024.	601744.
18000.000	-1.35	1020.03	1004.79	20727.	462210.	1007024.	601686.
17900.000	-0.03	1019.90	1005.48	20727.	462210.	1007024.	601594.
17500.000	-0.04	1019.08	1004.67	21251.	462210.	1007024.	603285.
17000.000	-0.73	1018.19	1002.76	21251.	462210.	1007024.	638202.
16500.000	-0.30	1017.28	1002.30	21251.	462210.	1007024.	642686.
16000.000	-0.24	1016.36	1001.37	21251.	462210.	1007024.	646609.
15500.000	-0.17	1015.44	1000.45	21251.	462210.	1007024.	649830.
15000.000	-0.10	1014.52	999.54	21251.	462210.	1007024.	653539.
14400.000	-0.03	1013.43	998.42	21251.	462210.	1007024.	658179.
13900.000	0.00	1012.53	997.46	21251.	462210.	1007024.	666967.
13400.000	-0.14	1011.54	996.28	21251.	462210.	1007024.	674317.
13200.000	0.23	1010.98	996.32	22515.	463963.	1010893.	678156.
12800.000	-0.80	1010.29	994.25	22515.	463963.	1010892.	675442.
12400.000	-0.48	1009.59	993.84	22515.	463963.	1010892.	671195.
11900.000	-0.69	1008.77	992.45	22515.	463963.	1010892.	658780.
11400.000	-0.58	1008.00	991.32	22515.	463963.	1010892.	647240.
11350.000	-0.55	1007.92	991.29	22515.	463963.	1010892.	646349.
11300.000	0.97	1007.90	990.81	22515.	463963.	1010892.	619899.
10900.000	0.81	1007.45	989.94	22515.	463963.	1010892.	609691.
10807.000	-0.46	1007.19	988.26	22515.	463963.	1010892.	611892.
10700.000	0.22	1007.05	988.63	22515.	463963.	1010892.	607534.
10300.000	-2.02	1006.29	985.07	22515.	463963.	1010892.	624060.
9900.000	-0.43	1005.45	986.21	22515.	463963.	1010892.	624574.
9600.000	-2.98	1005.15	982.50	22515.	463963.	1010892.	625018.
9500.000	-0.13	1004.36	985.80	22797.	463963.	1010892.	625193.
9100.000	-1.06	1003.72	983.94	22797.	463963.	1010892.	625556.
8700.000	-1.43	1003.14	982.73	22797.	463963.	1010892.	637205.
8300.000	-0.36	1002.37	983.13	22797.	463963.	1010892.	637190.
8200.000	-0.87	1002.24	982.39	22797.	463963.	1010892.	637121.
8100.000	-0.52	1002.01	982.63	22797.	463963.	1010892.	641713.
8007.000	0.38	1001.83	983.39	22797.	463963.	1010892.	643488.
7900.000	-0.35	1001.83	982.59	22797.	463963.	1010892.	654100.
7500.000	-2.46	1001.37	979.74	22797.	463963.	1010892.	668693.
7100.000	-0.18	1000.46	981.55	22797.	463963.	1010892.	668766.
6939.000	-4.29	1000.50	975.16	22797.	463963.	1010892.	669230.
6800.000	-2.01	1000.02	979.12	22797.	463963.	1010892.	678361.
6545.000	3.10	999.94	984.56	22797.	463963.	1010892.	664316.
6000.000	2.10	999.28	982.52	22797.	463963.	1010892.	640388.
5900.000	4.70	998.85	985.40	23080.	463963.	1010892.	675499.
5400.000	2.42	998.20	981.94	23080.	463963.	1010892.	632133.
5200.000	3.06	997.60	982.34	23080.	463963.	1010892.	607233.
4930.000	2.53	997.30	981.14	23080.	463963.	1010892.	575112.
4700.000	2.55	997.06	980.83	23080.	463963.	1010892.	532423.
4400.000	1.66	996.79	979.32	23080.	463963.	1010892.	480968.
4000.000	-0.46	996.40	976.27	23080.	463963.	1010892.	472318.
3850.000	-1.29	996.16	975.01	23080.	463963.	1010892.	483889.
3800.000	-1.13	995.54	975.13	23080.	463963.	1010892.	508596.
3450.000	-0.87	995.03	974.91	23080.	463963.	1010892.	519085.
3350.000	-6.92	994.75	967.15	23080.	463963.	1010892.	518798.
3200.000	-4.77	993.65	968.89	23080.	463963.	1010892.	518918.
3000.000	-1.01	993.21	973.75	23080.	463963.	1010892.	518746.
2875.000	-0.27	988.62	974.07	23080.	463963.	1010892.	513225.

Alt 1

Run: April 08

TABLE SB-2: SEGMENT 1 STATUS OF THE BED PROFILE AT TIME = 0.63480 DAYS

SECTION ID NO	AVG BED CHANGE	WS ELEV FEET	THALWEG FEET	Q CFS	SEDIMENT LOAD IN TONS/DAY CLAY	SILT	SAND
18800.000	0.01	1021.80	1007.48	20545.	433543.	824982.	595333.
18698.000	0.02	1021.48	1007.13	20545.	433542.	824982.	595016.
18600.000	-1.14	1021.33	1005.43	20545.	433542.	824983.	594039.
18300.000	-0.41	1020.62	1005.73	20545.	433542.	824983.	593187.
18000.000	-1.82	1019.99	1004.20	20545.	433542.	824983.	592221.
17900.000	0.00	1019.83	1005.52	20545.	433542.	824983.	589792.
17500.000	0.01	1019.00	1004.73	21050.	433542.	824983.	582133.
17000.000	-0.72	1018.11	1002.78	21050.	433542.	824983.	605829.
16500.000	-0.27	1017.20	1002.33	21050.	433542.	824983.	605258.
16000.000	-0.22	1016.28	1001.39	21050.	433542.	824983.	606431.
15500.000	-0.15	1015.36	1000.48	21050.	433542.	824983.	608396.
15000.000	-0.09	1014.44	999.55	21050.	433542.	824983.	610847.
14400.000	-0.01	1013.34	998.45	21050.	433542.	824983.	613814.
13900.000	0.01	1012.43	997.47	21050.	433542.	824983.	621241.
13400.000	-0.23	1011.47	996.18	21050.	433542.	824983.	636890.
13200.000	0.45	1010.87	996.60	22161.	434848.	827869.	634878.
12800.000	-0.93	1010.21	994.10	22161.	434848.	827869.	628790.
12400.000	-0.41	1009.51	993.94	22161.	434848.	827869.	620477.
11900.000	-0.55	1008.68	992.66	22161.	434848.	827869.	608662.
11400.000	-0.51	1007.90	991.38	22161.	434848.	827869.	598869.
11350.000	-0.37	1007.81	991.42	22161.	434848.	827869.	596532.
11300.000	1.04	1007.79	990.97	22161.	434848.	827869.	575933.
10900.000	0.93	1007.33	990.03	22161.	434848.	827869.	562393.
10807.000	-0.40	1007.09	988.32	22161.	434848.	827869.	561665.
10700.000	0.10	1006.96	988.48	22161.	434848.	827869.	555850.
10300.000	-0.70	1006.01	986.67	22161.	434848.	827869.	567215.
9900.000	-1.32	1005.34	985.14	22161.	434848.	827869.	566148.
9600.000	-0.97	1004.81	984.95	22161.	434848.	827869.	565911.
9500.000	-0.28	1004.17	985.63	22531.	434848.	827869.	571222.
9100.000	-1.65	1003.63	983.27	22531.	434848.	827869.	570953.
8700.000	-1.28	1003.01	982.90	22531.	434848.	827869.	579593.
8300.000	-0.29	1002.23	983.21	22531.	434848.	827869.	579613.
8200.000	-0.26	1002.04	983.08	22531.	434848.	827869.	579515.
8100.000	-0.67	1001.90	982.47	22531.	434848.	827869.	579455.
8007.000	0.35	1001.70	983.36	22531.	434848.	827869.	579148.
7900.000	-0.21	1001.68	982.72	22531.	434848.	827869.	579370.
7500.000	-0.74	1000.99	981.55	22531.	434848.	827869.	579466.
7100.000	-1.72	1000.42	979.92	22531.	434848.	827869.	578565.
6939.000	-1.48	1000.09	979.25	22531.	434848.	827869.	578468.
6800.000	-3.81	999.97	977.19	22531.	434848.	827869.	582208.
6545.000	3.11	999.82	984.57	22531.	434848.	827869.	568533.
6000.000	1.87	999.19	982.26	22531.	434848.	827869.	557066.
5900.000	4.48	998.78	985.14	22901.	434848.	827869.	582847.
5400.000	2.20	998.17	981.69	22901.	434848.	827869.	553117.
5200.000	2.89	997.60	982.15	22901.	434848.	827869.	535004.
4930.000	2.39	997.31	980.98	22901.	434848.	827869.	508606.
4700.000	2.44	997.08	980.70	22901.	434848.	827869.	471793.
4400.000	1.56	996.83	979.20	22901.	434848.	827869.	427170.
4000.000	-0.48	996.44	976.25	22901.	434848.	827869.	420012.
3850.000	-1.19	996.20	975.13	22901.	434848.	827869.	425401.
3800.000	-1.17	995.60	975.09	22901.	434848.	827869.	450923.
3450.000	-0.89	995.11	974.89	22901.	434848.	827869.	460829.
3350.000	-6.96	994.84	967.13	22901.	434848.	827869.	460725.
3200.000	-3.71	993.50	970.36	22901.	434848.	827869.	460814.
3000.000	-1.23	993.13	973.46	22901.	434848.	827869.	460679.
2875.000	-0.27	988.57	974.07	22901.	434848.	827869.	455876.

Alt 2

Run: April 08

Exhibit C

Murrieta Creek - HEC 6T run on 8 November 2012
Prepared by: M. Perry

		Long Term after 209 events, assuming no O&M for scour areas				Ave Annual since 1974, assuming routine O&M	Design Q, with-project	
XS	initial invert elevation	After 209 events, after 1974	diff	grade stabilizer, -2.72 ft	diff	Ave Annual (37 yrs)	0.6348 days (end of hydrograph)	0.5934 days (peak of hydrograph)
18900	1007.46	998.33	-9.13	1004.74	-6.41	-0.17	2.09	2.09
18800	1007.46	998.45	-9.01	1004.74	-6.29	-0.17	2.73	2.73
18698	1007.10	998.87	-8.23	1004.38	-5.51	-0.15	2.74	2.73
18600	1006.86	998.46	-8.40	1004.14	-5.68	-0.15	1.58	1.57
18300	1006.26	997.88	-8.38	1003.54	-5.66	-0.15	2.31	2.31
18000	1006.86	997.55	-9.31	1004.14	-6.59	-0.18	0.90	0.89
17900	1005.46	997.85	-7.61	1002.74	-4.89	-0.13	2.72	2.69
17500	1004.66	997.29	-7.37	1001.94	-4.65	-0.13	2.73	2.69
17000	1003.66	996.72	-6.94	1000.94	-4.22	-0.11	2.00	2.15
16500	1002.66	995.93	-6.73	999.94	-4.01	-0.11	2.45	2.45
16000	1001.66	995.15	-6.51	998.94	-3.79	-0.10	2.50	2.50
15500	1000.66	994.37	-6.29	997.94	-3.57	-0.10	2.57	2.58
15000	999.66	993.56	-6.10	996.94	-3.38	-0.09	2.63	2.63
14400	998.46	992.51	-5.95	995.74	-3.23	-0.09	2.71	2.72
13900	997.46	991.65	-5.81	994.74	-3.09	-0.08	2.73	2.79
13400	996.46	990.79	-5.67	993.74	-2.95	-0.08	2.49	2.59
13200	996.06	990.35	-5.71	993.34	-2.99	-0.08	3.17	3.11
12800	995.26	989.92	-5.34	992.54	-2.62	-0.07	1.79	1.76
12400	994.46	989.21	-5.25	991.74	-2.53	-0.07	2.31	2.26
11900	993.46	988.32	-5.14	990.74	-2.42	-0.07	2.17	2.09
11400	992.46	987.38	-5.08	989.74	-2.36	-0.06	2.21	2.10
11350	992.36	987.25	-5.11	989.64	-2.39	-0.06	2.35	2.23
11300	989.54	987.19	-2.35	989.54	-2.35	-0.06	1.04	0.78
10900	988.74	986.24	-2.50	988.74	-2.50	-0.07	0.93	0.83
10807	988.58	986.16	-2.42	988.58	-2.42	-0.07	-0.40	-0.35
10700	988.34	985.66	-2.68	988.34	-2.68	-0.07	0.10	0.06
10300	987.54	984.65	-2.89	987.54	-2.89	-0.08	-0.70	-0.60
9900	986.74	983.90	-2.84	986.74	-2.84	-0.08	-1.32	-1.34
9600	986.14	983.07	-3.07	986.14	-3.07	-0.08	-0.97	-0.97
9500	985.94	982.76	-3.18	985.94	-3.18	-0.09	-0.28	-0.16
9100	985.14	981.79	-3.35	985.14	-3.35	-0.09	-1.65	-1.64
8700	984.34	981.03	-3.31	984.34	-3.31	-0.09	-1.28	-1.13
8300	983.54	980.60	-2.94	983.54	-2.94	-0.08	-0.29	-0.29
8200	983.39	980.46	-2.93	983.39	-2.93	-0.08	-0.26	-0.26
8100	983.24	979.86	-3.38	983.24	-3.38	-0.09	-0.67	-0.11
8007	983.01	981.14	-1.87	983.01	-1.87	-0.05	0.35	0.35
7900	982.94	979.76	-3.18	982.94	-3.18	-0.09	-0.21	-0.21
7500	982.34	980.98	-1.36	982.34	-1.36	-0.04	-0.74	-0.75
7100	981.74	980.99	-0.75	981.74	-0.75	-0.02	-1.72	-1.76
6939	981.40	980.03	-1.37	981.40	-1.37	-0.04	-1.48	-1.48
6800	981.29	980.60	-0.69	981.29	-0.69	-0.02	-3.81	-3.71
6545	980.91	981.15	0.24	980.91	0.24	0.01	3.11	2.96
6000	980.09	980.24	0.15	980.09	0.15	0.00	1.87	1.74
5900	979.94	979.80	-0.14	979.94	-0.14	0.00	4.48	4.79

APPENDIX C

Hydrologic Soil Group—Western Riverside Area, California
(Murrieta Creek Bridge)

Map Scale: 1:6,250 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 300, 600, 1200, 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 11, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 24, 2015—Feb 26, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Cf	Chino silt loam, drained, saline-alkali	C/D	110.1	69.9%
Dv	Domino silt loam, saline-alkali	D	5.4	3.4%
GtA	Grangeville fine sandy loam, drained, 0 to 2 percent sl opes	A/D	6.0	3.8%
GuB	Grangeville fine sandy loam, poorly drained, saline-alk ali, 0 to 5 percent slopes	B/D	24.6	15.6%
GvB	Grangeville fine sandy loam, saline-alkali, 0 to 5 percent slopes	B/D	11.4	7.2%
Totals for Area of Interest			**157.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D

LEVEE CRITERIA

The following criteria is for the design of levee linings placed in or adjacent to natural watercourses that are to be approved or maintained by the District. The designer is given the choice of a number of materials to provide flexible or rigid linings. It is up to the designer to determine the most appropriate and economical material for his particular location.

Flow Velocities

The anticipated maximum flow velocity restricts the type of material that can be used and determines the structural requirements of the lining. The designer is required to submit engineering calculations which show the maximum expected flow velocity attacking or flowing adjacent to the levee. This velocity is used to determine the cutoff depth, levee thickness, and rock size.

The following criteria permits the design of a levee lining of certain materials up to a flow velocity of 20 fps. If conditions exist where the velocity would exceed 20 fps, measures will have to be taken, such as the construction of drop structures in the natural watercourse, to reduce the velocity.

Levee Cutoff Depths

All levee linings must extend below the grade of the natural watercourse to the depth indicated in the table for cutoff depths of this criteria. The only exception to this will be in the case of rock rip-rap and gabion lining where an apron can be provided that can adjust to scour conditions.

Lining Returns

It is required that the upstream and downstream terminus of the levee connect to the natural bank or adjoining levee improvements with transitions designed to ease differentials in alignment, grade, slope, and roughness of banks. The criteria for the depth of cut-off for the levee also apply to the transition section. If the proposed lining does not join an existing lining that meets this criteria, the proposed lining must be returned into the natural bank at an angle of 30 degrees, a perpendicular distance of not less than four feet, or in lieu thereof a four-foot cutoff wall.

LEVEE CRITERIA

Filter Blankets and Weep Holes

Filter blankets will be required under all rock rip-rap and gabion levee linings. Weep holes connected by continuous drainage material are required for all concrete and gunite levee linings. Weep holes are also required if grouted rip-rap is used.

Scour Gages

Scour gages are required in conjunction with all levee construction. The gages will be used to determine actual scour patterns for future refinement of the levee criteria. Unless otherwise directed, scour gages shall be 12-inch diameter holes, 20-feet deep, filled with 1/2-inch to 1-1/2-inch diameter stone, that has a color distinctly different from the surrounding material. The gages shall be placed in sets of (3) beginning at the toe of the levee and spaced at 50-feet perpendicular from the levee out into the watercourse.

The sets of three gages shall be spaced every 1,000 feet longitudinal to the levee. A minimum of 2 sets (gages) are required for each levee constructed. The exact location of the gages shall be shown on the project drawings, with the instruction to the Contractor to determine the elevation of the top of the gage upon completion of construction and make record of such for the as built drawings.

The tables on the following pages (F-32 to F-34) contain the criteria for cutoff depths, material and structural requirements, rock gradation, and filter design.

Typical levee cross-sections are shown on Pages F-35 and F-36. A typical cross-section at a scour gage is shown on Page F-37.

LEVEE CRITERIA

Cut-Off Depths

Velocities	Straight Reaches	*Curved Reach
0 - 6 f.p.s.	6-ft.	9-ft.
6 - 10 f.p.s.	8-ft.	12-ft.
10 - 15 f.p.s.	10-ft.	15-ft.
15 - 18 f.p.s.	12.5 ft.	18-ft.
18 - 20 f.p.s.	14 ft.	21-ft.

*Check the cut off depth for curved reach on Chart F-06 on Page F-38
Use that depth if greater than given hereon.

Material and Structural Requirements

Concrete Levees (1 1/2:1 max. side slope)

Velocities	Levee Thickness - T		Reinforcing
	Straight Reach	Curved Reach	
0 - 10 f.p.s.	6-inch	8-inch	#4 @ 18" Bothways
10 - 20 f.p.s.	8-inch	10-inch	#4 @ 18" Bothways

Gunite Levees (1 1/2:1 max. side slopes)

Velocities	Levee Thickness - T		Reinforcing
	Straight Reach	Curved Reach	
0 - 10 f.p.s.	8-inch	10-inch	#4 @ 18" Bothways
Gunite levees not permitted where velocities exceed 10 f.p.s.			

Material and Structural Requirements

Rip-Rap Levees (2:1 max. side slopes)

(Ungrouted)

Velocities	Rock Size (D50 Size)	Levee Thickness - T		Filter Thickness
		Straight Reach	Curved Reach	
0 - 7 f.p.s.	50 lb. (10")	15-inch	20-inch	6-inch
7 - 9 f.p.s.	100 lb. (12")	18-inch	24-inch	6-inch
10 f.p.s.	150 lb. (15")	23-inch	30-inch	9-inch
11 f.p.s.	300 lb. (18")	27-inch	36-inch	9-inch
12 f.p.s.	1/4-ton (21")	32-inch	42-inch	9-inch
13 f.p.s.	1/2-ton (27")	41-inch	54-inch	12-inch
13 - 15 f.p.s.	1-ton (34")	51-inch	68-inch	12-inch
16 - 17.5 f.p.s.	2-ton (43")	65-inch	86-inch	12-inch
18 - 20 f.p.s.	4-ton (54")	81-inch	108-inch	12-inch
(Grouted) Can be used only with special District approval				
16 - 20 f.p.s.	1-ton (34")	51-inch	68-inch	12-inch

Gabion Levees (2:1 side slopes)

Velocities	Levee Thickness (Straight or Curved Reach)	Rockfill	Wire Gage of Baskets	Apron Length
0 - 7 f.p.s.	12-inch Baskets	4" - 8"	12 ga.	12 feet
8 - 10 f.p.s.	18-inch Baskets	4" - 8"	11 ga.	18 feet
11 - 15 f.p.s.	18-inch Baskets	4" - 8"	11 ga.	21 feet

Gabion levees not permitted where velocities exceed 15 f.p.s.

LEVEE CRITERIA

Material and Structural Requirements

Rock Rip-Rap Gradation

Rock Sizes (Percentage Larger Than)	4 Ton	2 Ton	1 Ton	1/2 Ton	1/4 Ton	300#	150#	100#	50#
				D50					
8 Ton	0-5								
4 Ton	50-100	0-5							
2 Ton	95-100	50-100	0-5						
1 Ton		95-100	50-100	0-5					
1/2 Ton			95-100	50-100	0-5				
1/4 Ton				95-100	50-100	0-5			
300#						50-100	0-5		
200#					95-100			0-5	
150#						95-100	50-100		
100#								50-100	0-5
75#							95-100		
50#								95-100	50-100
25#									95-100

Filter Material

The following criteria is to be met when selecting the filter blanket material:

$$\frac{D15\ \text{filter}}{D85\ \text{base}} < 5 < \frac{D15\ \text{filter}}{D15\ \text{base}} < 40 > \frac{D50\ \text{filter}}{D50\ \text{base}}$$

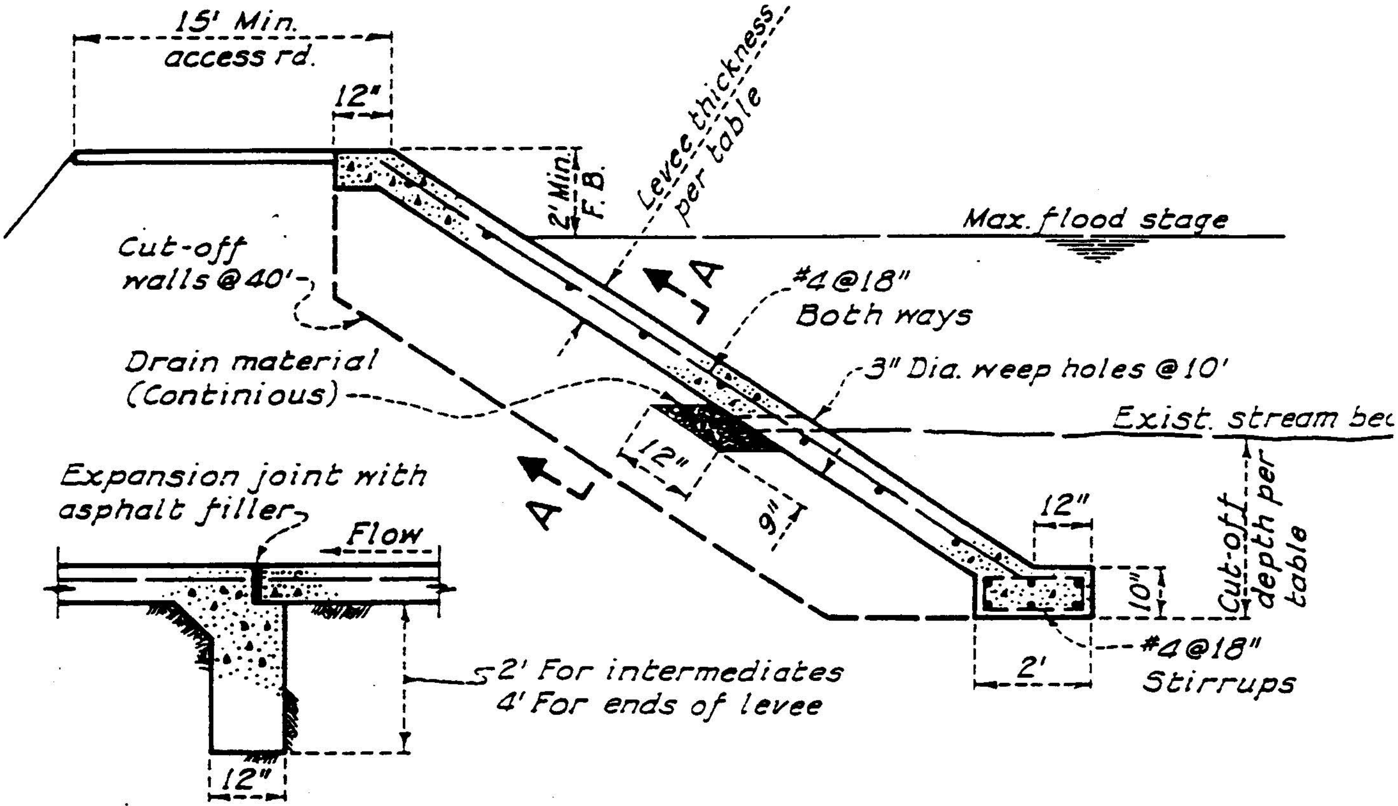
and

$$\frac{D15\ \text{rip rap}}{D85\ \text{filter}} < 5 < \frac{D15\ \text{rip rap}}{D15\ \text{filter}} < 40 > \frac{D50\ \text{rip rap}}{D50\ \text{filter}}$$

Base refers to the material underlying the filter, the natural bank material.

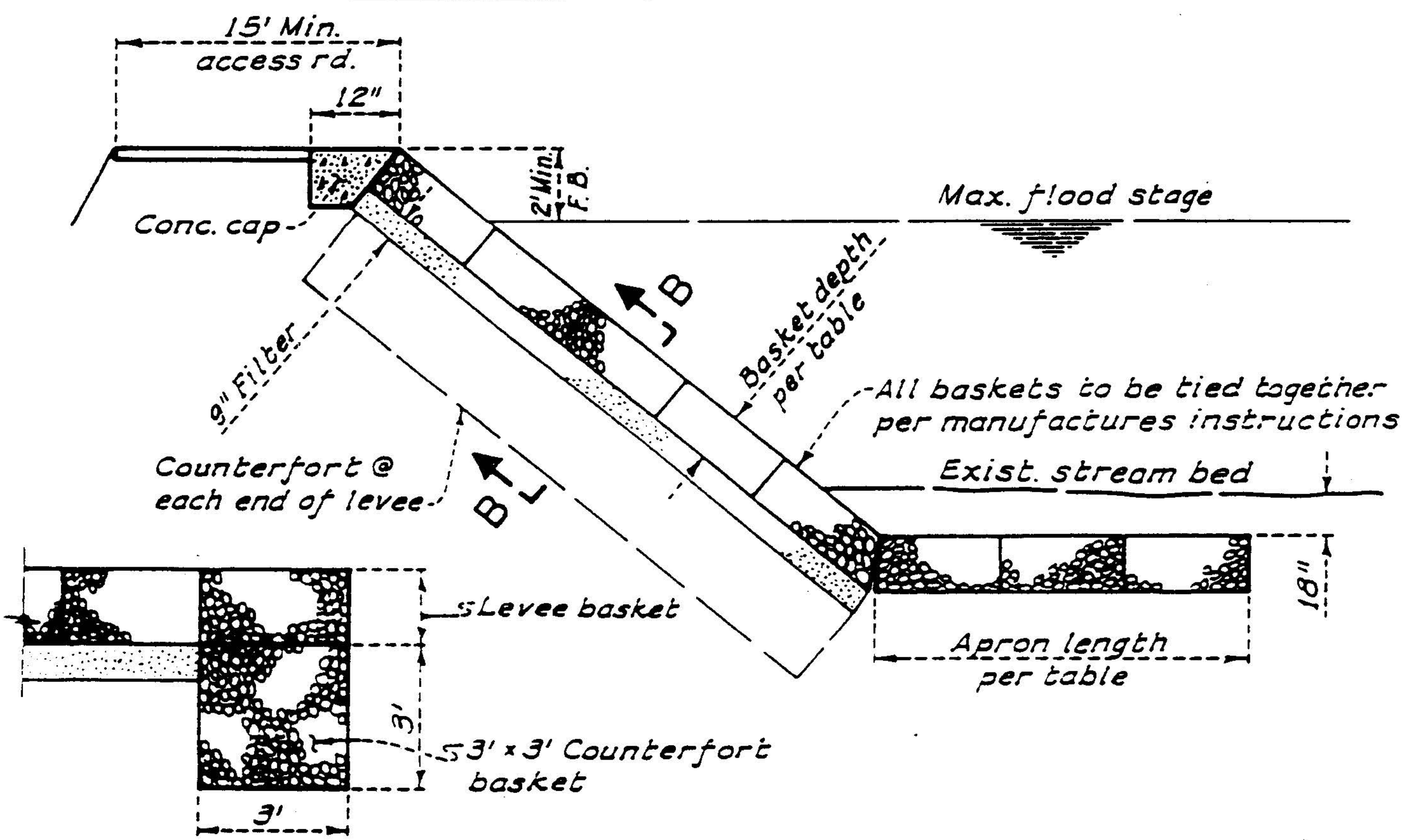
D15 for example refers to the 15 per cent size of the material and so forth for the other values; D50 and D85.

TYPICAL GUNITE OR CONCRETE LEVEE SECTION



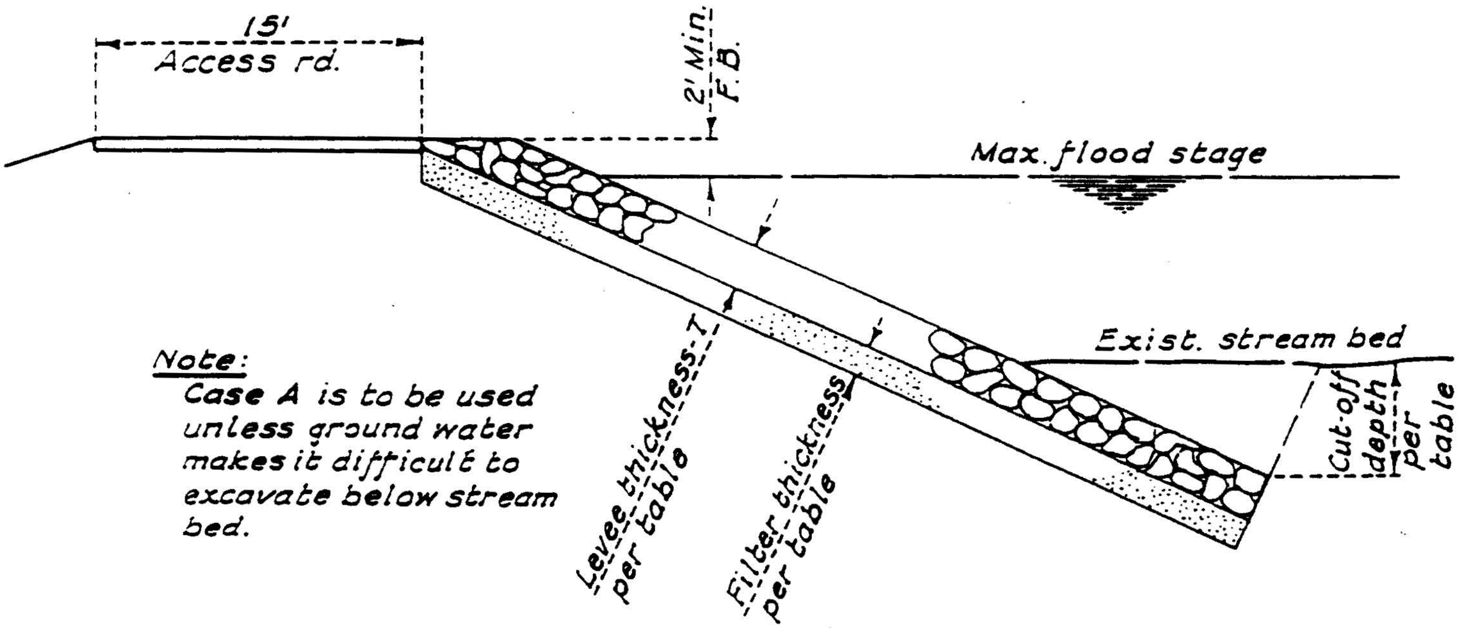
SECTION A-A

TYPICAL GABION LEVEE SECTION

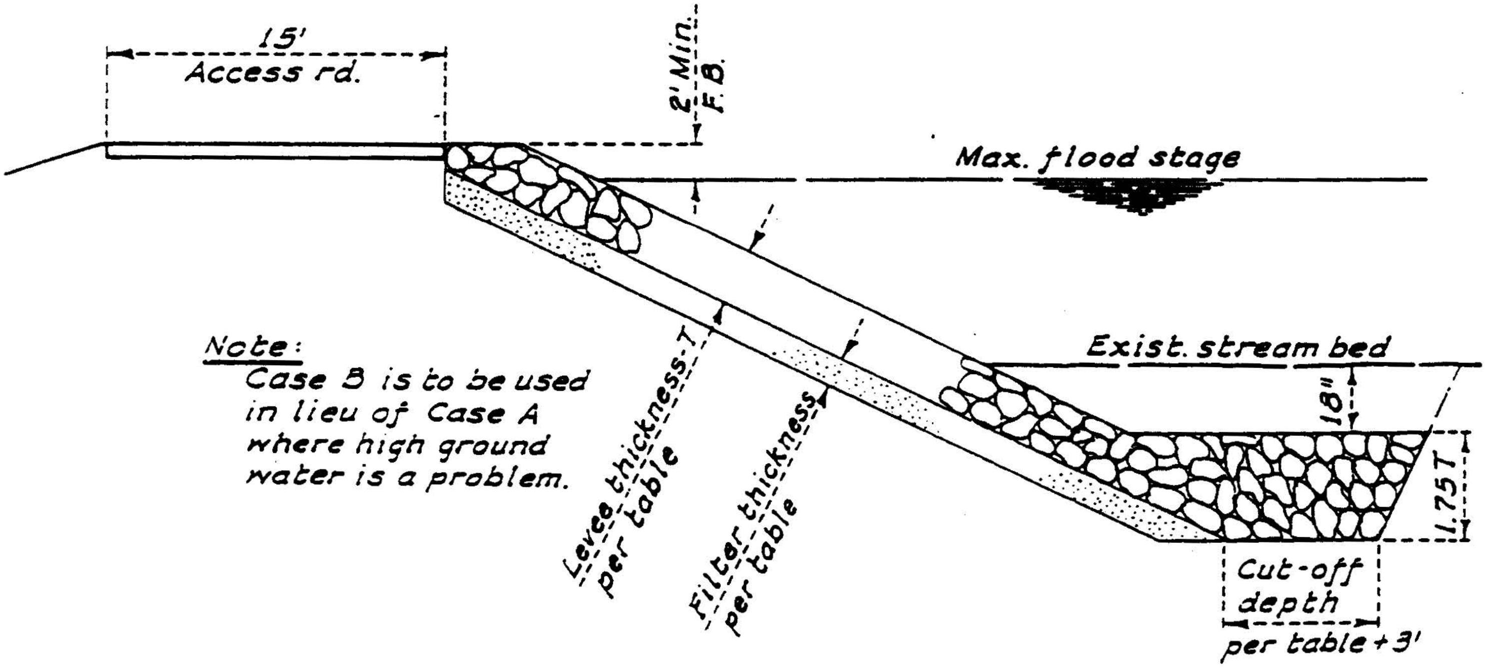


SECTION B-B

TYPICAL ROCK RIP - RAP LEVEE SECTIONS

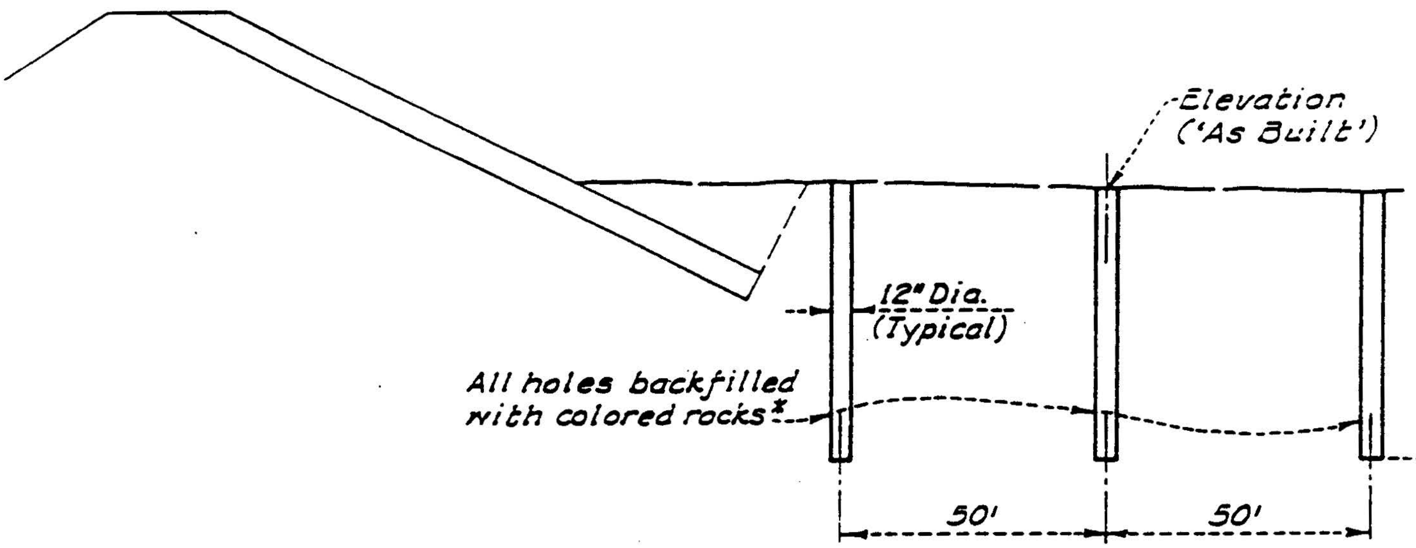


CASE A



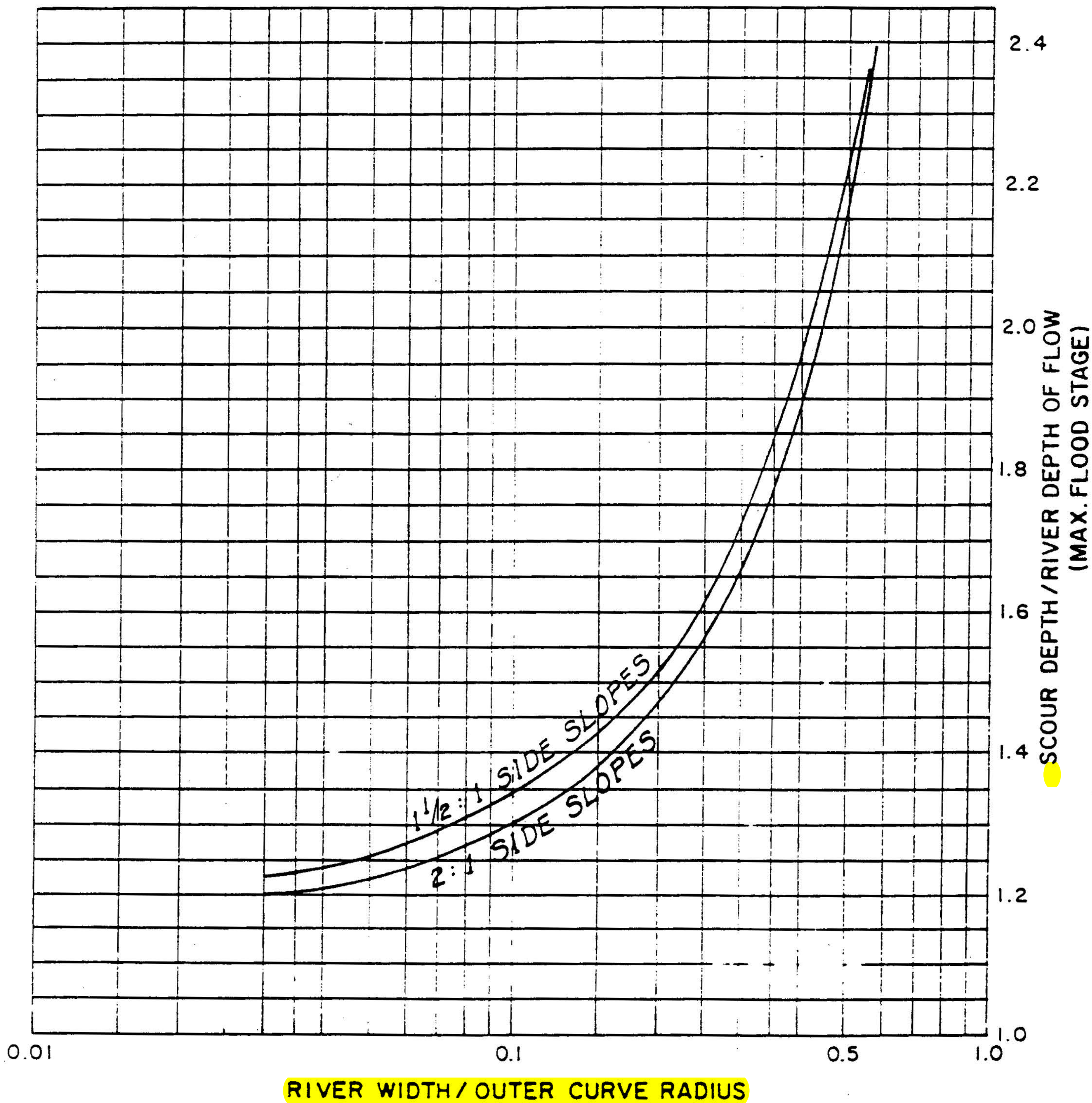
CASE B

TYPICAL SECTION AT SCOUR GAGES



* Rock to be 1/2" - 1 1/2" with a color that is distinctly different than the surrounding material.

The 'As Built' Elevation of the top of each scour gage is to be accurately surveyed and recorded on the 'As Built' drawings.



SCOUR DEPTHS ON OUTER CURVES

APPENDIX E

PROFILE

PLAN

Underground Service Alert

Call: TOLL FREE

1-800 422-4133

TWO WORKING DAYS BEFORE YOU DIG

ERSC INC.COM
Engineering Resources of Southern California

1861 West Redlands Blvd.
Redlands, CA 92373
P:909.890.1255
F:909.890.0995

CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE	BENCH MARK	SCALE
Contractor						RIVERSIDE COUNTY FLOOD CONTROL BENCH MARK No. Z10320 AN 1/2" IP, WITH RCFC TRI STAR CAP. 173; ± EAST OF DIAZ RD CL AND 34' ± NORTH BLOCK WALL, FLUSH ELEVATION: 1028.38 (NAVD88)	Horizontal
Inspector							Vertical
Date Completed							

SEAL:

Designed By	Drawn By	Checked By

Plans Prepared Under Supervision Of

STEVEN LATINO, PE — Date

R.C.E. No. xxxxx Expires xx-xx-xx

RECOMMENDED BY: NINO ABAD, ASSOCIATE ENGINEER DATE:

ACCEPTED BY: PATRICK A. THOMAS, DIRECTOR OF PUBLIC WORKS/CITY ENGINEER DATE:

R.C.E. No. 44223 Expires: 06-30-2019

CITY OF TEMECULA — DEPARTMENT OF PUBLIC WORKS

MURRIETA CREEK BRIDGE
AT OVERLAND DRIVE
PROJECT NO. PW 16-05
OVERLAND DRIVE CHANNEL IMPROVEMENTS A

Drawing No. C-1A

Sheet 1 of 3

PROFILE

PLAN

Underground Service Alert

Call: TOLL FREE
1-800
422-4133

TWO WORKING DAYS BEFORE YOU DIG

ERSC INC.COM
Engineering Resources of Southern California
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CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE	BENCH MARK	SCALE
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Inspector							Vertical
Date Completed							

SEAL:

Designed By	Drawn By	Checked By

Plans Prepared Under Supervision Of

STEVEN LATINO, PE Date

R.C.E. No. xxxxx Expires xx-xx-xx

RECOMMENDED BY: NINO ABAD, ASSOCIATE ENGINEER DATE:

ACCEPTED BY: PATRICK A. THOMAS, DIRECTOR OF PUBLIC WORKS/CITY ENGINEER DATE:

R.C.E. No. 44223 Expires: 06-30-2019

CITY OF TEMECULA DEPARTMENT OF PUBLIC WORKS

MURRIETA CREEK BRIDGE
AT OVERLAND DRIVE
PROJECT NO. PW 16-05
OVERLAND DRIVE CHANNEL IMPROVEMENTS B

Drawing No. C 1B

Sheet 2 of 3

ERSC INC.COM
Engineering Resources of Southern California

1861 West Redlands Blvd.
Redlands, CA 92373
P: 909.890.1255
F: 909.890.0995

CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE	BENCH MARK	SCALE
Contractor						RIVERSIDE COUNTY FLOOD CONTROL BENCH MARK No. Z10320 AN 1/2" IP, WITH RCFC TRI STAR CAP. 173; ± EAST OF DIAZ RD CL AND 34' ± NORTH BLOCK WALL, FLUSH ELEVATION: 1028.38 (NAVD88)	Horizontal
Inspector							Vertical
Date Completed							

SEAL:

Designed By	Drawn By	Checked By
Plans Prepared Under Supervision Of		
STEVEN LATINO, PE	Date	
R.C.E. No. xxxxx	Expires xx-xx-xx	

RECOMMENDED BY: ______ DATE: ______
NINO ABAD, ASSOCIATE ENGINEER

ACCEPTED BY: ______ DATE: ______
PATRICK A. THOMAS
DIRECTOR OF PUBLIC WORKS/CITY ENGINEER

R.C.E. No. 44223 Expires: 06-30-2019

CITY OF TEMECULA — DEPARTMENT OF PUBLIC WORKS

MURRIETA CREEK BRIDGE
AT OVERLAND DRIVE
PROJECT NO. PW 16-05
OVERLAND DRIVE CHANNEL IMPROVEMENTS C

Drawing No.
C-1C
Sheet 3 of 3

Appendix I

Response to Comment

Responses to Comments on the IS-MND

This section includes comments received during the circulation of the Draft IS-MND prepared for the Murrieta Creek Bridge at Overland Drive Project (proposed project), and responses to those comments relevant to the environmental analysis.

The Draft IS-MND was circulated for a 30-day public review period that began on January 12, 2024, and ended on February 12, 2024. The City of Temecula received one comment letter on the IS-MND. The commenter and the page number on which the commenter's letter appears are listed below.

Letter No. and Commenter		Page No.
1	Amy McNeill, Engineering Project Manager, Riverside County Flood Control District and Water Conservation District (RCFCD&WCD)	2

The comment letter and responses follow. The comment letter has been numbered sequentially and each separate issue raised by the commenter has been assigned a number. The response to comment identifies first the number of the comment letter, and then the number assigned to each issue (Response 1.2, for example, indicates that the response is for the second issue raised in comment Letter 1). Changes to the IS-MND are indicated in ~~strikethrough~~ and <u>underline.</u>

JASON E. UHLEY
General Manager-Chief Engineer

1995 MARKET STREET
RIVERSIDE, CA 92501
951.955.1200
951.788.9965 FAX
www.rcflood.org

RIVERSIDE COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

254776

February 5, 2024

City of Temecula
Community Development Department
41000 Main Street,
Temecula CA 92590

Attention: Nino Abad

Re: Murrieta Creek Bridge at Overland Drive (Avenida Alvarado over Murrieta Creek), CIP No. PW 16-05, Federal Aid Project No. BR-NBIL (543)

The Riverside County Flood Control and Water Conservation District (District) does not normally recommend conditions for land divisions or other land use cases in incorporated cities. The District also does not plan Check city land use cases or provide State Division of Real Estate letters or other flood hazard reports for such cases. District comments/recommendations for such cases are normally limited to items of specific interest to the District including District Master Drainage Plan facilities, other regional flood control and drainage facilities which could be considered a logical component or extension of a master plan system, and District Area Drainage Plan fees (development mitigation fees). In addition, information of a general nature is provided.

The District's review is based on the above-referenced project transmittal, received January 11, 2024. The District **has not** reviewed the proposed project in detail, and the following comments do not in any way constitute or imply District approval or endorsement of the proposed project with respect to flood hazard, public health and safety, or any other such issue:

☐ This project would not be impacted by District Master Drainage Plan facilities, nor are other facilities of regional interest proposed.

☐ This project involves District proposed Master Drainage Plan facilities, namely, ________. The District will accept ownership of such facilities on written request by the City. The Project Applicant shall enter into a cooperative agreement establishing the terms and conditions of inspection, operation, and maintenance with the District and any other maintenance partners. Facilities must be constructed to District standards, and District plan check and inspection will be required for District acceptance. Plan check, inspection, and administrative fees will be required. All regulatory permits (and all documents pertaining thereto, e.g., Habitat Mitigation and Monitoring Plans, Conservation Plans/Easements) that are to be secured by the Applicant for both facility construction and maintenance shall be submitted to the District for review. The regulatory permits' terms and conditions shall be approved by the District prior to improvement plan approval, map recordation, or finalization of the regulatory permits. There shall be no unreasonable constraint upon the District's ability to operate and maintain the flood control facility(ies) to protect public health and safety.

☐ This project proposes channels, storm drains larger than 36 inches in diameter, or other facilities that could be considered regional in nature and/or a logical extension a District's facility, the District would consider accepting ownership of such facilities on written request by the City. The Project Applicant shall enter into a cooperative agreement establishing the terms and conditions of inspection, operation, and maintenance with the District and any other maintenance partners. Facilities must be constructed to District standards, and District plan check and inspection will be required for District acceptance. Plan check, inspection, and administrative fees will be required. The regulatory permits' terms and conditions shall be approved by the District prior to improvement plan approval, map recordation, or finalization of the regulatory permits. There shall be no unreasonable constraint upon the District's ability to operate and maintain the flood control facility(ies) to protect public health and safety.

Re: Murrieta Creek Bridge at Overland Drive
(Avenida Alvarado over Murrieta Creek), 254776
CIP No. PW 16-05, Federal Aid
Project No. BR-NBIL (543)

☐ This project is located within the limits of the District's Murrieta Creek (☐Murrieta Valley ☐Temecula Valley ☐Santa Gertrudis Valley ☐Warm Springs Valley) Area Drainage Plan for which drainage fees have been adopted. If the project is proposing to create additional impervious surface area, applicable fees should be paid (in accordance with the Rules and Regulations for Administration of Area Drainage Plans) to the Flood Control District or City prior to issuance of grading or building permits. Fees to be paid should be at the rate in effect at the time of issuance of the actual permit.

☒ An encroachment permit shall be obtained for any construction and/or restoration related activities occurring within District right of way or facilities, namely, <u>Murrieta Creek Channel and Temecula Creek</u>. If the Permittee proposes to do work within a potentially jurisdictional area (such as open channels and basins), the Permittee shall accept full responsibility for obtaining, implementing, and complying with all applicable provisions of the appropriate regulatory permit(s). These regulatory permits include but are
1.1 not limited to: a California State Department of Fish and Wildlife Streambed Alteration Agreement in compliance with the Fish and Game Code Section 1600 et seq.; a Section 404 Permit issued by the U.S. Army Corps of Engineers in compliance with Section 404 of the Clean Water Act; and a 401 Water Quality Certification or a Report of Waste Discharge Requirements in compliance with Section 401 of the Clean Water Act or State Porter-Cologne Water Quality Act, respectively, from the appropriate Regional Water Quality Control Board. Encroachment permit processing will include review of these documents.
1.2 Please note that conservation easements and mitigation areas within the District's right of way may conflict with the maintenance of District facilities, therefore conservation easements and mitigation areas within District right of way are not permitted.
1.3 If a proposed storm drain connection exceeds the hydraulic performance of the existing drainage facilities, mitigation will be required. For further information, contact the District's Encroachment Permit Section at 951.955.1266.

☐ The District's previous comments are still valid.

<u>GENERAL INFORMATION</u>

1.4 This project may require a National Pollutant Discharge Elimination System (NPDES) permit from the State Water Resources Control Board. Clearance for grading, recordation, or other final approval should not be given until the City has determined that the project has been granted a permit or is shown to be exempt.

1.5 If this project involves a Federal Emergency Management Agency (FEMA) mapped floodplain, the City should require the applicant to provide all studies, calculations, plans, and other information required to meet FEMA requirements, and should further require the applicant obtain a Conditional Letter of Map Revision (CLOMR) prior to grading, recordation, or other final approval of the project and a Letter of Map Revision (LOMR) prior to occupancy.

1.6 The project proponent shall bear the responsibility for complying with all applicable mitigation measures defined in the California Environmental Quality Act (CEQA) document (i.e., Negative Declaration, Mitigated Negative Declaration, Environmental Impact Report) and/or Mitigation Monitoring and Reporting Program, if a CEQA document was prepared for the project. The project proponent shall also bear the responsibility for complying with all other federal, state, and local environmental rules and regulations that may apply. The District needs to demonstrate that all District related activities for the Project comply with CEQA. This is typically achieved through determinations from the CEQA Lead Agency for the project. We require the applicant to provide a copy of the approved, adopted, or certified CEQA document and the notice of determination if one was prepared by the Lead Agency for the proposed project. For this Project, the Lead Agency is the City of Temecula and the District will be a Responsible Agency under CEQA.

Very truly yours,

Amy McNeill

AMY MCNEILL
Engineering Project Manager

EM:blm

Letter 1

COMMENTER: Amy McNeill, Engineering Project Manager, RCFCD&WCD

DATE: **February 5, 2024**

Response 1.1

The commenter states an encroachment permit must be obtained for construction or restoration activities occurring within the Murrieta Creek Channel and Temecula Creek, which are both within RCFCD&WCD right of way or facilities. The commenter also notes that, if work will be completed within a jurisdictional area, the City of Temecula is responsible for obtaining, implementing, and complying with all provisions of the appropriate regulatory permits.

The Draft IS-MND indicated that project approval is required by the United States Army Corps of Engineers, United States Fish and Wildlife Service, California Department of Fish and Wildlife, Regional Water Quality Control Board, and Riverside County Flood Control District. Section 9, Other Public Agencies Whose Approval is Required, on Page 5 of the Draft IS-MND has been amended in response to the comment to provide clarity on the permits and approvals that are required, as follows:

The City of Temecula is the lead agency with responsibility for approving the project. The project would require regulatory permits from the U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and San Diego Regional Water Quality Control Board (RWQCB) due to impacts to jurisdictional Waters of the State or Waters of the United States. An encroachment permit from the Riverside County Flood Control District and Water Conservation District (RCFCD&WCD) would be required due to the proposed construction activities within the Murrieta Creek Channel. Approval from the Western Riverside County Regional Conservation Authority (RCA), CDFW, and the United States Fish and Wildlife Service (USFWS) would be required for compliance with the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) and the Determination of Biologically Equivalent or Superior Preservation (DBESP).

Response 1.2

The commenter states that conservation easements and mitigation areas within District rights of way are not permitted.

The commenter's statements regarding conservation easements and mitigation areas within District rights of way are noted. The project does not propose conservation easements or mitigation areas within District rights of way.

Response 1.3

The commenter states that, if a proposed storm drain connection exceeds the hydraulic performance of the existing drainage facilities, mitigation will be required.

Hydraulic analyses were performed for the project and are contained in the Hydrology and Hydraulics Report prepared by Engineering Resources of Southern California, Inc. in May 2020 (Appendix H). The hydraulic analyses confirmed that the hydraulic performance of the existing drainage facilities and Murrieta Creek would not be exceeded.

Response 1.4

The commenter notes that the project may require an NPDES permit from the State Water Resources Control Board.

As discussed in Section 10, *Hydrology and Water Quality,* of the Draft IS-MND, the City of Temecula would obtain coverage under the State Water Resource Control Board's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2022-0057-DWQ, NPDES No. CAS000002 (Construction Stormwater General Permit).

Response 1.5

The commenter indicates that projects involving FEMA mapped floodplains require a Conditional Letter of Map Revision (CLOMR).

As discussed in Section 10, *Hydrology and Water Quality,* of the Draft IS-MND, the bridge would be constructed above the 100-year water surface elevation associated with the mapped floodway.

Response 1.6

The commenter states that the City of Temecula must be responsible for complying with all mitigation measures defined in the CEQA document, as well as all other federal, state, and local environmental rules and regulations that apply. The commenter also states that the City is required to provide a copy of the approved, adopted, or certified CEQA document and the associated notice of determination.

This comment is noted. The City will comply with all mitigation measures outlined in the accompanying Mitigation Monitoring and Reporting Program, as well as with the conditions of all environmental regulatory permits. The adopted CEQA document and its NOP will be provided to the District following project approval.

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Appendix J

Mitigation Monitoring and Reporting Program

Mitigation Monitoring and Reporting Program

The Initial Study-Mitigated Negative Declaration (IS-MND) for the Murrieta Creek Bridge at Overland Drive Project (project) identifies the mitigation measures required to reduce the environmental impacts associated with the project. The California Environmental Quality Act (CEQA) requires a public agency to adopt a monitoring and reporting program for assessing and ensuring compliance with any required mitigation measures applied to proposed development. As stated in Section 21081.6(a)(1) of the Public Resources Code:

> "the public agency shall adopt a reporting or monitoring program for the changes made to the project or conditions of project approval, adopted in order to mitigate or avoid significant effects on the environment."

Section 21081.6 also provides general guidelines for implementing mitigation monitoring programs and indicates that specific reporting and/or monitoring requirements, to be enforced during project implementation, shall be defined as part of making findings or adopting a mitigated negative declaration.

The mitigation monitoring table lists the identified mitigation measures for the project. To ensure that the mitigation measures are properly implemented, a monitoring program has been devised which identifies the timing and responsibility for monitoring each measure.

The first column identifies mitigation measures that were identified in the Final IS-MND. The second column, entitled "Action Required," refers to the monitoring action that must be taken to ensure the mitigation measure's implementation. The third column, entitled "Monitoring Timing," refers to when the monitoring will occur to ensure that the mitigation action is complete. The fourth column, entitled "Monitoring Frequency," refers to how often the monitoring will occur to ensure that the mitigation action is complete. The fifth column, entitled "Monitoring Responsibility," refers to the agency responsible for oversight or ensuring that the mitigation measure is implemented. The "Compliance Verification" column is where the agency responsible for oversight verifies that the measures have been implemented.

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
Biological Resources							
BIO-1.1 Riparian/Riverine Resources							
Obtain all required permits/agreements/certifications from the USACE, the CDFW, the RWQCB, and the RCFC&WCD.	Obtain required permits/agreements/certifications from regulatory agencies.	Prior to ground-disturbing construction activities.	Once	City of Temecula			
BIO-1.2 Riparian/Riverine Resources							
Either preserve or restore Riparian/Riverine Resources by: a) Preserve riparian/riverine resources: existing riparian habitat (preferably within or adjacent to an area identified as a Criteria Area, Core, or Linkage by the MSHCP). Or b) Restore riparian/riverine resources: (1) restore areas temporarily impacted by the project onsite at a 1:1 ratio; and (2) provide offsite restoration for areas permanently impacted by the project. A detailed restoration program shall be prepared for approval by the USACE and the CDFW prior to construction and shall contain the following items: ▪ **Responsibilities and Qualifications.** Responsibilities and qualifications of the personnel to implement and supervise the plan. The responsibilities of the City, specialists, and maintenance personnel that will supervise and implement the plan shall be specified.	Prepare and implement a restoration program to be approved by USACE and CDFW.	Prior to construction.	Once	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
▪ **Site Selection.** Site selection for restoration and enhancement mitigation shall be determined in coordination with the City and the resource agencies. The mitigation site(s) shall be located in a dedicated open space area. The restoration site selected is located along Temecula Creek. ▪ **Site Preparation and Planting Implementation.** Site preparation shall include (1) protection of existing native species; (2) trash and weed removal; (3) native species salvage and reuse (i.e., duff); (4) soil treatments (i.e., imprinting, decompacting); (5) temporary irrigation installation; (6) erosion-control measures (i.e., rice or willow wattles); (7) seed mix application; and (8) container species, if appropriate. ▪ **Schedule.** A schedule shall be developed which includes planting to occur in late fall and early winter, between October 1 and January 30. ▪ **Maintenance Plan/Guidelines.** The maintenance plan shall include (1) weed control; (2) herbivory control; (3) trash removal; (4) irrigation system maintenance; (5) maintenance training; (6) replacement planting; and (7) biological monitoring during maintenance activities that occur during the breeding season.							

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
▪ **Monitoring Plan.** The monitoring plan shall include (1) qualitative monitoring (i.e., photographs and general observations); (2) quantitative monitoring (i.e., randomly placed transects); (3) performance criteria as approved by the resource agencies; (4) monthly reports for the first year, and every other month for following years; and (5) annual reports for three to five years, which will be submitted to the resource agencies. The site shall be monitored and maintained for five years to ensure successful establishment of riparian habitat within the restored and created areas; however, if there is successful coverage prior to five years, the City may be released from monitoring requirements with the approval of the resource agencies. ▪ **Long-term Preservation.** Long-term preservation of the site shall also be outlined in the conceptual mitigation plan to ensure the mitigation site is not impacted by future projects.							
BIO-1.3 Riparian/Riverine Resources							
Perform habitat rehabilitation of a 1.23-acre area in the Temecula Creek Mitigation Parcel. The City of Temecula shall mitigate temporary impacts at a 1:1 ratio and permanent impacts at a 3:1 ratio for rehabilitation at the Temecula Creek mitigation site. Rehabilitation	Perform habitat rehabilitation of a 1.23-acre area in the Temecula Creek Mitigation Parcel.	Following construction.	Monthly for three years	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
activities for permanent impacts would consist of 1) control of non-native weeds, and 2) replanting with appropriate native, riparian plant species that currently occur within the mitigation parcel. For temporary impacts, habitat shall be re-vegetated with a native seed mix suitable for use at each location after construction. This seed mix will be in addition to replanting cuttings, regular weeding and monitoring of the arroyo willow thicket that is currently on site. All restoration activities shall be overseen by a qualified Restoration Specialist familiar with riparian habitat restoration implementation, monitoring, and reporting. The work will be performed by a Restoration Contractor. The Restoration Contractor is a qualified native landscape contractor with experience in riparian restoration, who is responsible for site preparation, installation, and maintenance of the mitigation area. The Restoration Specialist shall identify the spatial distribution of native plantings for optimal habitat development based on various environmental factors, including, but not limited to, elevation and hydrology. Final quantities per species shall be determined based on site conditions after construction and as directed by the Restoration Specialist. Cuttings to be installed in the temporary impact areas shall be spaced irregularly and in clusters to emulate natural conditions. Actual species installed shall be dependent on those species that are							

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
available at the time of implementation. A vegetative cover consisting of desirable riparian plant species is expected to develop from the installed material with proper management. Plant spacing is designed to achieve dense native cover within three years or less. It is expected that native understory species will naturally colonize and establish.							
BIO-2.1 Least Bell's Vireo							
The limits of project construction shall be clearly delineated with the use of fencing (lathe and rope, orange snow fencing, or stakes and flagging) prior to the initiation of construction.	Fence limits of project construction.	Prior to the initiation of construction.	Once	City of Temecula			
BIO-2.2 Least Bell's Vireo							
To the extent practicable, vegetation removal within the creek and construction of the project shall be conducted during the non-breeding season for the least Bell's vireo (i.e., September 16 to March 14) in order to avoid indirect noise impacts on this species. If project construction begins during the vireo nesting season, a qualified Biologist shall survey all riparian habitat within 500 feet of the construction limits for the presence of least Bell's vireo nests/territories prior to the start of construction. Three surveys shall be conducted within one week prior to the initiation of construction within or adjacent to riparian habitat. Any active nests/territories shall be mapped on an	Ensure a qualified Biologist prepares a pre-construction least Bell's vireo survey report and submits the report to USFWS and CDFW. Survey all riparian habitat within 500 feet of the construction limits for the presence of least Bell's vireo nests/territories. Map active nests/territories on an aerial photograph and provide location information to USFWS and CDFW. Mark the location of any least Bell's vireo nests/territories on applicable construction plans.	Prior to the start of construction, if vegetation removal or construction begins during the vireo nesting season.	Three surveys within one week of construction initiation within or adjacent to riparian habitat. Update surveys once per week as long as construction is within 500 feet of riparian habitat. Surveys may be	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
aerial photograph by the Biologist, and the location information shall be given to the USFWS and CDFW. The location7 of any least Bell's vireo nests/territories shall be marked on applicable construction plans. If no active nests/territories are found, construction may proceed. Surveys shall be updated once per week as long as construction is within 500 feet of riparian habitat. Surveys may be discontinued if no vireos have been detected after eight weekly visits; if a vireo territory is observed, monitoring surveys shall be continued until vireo leave for the wintering grounds (August/September). A pre-construction least Bell's vireo survey report (including mapping of any active territories) shall be prepared by a qualified Biologist and shall be submitted to the USFWS and CDFW.			discontinued if no vireos have been detected after eight weekly visits; if a vireo territory is observed, monitoring surveys shall be continued until vireo leave for the wintering grounds (August/September).				
BIO-2.3 Least Bell's Vireo							
Any active territories shall be protected as Environmentally Sensitive Areas (ESAs) until no longer occupied to ensure compliance with the Federal and State Endangered Species Acts and Migratory Bird Treaty Act. To protect any active territory sites, the following restrictions on construction are required between March 15 and September 15 (or until territories are no longer active, as determined by a qualified Biologist): (1) no clearing of habitat shall be allowed within Murrieta Creek and (2) access and surveying shall not be allowed within approximately 100 feet of nests/territories (or as otherwise	Protect active territories by implementing construction restrictions: - No clearing of habitat within Murrieta Creek - Restrict access and surveying within approximately 100 feet of nests/territories Ensure all construction activities within Murrieta Creek during the breeding	During construction.	Throughout the breeding season (March 15 to September 15), or until territories are no longer active.	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
determined by a qualified Biologist). Any construction activities that would occur within Murrieta Creek during the breeding season shall be monitored by a qualified Biologist.	season are monitored by a qualified Biologist.						
BIO-2.4 Least Bell's Vireo							
If construction would result in noise readings greater than 60 A-weighted decibels (dBA) at the edge of least Bell's vireo habitat (Murrieta Creek), construction shall not be allowed during the breeding season (March 15 to September 15) unless appropriate noise measures are implemented, as approved by the USFWS and the CDFW. Soundwalls shall be installed, as-needed, to maintain a noise level of less than 60 dBA at the edge of riparian habitat. Installation of the noise barriers shall be monitored by a qualified Biologist to ensure that riparian habitat is not inadvertently affected. A noise monitoring methodology shall be used during the breeding season for construction within 500 feet of occupied habitat along Murrieta Creek. Noise monitoring stations shall be monitored weekly between March 15 and September 15 to ensure that noise levels remain less than 60 dBA.	Implement construction noise measures (soundwalls) to reduce noise readings below 60 dBA at the edge of least Bell's vireo habitat (Murrieta Creek) during the breeding season (March 15 to September 15). Monitor construction noise during the breeding season.	During construction.	Implement noise measures throughout the breeding season (March 15 to September 15). Monitor construction noise weekly throughout the breeding season (March 15 to September 15).	City of Temecula			
BIO-3 Burrowing Owl							
A pre-construction survey for burrowing owl will be conducted 30 days prior to construction. If burrowing owl is present in the impact area during the breeding season (March 1 to August 31), the	Ensure a pre-construction survey for burrowing owl is completed. Protect active burrows during the breeding season (March 1 to August 31) by establishing a 500-foot	30 days prior to construction.	Once if burrowing owls are not detected. If burrowing owls are	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
burrow will be protected until nesting activity has ended. To protect the active burrow, a 500-foot buffer will be established around the active burrow. Any encroachment into the buffer area around the active burrow will only be allowed if the Biologist determines that the proposed activity will not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest. If burrowing owl is present in the impact area during the non-breeding season (September 1 to February 28), the burrowing owl will be flushed from the burrow and the burrow will be closed using CDFW-approved burrow-closing procedures. If no burrowing owls are observed, construction may proceed.	buffer around the active burrow. Flush owls from their burrows if present during the non-breeding season (September 1 to February 28).		detected during breeding season, daily monitoring during breeding season (March 1 to August 31).				
BIO-4 Night Lighting							
Permanent night lighting used to light the bridge shall use best engineering practices to direct lighting to the roadway and shall minimize spillage of light into adjacent habitat areas to the extent practicable. Additionally, approved wildlife-friendly night lighting will be used. Lighting designs shall be submitted to the City of Temecula Planning Department for review and approval prior to the issuance of a grading permit for the project.	Use approved wildlife-friendly night lighting and direct lighting to the roadway to minimize spillage of light into adjacent habitat areas. Submit lighting designs to the City of Temecula Planning Department for review and approval.	Prior to the issuance of a grading permit.	Once	Project engineer			
BIO-5 Noise							
The bridge concrete deck shall receive grinding and grooving treatment per	Ensure the bridge deck receives grinding and grooving treatment.	Prior to bridge opening.	Once	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
Caltrans bridge design standards to reduce vehicular tire noise.							
Cultural Resources							
CR-1 Retain a Qualified Archaeological Monitor							
Retain a Riverside County qualified archaeological monitor to monitor all ground-disturbing activities in archaeological sensitive sediments in an effort to identify any unknown archaeological resources. The Project Archaeologist shall have the authority to temporarily redirect earthmoving activities in the event that suspected archaeological resources are unearthed during project construction. The Project Archeologist shall attend the pre-grading meeting with the City, Pechanga Tribe, the construction manager and any contractors and shall conduct a mandatory Cultural Resources Worker Sensitivity Training to those in attendance. The training shall include a brief review of the cultural sensitivity of the project site and surrounding area; what resources could potentially be identified during earthmoving activities; the requirements of the monitoring program; the protocols that apply in the event inadvertent discoveries of cultural resources are identified, including who to contact and appropriate avoidance measures until the find(s) can be properly evaluated; and any other appropriate protocols. All new construction personnel that will conduct earthwork or grading activities that begin work on the project following the	Retain a qualified archaeological monitor to monitor all ground-disturbing activities; attend a pre-grading meeting with the City, Pechanga Tribe, the construction manager, and any contractors; and, conduct a mandatory Cultural Resources Worker Sensitivity Training.	Prior to the issuance of a grading permit.	Daily during ground-disturbing activities.	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
initial Training shall take the Cultural Sensitivity Training prior to beginning work and the project archaeologist shall make themselves available to provide the training on an as-needed basis.							
CR-2 Cultural Resources Treatment and Monitoring Agreement							
Contact the Pechanga Tribe to notify the Tribe of grading, excavation and the monitoring program, and to coordinate with the City of Temecula and the Tribe to develop a Cultural Resources Treatment and Monitoring Agreement. The Agreement shall address the treatment of known cultural resources, the designation, responsibilities, and participation of professional Native American Tribal monitors during grading, excavation and ground disturbing activities; project grading and development scheduling; terms of compensation for the monitors; and treatment and final disposition of any cultural resources, sacred sites, and human remains discovered on the site. Tribal monitors shall have the authority to temporarily halt and redirect earth moving activities in the affected area in the event that suspected archaeological resources are unearthed. The Pechanga Tribe shall attend the pre-grading meeting with the City, Project Archaeologist, the construction manager and any contractors and shall conduct a mandatory Cultural Resources Worker Sensitivity Training to those in attendance. The training shall include a brief review of the cultural sensitivity of the project and the surrounding area;	Notify Pechanga Tribe of grading, excavation and the monitoring program, and develop a Cultural Resources Treatment and Monitoring Agreement with the Tribe.	Prior to beginning construction.	Daily during ground-disturbing activities.	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
what resources could potentially be identified during earthmoving activities; the requirements of the monitoring program; the protocols that apply in the event inadvertent discoveries of cultural resources are identified, including who to contact and appropriate avoidance measures until the find(s) can be properly evaluated; and any other appropriate protocols.							
CR-3 Pre-Grade Report							
Project Archaeologist shall file a Cultural Resource Monitoring Plan (CRMP) with the City to document the proposed methodology for grading activity observation which will be determined in consultation with the Pechanga Tribe. Methodology shall include: ▪ Project description and location; ▪ Project grading and development scheduling; ▪ Roles and responsibilities of individuals on the project; ▪ The pre-grading meeting and Cultural Resources Worker Sensitivity Training details; ▪ The protocols and stipulations that the contractor, City, Consulting Tribe(s) and Project Archaeologist shall follow in the event of inadvertent cultural resources discoveries, including any newly discovered cultural resource deposits that shall be subject to a cultural resource's evaluation;	Prepare and file a Cultural Resource Monitoring Plan (CRMP) with the City of Temecula.	Prior to beginning construction.	Once	Project Archaeologist			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
▪ The type of recordation needed for inadvertent finds and the stipulations of recordation of sacred items; and, ▪ Contact information of relevant individuals for the project.							
CR-4 Inadvertent Discovery of Human Remains							
If human remains are encountered, California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the Riverside County Coroner has made the necessary findings as to origin. Further, pursuant to California Public Resources Code Section 5097.98(b) remains shall be left in place and free from disturbance until a final decision as to their treatment and disposition has been made. If the Riverside County Coroner determines the remains to be Native American, the Native American Heritage Commission must be contacted within 24 hours. The Native American Heritage Commission must then immediately identify the "most likely descendant(s)" of receiving notification of the discovery. The most likely descendant(s) shall then make recommendations within 48 hours of being granted access to the site, and engage in consultations concerning the treatment of the remains as provided in Public Resources Code 5097.98 and the Treatment Agreement described in TCR-2.	Halt disturbance until the Riverside County Coroner has made the necessary findings as to origin. Leave remains in place and free from disturbance until a final decision as to their treatment and disposition has been made. If the Riverside County Coroner determines the remains to be Native American, contact the Native American Heritage Commission within 24 hours to identify the "most likely descendant(s)" of receiving notification of the discovery.	If human remains are encountered.	Each time human remains are encountered.	City of Temecula			
CR-5 Ownership of Cultural Resources							
The landowner shall relinquish ownership of all cultural resources,	Relinquish ownership of all cultural resources found on	If cultural resources are found.	Each time cultural	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
including sacred items, burial goods and all archaeological artifacts that are found on the project area to the appropriate Tribe for proper treatment and disposition.	the project area to the appropriate Tribe.		resources are found.				
CR-6 Avoidance of Sacred Sites							
It is understood by all parties that, unless otherwise required by law, the site of any reburial of Native American human remains or associated grave goods shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies, shall be asked to withhold public disclosure information related to such reburial, pursuant to the specific exemption set forth in California Government Code 6254(r).	Ensure reburial sites for Native American human remains or associated grave goods are not disclosed.	If human remains are reburied.	Each time human remains are reburied.	City of Temecula			
CR-7 Inadvertent Discovery of Cultural Resources							
If inadvertent discoveries of subsurface archaeological/cultural resources are discovered during grading, the Developer, the project archaeologist, and the Tribe shall assess the significance of such resources and shall meet and confer regarding the mitigation for such resources. Pursuant to California Public Resources Code § 21083.2(b) avoidance is the preferred method of preservation for archaeological resources. If the Developer, the project archaeologist and the Tribe cannot agree on the	Assess the significance of inadvertent discoveries of subsurface archaeological/cultural resources and meet to confer regarding the mitigation for such resources. If the Developer, the project archaeologist, and Pechanga Tribe cannot agree on the significance or the mitigation for such resources, these issues must be presented to the City's Planning Director for a decision.	Upon inadvertent discovery of subsurface archaeological/cultural resources.	For each inadvertent discovery of subsurface archaeologica l/cultural resources.	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
significance or the mitigation for such resources, these issues will be presented to the City's Planning Director for a decision. The Planning Director shall make the determination based on the provisions of the California Environmental Quality Act with respect to archaeological resources and shall take into account the religious beliefs, customs, and practices of the Tribe. Treatment of tribal cultural resources inadvertently discovered during the project's ground-disturbing activities shall be subject to the consultation process required by state law and AB 52: ▪ All ground disturbance activities within 100 feet of the discovered cultural resources shall be halted until a meeting is convened between the Project Applicant, the Project Archaeologist, the Tribal Representative(s), and the Community Development Director to discuss the significance of the find. ▪ At the meeting, the significance of the discoveries shall be discussed and after consultation with the Tribal Representative(s) and the Project Archaeologist, a decision shall be made, with the concurrence of the Community Development Director, as to the appropriate mitigation (documentation, recovery, avoidance, etc.) for the cultural resources.							

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
▪ Further ground disturbance, including but not limited to grading, trenching etc., shall not resume within the area of the discovery until an agreement has been reached by all parties as to the appropriate mitigation. Work shall be allowed to continue outside of the buffer area and will be monitored by additional Tribal Monitors, if needed. ▪ Treatment and avoidance of the newly discovered resources shall be consistent with the Cultural Resources Management Plan and Monitoring Agreements entered into with the appropriate tribes. This may include avoidance of the cultural resources through project design, in-place preservation of cultural resources located in native soils and/or re-burial on the project property so they are not subject to further disturbance in perpetuity as identified in Non-Disclosure of Reburial Condition/Mitigation Measures. ▪ If the find is determined to be significant and avoidance of the site has not been achieved, a Phase III data recovery plan shall be prepared by the Project Archeologist, in consultation with the Tribe, and shall be submitted to the City for their review and approval prior to implementation of the said plan. ▪ Pursuant to Calif. Pub. Res. Code § 21083.2(b), avoidance is the							

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
preferred method of preservation for archaeological resources and cultural resources. If the Project Applicant and the Tribe(s) cannot agree on the significance or the mitigation for the archaeological or cultural resources, these issues will be presented to the City Community Development Director for decision. The City Community Development Director shall make the determination based on the provisions of the California Environmental Quality Act with respect to archaeological resources, recommendations of the project archeologist and shall consider the cultural and religious principles and practices of the Tribe. Notwithstanding any other rights available under the law, the decision of the City Community Development Director shall be appealable to the City Planning Commission and/or City Council." Evidence of compliance with this mitigation measure, if a significant archaeological resource is found, shall be provided to City of Temecula upon the completion of a treatment plan and final report detailing the significance and treatment finding.							
CR-8 Final Disposition of Inadvertent Discovery							
In the event that Native American cultural resources are discovered during the course of grading (inadvertent discoveries), the following procedures	For each inadvertent discovery, carry out final disposition procedures in	Following inadvertent discovery of subsurface	For each inadvertent discovery of subsurface archaeologica	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
shall be carried out for final disposition of the discoveries. One or more of the following treatments, in order of preference, shall be employed with the tribes. Evidence of such shall be provided to the City of Temecula Community Development Department: ▪ Preservation-In-Place of the cultural resources, if feasible. Preservation in place means avoiding the resources, leaving them in the place where they were found with no development affecting the integrity of the resources. ▪ Reburial of the resources on the project property. The measures for reburial shall include, at least, measures and provisions to protect the future reburial area from any future impacts in perpetuity. Reburial shall not occur until all legally required cataloging and basic recordation have been completed, with an exception that sacred items, burial goods, and Native American human remains are excluded. Any reburial process shall be culturally appropriate. Listing of contents and location of the reburial shall be included in the confidential Phase IV report. The Phase IV Report shall be filed with the City under a confidential cover and not subject to Public Records Request. ▪ If preservation in place or reburial is not feasible then the resources	order of Pechanga Tribe preference.	archaeological/cultural resources.	l/cultural resources.				

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
shall be curated in a culturally appropriate manner at a Riverside County curation facility that meets State Resources Department Office of Historic Preservation Guidelines for the Curation of Archaeological Resources ensuring access and use pursuant to the Guidelines. The collection and associated records shall be transferred, including title, and are to be accompanied by payment of the fees necessary for permanent curation. Evidence of curation in the form of a letter from the curation facility stating that subject archaeological materials have been received and that all fees have been paid, shall be provided by the landowner to the City. There shall be no destructive or invasive testing on sacred items, burial goods, and Native American human remains. Results concerning finds of any inadvertent discoveries shall be included in the Phase IV monitoring report. Evidence of compliance with this mitigation measure, if a significant archaeological resource is found, shall be provided to City of Temecula upon the completion of a treatment plan and final report detailing the significance and treatment finding.							
CR-9 Final Inspection							
Prior to final inspection, the Project Archeologist is to submit two (2) copies of the Phase IV Cultural Resources Monitoring Report that complies with	Submit two copies of the Phase IV Cultural Resources Monitoring Report to the City's Planning Department, two	Prior to final inspection.	Once	Project Archaeologist			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
the Planning Department's requirements for such reports. The Phase IV report shall include evidence of the required cultural/historical sensitivity training for the construction staff held during the pre-grade meeting. The Planning Department shall review the reports to determine adequate mitigation compliance. Provided the reports are adequate, the Planning Department shall clear this condition. Once the report(s) are determined to be adequate, two (2) copies shall be submitted to the Eastern Information Center (EIC) at the University of California Riverside (UCR) and one (1) copy shall be submitted to the Pechanga Cultural Resources Department.	copies to the Eastern Information Center at the University of California Riverside, and one copy to the Pechanga Cultural Resources Department.						
Geology and Soils							
GEO-1.1 Paleontological Resource Monitoring							
Prior to excavation, the project applicant shall retain a Qualified Professional Paleontologist, as defined by the Society of Vertebrate paleontology (SVP; 2010). The Qualified Professional Paleontologist shall draft a Paleontological Resources Mitigation and Monitoring Plan, which shall direct all mitigation measures related to paleontological resources.	Retain a Qualified Professional Paleontologist to draft a Paleontological Resources Mitigation and Monitoring Plan.	Prior to excavation.	Once	City of Temecula			
GEO-1.2 Paleontological Resource Monitoring							
Prior to the start of construction, the Qualified Professional Paleontologist or their designee shall conduct a paleontological Worker Environmental Awareness Program (WEAP) training for	Conduct a paleontological Worker Environmental Awareness Program training for construction personnel regarding the appearance of fossils and the procedures for	Prior to the start of construction.	Once	Qualified Professional Paleontologist			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
construction personnel regarding the appearance of fossils and the procedures for notifying paleontological staff should fossils be discovered by construction personnel.	notifying paleontological staff should fossils be discovered by construction personnel.						
GEO-1.3 Paleontological Resource Monitoring							
Full-time paleontological monitoring shall be conducted during drilling for the bridge piers that reaches more than 10 feet below the surface or for the bridge abutments that reaches more than 25 feet below the surface. Paleontological monitoring shall be conducted by a paleontological monitor with experience with collection and salvage of paleontological resources and who meets the minimum standards of the SVP (2010) for a Paleontological Resources Monitor. The Qualified Professional Paleontologist may recommend that monitoring be reduced in frequency or ceased entirely based on geologic observations. Such decisions shall be subject to review and approval by the City of Temecula. In the event of a fossil discovery by the paleontological monitor or construction personnel, all construction activity within 50 feet of the find shall cease, and the Qualified Professional Paleontologist shall evaluate the find. If the fossil(s) is (are) not scientifically significant, then construction activity may resume. If it is determined that the fossil(s) is (are) scientifically significant, the following shall be completed:	Monitor for paleontological resources during drilling activities. If a fossil is discovered, stop all construction activity within 50 feet of the find. Evaluate the find. If the fossil(s) is (are) not scientifically significant, construction activity may resume. If it is determined that the fossil(s) is (are) scientifically significant, salvage the fossil to protect it from damage/destruction before construction activity resumes. Identify to the lowest possible taxonomic level. Prepare fossil to a curation-ready condition, and curate the fossil in a scientific institution with a permanent paleontological collection along with all pertinent field notes, photos, data, and maps.	During drilling for the bridge piers that reaches more than 10 feet below the surface or for the bridge abutments that reaches more than 25 feet below the surface.	Each time drilling occurs for the bridge piers at more than 10 feet below the surface or for the bridge abutments at more than 25 feet below the surface.	City of Temecula			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
▪ **Fossil Salvage.** The paleontological monitor shall salvage (i.e., excavate and recover) the fossil to protect it from damage/destruction. Typically, fossils can be safely salvaged quickly by a single paleontological monitor with minimal disruption to construction activity. In some cases, larger fossils (such as complete skeletons or large mammal fossils) require more extensive excavation and longer salvage periods. Bulk matrix sampling may be necessary to recover small invertebrates or microvertebrates from within paleontologically sensitive deposits. After the fossil(s) is (are) salvaged, construction activity may resume. ▪ **Fossil Preparation and Curation**. Fossils shall be identified to the lowest (i.e., most-specific) possible taxonomic level, prepared to a curation-ready condition, and curated in a scientific institution with a permanent paleontological collection along with all pertinent field notes, photos, data, and maps. Fossils of undetermined significance at the time of collection may also warrant curation at the discretion of the Qualified Professional Paleontologist.							
GEO-1.4 Final Paleontological Mitigation Report							

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Monitoring Frequency	Monitoring Responsibility	Compliance Verification Initial	Compliance Verification Date	Compliance Verification Comments
Upon completion of ground-disturbing activities (or laboratory preparation and curation of fossils, if necessary), the Qualified Professional Paleontologist shall prepare a final report describing the results of the paleontological monitoring efforts. The report shall include a summary of the field and laboratory methods employed; an overview of project geology; and, if fossils were discovered, an analysis of the fossils, including physical description, taxonomic identification, and scientific significance. The report shall be submitted to the City of Temecula and, if fossil curation occurred, the designated scientific institution.	Prepare a final report describing the results of the paleontological monitoring efforts. Submit the report to the City of Temecula and to the designated scientific institution, if fossil curation occurred.	Upon completion of ground-disturbing activities, or following laboratory preparation and curation of fossils, if necessary.	Once after ground disturbing activities are concluded, or after each laboratory preparation and curation of fossils.	Qualified Professional Paleontologist			

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