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March 2, 2020
Kleinfelder Project No. 20201437.001A

BFS Landscape Architects
425 Pacific Street
Monterey, California 93940

Attention: Mr. Mike Bellinger
Principal

Subject: Geotechnical Investigation
Proposed Carr Lake Restoration and Park Development
622 Sherwood Drive
Salinas, California 93906

Dear Mr. Bellinger:

Kleinfelder is pleased to present this report summarizing our geotechnical investigation for the proposed Carr Seasonal Wetland and Park facility located on Sherwood Drive in Salinas, California. The purpose of our geotechnical study was to evaluate subsurface soil conditions at the project site to provide geotechnical recommendations for design and construction. The conclusions and recommendations presented in this report are subject to the limitations presented in Section 5.

We appreciate the opportunity to provide geotechnical engineering services to you on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact Kleinfelder's project manager Andrea Traum at (408) 595.3275.

Respectfully submitted,

KLEINFELDER, INC

Lilian Lorincz, EIT
Staff Professional

Brian O'Neill, PE, GE
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
BRIAN O'NEILL
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Exp. 6-30-21
GEOTECHNICAL
STATE OF CALIFORNIA

Gabriel Alcantar, PE
Project Manager

Exhibit 51

KLEINFELDER
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GEOTECHNICAL INVESTIGATION PROPOSED CARR LAKE RESTORATION AND PARK DEVELOPMENT 622 SHERWOOD DRIVE SALINAS, CALIFORNIA 93906 KLEINFELDER PROJECT # 20201437.001A

March 2, 2020

A Report Prepared for:

BFS Landscape Architects
425 Pacific Street
Monterey, California 93940

Geotechnical Investigation
Proposed Carr Lake Restoration and Park Development
622 Sherwood Drive
Salinas, California 93906

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March 2, 2020
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TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (Continued)

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed new Carr Seasonal Wetland and Park located at 622 Sherwood Drive in Salinas, California. The location of the project site is presented on Figure 1, Site Vicinity Map. The purpose of our study was to evaluate subsurface soil and groundwater conditions at the project site to provide geotechnical recommendations for design and construction. The scope of our services was presented in our proposal titled "Revised Proposal for Geotechnical Engineering Investigation for the Proposed Carr Seasonal Wetland and Park, Sherwood Drive, Salinas, California" dated March 21, 2019.

This report includes a description of the work performed, a discussion of the subsurface and surficial conditions observed at the site, and recommendations developed from our engineering analyses of field and laboratory data.

1.1 PROJECT DESCRIPTION

Kleinfelder understands that the proposed Carr Seasonal Wetland and Park development will consist of the construction of a new seasonal wetland and public park facility located on the existing agricultural property (Figure 3). The seasonal wetland will straddle the existing Gabilan Creek onsite. New channel paths will be constructed surrounding the seasonal wetland including five pedestrian boardwalk walkways and bridges including an observation deck. The new park development is planned on the western side of the property nearest to Sherwood Drive. Per discussions with the design team and preliminary drawings, the proposed park development will consist of a gazebo, prefabricated restroom, picnic areas, basketball court, concrete skate park, grass amphitheater, and associated flatwork improvements including pedestrian walkways and asphalt parking areas.

We understand the proposed boardwalk and bridges will be trafficked by pedestrians and park maintenance vehicles only (maximum 7-kip axle load). Foundation loading information for onsite structures is not readily available so based on the proposed construction and our experience with similar buildings, we anticipate one-story structures will have maximum column dead plus live loads of between 10 to 25 kips. Overall site grading is anticipated to be limited to cuts of approximately 6 to 15 feet for the new seasonal lakebed and fills of approximately 2 to 4 feet in general for the new park and 7 to 8 feet for vista point berm. In addition, we understanding site retaining wall are not planned at this time.

1.2 SCOPE OF SERVICES

The scope of our geotechnical study consisted of pre-field work, field exploration (including infiltration testing), laboratory testing, engineering evaluation and analysis, and preparation of this report. Studies to assess environmental hazards that may affect the soil and groundwater at the site were beyond our geotechnical scope of work. A description of our scope of services performed for the geotechnical portion of the project follows.

1.2.1 Task 1 – Pre-Field Activities and Utility Clearance

We reviewed readily available published geologic literature in our files and the files of public agencies. In particular, Kleinfelder reviewed the Modified Phase 1 and 2 reports conducted by Environmental Investigations Services Inc conducted in 2015 and 2016 respectively. We also reviewed readily available seismic and faulting information for the general site vicinity. Prior to commencement of exploratory drilling, various geophysical techniques were used at the exploration locations to identify potential conflicts with subsurface structures. Exploration locations were also cleared for buried utilities through Underground Service Alert (USA).

1.2.2 Task 2 – Field Exploration

Subsurface conditions were explored by drilling borings (three borings within future bridge areas and two within the new building and viewpoint berm footprints) to depths of between approximately 11½ and 31½ feet below the ground surface (bgs). The borings were drilled using truck-mounted hollow-stem auger drilling equipment. In addition, six hand auger boreholes were performed to a depth of approximately 3 to 5½ feet bgs. The hand auger borings were scattered across the site in future bridge locations and within the proposed parking areas.

One double ring infiltrometer test was performed in the proposed permeable pavement area to evaluate the soil infiltration rate. The approximate locations of all borings and infiltration tests are shown on Figure 2.

Prior to commencement of the fieldwork, Underground Service Alert (USA) was notified and various geophysical techniques were used at the boring and hand auger locations to identify potential conflicts with subsurface structures. A Kleinfelder staff engineer supervised the field operations and logged the explorations. Selected samples were 20retrieved, placed in plastic bags or sealed, and transported to our Hayward, CA laboratory for further evaluation. Descriptions used on the logs result from field observations and data, as well as from laboratory test data. Stratification lines on the logs represent the approximate boundary between soil types, and the actual transition may vary and can be gradual. Appendix A presents a description of the field exploration program, exploration logs, and a legend of terms and symbols used on the logs.

1.2.3 Task 3 – Laboratory Testing

Laboratory testing was performed on selected samples to evaluate the physical and engineering characteristics of the subsurface soils. In-house laboratory testing consisted of in-situ moisture content and dry density, grain-size distribution, shear strength, R-value, and Atterberg limits. Preliminary corrosivity series (pH, minimum resistivity, and soluble sulfate and chloride) testing was conducted by CERCO analytical of Concord California.

Analytical testing was performed on a discrete topsoil sample for analysis. The topsoil analysis testing was performed by Waypoint Analytical of Anaheim, California to assess soil fertility, and localized concentrations of various metals to provide recommendations for proposed mass planting. All in-house and subcontracted laboratory test results are shown in Appendix B of this report.

1.2.4 Task 4 – Double Ring Infiltrometer Testing

One double-ring infiltration test was performed in general conformance to ASTM D3385. The test procedure consists of seating a 24-inch diameter outer ring and 12-inch diameter inner ring into the undisturbed soil. Both rings are initially filled with water and then refilled at selected time intervals, with the added volume of water noted. A field infiltration test develops a wetted front emanating vertically and laterally from the test surface. In the double-ring test, the infiltration from the outer ring is intended to provide the majority of water which spreads laterally from the test surface. The recorded volume discharge from the inner ring is used to calculate the infiltration rate.

A Kleinfelder engineer was onsite on October 22, 2019 to perform the infiltration test at the predetermined test location selected by the project landscape architect, shown in Figure 2. Once the test area was selected, top-soil was scarified by hand and shovel prior to setting the rings. Soil conditions within the upper two feet were noted by Kleinfelder prior to running the test. The test was run for a total of 150 minutes as no infiltration was observed for an entire 30 minute interval. The observed short-term infiltration rate is detailed in Section 3.11 of this report and documented in Appendix C.

1.2.5 Task 5 – Geotechnical Analyses and Report Preparation

This report summarizes the work performed, data acquired, and our findings, conclusions, and geotechnical recommendations for the design and construction of the proposed Carr Seasonal Wetland and Park. Our report includes the following items:

- Site vicinity map and exploration map showing the approximate boring/infiltration test locations;
- Appendices which include boring logs and laboratory test results;
- Discussion of subsurface conditions, as encountered in our field exploration;
- Recommendations for foundation design (spread footings and pile foundations), allowable bearing capacities, embedment depths, and resistance to lateral loads;
- Anticipated total and differential settlements;
- Slab-on-grade and flatwork support requirements;
- Discussion of liquefaction and settlement potential, and magnitudes;
- Discussion of slope stability;
- Recommendations for seismic design parameters in accordance with the 2019 CBC;
- Recommendations for site preparation, earthwork, temporary slope inclinations, fill placement, and compaction specifications;
- Recommendations for surface and subsurface drainage;
- Recommendations for asphalt parking areas and driveways based on Traffic Indices from the civil engineer and R-value testing;
- Results of our double ring infiltrometer tests for design of permeable pavement;

- Preliminary evaluation of the corrosion potential of the on-site soils; and
- Discussion of construction considerations

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The proposed site is located northeast of the intersection of Sherwood Drive and Sherwood Place in Salinas, California. The 73-acre site is currently undeveloped agricultural land with exception to localized areas of commercial and residential use on the Northwest corner. The property is bounded to the southwest by the Salinas Education Center campus, agricultural land to the east and south, and Sherwood Drive and residential developments to the north and west. The site is relatively flat with minor grade changes running west to east. The only existing structures on-site include the one-story residential and agricultural buildings located on the northwest corner of the site. Existing conditions onsite are shown on Figure 2 and Proposed construction is shown on Figure 3.

2.2 SUBSURFACE SOIL CONDITIONS

The existing surface throughout the property is disked agricultural fields with exception to cut agricultural roads between each field. Subsurface conditions at the site generally consist of alluvial deposits. As observed, the alluvial deposits generally consisted of medium stiff to very stiff lean to fat clays, with varying amounts of sand. Interbedded layers of dense to very dense poorly graded sands with varying amounts of gravel were also observed. The alluvial deposits were encountered to the maximum depth of our borings which was approximately 31½ feet bgs. Detailed descriptions of the deposits are provided in our boring logs presented in Appendix A. Groundwater was not encountered in any of our on-site explorations.

Localized zones of perched water, increased soil moisture content and fluctuations of the groundwater level, should be anticipated during and following the rainy season. Irrigation of landscaped areas and agricultural land on or adjacent to the site can also cause a fluctuation of local groundwater levels.

2.3 EXPANSIVE SOIL

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors, and may result in unacceptable settlement or heave of structures or concrete slabs supported on grade. The surficial lean to fat clays have plasticity indexes between 15 and 77 which can exhibit medium to very high expansion potential. Recommendations for mitigating expansive soils are provided in this report.

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 GENERAL

Based on the results of the field exploration, laboratory testing, and our engineering analyses conducted during this investigation, it is our professional opinion that the proposed project is geotechnically feasible provided the recommendations presented in this report are incorporated into the project design and construction. The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the borings, the results of the laboratory-testing program, and our engineering analyses performed. Our recommendations regarding the geotechnical aspects of the design and construction of the project are presented in the following sections.

3.2 SEISMIC DESIGN CONSIDERATIONS

3.2.1 2019 CBC Seismic Design Parameters

For a 2019 California Building Code (CBC) based design, recommended seismic design parameters are presented below in Table 1. The general seismic design parameters are obtained based on ASCE 7-16 and the site class, site coordinates, and the risk category of the building using the OSHPD web-based application (https://seismicmaps.org/).

Since the mapped S_1 value is greater than 0.2g and the site is classified as Site Class D per 2019 CBC, a site-specific ground motion hazard analysis is required unless one or more exceptions are taken by the structural engineering designer per Section 11.4.8 of ASCE 7-16. We understand the project design team will take the exceptions approach for design, and therefore a site-specific ground motion hazard analysis is not needed. As such, Kleinfelder is providing general procedure seismic design parameters consistent with Chapter 11 of ASCE 7-16, and the 2019 California Building Code as follows.

Table 1 – Ground Motion Parameters Based on 2019 CBC

Parameter	Value	ASCE 7-16 Reference
Latitude	36.68815°	-
Longitude	-121.64351°	-
S_S	1.835 g	Figure 22-1
S_1	0.639 g	Figure 22-2
Site Class	D	Table 20.3-1
F_a	1.0	Table 11.4-1
F_v	N/A	See Section 11.4.8
PGA	0.733 g	Figure 22-9
S_{MS}	1.835 g	Equation 11.4-1
S_{M1}	N/A	See Section 11.4.8
S_{DS}	1.223 g	Equation 11.4-3
S_{D1}	N/A	See Section 11.4.8
F_{PGA}	1.100	Table 11.8-1
PGA_M	0.806 g	Equation 11.8-1
C_{RS}	0.978	Figure 22-18A
C_{R1}	0.942	Figure 22-19A
T_L	12 seconds	

- ***Note: N/A = Not Applicable; Section 11.4.8 of ASCE 7-16 requires a site-specific ground motion hazard analysis be performed for Site Class D sites with S_1 greater than or equal to 0.2g unless exceptions are taken. If exceptions are taken, then a F_v value of 1.700 could be used only to calculate the T_s value.**

3.2.2 Liquefaction and Seismic Settlement

The term liquefaction describes a phenomenon in which saturated, cohesionless or very low plasticity soils temporarily lose shear strength (liquefy) due to increased pore water pressures induced by strong, cyclic ground motions during an earthquake. Structures founded on or above potentially liquefiable soils may experience bearing capacity failures due to the temporary loss of foundation support, vertical settlements (both total and differential), and/or undergo lateral spreading. The factors known to influence liquefaction potential include age, soil type, relative density, grain size, plasticity, confining pressure, depth to groundwater, and the intensity and duration of the seismic ground shaking. Liquefaction is most prevalent in young loose to medium dense, non-plastic coarse-grained soils. Because of the soil types encountered and due to the lack of groundwater, the potential for liquefaction and seismically induced settlement hazard at the site is considered low.

3.3 SHALLOW FOUNDATIONS

3.3.1 General

Based on the results of our field exploration, laboratory testing, and geotechnical analyses, the proposed gazebo, portable restroom structures, pedestrian bridges, and decks may be supported on conventional shallow foundations (spread footings) founded on subgrade prepared in accordance with section 3.5.2. Kleinfelder has assumed both building structures to be lightly loaded, and maximum loading for bridge abutment foundations are on the order of 15 kips. Recommendations for the design and construction of shallow foundations are presented below.

3.3.2 Spread Footings

Allowable Soil Bearing Pressure

Pedestrian Bridge and Deck Footings may be designed for a net allowable soil bearing pressure of 2,500 pounds per square foot (psf) for dead plus sustained live loads. Footings for the gazebo and portable restroom buildings may be designed for a net allowable soil bearing pressure of 3,000 psf for dead plus sustained live loads.

Pedestrian Bridge footings should be embedded at 30 inches below the lowest adjacent exterior grade, all other footings including the observation deck, gazebo, and portable restroom should be embedded at least 24 inches. Footing dimensions and reinforcement should be designed by the structural engineer; however, continuous and isolated spread footings should have minimum widths of 18 and 24 inches, respectively. A one-third increase in the above bearing pressure can be used for transient wind or seismic loads.

Estimated Settlement

We estimate total static settlement of foundations designed and constructed in accordance with the recommendations presented above to be less than ½ inch. Differential static settlement between similarly loaded footings is estimated to be less than ½ inch over 50 feet.

Lateral Resistance

Lateral load resistance may be derived from passive resistance along the vertical sides of the footings, friction acting at the base of the footing, or a combination of the two. An allowable passive resistance of 250 psf per foot of depth may be used for design. Allowable passive resistance values should not exceed 2,000 psf. An allowable coefficient of friction value of 0.30 between the base of the footings and the fill soils can be used for sliding resistance using the dead load forces. Friction and passive resistance may be combined without reduction. We recommend that the upper one foot be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in a similar manner.

3.4 DRILLED PIER FOUNDATIONS FOR LIGHT POLES

As an alternative to shallow foundation, the parking lot light poles may be founded on drilled pile foundations. It should be noted that drilling of the pile shafts will require heavy-duty excavation equipment to excavate through the alluvial soils.

Axial Capacity

The downward loading compressive axial capacity of drilled piers may be estimated based on an average allowable skin friction capacity of 200 pounds per square foot. The upper one foot of the skin friction capacity should be ignored. The uplift capacity may be estimated as 70 percent of the allowable compressive axial capacity. A one-third increase in the allowable capacities may be used for transient loading conditions such as wind or seismic loads.

Settlement

Static settlement of the proposed parking lot light poles supported on drilled piles, as recommended, is estimated to be less than ½ inch.

Lateral Resistance

The drilled pile foundations lateral resistance can be designed in general accordance with Section 1807.3 of the 2019 CBC. We recommend a lateral soil bearing pressure of 250 psf per foot of depth below grade. The total lateral soil bearing pressure should not exceed 2,500 psf per pile.

Since single drilled piles will act as isolated pole foundations, the allowable lateral soil bearing pressure may be increased by a factor of 2 for short-term lateral loads provided the structure will not be adversely affected by ½ inch of lateral movement at the ground surface.

3.5 EARTHWORK

3.5.1 General

Site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, state or federal specifications, and the recommendations included in this report. References to maximum dry unit weights are established in accordance with the latest version of ASTM Standard Test Method D1557 (modified Proctor). The earthwork operations should be observed and tested for relative compaction by a representative of Kleinfelder.

3.5.2 Site Preparation

Pavement, planters, abandoned utilities, foundations, and other existing improvements within the proposed improvement areas should be removed and the excavation(s) backfilled with structural fill. Debris produced by demolition operations, including wood, steel, piping, plastics, etc., should be separated and disposed of off-site. Existing utility pipelines or conduits that extend beyond the limits of the proposed construction and are to be abandoned in place should be plugged with non-shrinking cement grout to prevent migration of soil and/or water. Demolition, disposal and grading operations should be observed and tested by a representative of the geotechnical engineer. Areas to receive fill should be stripped of all dry, loose or soft earth materials and undocumented fill materials to the satisfaction of the geotechnical engineer.

Based on preliminary grading plans and site topography, the site is generally flat sloping from west to east toward the Gabilan Creek. Maximum cuts will occur within the proposed seasonal wetland on the east side of the property will be approximately 6 to 15 feet deep while maximum fills on the western end of the property will be approximately 2 to 4 feet within the new park areas. Also located in the park is the vista point berm which is planned for about 7 to 8 feet of fill. A final grading plan has not been completed, but we understand that earthwork construction for the project will result in excess cut material that will require export off-site. Where import soil is required, import fill characteristics should adhere to section 3.5.4 of this report.

- Spread Footings: Based off field explorations we anticipate all onsite foundation excavations to bear on either predominately clayey or predominately sandy soil. If the soil is predominately sand, the footing can be dug to design depth, scarified, and recompacted. However, if a predominately clay soil is encountered, we anticipate this soil is highly expansive. We recommend the over-excavation of this clay at a minimum depth of one foot below the footing base and replace with non-expansive structural fill. Non-expansive structural fill should adhere to the requirements specified in Table 3 of Section 3.5.4.
- Structural Fill Sections: We recommend areas receiving structural fill, including subgrade for building pads should be overexcavated and recompacted or replaced with non-expansive structural fill. Where expansive clays are encountered within building footprints, soil should be over-excavated at least one foot below foundation and slab depths. Depending on the observed condition of the existing soils, deeper overexcavation of the clay may be required in some areas. The overexcavation should extend horizontally at least 5 feet beyond the limits of building pads. However, for building pads with planted landscaped areas planned surrounding the perimeter of the structures, we recommend soils be properly prepared as described above at least 2 feet (lateral overbuild) beyond the limits of the building wall lines as well as a 1:1 (horizontal:vertical) plane extending downward from the top of the overbuild subgrade to a depth of 5 feet. Above this 1:1 line, the landscape architect's requirement for compaction should be met provided there are no buried utility lines or other structures adjacent to the building.

  Where onsite sandy soils are encountered within the footing and building footprints, scarification and recompaction are acceptable, so no overexcavation will be necessary for sandy subgrade soil conditions.

  Excavations within a 1:1 (horizontal:vertical) plane extending downward from a horizontal distance of 2 feet beyond the bottom outer edge of existing improvements should not be attempted without bracing and/or underpinning. All applicable excavation safety requirements and regulations, including OSHA requirements, should be met.
- At Grade Sidewalks, Exterior Slabs on Grade, Asphalt Pavement, and Pathway Trails: After the areas have been stripped of topsoil and soft earth materials and debris, we recommend that the exposed subgrades be proof-rolled with heavy construction equipment (e.g. loader or smooth-drum roller) to disclose areas of soft and yielding

material. Where soft and yielding material is observed, it should be overexcavated a minimum of 2 feet and replaced with non-expansive fill. The proof-rolling and subgrade preparation should extend beyond the proposed improvements a horizontal distance of at least 5 feet.

For areas of exterior concrete slabs on grade and sidewalks where expansive clay subgrade soils are exposed during grading, subgrade preparation should follow the same recommendations as presented above (the bulleted item for Structural Fill sections). Furthermore, exterior concrete flatwork subjected to more than occasional light vehicle traffic should be designed as rigid pavements. Rigid pavement design recommendations are provided in Section 3.10.

If expansive clay subgrade soils are exposed during construction for the areas of asphalt pavements and pathway trails, overexcavation and replacement with non-expansive fill is not expected to be necessary.

Based on past experience, it is common to encounter wet, unstable soils upon removal of existing site pavements or flatwork as a result of subsurface moisture becoming trapped beneath relatively impervious asphalt concrete or Portland cement concrete surfaces over time. Perched groundwater or saturated near surface conditions are also common in clayey soils following winter or heavy rains. The contractor should anticipate that pumping or saturated subgrade conditions may be encountered during site grading activities, and the subgrade may need to be stabilized. Recommendations for stabilization are provided in Section 3.5.8.

3.5.3 Foundation Excavations

Following excavation to the foundation subgrade elevations, the exposed subgrade should be observed by a representative of the geotechnical engineer to evaluate the presence of satisfactory materials at design elevations. If unsatisfactory material, such as soft or disturbed soil, debris or otherwise unsuitable soil is present at the base of footing excavations, it should be overexcavated and replaced with structural concrete, 2-sack sand-cement slurry, or structural fill to the depth determined by the geotechnical engineer.

3.5.4 Structural Fill Material and Compaction Criteria

Where encountered, the on-site sandy soils, minus any debris, organic matter, or other deleterious materials, may be used in the site structural fills. Rock or other soil fragments greater than 3 inches in size should not be used in the fills. Based on our field exploration and laboratory testing, near surface clays can exhibit high expansion potential and are not recommended for use in onsite structural fills. However, sandy granular material was encountered in B-1 and B-5 at depths between five and ten feet bgs. This material may be suitable for reuse as engineered fill pending further testing and observation during construction.

Due to compaction difficulties, we do not recommend compacting the onsite clayey soils to attempt to achieve at least 95 percent of the maximum dry unit weight (ASTM D1557). Onsite clayey soils for structural areas and utility trenches should be compacted to between 88 and 92 percent of the soil's maximum dry unit weight at 2 to 5% over optimum moisture content. For subgrade for pavement sections, onsite clayey soils should be compacted to between 90 and 93 percent compaction at 2 to 5% over optimum moisture. We recommend granular (sandy) fill soils, aggregate base and imported material should be compacted to at least 95 percent of the maximum dry unit weight.

Fill should be placed in loose horizontal lifts not more than 8 inches thick (loose measurement). The moisture content of the clayey fill is considered very important, and therefore, both relative compaction and moisture content should be used to evaluate compaction acceptance. If both criteria are not within the specified tolerances, the fill should not be accepted, and the contractor should rework the material until the fill is placed within the specified tolerances. Processing may require ripping the material, disking to break up clumps, and blending to attain uniform moisture contents necessary for compaction. Utility trench backfill should be mechanically compacted. Flooding should not be permitted. Table 2 present structural fill placement and compaction criteria.

Table 2 - Structural Fill Placement and Compaction Criteria

Fill Location/Use	Material Type	Relative Compaction[1] (ASTM D1557)	Moisture Content Range
Aggregate Base for Pavements and Concrete Slabs	Aggregate Base	At least 95 percent	-2 to +2% of optimum
Structural Areas and Utility Trench Backfill	On-site Soils or Imported Material	Between 88 and 92 percent for clayey soils	+2 to +5% of optimum

		At least 95 percent for sandy soils	-2 to +2% of optimum
Subgrade for Pavements	On-site Soils or Imported Material	Between 90 and 93 percent for clayey soils At least 95 percent for sandy soils	+2 to +5% of optimum -2 to +2% of optimum
Landscape Areas	Onsite soils or imported Material	At least 90 percent	At least optimum

Import materials, if required, should adhere to the requirements provided in Table 3 below for non-expansive fill. Imported fill should be non-corrosive, and be documented to be free of hazardous materials, including petroleum or petroleum byproducts, chemicals and harmful minerals. Kleinfelder should evaluate the proposed imported materials prior to their transportation and use on site. Table 3 also applies to onsite soils that are desired to be used as non-expansive backfill for over-excavated structural fill sections.

Table 3 – Non-Expansive Fill Requirements for Import and Onsite Soils

Fill Requirement		**Test Procedures**	
		ASTM[1]	**Caltrans**[2]
Gradation			
Sieve Size	**Percent Passing**		
3 inch	100	D422	202
¾-inch	70-100	D422	202
No. 200	15-70	D422	202
Plasticity			
Liquid Limit	**Plasticity Index**		
<30	<12	D4318	204
Organic Content			
No visible organics		---	---
Expansion Potential			---
20 or less		D4829	---
Soluble Sulfates			

Less than 2,000 ppm	---	417
Soluble Chloride		
Less than 300 ppm	---	422
Resistivity		
Greater than 2,000 ohm-cm	---	643
[1]*American Society for Testing and Materials Standards (latest edition)* [2]*State of California, Department of Transportation, Standard Test Methods (latest edition)*		

3.5.5 Excavation Characteristics

Borings drilled for our field exploration were advanced using hollow-stem-auger drilling equipment. Excavation effort was moderate within the alluvial soils. It is anticipated that conventional heavy-duty earthmoving equipment maintained in good condition should be capable of excavating the soil. During seasonal rains, handling of saturated soils may pose problems with equipment access and cleanup, and we suggest the materials be allowed to dry out, if possible, prior to excavation.

3.5.6 Temporary Excavations

All excavations must comply with applicable local, state, and federal safety regulations, including OSHA requirements. The responsibility for excavation safety and stability of temporary construction slopes lies solely with the contractor. We are providing this information below solely as a service to our client. Under no circumstances should this information provided be interpreted to mean that Kleinfelder is assuming responsibility for final engineering of excavations or shoring, construction site safety, or the contractors' activities; such responsibility is not being implied and should not be inferred.

Shoring and/or underpinning of existing improvements to remain may be required to perform the demolition and overexcavation. Excavations within a 1:1 plane extending downward from a horizontal distance of 2 feet beyond the bottom outer edge of existing improvements should not be attempted without bracing and/or underpinning the improvements. The geotechnical engineer or their field representative should observe the excavations so that modifications can be made to the excavations, as necessary, based on variations in the encountered soil conditions. All applicable excavation safety requirements and regulations, including OSHA requirements, should be met.

Where sloped excavations are used, barricades should be placed at the crest of the slopes so that vehicles and storage loads do not encroach within a distance equal to the depth of the excavation. Greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. Kleinfelder should be advised in advance of such heavy vehicle loadings so that specific setback requirements can be established. If temporary construction slopes are to be maintained during the rainy season, berms are recommended along the tops of the slopes to reduce runoff that may enter the excavation and erode the slope faces.

Stockpiled (excavated) materials should be placed no closer to the edge of an excavation than a distance equal to the depth of the excavation, but no closer than 4 feet. All trench excavations should be made in accordance with OSHA requirements.

3.5.7 Trench Backfill

Pipe zone backfill (i.e. material beneath and in the immediate vicinity of the pipe) should consist of imported sandy soil less than ¾-inch in maximum dimension. Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of onsite soils or imported fill meeting the requirements outlined in Table 3.

If imported material is used for trench zone backfill, we recommend it consist of silty sand. In general, gravel should not be used for trench zone backfill due to the potential for soil migration into the relatively large void spaces present in this type of material and water seepage along trenches backfilled with coarse-grained sand and/or gravel.

Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local building requirements and/or bedding requirements for specific types of pipes. We recommend the project civil engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

Trench backfill should be placed and compacted in accordance with recommendations provided for structural fill in Section 3.5.4. Mechanical compaction is recommended; ponding or jetting should not be allowed, especially in areas supporting structural loads or beneath concrete slabs supported on grade, pavements, or other improvements.

3.5.8 Unstable Subgrade Conditions

It is common to encounter wet, unstable soils upon removal of site pavements or flatwork as a result of subsurface moisture becoming trapped beneath relatively impervious asphalt concrete or Portland cement concrete surfaces. Additionally, depending on time of year and weather conditions we anticipate that near surface soils may become saturated. Pumping subgrade conditions may be encountered during site grading activities, and the subgrade may need to be stabilized with geotextiles and crushed rock. Additionally, should grading be performed during or following periods of rainfall, the moisture content of the near-surface soils will also be significantly above the optimum moisture content. These conditions could seriously impede grading by causing an unstable subgrade condition. Typical remedial measures include the following:

- Drying: Drying unstable subgrade involves disking or ripping wet subgrade to a depth of approximately 18 to 24 inches and allowing the exposed soil to dry. Multiple passes of the equipment (likely on a daily basis) will be needed because as the surface of the soil dries, a crust forms that reduces further evaporation. Frequent disking will help prevent the formation of a crust and will promote drying. This process could take several days to several weeks depending on the depth of ripping, the number of passes, and the weather.
- Removal and Replacement with Crushed Rock and Geotextile Fabric: Unstable subgrade could be over-excavated 12 to 24 inches below existing grade and replaced with ¾- or 1-inch crushed rock underlain by geotextile fabric. The geotextile fabric should consist of a woven geotextile, such as Mirafi HP series or equivalent. The final depth of removal will depend upon the conditions observed in the field once over-excavation begins. The geotextile fabric should be placed in accordance with the manufacturer's recommendations.
- Soil Treatment: Unstable subgrade could be stabilized by mixing the upper 12 to 18 inches of the subgrade with lime. For estimating purposes, an application rate of 3 to 5 percent high calcium quick lime may be used. Final application rates should be determined in the field at the time of construction in consultation with the geotechnical engineer. Chemical treatment should be performed by a specialty contractor experienced in this work. Since soil treatment uses the on-site soil, the expense of importing material can be avoided.

3.6 SLABS-ON-GRADE

Concrete slab-on-grade floors are appropriate for the restroom building provided the subgrade is prepared in accordance with Section 3.5.2. A modulus of subgrade reaction of 100 pounds per cubic inch (pci) may be used for design of slabs supported on 6 inches of aggregate base material over compacted structural fill. Please note that crushed aggregate base may utilize recycled materials, subject to approval from the project owner.

Floor slab control joints should be used to reduce damage due to shrinkage cracking. Control joint spacing is a function of slab thickness, aggregate size, slump and curing conditions. The requirements for concrete slab thickness, joint spacing, and reinforcement should be established by the designer, based on experience, recognized design guidelines and the intended slab use. Placement and curing conditions will have a strong impact on the final concrete slab integrity.

3.7 EXTERIOR FLATWORK

Exterior flatwork applies to the proposed sidewalks, concrete skate park, and basketball courts. Prior to constructing exterior concrete slabs supported-on-grade, surficial soils should be prepared as recommended above in Section 3.5.2 of this report. Exterior concrete slabs for pedestrian traffic or landscape should be at least four inches in thickness. Re-scarification and recompaction may not be required if exterior slabs are to be placed directly on compacted aggregate base sections overlying undisturbed structural fill, or native soil compacted during site preparation. Where flatwork will support vehicular traffic, we recommend that the flatwork be designed as a pavement.

Once the slab subgrade soil has been moisture conditioned and compacted, the soil should not be allowed to dry prior to concrete placement. If the subgrade soil is allowed to dry, the moisture content of the soil should be restored by sprinkling or wetting prior to placement of concrete. Kleinfelder should check the moisture content of the subgrade soil prior to construction of the slabs.

Proper moisture conditioning and compaction of subgrade soils is important. Even with proper site preparation, we anticipate that over time there will be some soil moisture change on the subgrade soil supporting the concrete flatwork. For example, exterior flatwork will be subjected to edge effects (shrink-swell) due to the drying out or wetting of subgrade soils where adjacent to landscaped or vacant areas.

To help reduce edge effects in potentially expansive soil, Kleinfelder suggests the use of thickened edges on slabs to control water infiltration directly below. Control joints should be also used to reduce the potential for flatwork panel cracks as a result of minor soil shrink-swell. Steel reinforcement will aid in keeping the control joints and other cracks closed.

3.8 SLOPE STABILITY

As indicated on the provided site grading plans, slopes of 4:1 (horizontal to vertical) or flatter are anticipated for the proposed seasonal wetland and new park. The anticipated soil types onsite indicate that a 4:1 slope will be sufficiently stable for design purposes. If the inclination of these slopes are changed at all during the design phase of this project, Kleinfelder will require re-evaluation of all slope conditions.

3.9 SITE DRAINAGE

Foundation and slab performance depend greatly on proper irrigation and how well runoff water drains from the site. This drainage should be maintained both during construction and over the entire life of the project. The ground surface around structures located within the park should be graded such that water drains rapidly away from structures without ponding.

We recommend that landscape planters either not be located immediately adjacent to buildings and pavement areas or be isolated and properly drained to area drains such that cycles of wetting and drying do not impact pavements, flatwork, and other structures. Drought resistant plants and minimum watering are recommended for planters, if used. No planters should be installed immediately adjacent to structures unless they are water-proofed and have a drainpipe connected to an area drain outlet. Planters should be built such that water exiting from them will not seep into the foundation areas or beneath slabs and pavement.

Roof water should be directed to fall on hardscape areas sloping to an area drain, or roof gutters and downspouts should be installed and routed to area drains. Roof downspouts and their associated drains should be isolated from other subdrain systems, where used, to avoid flooding. In any event, maintenance personnel should be instructed to keep areas uniformly moist throughout the life of the project (e.g. limit or eliminate cycles of wetting and drying) as cycles of wetting and drying will cause distress in surrounding improvements. Should excessive irrigation, waterline breaks, or unusually high rainfall occur, saturated zones and "perched" groundwater may develop. Consequently, the site should be graded so that water drains away readily without saturating the foundation or landscaped areas. Potential sources of water such as water pipes, drains, and the like should be frequently examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired. Wet utilities should also be designed to be watertight and should be inspected and repaired as needed.

3.10 PAVEMENT SECTIONS

Asphalt concrete pavement sections presented in the table below are based on the laboratory-obtained R-value and current Caltrans design procedures. Traffic indices of 5.0, 6.0, and 7.0 were assumed for the design of onsite parking lots and driveways. The traffic indices assumed above should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project. Changes in the traffic indices will affect the corresponding pavement section. Table 4 presents recommended Hot Mix Asphalt (HMA) pavement sections.

Table 4 - Asphalt Concrete Pavement Sections
(Design R-Value of 5)

TRAFFIC USE	TRAFFIC INDEX, TI	ASPHALT CONCRETE * (INCHES)	AGGREGATE BASE (INCHES)
Parking Lot Pavement	5.0	3.0	10.0
Parking Lot Pavement	6.0	4.0	11.5
Park Entrance Driveway	7.0	5.0	13.5

*rounded to the nearest ½ inch

An asphalt performance grade (PG) binder of 52-10 should be used for the project. Air temperature data nearest the project site was used with the MERRA Climate Data option and the PG binder was selected using the FHWA program LTTPBind Online web-based tool based on the AASHTO M323-13 standard with a target rut depth of ½ inch. The high-end and low-end temperature rating was selected to provide a reliability of at least 98 and 90 percent, respectively.

Rigid pavements are constructed of Portland cement concrete (PCC) over compacted aggregate base, and are anticipated for exterior flatwork slabs that will be subject to vehicle loading. PCC pavement sections should include an underlying aggregate base (AB) layer at least 6 inches thick. Table 5 presents recommended rigid PCC pavement sections.

Table 5 – Recommended PCC Rigid Pavement Sections

Traffic Index	PCC (inches)	AB (inches)
5	7.5	6.0
6	8.0	6.0

Pavement sections provided above are contingent on the following recommendations being implemented during construction.

- All pavement subgrades should be prepared as recommended in sections 3.5.2 and 3.5.4 of this report. Recommended soil moisture contents may be established by scarifying moisture conditioning and compacting the subgrade immediately prior to placement of aggregate base.
- Subgrade soils should be in a stable, non-pumping condition at the time aggregate base materials are placed and compacted.
- Aggregate base materials should be compacted to at least 95 percent relative compaction.
- Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become wet.
- Aggregate base materials should meet current Caltrans specifications for Class 2 aggregate base.
- Asphalt paving materials and placement methods should meet current Caltrans specifications for asphalt concrete.

- All concrete curbs separating pavement and landscaped areas should extend at least 3 inches into the subgrade and below the bottom of adjacent, aggregate base materials.

3.11 SOIL CORROSION

A preliminary evaluation of the corrosion potential of the on-site soils to steel and buried concrete was completed. Outside laboratory testing was performed at CERCO Analytical on an individual soil sample to evaluate pH, minimum resistivity, chloride and soluble sulfate content. Results are presented in Table 6.

Table 6 - Corrosion Test Results

BORING	DEPTH (FT)	MINIMUM RESISTIVITY (OHM-CM)	PH	SOLUBLE SULFATE CONTENT (PPM)	SOLUBLE CHLORIDE CONTENT (PPM)
B-6	3-4	330	7.8	70	230

These tests are only an indicator of soil corrosivity for the samples tested. Other soils found on site may be more, less, or of a similar corrosive nature. Imported fill materials should be tested to confirm that their corrosion potential is not more severe than those noted.

Resistivity values below 1,000 ohm-cm are considered to be extremely corrosive to buried ferrous metals (NACE, 2006). The concentrations of soluble sulfates indicate that the subsurface soils represent a Class S0 exposure to sulfate attack on concrete in contact with the soil based on ACI 318-14 Table 19.3.1.1 (ACI, 2014). Therefore, in accordance with ACI Building Code 318-14, no special provisions for selection of cement type are required.

Kleinfelder's scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included.

3.12 INFILTRATION TESTING

Due to the potential use of possible permeable pathways for this project, Kleinfelder was asked to evaluate the site soil infiltration. We performed one double ring infiltrometer test, in general conformance with ASTM D3385 within the area just east of the new park location as shown on Figure 3. Table 7 below provides a summary of the infiltration test results and the full results of the test are shown in Appendix C.

Table 7 - Summary of Infiltrometer Testing

Test Location	Visual Classification	Short-Term Infiltration Rate (inches per hour)
INF-1	Fat Clay	0.23

Based on our field observations and testing results, water infiltration within the upper 5 feet of soil is expected to be very low. If permeable pavement is employed for new walkways, we recommend pavement have properly designed drainage by a licensed Civil Engineer to divert water away from structural members including building foundations and slabs on grade. The subgrade below the permeable pavements will also be subject to expansion due to the high volume of water inundation due to this observed low infiltration rate.

4 ADDITIONAL SERVICES

4.1 PLANS AND SPECIFICATIONS REVIEW

We recommend that Kleinfelder perform a general review of the project plans and specifications before they are finalized to verify that our geotechnical recommendations have been properly interpreted and implemented during design. If we are not accorded the privilege of performing this review, we can assume no responsibility for misinterpretation of our recommendations.

4.2 CONSTRUCTION OBSERVATION AND TESTING

The construction process is an integral design component with respect to the geotechnical aspects of a project. Because geotechnical engineering is an inexact science due to the variability of natural processes, and because we sample only a limited portion of the soils affecting the performance of the proposed structure, unanticipated or changed conditions can be encountered during grading. Proper geotechnical observation and testing during construction are imperative to allow the geotechnical engineer the opportunity to verify assumptions made during the design process. Therefore, we recommend that Kleinfelder be retained during the construction of the proposed improvements to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this study.

Our services are typically needed at the following stages of grading.

- During grading;
- After the overexcavation, but prior to scarification;
- During utility trench backfill;
- During site paving; and
- After excavation for foundations.

5 LIMITATIONS

This geotechnical study has been prepared for the exclusive use of BFS Landscape Architecture and their agents for specific application to the proposed Carr Seasonal Wetland and Park facility located at 622 Sherwood Drive in Salinas, California. The findings, conclusions and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The scope of services was limited to a background data review and the field exploration described in Section 1.2. It should be recognized that definition and evaluation of subsurface conditions are difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. The conclusions of this assessment are based on our field exploration and laboratory testing programs, and engineering analyses.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues covered in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil or groundwater conditions could vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction, including the estimated Traffic Index or locations of the improvements, changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid until the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field. Kleinfelder must be retained so that all geotechnical aspects of construction will be monitored on a full-time basis by a representative from Kleinfelder, including site preparation, preparation of foundations, and placement of structural fill and trench backfill. These services provide Kleinfelder the opportunity to observe the actual soil and groundwater conditions encountered during construction and to evaluate the applicability of the recommendations presented in this report to the site conditions. If Kleinfelder is not retained to provide these services, we will cease to be the engineer of record for this project and will assume no responsibility for any potential claim during or after construction on this project. If changed site conditions affect the recommendations presented herein, Kleinfelder must also be retained to perform a supplemental evaluation and to issue a revision to our original report.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinion, recommendations, or conclusions contained in the report. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's geotechnical engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of this report and the nature of the new project, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and the client agrees to defend, indemnify, and hold harmless Kleinfelder from any claims or liability associated with such unauthorized use or non-compliance.

6 REFERENCES

American Concrete Institute (ACI), 2014, Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14).

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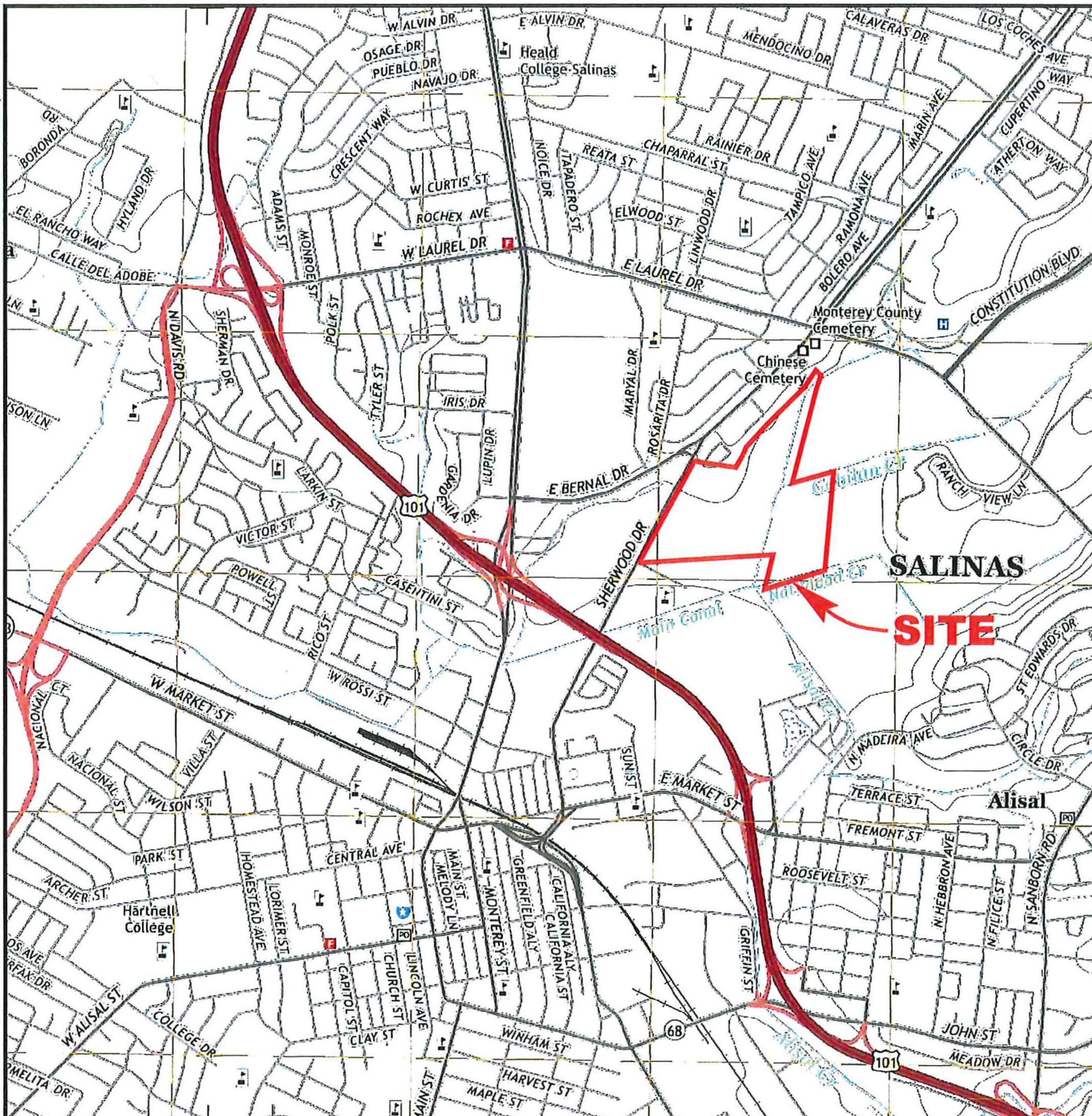
Figures

PLOTTED: 02 Mar 2020, 2:26pm, GGomez

CAD FILE: W:\2020\20201437.001A\PLANS\ LAYOUT: FIGURE 1



N

0 2000 4000

SCALE: 1" = 2000' SCALE IN FEET

REFERENCE:
Salinas Quadrangle California 7.5-Minute Series

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ATTACHED IMAGES:
ATTACHED XREFS:
OFFICE_NAME

KLEINFELDER Bright People. Right Solutions.	PROJECT NO. 20201437	SITE VICINITY MAP	FIGURE
	DRAWN: 11/5/2019		
	DRAWN BY: GG		1
	CHECKED BY: JE	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	
	FILE NAME: STO19D062.CAD		

ATTACHED IMAGES: Images: SITE 1800.jpg
ATTACHED XREFS:
OFFICE_NAME
CAD FILE: W:\2020\20201437.001A\PLANS\ LAYOUT: FIGURE 2 PLOTTED: 02 Mar 2020, 2:27pm, GGomez

Borings Drilled By Kleinfelder, Oct., 2019

Hand Augers Drilled By Kleinfelder, Oct., 2019

Borings Drilled By Environmental Investigation Services, Inc., Sep 11, 2015

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SCALE: 1" = 200' SCALE IN FEET

REFERENCE 1:
"Figure 3, Phase II Limited Soil and Soil Vapor Investigation Report, For 618 Sherwood Drive, Salinas, California, EIS Project # 1547-2" by Environmental Investigation Services, Inc, Dated September 11, 2015"

REFERENCE 2:
"Figure 2, Phase II Limited Soil and Soil Vapor Investigation Report, For 618 Sherwood Drive, Salinas, California, EIS Project # 1547-2" by Environmental Investigation Services, Inc, Dated September 11, 2015"

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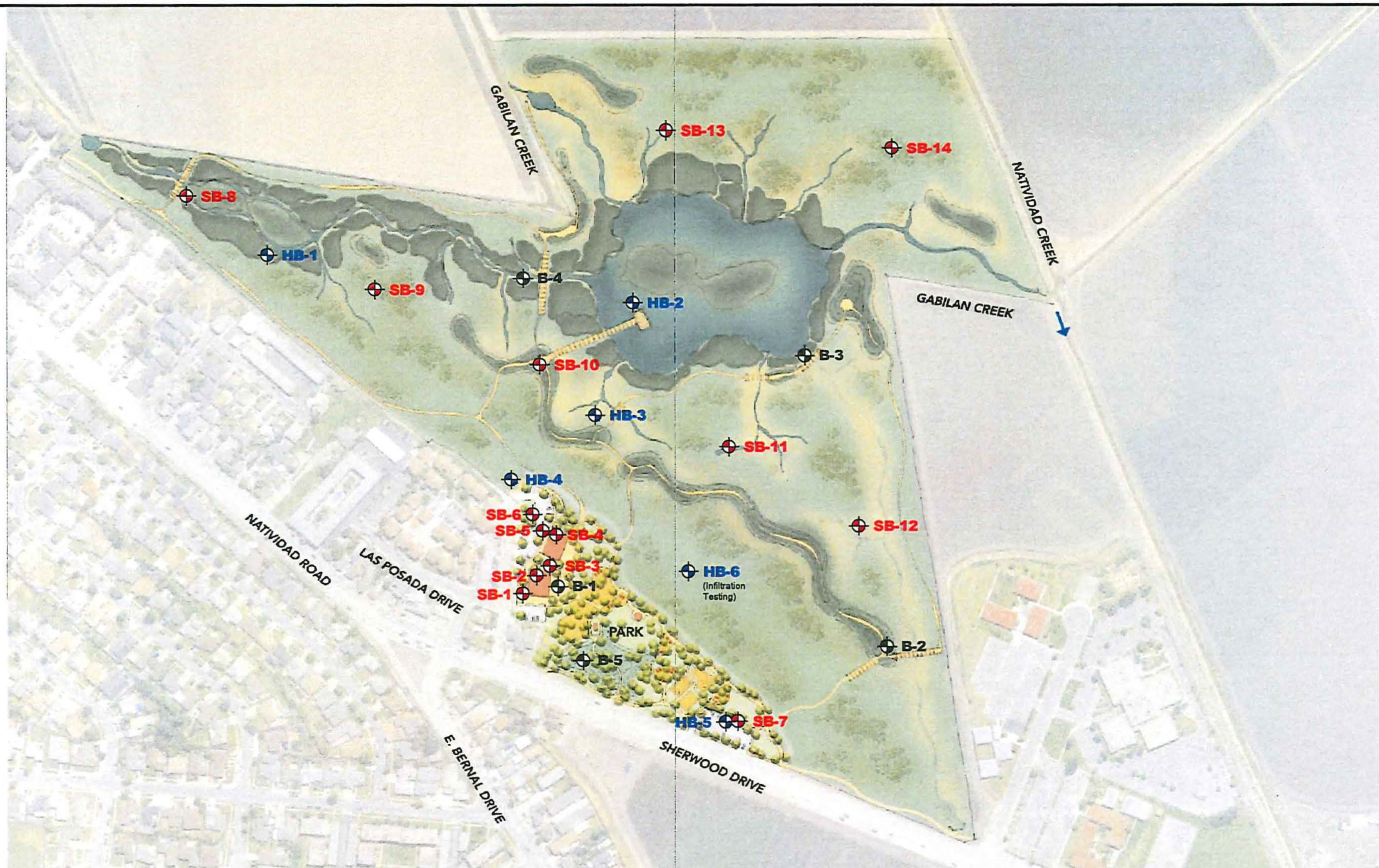
PROJECT NO. 20201437	EXPLORATION MAP WITH EXISTING CONDITIONS	FIGURE
DRAWN: 11/5/2019		2
DRAWN BY: GG		
CHECKED BY: JE	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	
FILE NAME: STO19D062.CAD		



Borings Drilled By Environmental Investigation Services, Inc., Sep 11, 2015

Borings Drilled By Kleinfelder, Oct., 2019

Hand Augers Drilled By Kleinfelder, Oct., 2019

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PROJECT NO. 20201437	**EXPLORATION MAP WITH PROPOSED CONDITIONS**	FIGURE
DRAWN: 11/5/2019		**3**
DRAWN BY: GG		
CHECKED BY: JE	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	
FILE NAME: STO19D062.CAD		

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Appendix A

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APPENDIX A
Field Explorations

LIST OF ATTACHMENTS

The following figures are attached and complete this appendix.

Figure A-1	Graphics Key
Figure A-2	Soil Description Key
Figures A-3 – A13	Boring Logs

SAMPLE/SAMPLER TYPE GRAPHICS

- BULK SAMPLE
- CALIFORNIA SAMPLER (3 in. (76.2 mm.) outer diameter)
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS
WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

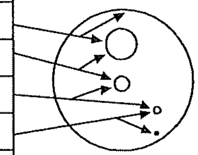
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu≥4 and 1≤Cc≤3	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu<4 and/ or 1>Cc>3	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu≥4 and 1≤Cc≤3	GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu<4 and/ or 1>Cc>3	GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (Half or more of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu≥6 and 1≤Cc≤3	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu<6 and/ or 1>Cc>3	SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu≥6 and 1≤Cc≤3	SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu<6 and/ or 1>Cc>3	SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit 50 or greater)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

KLEINFELDER *Bright People. Right Solutions.*	PROJECT NO.: 20201437.001A	GRAPHICS KEY	FIGURE
	DRAWN BY: GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-1
	CHECKED BY: JE		
	DATE: 11/6/2019		

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

Term of Use	AMOUNT: Secondary Constituent is Fine Grained	AMOUNT: Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	$\geq$5 to <15%	$\geq$15 to <30%
Modifier	$\geq$15%	$\geq$30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25 $\leq$ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5 $\leq$ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1 $\leq$ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2 $\leq$ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4 $\leq$ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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PROJECT NO.: 20201437.001A
DRAWN BY: GG
CHECKED BY: JE
DATE: 11/6/2019

SOIL DESCRIPTION KEY

Carr Seasonal Wetland and Park
622 Sherwood Drive
Salinas, California

FIGURE A-2

PLOTTED: 11/06/2019 04:44 PM BY: GGomez
OFFICE FILTER: STOCKTON
PROJECT NUMBER: 20201437.001A
gINT FILE: Klf_gint_master_2020
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_GEO-LEG 2 (SOIL DESC KEY)]

Date Begin - End:	10/21/2019	Drilling Company:	EGI		BORING LOG B-1
Logged By:	J. Elefante	Drill Crew:	Kyle/Millo		
Hor.-Vert. Datum:	Not Available	Drilling Equipment:	B53R	Hammer Type - Drop:	140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Hollow Stem Auger	Hammer Efficiency:	60%
Weather:	Not Available	Exploration Diameter:	8 in. O.D.	Hammer Cal. Date:	5/07/2018

FIELD EXPLORATION — LABORATORY RESULTS

Latitude: 36.69062°
Longitude: -121.64378°
Approximate Ground Surface Elevation (ft.): 48.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Lean CLAY with Sand (CL): medium plasticity, dark brown, moist, medium to fine grained sand					CL			98	58	36	21	R-Value = 3
45			**Silty SAND (SM)**: fine to medium-grained sand, brown, moist												
	5		**Well-Graded SAND (SW)**: fine to coarse-grained sand, yellowish brown, moist, dense	2B 2A		BC=24 28 27	6" 6"	SW-SM			97	9.4			
40			very dense	3A		BC=20 34 27	6"		9.4	110.8					
	10		**Poorly Graded SAND (SP)**: yellowish brown, moist, very dense, medium to coarse grained sand, subangular	4A		BC=23 26 36	6" 5"								
35															
	15		Brown, medium grained sand, subrounded, dense	5B 5A		BC=28 32 27 PP=4.0			16.8	106.1					
			Fat CLAY (CH): high plasticity, light brown, moist, hard, traced fine grained sand												
30															
	20		Brown, very stiff	6B 6A		BC=14 16 22 PP=2.5	6" 6"		33.7	89.6					
25															
	25		**Poorly Graded SAND (SP)**: light yellowish brown, moist, dense, fine grained sand	7B 7A		BC=14 26 29	6" 6"		26.3	90.9					
20															
	30			8B 8A		BC=14 20 26 PP=2.5	6" 6"								
15															
	35														

The boring was terminated at approximately 31.5 ft. below ground surface. The boring was backfilled with neat cement grout on October 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
Cuttings spread thinly onsite
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20201437.001A	BORING LOG B-1	FIGURE
DRAWN BY: GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-3
CHECKED BY: JE		
DATE: 11/6/2019		PAGE: 1 of 1

PLOTTED: 03/02/2020 02:39 PM BY: GGomez
OFFICE FILTER: STOCKTON
PROJECT NUMBER: 20201437.001A
gINT FILE: Klf_gint_master_2020
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 10/21/2019	**Drilling Company:** EGI		**BORING LOG B-2**
Logged By: J. Elefante	**Drill Crew:** Kyle/Millo		
Hor.-Vert. Datum: Not Available	**Drilling Equipment:** B53R	**Hammer Type - Drop:** 140 lb. Auto - 30 in.	
Plunge: -90 degrees	**Drilling Method:** Hollow Stem Auger	**Hammer Efficiency:** 60%	
Weather: Sunny	**Exploration Diameter:** 8 in. O.D.	**Hammer Cal. Date:** 5/07/2018	

Latitude: 36.68782°
Longitude: -121.64471°
Approximate Ground Surface Elevation (ft.): 38.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. / Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Fat CLAY (CH): medium plasticity, black, moist, stiff	1B 1A		BC=6 6 8 PP=1.5	6" 6"						56	35	
35			dark olive, medium stiff	2B 2A		BC=7 8 9 PP=1.0	6" 6"		54.7	68.1					TXUU: c = 0.86 ksf
	5		High plasticity	3B 3A		BC=6 5 7 PP=1.0	4" 6"		56.6	65.4					
30				4B 4A		BC=5 6 9 PP=1.0	6" 6"		52.4	69.9	100	97			
	10			5B 5A		BC=7 8 9 PP=1.0	6" 6"		60.2	62.8					
25															
	15														
20															
	20														
15															
	25														
10															
	30														
5															

The boring was terminated at approximately 11.5 ft. below ground surface. The boring was backfilled with neat cement grout on October 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Cuttings spread thinly onsite
The exploration location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20201437.001A DRAWN BY: GG CHECKED BY: JE DATE: 11/6/2019	BORING LOG B-2 Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	FIGURE A-4 PAGE: 1 of 1

gINT FILE: Klf_gint_master_2020 PROJECT NUMBER: 20201437.001A OFFICE FILTER: STOCKTON
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG] PLOTTED: 03/02/2020 02:39 PM BY: GGomez

BORING LOG B-3

Date Begin - End:	10/21/2019	**Drilling Company:**	EGI		
Logged By:	J. Elefante	**Drill Crew:**	Kyle/Millo		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B53R	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger	**Hammer Efficiency:**	60%
Weather:	Sunny	**Exploration Diameter:**	8 in. O.D.	**Hammer Cal. Date:**	5/07/2018

Latitude: 36.68824°
Longitude: -121.64154°
Approximate Ground Surface Elevation (ft.): 37.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Blow Counts(BC)= Uncorr. Blows/6 in. / Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Fat CLAY (CH): medium plasticity, dark grayish brown, moist, stiff, fine grained sand	1B 1A	BC=6 6 6 PP=2.0	6" 6"		53.8	69.2					
35		Visable Shell fragments	2B 2A	BC=6 8 9 PP=1.25	6" 6"		60.6	63.7			104	77	
	5	dark gray, trace sand, fine to medium grained	4B 4A	BC=5 5 7 PP=1.25	6" 6"		69.3 56.4	60.0 67.1		95			TXUU: c = 0.58 ksf
30			4B 4A	BC=5 8 6 PP=1.5	6" 6"								
	10	**SILT (ML)**: low plasticity, dark brown, moist, soft	5B 5A	BC=7 7 10 PP=0.5	6" 6"		171.7	29.4					
25	15		6B 6A	BC=6 7 8 PP=0.5	6" 6"								
20	20	medium plasticity, medium stiff	7B 7A	BC=8 11 10 PP=0.75	6" 6"								

Elevation scale: 35, 30, 25, 20, 15, 10, 5. Depth scale: 5, 10, 15, 20, 25, 30.

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with neat cement grout on October 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
Cuttings spread thinly onsite
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20201437.001A	BORING LOG B-3	FIGURE
DRAWN BY: GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-5
CHECKED BY: JE		
DATE: 11/6/2019		PAGE: 1 of 1

PLOTTED: 03/02/2020 02:39 PM BY: GGomez
PROJECT NUMBER: 20201437.001A OFFICE FILTER: STOCKTON
gINT FILE: Klf_gint_master_2020
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	10/21/2019	Drilling Company:	EGI		BORING LOG B-4
Logged By:	J. Elefante	Drill Crew:	Kyle/Millo		
Hor.-Vert. Datum:	Not Available	Drilling Equipment:	B53R	Hammer Type - Drop:	140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Hollow Stem Auger	Hammer Efficiency:	60%
Weather:	Sunny	Exploration Diameter:	8 in. O.D.	Hammer Cal. Date:	5/07/2018

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.69051°
Longitude: -121.64067°
Approximate Ground Surface Elevation (ft.): 40.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Fat CLAY (CL): medium plasticity, olive brown, moist, stiff	1B 1A		BC=6 7 9 PP=1.25	6" 6"		57.2	64.7			104	66	
			Fat CLAY with trace Sand (CH): grayish black, moist, stiff	2B 2A		BC=5 6 7 PP=1.5	6" 6"		40.7	77.4					TXUU: c = 0.85 ksf
-35	5		**Clayey SAND with Gravel (SC)**: fine to medium-grained, moist, dense, 1-1.75" well graded gravel, subrounded	3B 3A		BC=9 12 17	6" 6"				91	36			
			yellowish brown, very dense	4A		BC=50/5"	5"		12.2						
-30	10		**Well-Graded GRAVEL with Silt (GW-GM)**: yellowish brown, moist, very dense, 1-3/4" gravel, well graded, sub-rounded	5C 5B 5A		BC=14 18 20	6" 6" 6"								
			Silty SAND (SM): dark olive brown, moist, dense, poorly graded												
-25	15			6A		BC=27 16 19	11"		14.5			24			
-20	20		fine to medium grained sand	7B 7A		BC=24 23 36	6" 6"								
-15	25														
-10	30														

The boring was terminated at approximately 21.5 ft. below ground surface. The boring was backfilled with neat cement grout on October 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
Cuttings spread thinly onsite
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20201437.001A	BORING LOG B-4	FIGURE
DRAWN BY: GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-6
CHECKED BY: JE		
DATE: 11/6/2019		PAGE: 1 of 1

Date Begin - End:	10/22/2019	Drilling Company:	EGI			**BORING LOG B-5**
Logged By:	M. Ryan	Drill Crew:	Kyle/Millo			
Hor.-Vert. Datum:	Not Available	Drilling Equipment:	B53R	Hammer Type - Drop:	140 lb. Auto - 30 in.	
Plunge:	-90 degrees	Drilling Method:	Hollow Stem Auger	Hammer Efficiency:	60%	
Weather:	Sunny	Exploration Diameter:	8 in. O.D.	Hammer Cal. Date:	5/07/2018	

Latitude: 36.69032°
Longitude: -121.64462°
Approximate Ground Surface Elevation (ft.): 49.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
	0	**Sandy Lean CLAY (CL)**: medium plasticity, dark olive brown, moist, fine to coarse grained sand												
45			1				CL				55	28	15	
	5	**Poorly Graded SAND with Gravel (SP)**: dark yellowish brown, moist, medium dense, 3/4" diameter, subangular, well graded, micaceous	2B 2C		BC=17 18 22	6" 6" 6"	SP	5.0	105.9	80	3.9			
		Grades coarser, gravel up to 1" diameter	3C		BC=18 19 23	6" 6" 6"								
40	10													
		Fat CLAY with Sand (CH): high plasticity, olive brown, moist, hard, coarse sand	4B 4C		BC=20 36 34 PP=4.5	6" 6" 6"								
		Silty SAND (SM): medium dense, coarse sand, subrounded												
35	15	**Fat CLAY with trace Sand (CH)**: high plasticity, olive brown, moist, hard, fine grained sand	5B 5C		BC=23 25 28 PP=4.25	6" 6" 6"		21.7	99.6					
30	20	**SILT (ML)**: low plasticity, olive, moist, stiff, micaceous	6C		BC=19 17 20 PP=2.0	6"		27.9	94.6					
25	25		7C		BC=36 40 50	6" 6"								
20	30		8B 8C		BC=29 31 36	6" 6"								
15	35													

The boring was terminated at approximately 31.5 ft. below ground surface. The boring was backfilled with neat cement grout on October 22, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
Cuttings spread thinly onsite
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20201437.001A		BORING LOG B-5	FIGURE
DRAWN BY:	GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-7
CHECKED BY:	JE		
DATE:	11/6/2019		PAGE: 1 of 1

BORING LOG HB-1

Date Begin - End:	10/21/2019	**Drilling Company:**	EGI
Logged By:	M. Ryan	**Drill Crew:**	Kyle
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	Sunny	**Exploration Diameter:**	3 in. O.D.

FIELD EXPLORATION / LABORATORY RESULTS

Latitude: 36.69251°
Longitude: -121.63975°
Approximate Ground Surface Elevation (ft.): 46.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
45			Agricultural topsoil, 2" thick, sand clumps, organics Sandy, clumps of clay up to 2" diameter	1	X										
			Sandy Lean CLAY (CL): black, moist, medium stiff, organics present, medium plasticity Mottled black and olive	2	X										
			Black with medium brown mottling, high plasticity, trace sand and gravel up to 3/4"	3	X								37	23	
40	5		The boring was terminated at approximately 4 ft. below ground surface. The boring was backfilled with excavated material on October 21, 2019.												
35	10														
30	15														

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

Date Begin - End:	10/21/2019	**Drilling Company:**	EGI
Logged By:	M. Ryan	**Drill Crew:**	Kyle
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	Sunny	**Exploration Diameter:**	3 in. O.D.

BORING LOG HB-2

FIELD EXPLORATION

Latitude: 36.68962°
Longitude: -121.64079°
Approximate Ground Surface Elevation (ft.): 39.00
Surface Condition: Agricultural Field

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Agricultural topsoil, 6" thick, sand clumps, organics												
			Fat CLAY (CH): medium plasticity, black, moist, medium stiff, organics and rootlets	1	X										
			Olive mottling and oxidation	2	X										
35			No organics and increased oxidation	3	X										
	5										100	91			
			Fat CLAY with Sand (CH): medium plasticity, dark brown, moist, medium stiff	4	X										
30	10														
25	15														
20															

The boring was terminated at approximately 6 ft. below ground surface. The boring was backfilled with excavated material on October 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

PLOTTED: 03/02/2020 02:40 PM BY: GGomez

PROJECT NUMBER: 20201437.001A OFFICE FILTER: STOCKTON

gINT FILE: Klf_gint_master_2020

gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG]

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PROJECT NO.: 20201437.001A		BORING LOG HB-2	FIGURE
DRAWN BY:	GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-9
CHECKED BY:	JE		
DATE:	11/6/2019		PAGE: 1 of 1

PLOTTED: 03/02/2020 02:40 PM BY: GGomez

Date Begin - End:	10/21/2019	Drilling Company:	EGI
Logged By:	M. Ryan	Drill Crew:	Kyle
Hor.-Vert. Datum:	Not Available	Drilling Equipment:	Hand Auger
Plunge:	-90 degrees	Drilling Method:	Hand Auger
Weather:	Sunny	Exploration Diameter:	3 in. O.D.

BORING LOG HB-3

Latitude: 36.69006°
Longitude: -121.64195°
Approximate Ground Surface Elevation (ft.): 39.00
Surface Condition: Agricultural Field

FIELD EXPLORATION								LABORATORY RESULTS								
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Agricultural topsoil, 12" thick, sand clumps, organics												
			Fat CLAY with trace Sand (CH): high plasticity, olive with very dark brown mottling, moist, medium soft, trace sand, damp, oxidation	1	X										
				2	X										
				3	X										
35			Encountered trace small shells												
				4	X										
	5		Grades increasing sand content												
			Sandy Lean CLAY (CL): moist, fine grained, subangular sand, medium plasticity	5	X										
30	10														
25	15														
20															

The boring was terminated at approximately 6 ft. below ground surface. The boring was backfilled with excavated material on October 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

gINT FILE: Klf_gint_master_2020 PROJECT NUMBER: 20201437.001A OFFICE FILTER: STOCKTON
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG]

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PROJECT NO.: 20201437.001A	BORING LOG HB-3	FIGURE
DRAWN BY: GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-10
CHECKED BY: JE		
DATE: 11/6/2019		PAGE: 1 of 1

Date Begin - End:	10/21/2019	**Drilling Company:**	EGI	**BORING LOG HB-4**
Logged By:	M. Ryan	**Drill Crew:**	Kyle	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger	
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger	
Weather:	Sunny	**Exploration Diameter:**	3 in. O.D.	

Latitude: 36.69080°
Longitude: -121.64229°
Approximate Ground Surface Elevation (ft.): 42.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description (FIELD EXPLORATION)	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol (LABORATORY RESULTS)	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Agricultural topsoil, 6" thick, sand clumps, organics												
			Fat CLAY (CH): high plasticity, olive gray, mottled with black, moist, medium stiff, organics and rootlets	1	X										
40															
				2	X										
			Grades coarser	3	X										
	5		**Poorly Graded SAND with Silt (SP-SM)**: low plasticity silt, moist, well graded	4	X										
35															
	10														
30															
	15														
25															

The boring was terminated at approximately 6 ft. below ground surface. The boring was backfilled with excavated material on October 21, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

PLOTTED: 03/02/2020 02:40 PM BY: GGomez
OFFICE FILTER: STOCKTON
PROJECT NUMBER: 20201437.001A
gINT FILE: Klf_gint_master_2020
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_BORING/TEST PIT SOIL LOG]

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20201437.001A	BORING LOG HB-4	FIGURE
	DRAWN BY: GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-11
	CHECKED BY: JE		
	DATE: 11/6/2019		PAGE: 1 of 1

Date Begin - End:	10/22/2019	**Drilling Company:**	EGI		**BORING LOG HB-5**
Logged By:	M. Ryan	**Drill Crew:**	Kyle		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger		
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	Sunny	**Exploration Diameter:**	3 in. O.D.		

Latitude: 36.68921°
Longitude: -121.64538°
Approximate Ground Surface Elevation (ft.): 47.00
Surface Condition: Agricultural Field

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Agricultural topsoil, 12" thick, sand clumps, organics at top of log												
			Clayey SAND (SC): fine to medium-grained sand, dark olive brown, moist, trace 3/4" gravel	1	X								22	8	
45				2	X										
	5			3	X										
40			The boring was terminated at approximately 6 ft. below ground surface. The boring was backfilled with excavated material on October 22, 2019.												
	10														
35															
	15														
30															

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20201437.001A		BORING LOG HB-5	FIGURE
DRAWN BY:	GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-12
CHECKED BY:	JE		
DATE:	11/6/2019		PAGE: 1 of 1

Date Begin - End:	10/22/2019	**Drilling Company:**	EGI
Logged By:	M. Ryan	**Drill Crew:**	Kyle
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	Sunny	**Exploration Diameter:**	3 in. O.D.

BORING LOG HB-6

Depth (feet)	Graphical Log	FIELD EXPLORATION Latitude: ° Longitude: ° Surface Condition: Agricultural Field Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Agricultural topsoil, 6" thick, sand clumps, organics dark brown												
		Fat CLAY with Sand (CH): medium plasticity, greenish black, moist, subangular, well graded												
5														
10														
15														

The boring was terminated at approximately 3 ft. below ground surface. The boring was backfilled with excavated material on October 22, 2019.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:

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PROJECT NO.: 20201437.001A		BORING LOG HB-6	FIGURE
DRAWN BY:	GG	Carr Seasonal Wetland and Park 622 Sherwood Drive Salinas, California	A-13
CHECKED BY:	JE		
DATE:	11/6/2019		PAGE: 1 of 1

PLOTTED: 03/02/2020 02:41 PM BY: GGomez

gINT FILE: Klf_gint_master_2020 PROJECT NUMBER: 20201437.001A OFFICE FILTER: STOCKTON
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Appendix B

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APPENDIX B
Laboratory Testing

LIST OF ATTACHMENTS

The following Figures are attached and complete this appendix.

Exploration ID	Depth (ft.)	Sample No.	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
						Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	0.0 - 2.5		DARK BROWN SANDY LEAN CLAY (CL)			100	98	58	36	15	21	R-Value = 3
B-1	6.0	2A	DARK YELLOWISH BROWN WELL GRADED SAND WITH SILT (SW-SM)				97	9.4				
B-1	8.5	3A		9.4	110.8							
B-1	16.0	5A		16.8	106.1							
B-1	21.0	6A		33.7	89.6							
B-1	26.0	7A		26.3	90.9							
B-2	0.5	1B	BLACK FAT CLAY WITH SAND (CH)						56	21	35	
B-2	3.5	2A	DARK OLIVE GRAY FAT CLAY (CH)	54.7	68.1							TXUU: c = 0.86 ksf
B-2	6.0	3A		56.6	65.4							
B-2	8.5	4A	DARK OLIVE FAT CLAY (CH)	52.4	69.9		100	97				
B-2	11.0	5A		60.2	62.8							
B-3	1.0	1A		53.8	69.2							
B-3	3.5	2A	DARK GRAYISH BROWN FAT CLAY (CH)	60.6	63.7				104	27	77	
B-3	5.5	4B	DARK GRAY FAT CLAY (CH)	69.3	60.0			95				TXUU: c = 0.58 ksf
B-3	6.0	4A		56.4	67.1							
B-3	11.0	5A										
B-4	1.0	1A	DARK GRAYISH BROWN FAT CLAY (CH)	57.2	64.7				104	38	66	
B-4	3.5	2A	GRAYISH BLACK FAT CLAY WITH SAND (CH)	40.7	77.4							TXUU: c = 0.85 ksf
B-4	6.0	3A	DARK BROWN CLAYEY SAND (SC)				91	36				
B-4	7.5	4A	CLAYEY SAND WITH GRAVEL (SC)	12.2								Visual Classification
B-4	15.5 - 16.5		DARK OLIVE BROWN SILTY SAND (SM)	14.5				24				
B-5	3.5		DARK OLIVE BROWN SANDY LEAN CLAY (CL)					55	28	13	15	
B-5	6.0	2C	DARK YELLOWISH BROWN POORLY GRADED SAND WITH GRAVEL (SP)	5.0	105.9		80	3.9				
B-5	15.5	5B		21.7	99.6							
B-5	21.0	6C		27.9	94.6							
HB-1	3.5	3	BLACK SANDY LEAN CLAY (CL)						37	14	23	

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic
NA = Not Available

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PROJECT NO.: 20201437.001A
DRAWN BY: GG
CHECKED BY: JE
DATE: 11/6/2019

LABORATORY TEST RESULT SUMMARY

Carr Lake and Park
622 Sherwood Drive
Salinas, California 93906

FIGURE
B-1

Exploration ID	Depth (ft.)	Sample No.	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
						Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
HB-2	4.5		BALCK FAT CLAY (CH)				100	91				
HB-5	1.0	1	DARK OLIVE BROWN CLAYEY SAND (SC)						22	14	8	

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic
NA = Not Available

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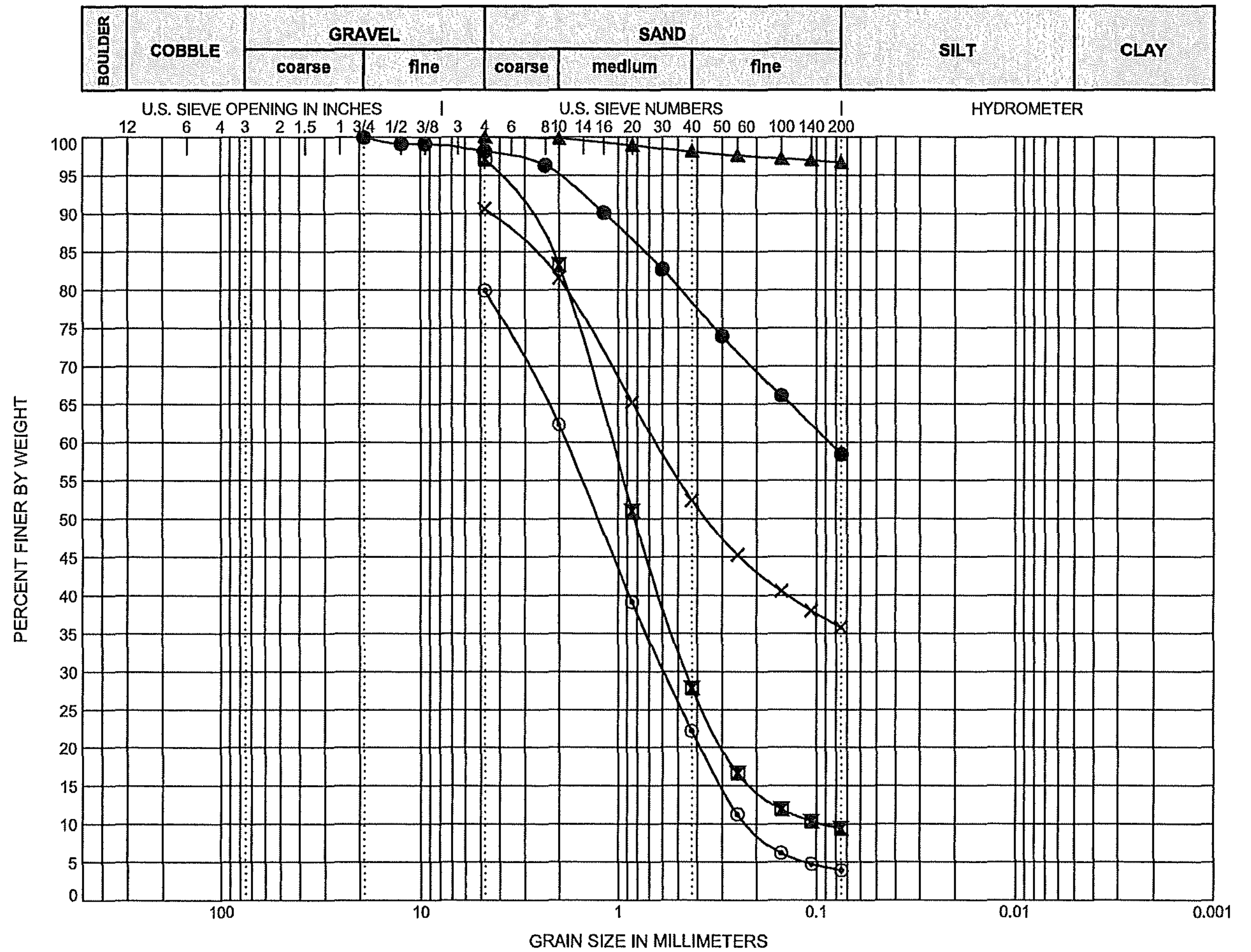
PROJECT NO.: 20201437.001A
DRAWN BY: GG
CHECKED BY: JE
DATE: 11/6/2019

LABORATORY TEST RESULT SUMMARY

Carr Lake and Park
622 Sherwood Drive
Salinas, California 93906

FIGURE
B-2



	Exploration ID	Depth (ft.)	Sample Number	Sample Description	LL	PL	PI
●	B-1	0 - 2.5	NA	DARK BROWN SANDY LEAN CLAY (CL)	36	15	21
⊠	B-1	6	2A	DARK YELLOWISH BROWN WELL GRADED SAND WITH SILT (SW-SM)	NM	NM	NM
▲	B-2	8.5	4A	DARK OLIVE FAT CLAY (CH)	NM	NM	NM
×	B-4	6	3A	DARK BROWN CLAYEY SAND (SC)	NM	NM	NM
⊙	B-5	6	2C	DARK YELLOWISH BROWN POORLY GRADED SAND WITH GRAVEL (SP)	NM	NM	NM

	Exploration ID	Depth (ft.)	D_{100}	D_{60}	D_{30}	D_{10}	Cc	Cu	Passing 3/4"	Passing #4	Passing #200	%Silt	%Clay
●	B-1	0 - 2.5	19	0.086	NM	NM	NM	NM	100	98	58	NM	NM
⊠	B-1	6	4.75	1.078	0.453	0.093	2.04	11.57		97	9.4	NM	NM
▲	B-2	8.5	4.75	NM	NM	NM	NM	NM		100	97	NM	NM
×	B-4	6	4.75	0.639	NM	NM	NM	NM		91	36	NM	NM
⊙	B-5	6	4.75	1.835	0.584	0.22	0.84	8.34		80	3.9	NM	NM

Sieve Analysis and Hydrometer Analysis testing performed in general accordance with ASTM D6913(Sieve Analysis) and ASTM D7928 (Hydrometer Analysis).
NP = Nonplastic
NA = Not Available
NM = Not Measured

Coefficients of Uniformity - $C_u = D_{60} / D_{10}$
Coefficients of Curvature - $C_C = (D_{30})^2 / D_{60} D_{10}$
D_{60} = Grain diameter at 60% passing
D_{30} = Grain diameter at 30% passing
D_{10} = Grain diameter at 10% passing

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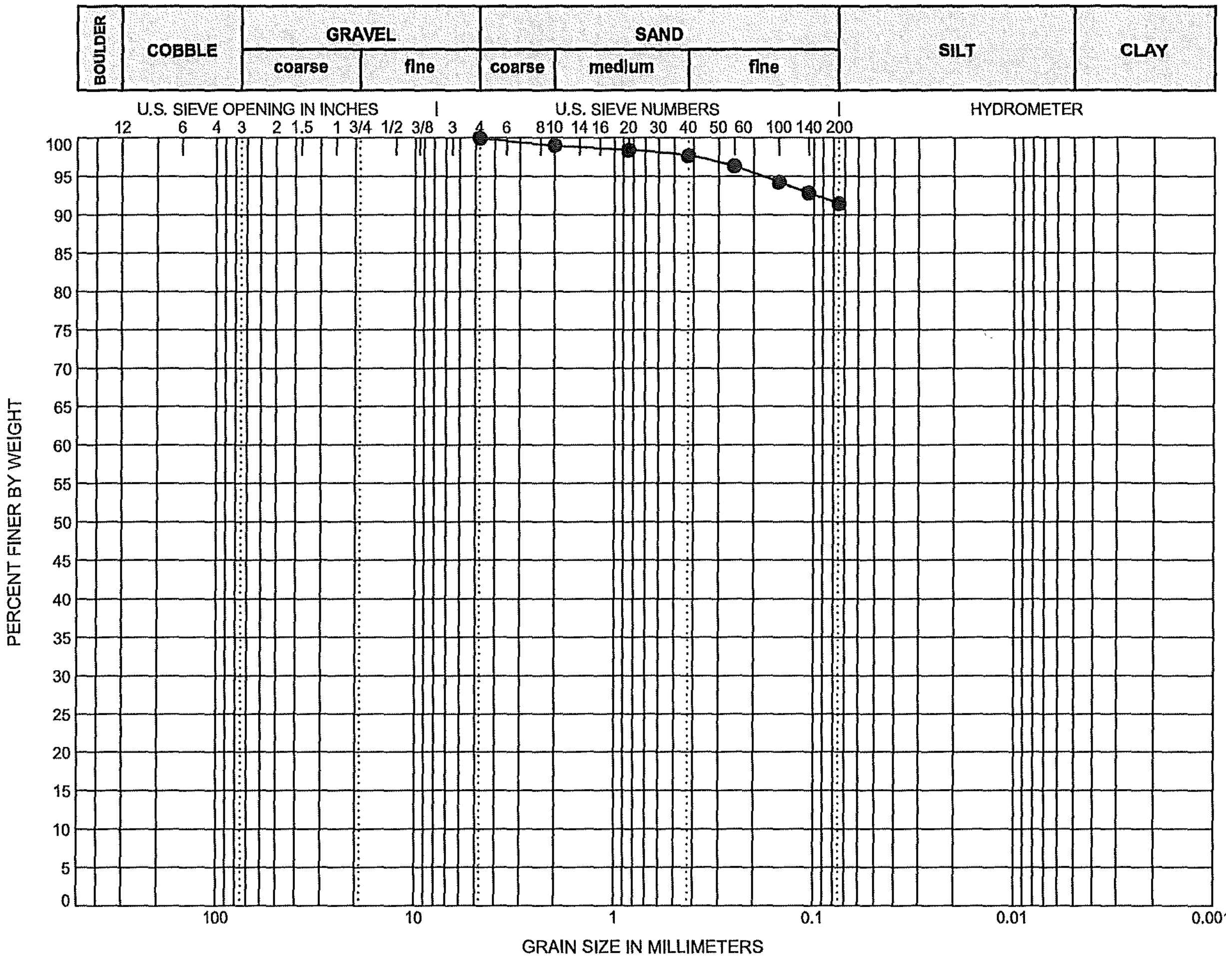
PROJECT NO.: 20201437.001A		SIEVE ANALYSIS	FIGURE
DRAWN BY:	GG	Carr Lake and Park 622 Sherwood Drive Salinas, California 93906	B-3
CHECKED BY:	JE		
DATE:	11/6/2019		

PLOTTED: 11/26/2019 09:21 AM BY: JSala



	Exploration ID	Depth (ft.)	Sample Number	Sample Description	LL	PL	PI
●	HA-2	4.5	NA	BALCK FAT CLAY (CH)	NM	NM	NM

	Exploration ID	Depth (ft.)	D_{100}	D_{60}	D_{30}	D_{10}	Cc	Cu	Passing 3/4"	Passing #4	Passing #200	%Silt	%Clay
●	HA-2	4.5	4.75	NM	NM	NM	NM	NM		100	91	NM	NM

Sieve Analysis and Hydrometer Analysis testing performed in general accordance with ASTM D6913(Sieve Analysis) and ASTM D7928 (Hydrometer Analysis).
NP = Nonplastic
NA = Not Available
NM = Not Measured

Coefficients of Uniformity - $C_u = D_{60} / D_{10}$
Coefficients of Curvature - $C_C = (D_{30})^2 / D_{60} D_{10}$
D_{60} = Grain diameter at 60% passing
D_{30} = Grain diameter at 30% passing
D_{10} = Grain diameter at 10% passing

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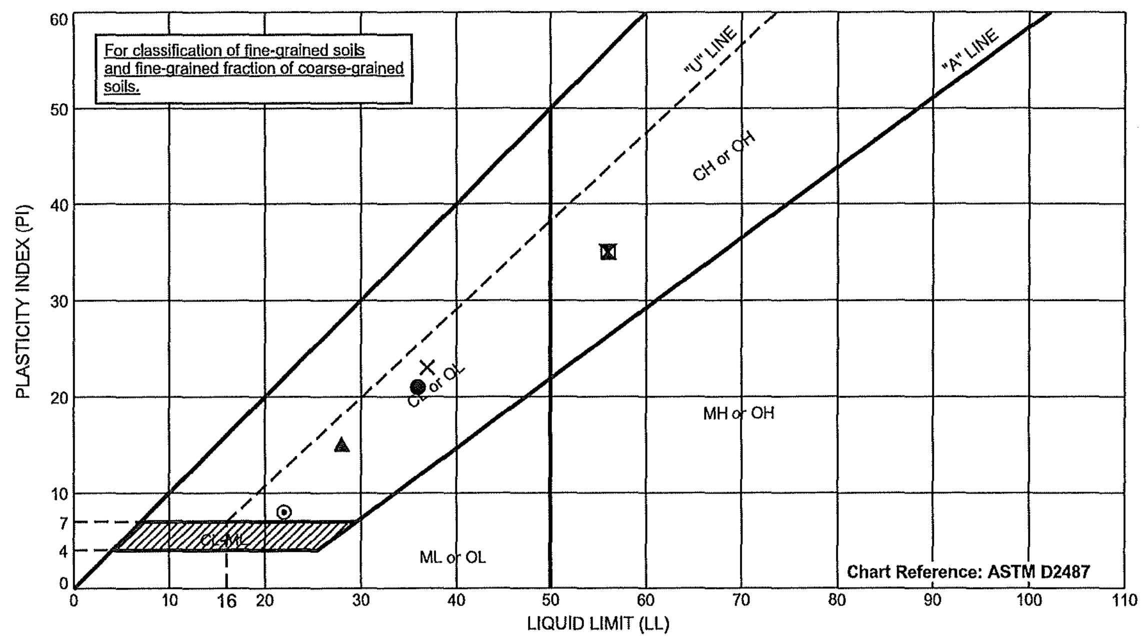
DRAWN BY: GG
CHECKED BY: JE
DATE: 11/6/2019

SIEVE ANALYSIS

Carr Lake and Park
622 Sherwood Drive
Salinas, California 93906

FIGURE
B-4

OFFICE FILTER: STOCKTON
PROJECT NUMBER: 20201437.001A
gINT FILE: Klf_gint_master_2020
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2020.GLB [_KLF_SIEVE ANALYSIS]



	Exploration ID	Depth (ft.)	Sample Number	Sample Description	Passing #200	LL	PL	PI
●	B-1	0 - 2.5	NA	DARK BROWN SANDY LEAN CLAY (CL)	58	36	15	21
⊠	B-2	0.5	1B	BLACK FAT CLAY WITH SAND (CH)	NM	56	21	35
▲	B-5	3.5	NA	DARK OLIVE BROWN SANDY LEAN CLAY (CL)	55	28	13	15
✕	HA-1	3.5	3	BLACK SANDY LEAN CLAY (CL)	NM	37	14	23
⊙	HA-5	1	1	DARK OLIVE BROWN CLAYEY SAND (SC)	NM	22	14	8

Testing performed in general accordance with ASTM D4318.
NP = Nonplastic
NA = Not Available
NM = Not Measured

PROJECT NO.: 20201437.001A	ATTERBERG LIMITS	FIGURE
DRAWN BY: GG CHECKED BY: JE DATE: 11/6/2019	Carr Lake and Park 622 Sherwood Drive Salinas, California 93906	B-5

Laboratory Test Report

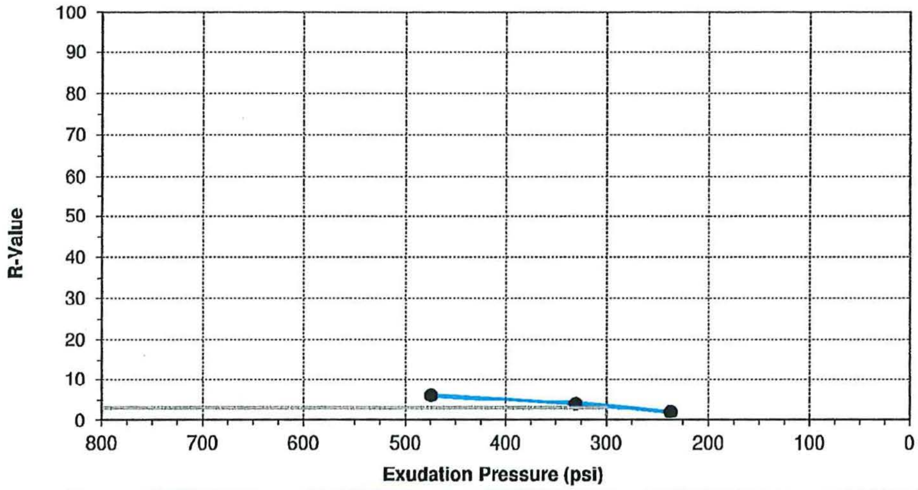
Client:	**BFS Landscape Architects**	Report No.:	**19-HAY-01551 Rev. 0**	Issued:	**11/22/2019**
Project:	**20201437.001A**			Field ID:	**HL12684**
	Carr Lake and Park, Salinas CA - GEO	Sampled by:		Date:	**10/21/2019**
	01-000L - Laboratory Testing	Submitted by:	**G. Alcantar**	Date:	**11/6/2019**

Tested on **11/15/2019** by **Justin Savage**

Test Method: **ASTM D2844**

Material Description: **Dark Brown Sandy Lean Clay (CL)**

Specific Location: **B-1 @ 0-2.5'**



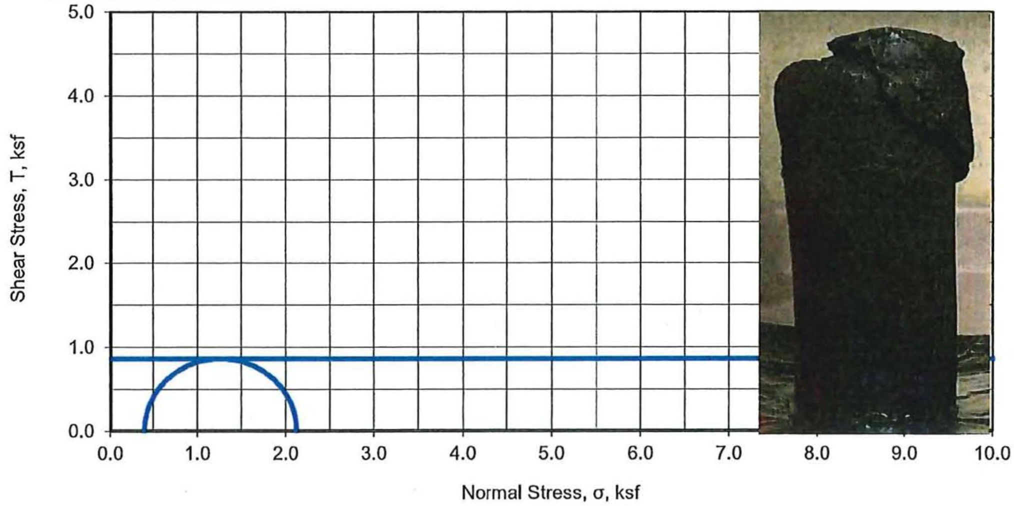
Briquette No.	**A**	**B**	**C**
Dry Unit Weight at Test (pcf)	106.3	104.1	108.9
Expansion Pressure (psf)	260	247	260
Exudation Pressure (psi)	330	237	474
Moisture at Time of Test (%)	18.8	20.7	17.0
Resistance Value	4	2	6
R - VALUE AT 300 PSI EXUDATION PRESSURE:			**3**

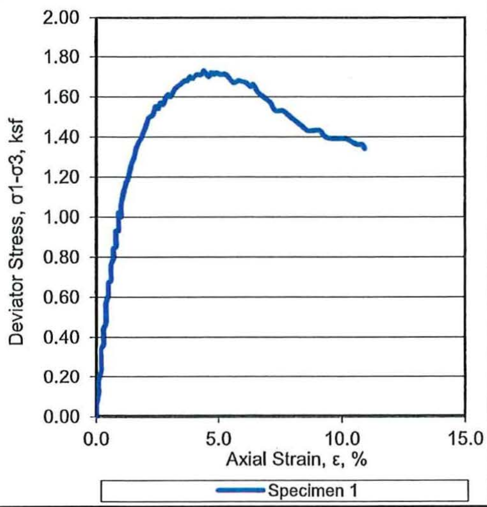
Remarks:
HL12684A

Reviewed on 11/22/2019 by Cindy Pimentel,
Senior Technician

Total		
c =	0.86	ksf

Specimen Shear Picture





Specimen No.			1
Initial	Diameter, in	D_o	2.40
	Height, in	H_o	5.53
	Water Content, %	ω_o	54.7
	Dry Density, lbs/ft³	γ_{d_o}	68.1
	Saturation, %	S_o	101
	Void Ratio	e_o	1.428
Minor Principal Stress, ksf		σ_3	0.40
Maximum Deviator Stress, ksf		$(\sigma1-\sigma3)_{max}$	1.73
Time to $(\sigma_1-\sigma_3)_{max}$, min		t_f	4.35
Deviator Stress @ 15% Axial Strain, ksf		$(\sigma_1-\sigma_3)_{15\%}$	1.34
Ultimate Deviator Stress, ksf		$(\sigma_1-\sigma_3)_{ult}$	na
Rate of strain, %/min		$'\varepsilon$	1.00
Axial Strain at Failure, %		ε_f	4.35

Description of Specimen: Dark Olive Gray Fat Clay (CH)

Amount of Material Finer than the No. 200, %: nm

LL: nm | PL: nm | PI: nm | G_S: 2.65 Assumed | Specimen Type: Undisturbed | Test Method: ASTM D2850

Membrane correction applied

Boring:	B-2
Sample:	2A
Depth, ft:	3.5
Test Date:	11/11/19

Remarks: nm= not measured, na = not applicable

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2601 Barrington Ct, Hayward, CA 94545

Project No.:	20201437.001A
Date:	11/15/19
Entry By:	CP
Checked By:	CP
File Name:	HL12684

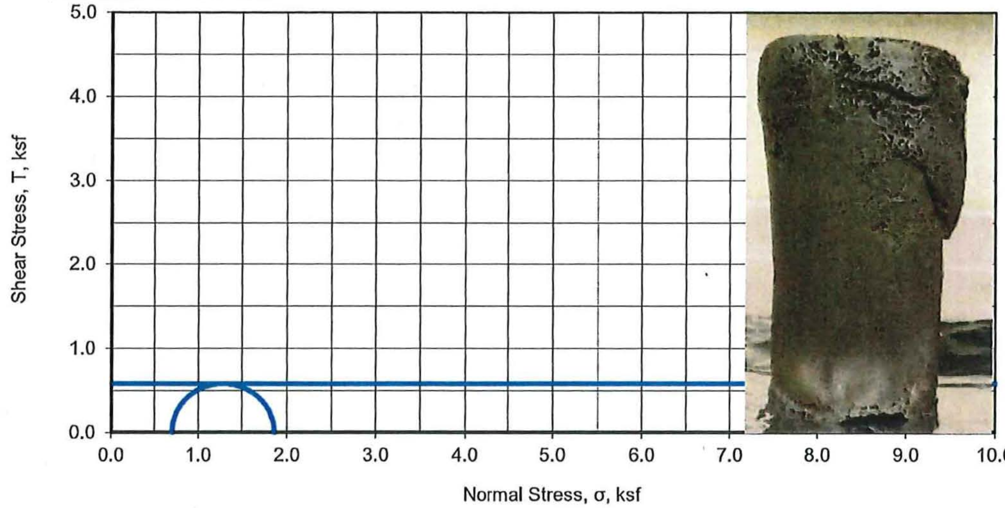
TRIAXIAL COMPRESSION TEST (UU)

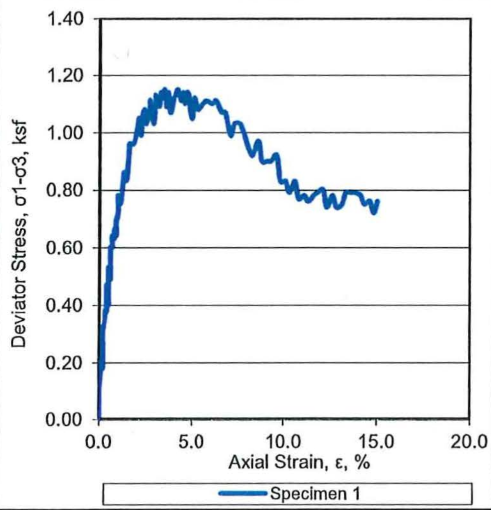
Carr Lake and Park
622 Sherwood Drive
Salinas, California 93906

Figure
B-7

Total		
c =	0.58	ksf

Specimen Shear Picture





Specimen No.			1
Initial	Diameter, in	D_o	2.40
	Height, in	H_o	5.51
	Water Content, %	ω_o	69.3
	Dry Density, lbs/ft^3	γ_{d_o}	60.0
	Saturation, %	S_o	100
	Void Ratio	e_o	1.757
Minor Principal Stress, ksf		σ_3	0.70
Maximum Deviator Stress, ksf		$(\sigma1-\sigma3)_{max}$	1.15
Time to $(\sigma_1-\sigma_3)_{max}$, min		t_f	3.47
Deviator Stress @ 15% Axial Strain, ksf		$(\sigma_1-\sigma_3)_{15\%}$	0.76
Ultimate Deviator Stress, ksf		$(\sigma_1-\sigma_3)_{ult}$	na
Rate of strain, %/min		$\dot{\varepsilon}$	1.00
Axial Strain at Failure, %		ε_f	3.47

Description of Specimen: Dark Gray Fat Clay (CH)

Amount of Material Finer than the No. 200, %: 95

LL: nm	PL: nm	PI: nm	G_S: 2.65 Assumed	Specimen Type: Undisturbed	Test Method: ASTM D2850

Membrane correction applied

Boring:	B-3
Sample:	3B
Depth, ft:	5.5
Test Date:	11/9/19

Remarks: nm= not measured, na = not applicable

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Project No.:	20201437.001A
Date:	11/15/19
Entry By:	CP
Checked By:	CP
File Name:	HL12684

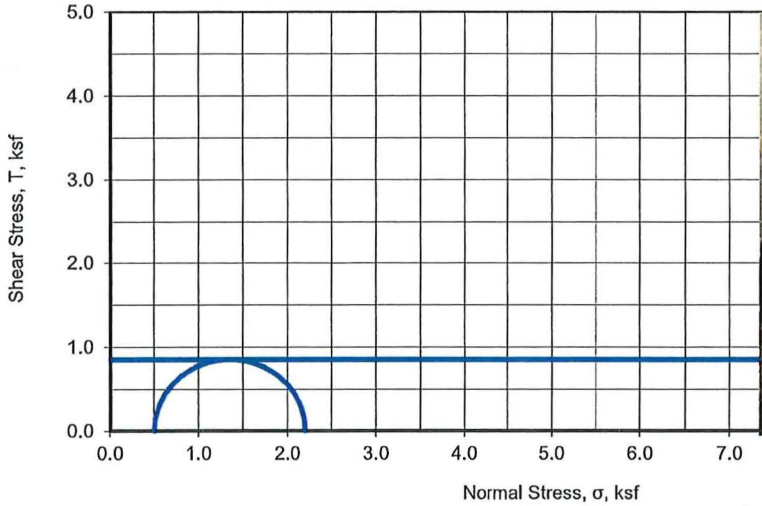
TRIAXIAL COMPRESSION TEST (UU)

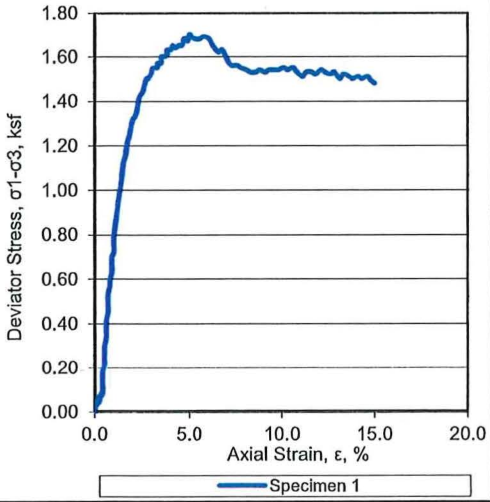
Carr Lake and Park
622 Sherwood Drive
Salinas, California 93906

Figure
B-8

Total		
c =	0.85	ksf

Specimen Shear Picture





Specimen No.			1
Initial	Diameter, in	D_o	2.40
	Height, in	H_o	5.70
	Water Content, %	ω_o	40.7
	Dry Density, lbs/ft^3	γ_{d_o}	77.4
	Saturation, %	S_o	100
	Void Ratio	e_o	1.137
Minor Principal Stress, ksf		σ_3	0.50
Maximum Deviator Stress, ksf		$(\sigma 1-\sigma 3)_{max}$	1.70
Time to $(\sigma_1\text{-}\sigma_3)_{max}$, min		t_f	4.95
Deviator Stress @ 15% Axial Strain, ksf		$(\sigma_1-\sigma_3)_{15\%}$	1.48
Ultimate Deviator Stress, ksf		$(\sigma_1-\sigma_3)_{ult}$	na
Rate of strain, %/min		$\dot{\varepsilon}$	1.00
Axial Strain at Failure, %		ε_f	4.95

Description of Specimen: Grayish Black Fat Clay with Sand (CH)

Amount of Material Finer than the No. 200, %: nm

LL: nm | PL: nm | PI: nm | G_S: 2.65 Assumed | Specimen Type: Undisturbed | Test Method: ASTM D2850

Membrane correction applied

Boring:	B-4
Sample:	2A
Depth, ft:	3.5
Test Date:	11/11/19

Remarks: nm= not measured, na = not applicable

KLEINFELDER
Bright People. Right Solutions.
2601 Barrington Ct, Hayward, CA 94545

Project No.:	20201437.001A
Date:	11/15/19
Entry By:	CP
Checked By:	CP
File Name:	HL12684

TRIAXIAL COMPRESSION TEST (UU)

Carr Lake and Park
622 Sherwood Drive
Salinas, California 93906

Figure
B-9

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

13 November, 2019

Job No.1911044
Cust. No.10781

Mr. Gabriel Alcantar
Kleinfelder
75 E. Santa Clara, Level 5
San Jose, CA 95113

Subject: Project No.: 20201437.001A
Project Name: 622 Sherwood Drive, Salinas
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Alcantar:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on November 06, 2019. Based on the analytical results, a brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity at 100% saturation measurement, this sample is classified as "severely corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration is 230 mg/kg and is determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentration is 70 mg/kg and is determined to be insufficient to damage reinforced concrete structures and cement mortar-coated steel at this location.

The pH of the soil is 7.80 which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 60-mV and is indicative of potentially "severely corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

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Client: Kleinfelder
Client's Project No.: 20201437.001A
Client's Project Name: 622 Sherwood Drive, Salinas
Date Sampled: 10/21-23/19
Date Received: 6-Nov-19
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 13-Nov-2019

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Resistivity (As Received) (ohms-cm)	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1911044-001	B-6, 1A	+60	7.80	980	330	-	230	70

Method:	ASTM D1498	ASTM D4972	ASTM G57	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	-	-	50	15	15
Date Analyzed:	12-Nov-2019	12-Nov-2019	13-Nov-2019	13-Nov-2019	-	12-Nov-2019	12-Nov-2019

* Results Reported on "As Received" Basis

Cheryl McMillen
Laboratory Director

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

Anaheim Office
November 20, 2019
Report 19-315-0007

Kleinfelder, Inc.
380 North First Street
Suite A
San Jose CA 95112

Attn: Andrea Traum

RE: Carr Lake & Park, Salinas, Job #20201437.001A

Background

One sample was processed on November 11, 2019 identified as site soil from a depth of 6 to 24 inches from an area where new landscaping is scheduled for installation. Fertilizer and amendment recommendations were requested. The sample was analyzed for horticultural suitability, fertility, and physical characteristics. The results of the analyses are attached.

Analytical Results and Comments

The reaction of the sample is slightly alkaline at a pH of 7.5 with qualitative lime favorably low. This is within the range preferred for most plants. Salinity (ECe), sodium and boron are safely low. The sodium adsorption ratio (SAR) indicates that sodium is adequately balanced by soluble calcium and magnesium; this balance is important for soil structure quality, which relates to the rate at which water infiltrates the soil.

According to the USDA Soil Classification system, the texture of the less than 2mm fraction of the soil is classified as clay. Organic matter content is low at 0.9% dry weight. Based on this information the estimated infiltration rate is slow at 0.13 inch per hour. Infiltration rates may vary due to differences in compaction across the site. The over 60% silt plus clay present and particularly the over 40% clay present indicates that this soil will have a strong potential for issues with slow drainage and high water holding capacity and irrigation timing should take this into account. Additional subdrainage is recommended for larger specimens being installed in flat areas in this soil.

In terms of soil fertility, nitrogen, phosphorus and potassium are low. All of the other major nutrients are sufficient for proper plant nutrition at this time. Of the micronutrients; copper is sufficient while zinc, manganese and iron are low.

The primary symptom of zinc, manganese and iron deficiencies is a general yellowing of leaves with veins remaining green. In severe cases, leaves may become pale yellow or whitish, but veins remain green. Brown spots may develop between veins and leaf margins may turn brown. Zinc deficiencies typically appear first on older, interior leaves. Manganese deficiency symptoms appear first on younger leaves. Iron deficiency shows first and more severely on the newer growth at branch tips. If these symptoms are present after plant installation they may be treated with an application of a chelated micronutrient product at the manufacturer's recommended rate. Incorporation of a composted greenwaste amendment would also provide additional micronutrients and may be sufficient to negate any deficiency, product depending.

Waypoint ANALYTICAL

Anaheim Office
Report 19-315-0017

Boron is safely low for general ornamental plants and may be below optimum levels for plant nutritional purposes. Irrigation water often supplies sufficient boron to meet plant nutritional requirements. However, if boron is low in the irrigation water and/or plants show symptoms of boron deficiency after they are well established, you may consider an application of a product containing boron at the manufacturer's label rate. Boron deficiency symptoms often include stunted or deformed younger growth and tight internodes. Tissue testing can be performed to identify a boron deficiency if it is suspected. Incorporation of a composted greenwaste amendment may be sufficient to negate this deficiency, product depending.

Recommendations

Incorporation of nitrogen, phosphorus and potassium fertilizers is recommended at the time of planting. Incorporation of a nitrogen stabilized organic amendment or composted greenwaste product is recommended in order to improve soil nutrient holding capacity and porosity. If a composted greenwaste amendment is chosen, that would provide additional phosphorus and potassium as well as supplemental micronutrients, product depending.

To Prepare for Mass Planting:
Drainage of the root zone should be improved by first loosening the top 10 inches of any undisturbed or compacted soil. The following materials should then be evenly spread and thoroughly blended with the top 6 inches of soil to form a homogenous layer:

Amount per 1000 Square Feet	
6 cubic yards	Nitrogen Stabilized Organic Amendment*
8 pounds	Ammonium Phosphate (16-20-0)*
8 pounds	Potassium Sulfate (0-0-50)*

*The rate may change based on the analysis of the chosen organic amendment. This rate is based on 270 lbs. of dry weight of organic matter per cubic yard of amendment. If a composted greenwaste amendment is chosen that provides a substantial amount of phosphorus or potassium, the ammonium phosphate should be replaced with ammonium sulfate (21-0-0) at a 7 pound rate and the potassium sulfate should be decreased or omitted accordingly.

To Prepare Backfill For Trees and Shrubs:

- Excavate planting pits at least twice as wide as the diameter of the rootball.
- Soil immediately below the root ball should be left undisturbed to provide support but the sides and the bottom around the side should be cultivated to improve porosity.
- The top of the rootball should be at or slightly above final grade.
- The top 12 inches of backfill around the sides of the rootball of trees and shrubs may consist of the above amended soil or may be prepared as follows:

3 parts	Site Soil
1 part	Nitrogen Stabilized Organic Amendment*

Uniformly blended with:

Amount / Cubic Yard of Backfill	
1/2 pound	Ammonium Phosphate (16-20-0)*
1/2 pound	Potassium Sulfate (0-0-50)*

- Backfill below 12 inches required for 24 inch box or larger material should not contain the organic amendment or ammonium phosphate, but should still contain the potassium sulfate at the recommended rate. In order to improve phosphorus levels below 12 inches in depth, triple superphosphate should be incorporated at a 1/4 pound rate.
- Ideally a weed and turf free zone should be maintained just beyond the diameter of the planting hole. A 2-4 inch deep layer of coarse mulch can be placed around the tree or shrub. Mulch should be kept a minimum 4 inches from the trunk.
- Irrigation of new plantings should take into consideration the differing texture of the rootball substrate and surrounding soil matrix to maintain adequate moisture during this critical period of establishment.

Maintenance

Maintenance fertilization should rely primarily on a nitrogen only program supplemented with a complete fertilizer in the fall and spring. Beginning 45-60 days after planting, ammonium sulfate (21-0-0) should be applied at a rate of 5 pounds per 1000 square feet with reapplication every 45-60 days. Alternatively, slow release Sulfur Coated Urea (43-0-0) may be applied at 6 pounds per 1000 square feet every 90 days. Once plants are performing satisfactorily, the frequency of fertilization may be decreased depending on color and rate of growth desired. In the winter for a quick greening effect, calcium nitrate (15.5-0-0) may be applied at a 6 pound rate if applicable. Early fall and spring, substitute a complete fertilizer such as 15-15-15 to help insure continuing adequate phosphorus and potassium.

Alternatively, Blood Meal (12-0-0) provides available nitrogen fairly rapidly while materials such as Feather Meal (12-0-0), Soybean or Cotton Seed Meal (7-1-1) are slower to provide available nitrogen, but they extend the length of time they make this contribution. In order to provide a good supply of nitrogen for a 3-4 month time frame a good combination would be 6 pounds Blood Meal and 14 pounds Feather Meal per 1000 square feet. In the fall and spring, substitute a complete organic fertilizer such as 5-5-5 applied at the manufacturer's label rate. Or, nutrient rich composted greenwaste may be spread in a 1 to 2 inch layer, which generally carries enough nutrition to boost complete nutrition though a source of nitrogen might also be added at a half rate to assure adequate nitrogen availability.

If we can be of any further assistance, please feel free to contact us.

A Lucchesi

Annmarie Lucchesi
alucchesi@waypointanalytical.com

Emailed 4 Pages: atraum@kleinfelder.com

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Project : Carr Lake + Park-Salinas
Job # 20201437.001A

COMPREHENSIVE SOIL ANALYSIS

Report No : **19-315-0017**
Purchase Order :
Date Recd : 11/11/2019
Date Printed : 11/15/2019
Page : 1 of 1

Sample Description - Sample ID	Half Sat % / TEC	pH / Qual Lime	ECe dS/m	NO_3-N ppm	NH_4-N ppm	PO_4-P ppm	K ppm	Ca ppm	Mg ppm	Cu ppm	Zn ppm	Mn ppm	Fe ppm	Organic % dry wt.	Lab No.
				Sufficiency Factors											
Site Soil	28	7.5	0.9	3	7	9	88	2440	525	1.2	1.3	3	10	0.91	10040
	166	Low		0.2		0.3	0.4	0.9	1.4	0.6	0.2	0.2	0.1		

Saturation Extract Values						SAR	Gravel %		Percent of Sample Passing 2 mm Screen					USDA Soil Classification	Lab No.
									Sand						
Ca meq/L	Mg meq/L	Na meq/L	K meq/L	B ppm	SO_4 meq/L		Coarse 5 - 12	Fine 2 - 5	Very Coarse 1 - 2	Coarse 0.5 - 1	Med. to Very Fine 0.05 - 0.5	Silt .002-.05	Clay 0-.002		
4.1	2.0	2.2	0.1	0.06	3.5	1.3	1.7	2.4	7.0	11.2	21.4	16.2	44.1	Clay	10040

ficiency factor (1.0=sufficient for average crop) below each nutrient value. N factor based on 200 ppm constant feed. SAR = Sodium adsorption ratio. Half Saturation %=approx field moisture capacity. Nitrogen(N), Potassium(K), cium(Ca) and Magnesium(Mg) by sodium chloride extraction. Phosphorus(P) by sodium bicarbonate extraction. Copper(Cu), Zinc(Zn), Manganese(Mn) & Iron(Fe) by DTPA extraction. Sat. ext. method for salinity (ECe as dS/m),Boron Sulfate(SO_4), Sodium(Na). Gravel fraction expressed as percent by weight of oven-dried sample passing a 12mm(1/2 inch) sieve. Particle sizes in millimeters. Organic percentage determined by Walkley-Black or Loss on Ignition.

LOW , SUFFICIENT , HIGH

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Appendix C

Project Identification:	Carr Lake		
Test Location:	Infiltration Test		
Liquid Used:	Water		
pH:			
Tested By:	M. Ryan		
ASTM Method:	D3385-09		

Constants:	Area (cm^2)	Depth of Liquid (cm)	Penetration (cm)	Liquid Containers No.	Vol (cm^2/cm)
Inner Ring	715	25.4	12.7	1	89.154
Annular Space	2136	25.4	12.7	2	152.908

Liquid Level Maintained by Mariott Tube

Trial No.		Date 2019	Time hr:min:sec	Elapsed Time Δ/(total) (min)	Flow Readings Inner Ring Reading (cm)	Inner Ring Flow (cm^3)	Annular Space Reading (cm)	Annular Space Flow (cm^3)	Liquid Temp degrees C	Incremental Infiltration Rate Inner cm/hr	Annular cm/hr	Notes
	S	22-Oct	11:05:00	30	44.50		44.00					Start test at 11:05 am
1	E	22-Oct	11:35:00	(30)	44.50	0.00	44.00	0.00		0.00000	0.00000	30 min measurement intervals
	S	22-Oct	11:35:00	30	44.50		44.00					
2	E	22-Oct	12:05:00	(60)	44.50	0.00	44.00	0.00		0.00000	0.00000	
	S	22-Oct	12:05:00	30	44.50		44.00					No observed infiltration for first 60 mins
3	E	22-Oct	12:35:00	(90)	41.50	267.46	43.00	152.91		0.74815	0.14317	3 cm drop for third interval
	S	22-Oct	12:35:00	30	41.50		43.00					
4	E	22-Oct	13:05:00	(120)	37.50	356.62	40.90	321.11		0.99753	0.30066	4 cm drop for fourth interval
	S	22-Oct	13:05:00	30	37.50		40.90					
5	E	22-Oct	13:35:00	(150)	37.50	0.00	40.90	0.00		0.00000	0.00000	No observed infiltration on 5th interval
	S											
6	E											Test ended at 150 minutes
	S											
7	E											
	S											
8	E											
	S											
9	E											
	S											
10	E											
	S											
11	E											
	S											
12	E											
	S											
13	E											
	S											
14	E											

Inner:	0.58189	cm/hr =	1.62E-04	cm/sec	*0.229091*	*in/hr*
Outer:	0.14794	cm/hr =	4.11E-05	cm/sec	0.058246	in/hr

Final Calculated Infiltration Rate: **0.23 in/hr**

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Appendix D

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

END OF REPORT
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November 22, 2019
TRC Project Number BFS.2019.0001

Mr. Mike Bellinger
Principal
BFS Landscape Architects
425 Pacific Street
Monterey, CA 93940

Subject: **Human Health Screening Evaluation**
Proposed Carr Lake Restoration and Park Development
Salinas, California

Dear Mr. Bellinger,

ToxRisk Consulting, LLC (TRC) has prepared this human health screening evaluation (HHSE) for the proposed Carr Lake re-development at 618 Sherwood Drive in Salinas, California (the "Site"). The Site, comprises six parcels that total 73 acres. The assessor's parcel numbers (APN's) are:

- APN 003-821-033-000;
- APN 003-212-016-000;
- APN 003-212-015-000;
- APN 261-191-001-000;
- APN 003-212-007-000; and
- APN 261-191-007-000.

The parcels are used for agriculture and portions of two parcels (APN 003-212-016-000 and APN 003-821-033-000) are developed with farming support buildings and a residence. During the course of agricultural operations on the parcels, releases of petroleum hydrocarbons and petroleum-related constituents may have occurred, and pesticides were applied to the cultivated areas. Phase II environmental site investigations were performed in 2016 and 2019 to assess the potential presence of these compounds in soil on the Site (EIS 2016; Earth Systems 2019). The results of these investigations provide data regarding soil conditions that were used to prepare this human health screening evaluation (HHSE).

The purpose of the HHSE is:

- To estimate the health hazard that may be associated with potential exposures to the

Exhibit 51

chemical(s) of concern in soil under pertinent exposure scenarios; and

- To offer recommendations regarding the need for collecting additional site information, the need for cleanup, and the need for mitigation measures incorporated into the proposed development design.

The HHSE was performed in general accordance with the *Preliminary Endangerment Assessment Guidance Manual* (DTSC 2015). The HHSE report is organized as follows:

- Exposure Pathways and Media of Concern – An exposure pathway describes the course a chemical could take from a source to the location of a human receptor where that chemical could be ingested, inhaled, or absorbed through the skin. An exposure pathway includes sources, release mechanisms, transport mechanisms, affected media (e.g., soil, groundwater, outdoor or indoor air), potential exposure routes (i.e., ingestion, inhalation, or dermal absorption), and potential receptors.

- Chemicals of Potential Concern (COPCs) and Exposure Point Concentrations (EPCs) – chemicals to be addressed in the HHSE are identified from site history and data developed in environmental site investigations. An EPC is the concentration of COPC at the location where exposure of a receptor could occur.

- Human Health Screening Levels – screening levels define acceptable environmental concentrations of the COPCs based on cancer risk or noncancer hazard. COPCs present at concentrations less than screening levels generally do not pose a hazard that requires further investigation, mitigation, or remediation.

- Risk Characterization – provides a discussion of the health hazards that may be associated with exposure to the COPCs at the estimated exposure point concentrations.

- Conclusions and Recommendations – based on the risk characterization, conclusions about the potential health hazards associated with the site are provided and recommendations for no further action, further investigation, mitigation, or remediation are made, as appropriate, to address those hazards.

1.0 EXPOSURE PATHWAYS AND MEDIA OF CONCERN

Based on current knowledge of the site and proposed land use, the HHSE will be limited to the following receptor groups and exposure pathways (Table 1).

Table 1
Potential Exposure Pathways
Proposed Carr Lake Recreational Area, Salinas, California

Receptor Group	Affected Medium	Exposure Route
Adults and children using the proposed recreational area	Soil	Incidental ingestion
		Dermal contact
		Dust inhalation

The source of water supplied to the proposed recreational area is assumed to be unaffected by agricultural operations or releases that may have occurred on the subject site. California Water Service Company (Cal Water) is the public water purveyor that supplies the area in which the proposed recreational area is located. Therefore, potential health hazards are assumed to be related to soil exposures only and potential exposures to groundwater were not evaluated.

2.0 CHEMICALS OF POTENTIAL CONCERN (COPCS) AND EXPOSURE CONCENTRATIONS

Soil samples from the proposed recreational area (n = 26) were analyzed for the following classes of chemical compounds: organochlorine pesticides (OCPs); petroleum hydrocarbons and related constituents; and metals (arsenic and lead only). Soil sample collection locations are presented on Plates 1-4. All chemicals detected at least once in any soil sample reported in EIS (2016) and Earth Systems (2019) were identified as COPCs and were evaluated in the HHSE. The COPCs addressed in the HHSE are presented in Table 2.

Table 2
Chemicals of Potential Concern
Proposed Carr Lake Recreational Area, Salinas, California

OCPs	TPH	Metals
4,4'-DDD	TPH-d	Arsenic
4,4'-DDE	TPH-o	Lead
4,4'-DDT		
Chlordane		
a-Chlordane		
g-Chlordane		
Dieldrin		
Endrin		
Heptachlor epoxide		
Toxaphene		

The exposure point concentration is that concentration of a COPC to which a receptor may be exposed in a given medium (i.e., soil, groundwater, or air). In the HHSE, the maximum concentration of each COPC reported in any soil sample (EIS 2016; Earth Systems 2019) was compared to the appropriate screening level (See Section 5.0, "Risk Characterization"). An upper-bound estimate of the average concentration for each COPC was also compared to screening levels. The upper-bound estimate of the average concentration is the 95% upper confidence limit of the average concentration (95UCL). A receptor is unlikely to spend all of their time onsite in a single location. Instead receptors will move around the Site during each visit; therefore, exposure to the COPCs is better represented by average concentrations, hence the use of the 95UCL in this HHSE (Attachment A). The following exposure point concentrations were applied in the HHSE (Table 3).

Table 3
Maximum and 95UCL Soil Concentrations for the COPCs
Proposed Carr Lake Recreational Ara
Salinas, California

COPC	Maximum Soil Concentration (mg/kg)	95UCL Concentration (mg/kg)
4,4'-DDD	0.074	--[a]
4,4'-DDE	0.7	0.0067
4,4'-DDT	0.3	0.006
Chlordane	0.24	0.0247
a-Chlordane	0.025	0.223
g-Chlordane	0.018	0.0933
Dieldrin	0.15	0.0603
Endrin	0.017	0.0044
Heptachlor epoxide	0.0018	--[a]
Toxaphene	6.5	1.913
TPH-d	26	--[a]
TPH-o	660	--[a]
Arsenic	11	7.46
Lead	26	16.83

[a] The number of samples in which this COPC was present at a concentration greater than the method detection limit were too few to accurately calculate a 95UCL.

3.0 HUMAN HEALTH SCREENING LEVELS

The California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) has developed modified human health screening levels (DTSC-SLs) that are based on the U.S. Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) calculation methods but incorporate Cal/EPA toxicity criteria and the standard default exposure assumptions presented by DTSC (2019a). Like RSLs, DTSC-SLs are concentrations in environmental media (i.e., soil, groundwater, tap water, or air) that are not expected to pose a hazard to human health under standard default exposure assumptions presented by DTSC (2019a). The DTSC-SLs "...should be used in conjunction with the...RSLs to evaluate chemical concentrations in environmental media at California sites and facilities" (DTSC 2019b). DTSC-SLs are based on a target cancer risk level of 1×10^{-6} and a target noncancer hazard quotient of 1.0.

For the health risk assessment of residual constituents in soil, the DTSC-SLs address the following exposure pathways:

- Soil ingestion;
- Dust inhalation; and
- Dermal contact.

Because the future land use will be recreational, screening levels based on a site-specific recreational exposure scenario were developed using the U.S. EPA on-line screening level calculator[1] as recommended in DTSC (2019b). Exposure frequency under residential land use would be much higher than under recreational land use. Therefore, the exposure frequency values assumed for the recreational scenario were as follows:

- Ages 0-2 years – 7 days/year
- Ages 2-6 years – 14 days/year
- Ages 6-16 years – 36 days/year
- Ages 16-26 years – 72 days/year

Screening levels based on recreational land use are presented in Table 4. Inputs to, and output from, the U.S. EPA on-line risk calculator are provided in Attachment B.

[1] Available on-line at https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search.

Table 4
Screening Levels for the COPCs
Proposed Carr Lake Recreational Area, Salinas, California

COPC	Recreational Land Use Screening Level (mg/kg)	Basis	Source
Chlordane	27.3	Cancer Risk	U.S. EPA Risk Calculator
a-Chlordane	27.3	Cancer Risk	U.S. EPA Risk Calculator
g-Chlordane	27.3	Cancer Risk	U.S. EPA Risk Calculator
4,4'-DDD	34.6	Cancer Risk	U.S. EPA Risk Calculator
4,4'-DDE	32.2	Cancer Risk	U.S. EPA Risk Calculator
4,4'-DDT	29.8	Cancer Risk	U.S. EPA Risk Calculator
Dieldrin	0.52	Cancer Risk	U.S. EPA Risk Calculator
Endrin	569	Noncancer Hazard	U.S. EPA Risk Calculator
Heptachlor epoxide	1.16	Cancer Risk	U.S. EPA Risk Calculator
Toxaphene	6.92	Cancer Risk	U.S. EPA Risk Calculator
TPH-d	1,200	Noncancer Hazard	SFBRWQCB (2019)
TPH-o	180,000	Noncancer Hazard	SFBRWQCB (2019)
Arsenic	NA[a]	NA[a]	DTSC (2009, 2015)
Lead	80	NA[b]	DTSC (2019)

[a] Not applicable, naturally occurring background concentrations were used to evaluate arsenic in soil as discussed in DTSC (2015) and DTSC (2009), see Section 6.3.
[b] Lead screening level established in DTSC (2019b).

4.0 TOXICITY VALUES

The screening levels described in Section 3.0 were used to perform the HHSE and to complete the risk characterization presented in Section 5.0; therefore, the selection and compilation of specific toxicity values was not necessary (see Section 3.2.8.4 in DTSC 2015).

5.0 RISK CHARACTERIZATION

With the exception of arsenic and lead, health risks that may be associated with exposure to the COPCs present in soil on the Site were evaluated by comparing the maximum soil concentration for each COPC to the DTSC-SL for that chemical. The basic screening risk equations are:

$$Cancer\ Risk = \frac{C_{soil}}{SL_{ca}} \times (1 \times 10^{-6})$$

Where:

C_{soil} = soil concentration of analyte
SL_{ca} = soil screening level based on carcinogenicity

And:

$$Hazard\ Quotient = \frac{C_{soil}}{SL_{nc}}$$

Where:

C_{soil-i} = soil concentration of analyte
SL_{nc} = soil screening level based on noncancer hazard

The cancer risk and noncancer hazard quotient based on the maximum soil concentrations reported for each of the COPCs is presented in Table 5.

Table 5
Cancer Risk and Noncancer Hazard Estimates for the COPCs
Proposed Carr Lake Recreational Area, Salinas, California

COPC	Maximum Soil Concentration (mg/kg)	Screening Levels		Cancer Risk	Hazard Quotient
		Based on Cancer Risk (mg/kg)	Based on Noncancerous Effects (mg/kg)		
Chlordane (Technical)	0.048	27.3	1,060	1.76E-09	4.53E-05
a-Chlordane	0.0099	27.3	1,060	3.63E-10	9.34E-06
g-Chlordane	0.018	27.3	1,060	6.59E-10	1.70E-05
p,p-DDD	0.074	34.6	56.9	2.14E-09	1.30E-03
p,p-DDE	0.7	32.2	704	2.17E-08	9.94E-04
p,p-DDT	0.3	29.8	1,100	1.01E-08	2.73E-04
Dieldrin	0.15	0.52	94.8	2.89E-07	1.58E-03
Endrin	0.017	--	569	--	2.99E-05
Heptachlor epoxide	0.0018	1.16	70.3	1.55E-09	2.56E-05
Toxaphene	6.5	6.92	487	9.39E-07	1.33E-02
TPH-d	26	--	1,200	--	2.17E-02
TPH-o	660	--	180,000	--	3.67E-03
Arsenic[a]	28.7	NA	NA	NA	NA
Lead[b]	12.6	NA	NA	NA	NA
TOTALS				**1×10^{-6}**	**0.018**

[a] Health hazards that may be associated with arsenic are evaluated based on a comparison to background.
[b] Health hazards that may be associated with lead are evaluated based on a comparison to the DTSC residential screening level of 80 mg/kg

Cal/EPA policy is used to interpret the significance of cancer risk and noncancer hazard estimates (DTSC 2015, 2019b). The point of departure for risk management decisions based on cancer risk is 1×10^{-6}; therefore, where the cumulative cancer risk estimated on a given site is less than 1×10^{-6}, further investigation, mitigation, or remediation is generally not warranted. Similarly, where the noncancer hazard index is less than 1.0, further investigation, mitigation, or remediation is generally not warranted.

5.1 Organochlorine Pesticides (OCPs)

Ten OCPs were identified in one or more soil samples collected from the proposed Carr Lake recreation area. Each of the OCPs, except endrin, are classified as carcinogens. The cumulative cancer risk that may be associated with the maximum concentrations of the OCPs is 1×10^{-6} (rounded to one significant figure [EPA 1989]), which is equivalent to the 1×10^{-6} point of departure under Cal/EPA policy. The maximum concentrations of toxaphene and dieldrin account for most of the cancer risk. Using the 95UCL concentrations calculated for each of the OCPs, the estimated cancer risk is 4×10^{-7}, which is well below the 1×10^{-6} point of departure.

Given that the maximum and 95UCL OCP concentrations yield cancer risks at or below the 1×10^{-6} point of departure, and because, based on a review of the re-development plans, the location of the maximum toxaphene and dieldrin concentrations will be in an area not generally accessible to park users (sample SB-9 and SB-8, respectively, as reported in EIS 2016), further investigation, mitigation, or remediation is not considered to be necessary to protect recreational users.

The noncancer hazard index that may be associated with exposure to the OCPs under residential land use screening levels was 0.018, which is well below the Cal/EPA point of departure. Based on the noncancer hazard index and Cal/EPA policy, the OCPs in soil do not require further investigation, mitigation, or remediation to protect recreational park visitors.

5.2 Lead

The maximum lead concentration on the Site was 26 mg/kg (SB-9), which is well below the DTSC-SL for lead of 80 mg/kg under residential land use. Therefore, lead was not present at a concentration that warrants further investigation, mitigation, or remediation.

5.3 Arsenic

DTSC recognizes that arsenic naturally occurs in California soils at concentrations that exceed health-based screening levels; therefore, the agency has provided guidance for estimating natural background concentrations and for establishing site-specific arsenic cleanup levels (DTSC 2009, 2015).

To establish whether arsenic concentrations in soil required mitigation or remediation, methods presented in *Arsenic Strategies: Determination of Arsenic Remediation, Development of Arsenic Cleanup Goals* (DTSC 2009) were used calculate an arsenic cleanup goal for the Site. Calculation of an arsenic cleanup goal involved the following steps:

1. Generate summary statistics for the arsenic data set.
2. Identify and remove outliers from the data set.
3. Determine the statistical distribution that best fits the data.
4. Calculate the 98th percentile concentration of arsenic as the arsenic cleanup goal.

Table 6 presents summary statistics for the arsenic data set.

Table 6
Descriptive Statistics for Arsenic in Soil
Proposed Carr Lake Recreational Area, Salinas, California

Descriptive Statistic	Value
Number of Samples	26
Minimum Detected Value	3.7
Maximum Detected Value	11
Mean	6.8
First Quartile (Q1)	5
Third Quartile (Q3)	8.35
Fourth Spread, f_s	3.35
Standard Deviation	2.24

Outliers in the arsenic data set were identified using the fourth spread method (DTSC 2009). The fourth spread, f_s, is "defined as the measure of spread in a data set that is resistant to outliers and is calculated according to the following equation:"

$$f_s = Q_3 - Q_1$$

Outliers are defined as any datum greater than Q3 + $1.5f_s$ or less than $Q_1 - 1.5f_s$. For the Carr Lake data set, therefore, outliers are any value greater than 13.4 mg/kg or less than -0.03 mg/kg. Because there are no samples with arsenic concentrations greater than 13.4 mg/kg or less than -0.03 mg/kg, no outliers exist in the data set.

The public domain EPA statistical package, ProUCL (version 5.1.002) was used to create a Q-plot based on normal distribution for the 26 data points (Figure 1).

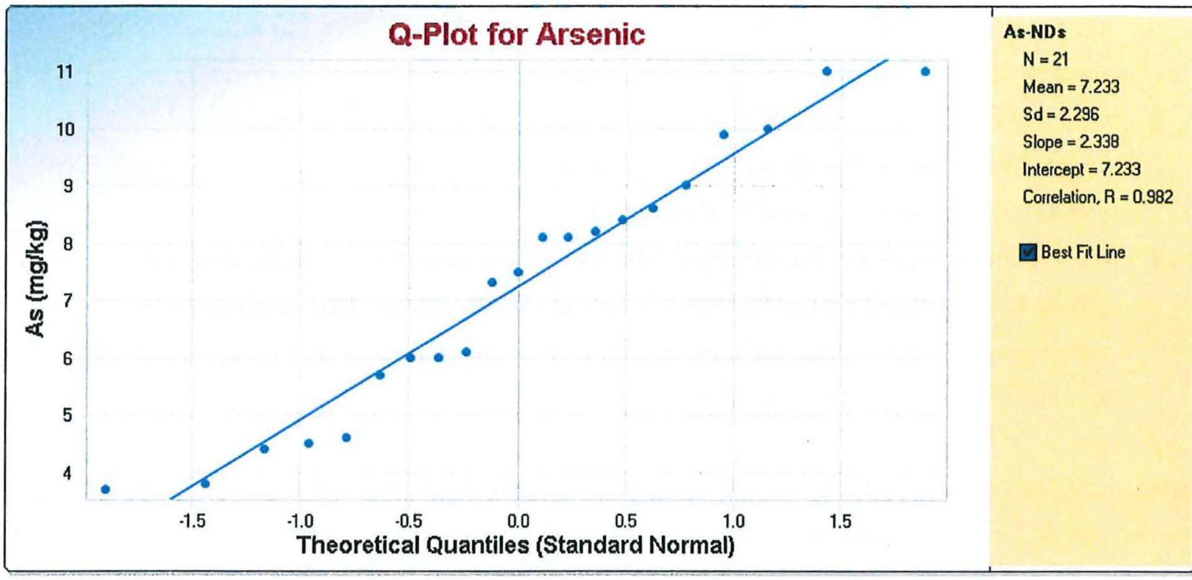

FIGURE 1. Q-PLOT OF ARSENIC DATA

Based on the correlation coefficient (R) of 0.982 and a visual inspection of the Q-plot, the arsenic data fit a normal distribution. Consistent with DTSC guidance for smaller data sets, the 98th percentile concentration, 11 mg/kg, represents an acceptable cleanup goal for arsenic (DTSC 2009). Therefore, further investigation, mitigation, or remediation are not required given that all reported concentrations of arsenic in the 26 soil samples from the Site are 11 mg/kg or less.

6.0 CONCLUSIONS AND RECOMMENDATIONS

An HHSE was completed for the proposed Carr Lake recreational area in Salinas, California. The HHSE was performed in general accordance with DTSC guidance and was based on Phase II environmental site investigation data presented in EIS (2016) and Earth Systems (2019). The HHSE addressed adults and children using the recreational area who are potentially exposed by the soil ingestion, dermal contact, and dust inhalation pathways to OCPs, lead, and arsenic detected in soil samples collected from the subject site. Based on the HHSE, the following conclusions can be drawn:

1. OCPs do not pose a hazard that requires further investigation, mitigation, or remediation based on laboratory analysis of 26 soil samples and comparison of the maximum soil

concentration of each detected OCP to a site-specific soil screening level calculated for recreational land use. No OCP was present in any soil sample at a concentration greater than the site-specific screening level calculated using the U.S. EPA on-line screening level calculator as recommended in DTSC HERO Note 3 (DTSC 2019b). The maximum OCP concentrations were reported in locations not intended for recreational access.

2. Lead does not pose a hazard that requires further investigation, mitigation, or remediation. The maximum concentration of lead, 26 mg/kg, was well below the DTSC residential soil screening level of 80 mg/kg.
3. Arsenic does not pose a hazard that requires further investigation, mitigation, or remediation. Arsenic was not present in any of the 26 soil samples analyzed at a concentration greater than the site-specific arsenic cleanup goal of 11 mg/kg, which was developed based on DTSC guidance.

Based on the foregoing analysis and conclusions further investigation, mitigation, or remediation is not warranted for the subject Site.

6.0 CLOSING

Thank you for the opportunity to do this work. Should you have questions or wish to discuss this report, please contact me at 425-922-5424 or by email at sdwyer@toxriskconsulting.com.

Sincerely,
ToxRisk Consulting, LLC

Scott D. Dwyer, PhD, DABT
Consulting Toxicologist

Plates 1-4
Attachment A – Calculation of 95UCL
Attachment B – U.S. EPA On-line Screening Level Calculator Output

7.0 REFERENCES

DTSC. 2015. Preliminary Endangerment Assessment Guidance Manual. State of California, Environmental Protection Agency, Department of Toxic Substances Control, Sacramento, California. January 1994 (Interim Final – Revised October 2015).

DTSC. 2019a. Human Health Risk Assessment (HHRA) Note 1 – Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Hazardous Waste Sites and Permitted Facilities. Department of Toxic Substances Control, California Environmental Protection Agency, Sacramento, California. April 9.

DTSC. 2019b. Human Health Risk Assessment (HHRA) Note 3 – DTSC-modified Screening Levels (DTSC-SLs). Department of Toxic Substances Control, California Environmental Protection Agency, Sacramento, California. April.

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Environmental Investigation Services (EIS). 2016. Phase II Limited Soil and Soil Vapor Investigation Report for 618 Sherwood Drive, Salinas, California, EIS Project #1547-2. Prepared for Big Sur Land Trust, Monterey, California. January 29.

EPA. 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington DC, EPA/540/1-89/002, December.

Gilbert, Richard O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.

PLATES

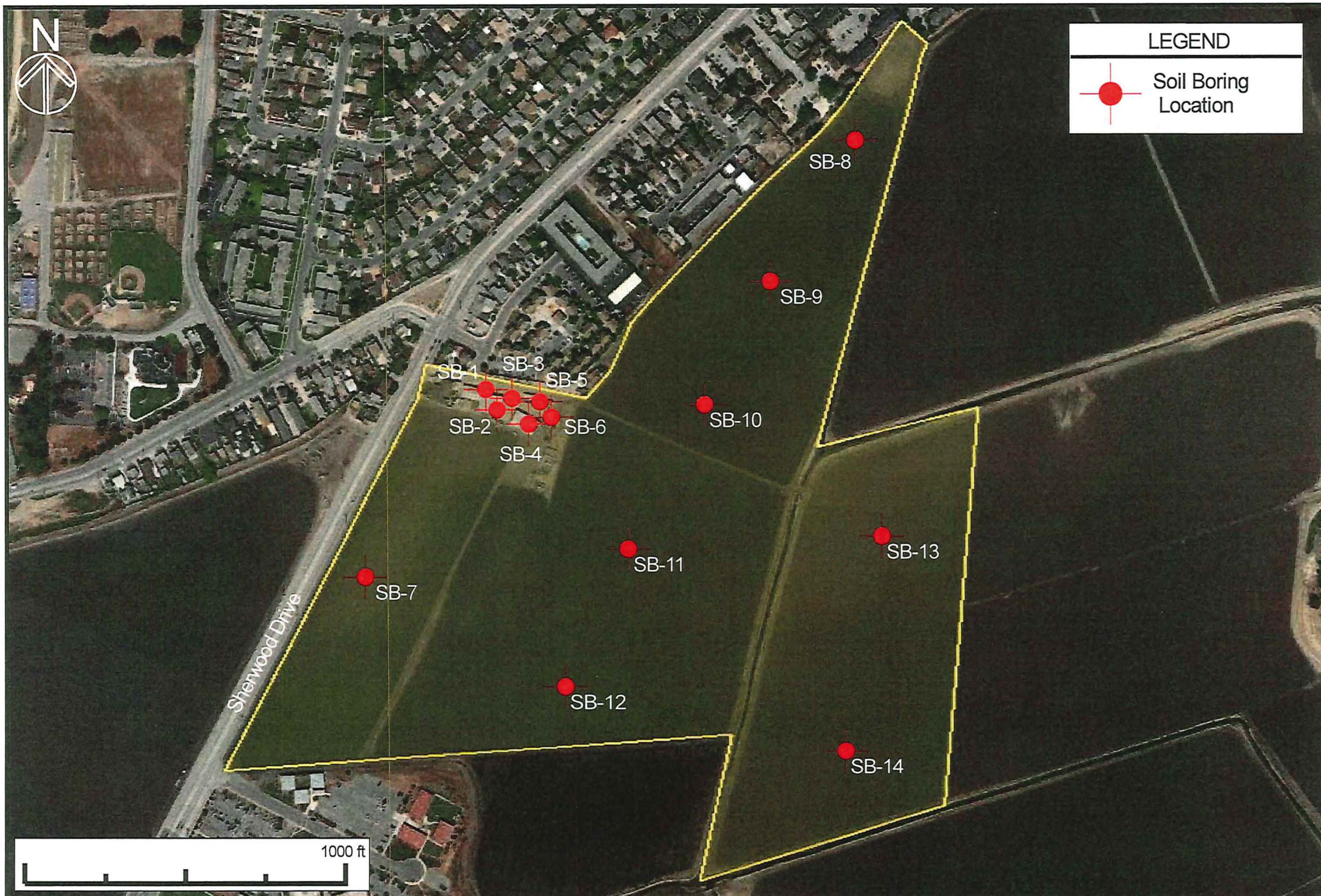
ENVIRONMENTAL INVESTIGATION SERVICES, INC.
15951 Los Gatos Ave, Suite 17, Los Gatos, CA 95032
(408) 402-9800 Fax: (408) 402-9830

EIS Project # 1547-2

January 29, 2016

Plate 1

Site Map
Sherwood Drive Agricultural Property
Salinas, California



ENVIRONMENTAL INVESTIGATION SERVICES, INC.
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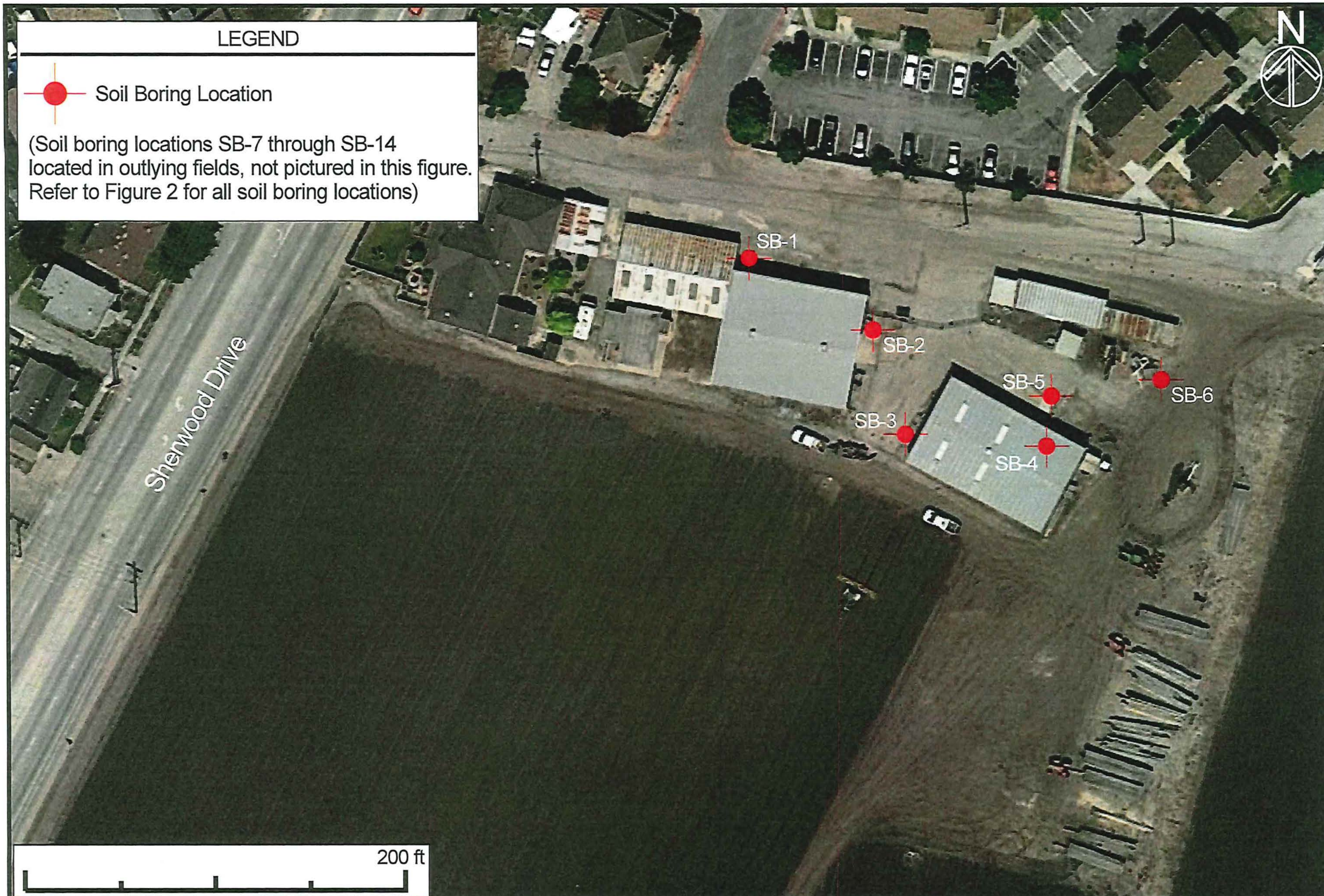
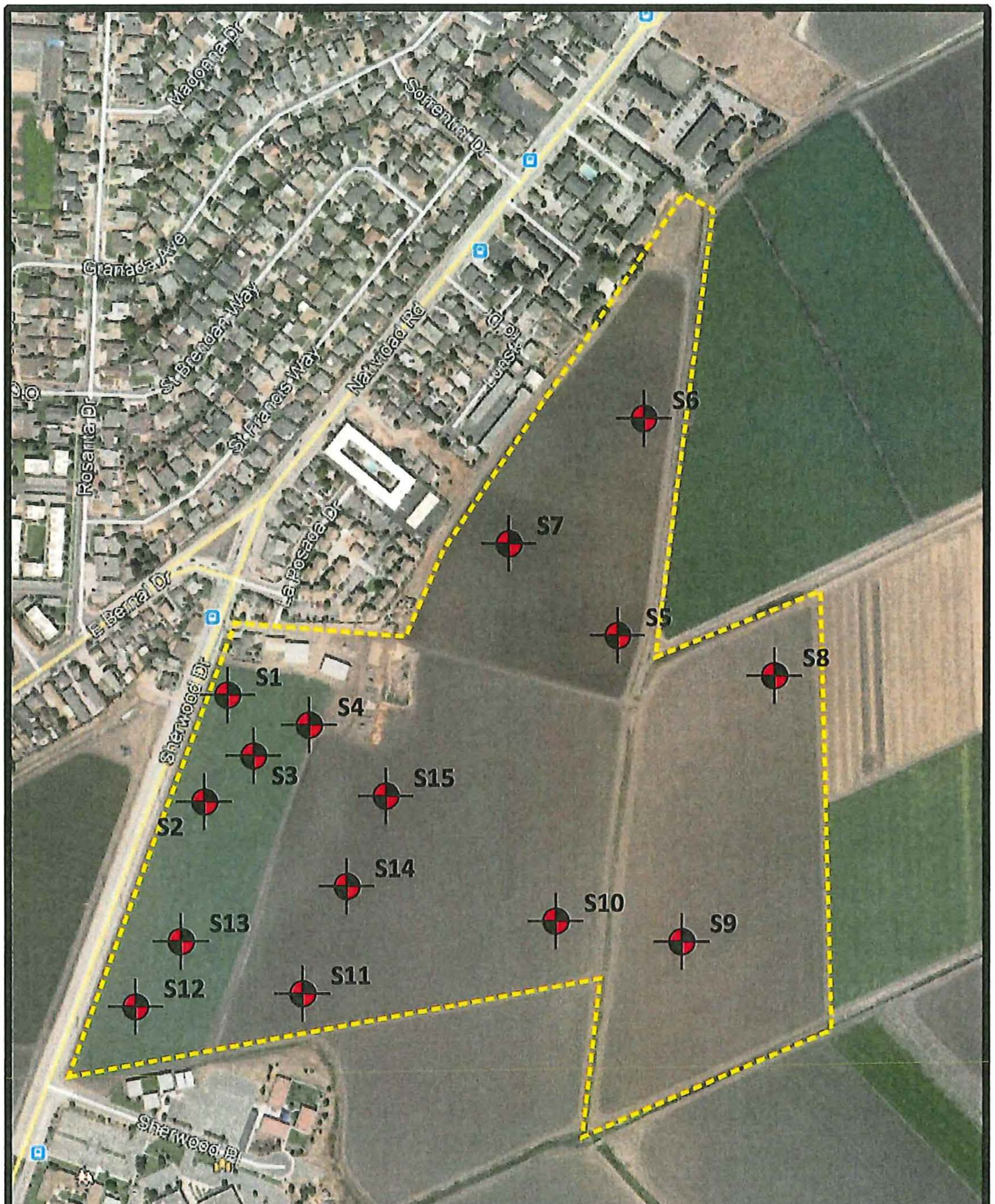
EIS Project # 1547-2	**Plate 2**	Soil Boring Location Map 618 Sherwood Drive Salinas, California
January 29, 2016		



ENVIRONMENTAL INVESTIGATION SERVICES, INC. 15951 Los Gatos Ave, Suite 17, Los Gatos, CA 95032 (408) 402-9800 Fax: (408) 402-9830	EIS Project # 1547-2 January 29, 2016	**Plate 3**	Soil Boring Location Detail 618 Sherwood Drive Salinas, California



S15 **Approximate Sample Location**

0 500 1000 1500

Approximate Scale in Feet

Base: Google Earth (2018)

Earth Systems Pacific	**Big Sur Land Trust Carr Lake** **Sherwood Drive** **Salinas, California**	**Plate 4** **Soil Sample Location Map**

ATTACHMENT A
CALCULATION OF 95UCL

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/7/2019 1:38:50 PM
From File	Data_2019.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Chlordane (Technical)

General Statistics			
Total Number of Observations	30	Number of Distinct Observations	11
Number of Detects	6	Number of Non-Detects	24
Number of Distinct Detects	6	Number of Distinct Non-Detects	5
Minimum Detect	0.03	Minimum Non-Detect	0.025
Maximum Detect	0.24	Maximum Non-Detect	1.2
Variance Detects	0.00686	Percent Non-Detects	80%
Mean Detects	0.0883	SD Detects	0.0829
Median Detects	0.0475	CV Detects	0.938
Skewness Detects	1.622	Kurtosis Detects	2.031
Mean of Logged Detects	-2.737	SD of Logged Detects	0.82

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.763	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.353	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0415	KM Standard Error of Mean	0.00944
KM SD	0.044	95% KM (BCA) UCL	0.0596
95% KM (t) UCL	0.0575	95% KM (Percentile Bootstrap) UCL	0.0566
95% KM (z) UCL	0.057	95% KM Bootstrap t UCL	0.0763
90% KM Chebyshev UCL	0.0698	95% KM Chebyshev UCL	0.0826
97.5% KM Chebyshev UCL	0.1	99% KM Chebyshev UCL	0.135

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.592	Anderson-Darling GOF Test
5% A-D Critical Value	0.706	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.348	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.337	Detected Data Not Gamma Distributed at 5% Significance Level
Detected data follow Appr. Gamma Distribution at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.761	k star (bias corrected MLE)	0.991
Theta hat (MLE)	0.0502	Theta star (bias corrected MLE)	0.0891
nu hat (MLE)	21.13	nu star (bias corrected)	11.9
Mean (detects)	0.0883		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0284
Maximum	0.24	Median	0.01
SD	0.047	CV	1.658
k hat (MLE)	1.036	k star (bias corrected MLE)	0.955
Theta hat (MLE)	0.0274	Theta star (bias corrected MLE)	0.0297
nu hat (MLE)	62.16	nu star (bias corrected)	57.28
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (57.28, α)	40.88	Adjusted Chi Square Value (57.28, β)	40.08
95% Gamma Approximate UCL (use when n>=50)	0.0397	95% Gamma Adjusted UCL (use when n<50)	0.0405

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0415	SD (KM)	0.044
Variance (KM)	0.00194	SE of Mean (KM)	0.00944
k hat (KM)	0.889	k star (KM)	0.822
nu hat (KM)	53.31	nu star (KM)	49.32
theta hat (KM)	0.0467	theta star (KM)	0.0505
80% gamma percentile (KM)	0.0677	90% gamma percentile (KM)	0.1
95% gamma percentile (KM)	0.133	99% gamma percentile (KM)	0.211

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (49.32, α)	34.19	Adjusted Chi Square Value (49.32, β)	33.47
95% Gamma Approximate KM-UCL (use when n>=50)	0.0598	95% Gamma Adjusted KM-UCL (use when n<50)	0.0611

Lognormal GOF Test on Detected Observations Only		
Shapiro Wilk Test Statistic	0.866	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.309	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level
Detected Data appear Lognormal at 5% Significance Level		

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0289	Mean in Log Scale	-4.237
SD in Original Scale	0.0471	SD in Log Scale	1.14
95% t UCL (assumes normality of ROS data)	0.0435	95% Percentile Bootstrap UCL	0.0445
95% BCA Bootstrap UCL	0.0513	95% Bootstrap t UCL	0.0662
95% H-UCL (Log ROS)	0.0486		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.405	KM Geo Mean	0.0332
KM SD (logged)	0.533	95% Critical H Value (KM-Log)	1.979
KM Standard Error of Mean (logged)	0.123	95% H-UCL (KM -Log)	0.0466
KM SD (logged)	0.533	95% Critical H Value (KM-Log)	1.979
KM Standard Error of Mean (logged)	0.123		

DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0672	Mean in Log Scale	-3.295
SD in Original Scale	0.112	SD in Log Scale	0.98

95% t UCL (Assumes normality)	0.102	95% H-Stat UCL	0.0937

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use	
Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0611

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

a-Chlordane

General Statistics

Total Number of Observations	30	Number of Distinct Observations	21
Number of Detects	19	Number of Non-Detects	11
Number of Distinct Detects	17	Number of Distinct Non-Detects	4
Minimum Detect	0.002	Minimum Non-Detect	0.001
Maximum Detect	0.025	Maximum Non-Detect	0.05
Variance Detects	2.55E-05	Percent Non-Detects	36.67%
Mean Detects	0.00609	SD Detects	0.00505
Median Detects	0.0047	CV Detects	0.83
Skewness Detects	3.181	Kurtosis Detects	11.78
Mean of Logged Detects	-5.291	SD of Logged Detects	0.578

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.633	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.252	Lilliefors GOF Test
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00472	KM Standard Error of Mean	8.80E-04
KM SD	0.00453	95% KM (BCA) UCL	0.00635
95% KM (t) UCL	0.00621	95% KM (Percentile Bootstrap) UCL	0.00624
95% KM (z) UCL	0.00616	95% KM Bootstrap t UCL	0.00712
90% KM Chebyshev UCL	0.00736	95% KM Chebyshev UCL	0.00855
97.5% KM Chebyshev UCL	0.0102	99% KM Chebyshev UCL	0.0135

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.778	Anderson-Darling GOF Test
5% A-D Critical Value	0.749	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.178	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.2	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.788	k star (bias corrected MLE)	2.383
Theta hat (MLE)	0.00218	Theta star (bias corrected MLE)	0.00256
nu hat (MLE)	105.9	nu star (bias corrected)	90.54
Mean (detects)	0.00609		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.002	Mean	0.00752
Maximum	0.025	Median	0.0073
SD	0.00442	CV	0.587
k hat (MLE)	3.494	k star (bias corrected MLE)	3.167
Theta hat (MLE)	0.00215	Theta star (bias corrected MLE)	0.00238
nu hat (MLE)	209.6	nu star (bias corrected)	190
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (190.00, α)	159.1	Adjusted Chi Square Value (190.00, β)	157.5
95% Gamma Approximate UCL (use when n>=50)	0.00898	95% Gamma Adjusted UCL (use when n<50)	0.00908

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00472	SD (KM)	0.00453
Variance (KM)	2.06E-05	SE of Mean (KM)	8.80E-04
k hat (KM)	1.083	k star (KM)	0.996
nu hat (KM)	64.95	nu star (KM)	59.79
theta hat (KM)	0.00436	theta star (KM)	0.00473
80% gamma percentile (KM)	0.00759	90% gamma percentile (KM)	0.0109
95% gamma percentile (KM)	0.0141	99% gamma percentile (KM)	0.0218

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (59.79, α)	43.01	Adjusted Chi Square Value (59.79, β)	42.19
95% Gamma Approximate KM-UCL (use when n>=50)	0.00656	95% Gamma Adjusted KM-UCL (use when n<50)	0.00668

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.938	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.129	Lilliefors GOF Test
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.00472	Mean in Log Scale	-5.611
SD in Original Scale	0.00444	SD in Log Scale	0.692
95% t UCL (assumes normality of ROS data)	0.0061	95% Percentile Bootstrap UCL	0.00617
95% BCA Bootstrap UCL	0.00663	95% Bootstrap t UCL	0.00724
95% H-UCL (Log ROS)	0.00611		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-5.684	KM Geo Mean	0.0034
KM SD (logged)	0.813	95% Critical H Value (KM-Log)	2.255

KM Standard Error of Mean (logged)	0.166	95% H-UCL (KM -Log)	0.00665
KM SD (logged)	0.813	95% Critical H Value (KM-Log)	2.255
KM Standard Error of Mean (logged)	0.166		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00536	Mean in Log Scale	-5.693
SD in Original Scale	0.00587	SD in Log Scale	1.048
95% t UCL (Assumes normality)	0.00718	95% H-Stat UCL	0.00957

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.00668	95% GROS Adjusted Gamma UCL	0.00908

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

g-Chlordane

General Statistics

Total Number of Observations	30	Number of Distinct Observations	23
Number of Detects	19	Number of Non-Detects	11
Number of Distinct Detects	19	Number of Distinct Non-Detects	4
Minimum Detect	0.0017	Minimum Non-Detect	0.001
Maximum Detect	0.018	Maximum Non-Detect	0.05
Variance Detects	1.37E-05	Percent Non-Detects	36.67%
Mean Detects	0.00585	SD Detects	0.0037
Median Detects	0.0048	CV Detects	0.633
Skewness Detects	2.196	Kurtosis Detects	5.983
Mean of Logged Detects	-5.286	SD of Logged Detects	0.535

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.79	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.2	Lilliefors GOF Test
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00455	KM Standard Error of Mean	6.98E-04
KM SD	0.00357	95% KM (BCA) UCL	0.00593
95% KM (t) UCL	0.00574	95% KM (Percentile Bootstrap) UCL	0.0057
95% KM (z) UCL	0.0057	95% KM Bootstrap t UCL	0.00616
90% KM Chebyshev UCL	0.00665	95% KM Chebyshev UCL	0.0076
97.5% KM Chebyshev UCL	0.00891	99% KM Chebyshev UCL	0.0115

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.415	Anderson-Darling GOF Test
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.123	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.2	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.609	k star (bias corrected MLE)	3.075
Theta hat (MLE)	0.00162	Theta star (bias corrected MLE)	0.0019
nu hat (MLE)	137.2	nu star (bias corrected)	116.8
Mean (detects)	0.00585		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0017	Mean	0.00737
Maximum	0.018	Median	0.00695
SD	0.00356	CV	0.482
k hat (MLE)	4.118	k star (bias corrected MLE)	3.728
Theta hat (MLE)	0.00179	Theta star (bias corrected MLE)	0.00198
nu hat (MLE)	247.1	nu star (bias corrected)	223.7
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (223.69, α)	190.1	Adjusted Chi Square Value (223.69, β)	188.3
95% Gamma Approximate UCL (use when n>=50)	0.00868	95% Gamma Adjusted UCL (use when n<50)	0.00876

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00455	SD (KM)	0.00357
Variance (KM)	1.27E-05	SE of Mean (KM)	6.98E-04
k hat (KM)	1.63	k star (KM)	1.489
nu hat (KM)	97.77	nu star (KM)	89.33
theta hat (KM)	0.00279	theta star (KM)	0.00306
80% gamma percentile (KM)	0.00705	90% gamma percentile (KM)	0.00951
95% gamma percentile (KM)	0.0119	99% gamma percentile (KM)	0.0173

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (89.33, α)	68.54	Adjusted Chi Square Value (89.33, β)	67.49
95% Gamma Approximate KM-UCL (use when n>=50)	0.00593	95% Gamma Adjusted KM-UCL (use when n<50)	0.00603

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.982	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0974	Lilliefors GOF Test
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.00461	Mean in Log Scale	-5.585

SD in Original Scale	0.00342	SD in Log Scale	0.641
95% t UCL (assumes normality of ROS data)	0.00567	95% Percentile Bootstrap UCL	0.00568
95% BCA Bootstrap UCL	0.00589	95% Bootstrap t UCL	0.0062
95% H-UCL (Log ROS)	0.0059		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-5.682	KM Geo Mean	0.00341
KM SD (logged)	0.796	95% Critical H Value (KM-Log)	2.236
KM Standard Error of Mean (logged)	0.163	95% H-UCL (KM -Log)	0.00651
KM SD (logged)	0.796	95% Critical H Value (KM-Log)	2.236
KM Standard Error of Mean (logged)	0.163		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00521	Mean in Log Scale	-5.69
SD in Original Scale	0.00518	SD in Log Scale	1.036
95% t UCL (Assumes normality)	0.00681	95% H-Stat UCL	0.00939

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.00603	95% GROS Adjusted Gamma UCL	0.00876

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

p,p-DDD

General Statistics

Total Number of Observations	30	Number of Distinct Observations	27
Number of Detects	26	Number of Non-Detects	4
Number of Distinct Detects	25	Number of Distinct Non-Detects	3
Minimum Detect	0.001	Minimum Non-Detect	0.001
Maximum Detect	0.074	Maximum Non-Detect	0.05
Variance Detects	4.26E-04	Percent Non-Detects	13.33%
Mean Detects	0.0154	SD Detects	0.0206
Median Detects	0.00675	CV Detects	1.336
Skewness Detects	2.07	Kurtosis Detects	3.478
Mean of Logged Detects	-4.826	SD of Logged Detects	1.134

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.658	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.316	Lilliefors GOF Test
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0139	KM Standard Error of Mean	0.00363
KM SD	0.0194	95% KM (BCA) UCL	0.0206
95% KM (t) UCL	0.0201	95% KM (Percentile Bootstrap) UCL	0.0198
95% KM (z) UCL	0.0199	95% KM Bootstrap t UCL	0.0234
90% KM Chebyshev UCL	0.0248	95% KM Chebyshev UCL	0.0298
97.5% KM Chebyshev UCL	0.0366	99% KM Chebyshev UCL	0.0501

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.263	Anderson-Darling GOF Test
5% A-D Critical Value	0.778	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.189	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.177	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.893	k star (bias corrected MLE)	0.816
Theta hat (MLE)	0.0173	Theta star (bias corrected MLE)	0.0189
nu hat (MLE)	46.45	nu star (bias corrected)	42.42
Mean (detects)	0.0154		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.001	Mean	0.0147
Maximum	0.074	Median	0.00845
SD	0.0192	CV	1.308
k hat (MLE)	1	k star (bias corrected MLE)	0.922
Theta hat (MLE)	0.0147	Theta star (bias corrected MLE)	0.016
nu hat (MLE)	59.97	nu star (bias corrected)	55.31
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (55.31, α)	39.22	Adjusted Chi Square Value (55.31, β)	38.44
95% Gamma Approximate UCL (use when n>=50)	0.0207	95% Gamma Adjusted UCL (use when n<50)	0.0212

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0139	SD (KM)	0.0194
Variance (KM)	3.76E-04	SE of Mean (KM)	0.00363
k hat (KM)	0.515	k star (KM)	0.486
nu hat (KM)	30.92	nu star (KM)	29.16
theta hat (KM)	0.027	theta star (KM)	0.0286
80% gamma percentile (KM)	0.0228	90% gamma percentile (KM)	0.0379
95% gamma percentile (KM)	0.054	99% gamma percentile (KM)	0.0938

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (29.16, α)	17.84	Adjusted Chi Square Value (29.16, β)	17.32
95% Gamma Approximate KM-UCL (use when n>=50)	0.0228	95% Gamma Adjusted KM-UCL (use when n<50)	0.0234

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.957	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.104	Lilliefors GOF Test

5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0137	Mean in Log Scale	-5.034
SD in Original Scale	0.0197	SD in Log Scale	1.245
95% t UCL (assumes normality of ROS data)	0.0198	95% Percentile Bootstrap UCL	0.0201
95% BCA Bootstrap UCL	0.0214	95% Bootstrap t UCL	0.0235
95% H-UCL (Log ROS)	0.027		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-5.003	KM Geo Mean	0.00672
KM SD (logged)	1.187	95% Critical H Value (KM-Log)	2.721
KM Standard Error of Mean (logged)	0.225	95% H-UCL (KM -Log)	0.0247
KM SD (logged)	1.187	95% Critical H Value (KM-Log)	2.721
KM Standard Error of Mean (logged)	0.225		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0144	Mean in Log Scale	-4.989
SD in Original Scale	0.0197	SD in Log Scale	1.29
95% t UCL (Assumes normality)	0.0205	95% H-Stat UCL	0.0311

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use	
KM H-UCL	0.0247

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

p,p-DDE

General Statistics

Total Number of Observations	30	Number of Distinct Observations	24
Number of Detects	29	Number of Non-Detects	1
Number of Distinct Detects	23	Number of Distinct Non-Detects	1
Minimum Detect	0.0018	Minimum Non-Detect	0.001
Maximum Detect	0.7	Maximum Non-Detect	0.001
Variance Detects	0.0223	Percent Non-Detects	3.33%
Mean Detects	0.165	SD Detects	0.149
Median Detects	0.12	CV Detects	0.903
Skewness Detects	2.249	Kurtosis Detects	5.839
Mean of Logged Detects	-2.189	SD of Logged Detects	1.086

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.768	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.23	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.16	KM Standard Error of Mean	0.0273
KM SD	0.147	95% KM (BCA) UCL	0.205
95% KM (t) UCL	0.206	95% KM (Percentile Bootstrap) UCL	0.205
95% KM (z) UCL	0.205	95% KM Bootstrap t UCL	0.23
90% KM Chebyshev UCL	0.242	95% KM Chebyshev UCL	0.279
97.5% KM Chebyshev UCL	0.33	99% KM Chebyshev UCL	0.432

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.586	Anderson-Darling GOF Test	
5% A-D Critical Value	0.764	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.14	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.166	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only

k hat (MLE)	1.429	k star (bias corrected MLE)	1.304
Theta hat (MLE)	0.116	Theta star (bias corrected MLE)	0.127
nu hat (MLE)	82.89	nu star (bias corrected)	75.65
Mean (detects)	0.165		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0018	Mean	0.16
Maximum	0.7	Median	0.12
SD	0.149	CV	0.933
k hat (MLE)	1.283	k star (bias corrected MLE)	1.177
Theta hat (MLE)	0.125	Theta star (bias corrected MLE)	0.136
nu hat (MLE)	77	nu star (bias corrected)	70.63
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (70.63, α)	52.29	Adjusted Chi Square Value (70.63, β)	51.38
95% Gamma Approximate UCL (use when n>=50)	0.216	95% Gamma Adjusted UCL (use when n<50)	0.22

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.16	SD (KM)	0.147
Variance (KM)	0.0216	SE of Mean (KM)	0.0273
k hat (KM)	1.179	k star (KM)	1.084
nu hat (KM)	70.77	nu star (KM)	65.03
theta hat (KM)	0.135	theta star (KM)	0.147
80% gamma percentile (KM)	0.255	90% gamma percentile (KM)	0.361
95% gamma percentile (KM)	0.465	99% gamma percentile (KM)	0.707

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (65.03, α)	47.47	Adjusted Chi Square Value (65.03, β)	46.61
95% Gamma Approximate KM-UCL (use when n>=50)	0.219	95% Gamma Adjusted KM-UCL (use when n<50)	0.223

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.847	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.199	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.161	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.16	Mean in Log Scale	-2.27
SD in Original Scale	0.149	SD in Log Scale	1.155
95% t UCL (assumes normality of ROS data)	0.206	95% Percentile Bootstrap UCL	0.209
95% BCA Bootstrap UCL	0.217	95% Bootstrap t UCL	0.23
95% H-UCL (Log ROS)	0.358		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.347	KM Geo Mean	0.0957
KM SD (logged)	1.348	95% Critical H Value (KM-Log)	2.944
KM Standard Error of Mean (logged)	0.25	95% H-UCL (KM -Log)	0.496
KM SD (logged)	1.348	95% Critical H Value (KM-Log)	2.944
KM Standard Error of Mean (logged)	0.25		

DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.16	Mean in Log Scale	-2.37
SD in Original Scale	0.15	SD in Log Scale	1.454
95% t UCL (Assumes normality)	0.206	95% H-Stat UCL	0.621
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics
Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.223	95% GROS Adjusted Gamma UCL	0.22

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

p,p-DDT

General Statistics			
Total Number of Observations	30	Number of Distinct Observations	24
Number of Detects	18	Number of Non-Detects	12
Number of Distinct Detects	17	Number of Distinct Non-Detects	7
Minimum Detect	0.018	Minimum Non-Detect	0.001
Maximum Detect	0.3	Maximum Non-Detect	0.25
Variance Detects	0.00415	Percent Non-Detects	40%
Mean Detects	0.0949	SD Detects	0.0644
Median Detects	0.0835	CV Detects	0.679
Skewness Detects	2.116	Kurtosis Detects	5.731
Mean of Logged Detects	-2.538	SD of Logged Detects	0.632

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.797	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.246	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0652	KM Standard Error of Mean	0.0125
KM SD	0.0642	95% KM (BCA) UCL	0.0861
95% KM (t) UCL	0.0866	95% KM (Percentile Bootstrap) UCL	0.0859
95% KM (z) UCL	0.0859	95% KM Bootstrap t UCL	0.0922
90% KM Chebyshev UCL	0.103	95% KM Chebyshev UCL	0.12
97.5% KM Chebyshev UCL	0.144	99% KM Chebyshev UCL	0.19

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.443	Anderson-Darling GOF Test	
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.165	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.205	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	2.889	k star (bias corrected MLE)	2.444
Theta hat (MLE)	0.0328	Theta star (bias corrected MLE)	0.0388
nu hat (MLE)	104	nu star (bias corrected)	88
Mean (detects)	0.0949		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0651
Maximum	0.3	Median	0.057
SD	0.063	CV	0.968
k hat (MLE)	1.23	k star (bias corrected MLE)	1.129
Theta hat (MLE)	0.0529	Theta star (bias corrected MLE)	0.0576
nu hat (MLE)	73.81	nu star (bias corrected)	67.76
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (67.76, α)	49.82	Adjusted Chi Square Value (67.76, β)	48.93
95% Gamma Approximate UCL (use when n>=50)	0.0885	95% Gamma Adjusted UCL (use when n<50)	0.0901

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0652	SD (KM)	0.0642
Variance (KM)	0.00412	SE of Mean (KM)	0.0125
k hat (KM)	1.034	k star (KM)	0.953
nu hat (KM)	62.05	nu star (KM)	57.18
theta hat (KM)	0.0631	theta star (KM)	0.0685
80% gamma percentile (KM)	0.105	90% gamma percentile (KM)	0.152

95% gamma percentile (KM)	0.199	99% gamma percentile (KM)	0.308

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (57.18, α)	40.8	Adjusted Chi Square Value (57.18, β)	40
95% Gamma Approximate KM-UCL (use when n>=50)	0.0914	95% Gamma Adjusted KM-UCL (use when n<50)	0.0933

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.962	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.155	Lilliefors GOF Test
5% Lilliefors Critical Value	0.202	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0686	Mean in Log Scale	-2.978
SD in Original Scale	0.06	SD in Log Scale	0.783
95% t UCL (assumes normality of ROS data)	0.0872	95% Percentile Bootstrap UCL	0.0874
95% BCA Bootstrap UCL	0.091	95% Bootstrap t UCL	0.0957
95% H-UCL (Log ROS)	0.0955		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.657	KM Geo Mean	0.0258
KM SD (logged)	1.854	95% Critical H Value (KM-Log)	3.705
KM Standard Error of Mean (logged)	0.441	95% H-UCL (KM -Log)	0.516
KM SD (logged)	1.854	95% Critical H Value (KM-Log)	3.705
KM Standard Error of Mean (logged)	0.441		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0728	Mean in Log Scale	-3.199
SD in Original Scale	0.0636	SD in Log Scale	1.476
95% t UCL (Assumes normality)	0.0925	95% H-Stat UCL	0.286

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0933	95% GROS Adjusted Gamma UCL	0.0901

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Dieldrin

General Statistics

Total Number of Observations	30	Number of Distinct Observations	28
Number of Detects	25	Number of Non-Detects	5
Number of Distinct Detects	25	Number of Distinct Non-Detects	3
Minimum Detect	0.0073	Minimum Non-Detect	0.001
Maximum Detect	0.15	Maximum Non-Detect	0.05
Variance Detects	0.00173	Percent Non-Detects	16.67%
Mean Detects	0.05	SD Detects	0.0416
Median Detects	0.034	CV Detects	0.831
Skewness Detects	1.223	Kurtosis Detects	0.517
Mean of Logged Detects	-3.325	SD of Logged Detects	0.849

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.843	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.918	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.226	Lilliefors GOF Test
5% Lilliefors Critical Value	0.173	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0424	KM Standard Error of Mean	0.00765
KM SD	0.041	95% KM (BCA) UCL	0.0557
95% KM (t) UCL	0.0554	95% KM (Percentile Bootstrap) UCL	0.0554
95% KM (z) UCL	0.055	95% KM Bootstrap t UCL	0.0577
90% KM Chebyshev UCL	0.0654	95% KM Chebyshev UCL	0.0758
97.5% KM Chebyshev UCL	0.0902	99% KM Chebyshev UCL	0.119

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.389	Anderson-Darling GOF Test
5% A-D Critical Value	0.76	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.133	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.177	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.667	k star (bias corrected MLE)	1.494
Theta hat (MLE)	0.03	Theta star (bias corrected MLE)	0.0335
nu hat (MLE)	83.35	nu star (bias corrected)	74.68
Mean (detects)	0.05		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0073	Mean	0.0435
Maximum	0.15	Median	0.0285
SD	0.0406	CV	0.931
k hat (MLE)	1.435	k star (bias corrected MLE)	1.314
Theta hat (MLE)	0.0303	Theta star (bias corrected MLE)	0.0331
nu hat (MLE)	86.11	nu star (bias corrected)	78.83
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (78.83, α)	59.38	Adjusted Chi Square Value (78.83, β)	58.4
95% Gamma Approximate UCL (use when n>=50)	0.0578	95% Gamma Adjusted UCL (use when n<50)	0.0588

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0424	SD (KM)	0.041

Variance (KM)	0.00168	SE of Mean (KM)	0.00765
k hat (KM)	1.071	k star (KM)	0.986
nu hat (KM)	64.27	nu star (KM)	59.17
theta hat (KM)	0.0396	theta star (KM)	0.043
80% gamma percentile (KM)	0.0684	90% gamma percentile (KM)	0.0981
95% gamma percentile (KM)	0.128	99% gamma percentile (KM)	0.197

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (59.17, α)	42.49	Adjusted Chi Square Value (59.17, β)	41.67
95% Gamma Approximate KM-UCL (use when n>=50)	0.0591	95% Gamma Adjusted KM-UCL (use when n<50)	0.0603

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.973	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.918	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0788	Lilliefors GOF Test
5% Lilliefors Critical Value	0.173	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.043	Mean in Log Scale	-3.604
SD in Original Scale	0.0411	SD in Log Scale	1.022
95% t UCL (assumes normality of ROS data)	0.0557	95% Percentile Bootstrap UCL	0.0554
95% BCA Bootstrap UCL	0.0574	95% Bootstrap t UCL	0.0587
95% H-UCL (Log ROS)	0.0739		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.84	KM Geo Mean	0.0215
KM SD (logged)	1.457	95% Critical H Value (KM-Log)	3.101
KM Standard Error of Mean (logged)	0.275	95% H-UCL (KM -Log)	0.144
KM SD (logged)	1.457	95% Critical H Value (KM-Log)	3.101
KM Standard Error of Mean (logged)	0.275		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0426	Mean in Log Scale	-3.854
SD in Original Scale	0.0415	SD in Log Scale	1.565
95% t UCL (Assumes normality)	0.0555	95% H-Stat UCL	0.186

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.0603	95% GROS Adjusted Gamma UCL	0.0588

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Endrin

General Statistics

Total Number of Observations	30	Number of Distinct Observations	18
Number of Detects	14	Number of Non-Detects	16
Number of Distinct Detects	14	Number of Distinct Non-Detects	5
Minimum Detect	0.0014	Minimum Non-Detect	0.001
Maximum Detect	0.017	Maximum Non-Detect	0.05
Variance Detects	1.63E-05	Percent Non-Detects	53.33%
Mean Detects	0.00494	SD Detects	0.00403
Median Detects	0.0039	CV Detects	0.817
Skewness Detects	2.44	Kurtosis Detects	6.424
Mean of Logged Detects	-5.52	SD of Logged Detects	0.627

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.697	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.309	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00331	KM Standard Error of Mean	6.49E-04
KM SD	0.00325	95% KM (BCA) UCL	0.00447
95% KM (t) UCL	0.00441	95% KM (Percentile Bootstrap) UCL	0.00437
95% KM (z) UCL	0.00437	95% KM Bootstrap t UCL	0.00506
90% KM Chebyshev UCL	0.00525	95% KM Chebyshev UCL	0.00614
97.5% KM Chebyshev UCL	0.00736	99% KM Chebyshev UCL	0.00976

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.77	Anderson-Darling GOF Test
5% A-D Critical Value	0.744	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.233	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.231	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.551	k star (bias corrected MLE)	2.052
Theta hat (MLE)	0.00193	Theta star (bias corrected MLE)	0.00241
nu hat (MLE)	71.42	nu star (bias corrected)	57.45
Mean (detects)	0.00494		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0014	Mean	0.00764
Maximum	0.017	Median	0.01
SD	0.00373	CV	0.488
k hat (MLE)	3.337	k star (bias corrected MLE)	3.026
Theta hat (MLE)	0.00229	Theta star (bias corrected MLE)	0.00252
nu hat (MLE)	200.2	nu star (bias corrected)	181.5
Adjusted Level of Significance (β)	0.041		

Approximate Chi Square Value (181.54, α)	151.4	Adjusted Chi Square Value (181.54, β)	149.8
95% Gamma Approximate UCL (use when n>=50)	0.00916	95% Gamma Adjusted UCL (use when n<50)	0.00926

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00331	SD (KM)	0.00325
Variance (KM)	1.06E-05	SE of Mean (KM)	6.49E-04
k hat (KM)	1.036	k star (KM)	0.954
nu hat (KM)	62.15	nu star (KM)	57.26
theta hat (KM)	0.00319	theta star (KM)	0.00347
80% gamma percentile (KM)	0.00534	90% gamma percentile (KM)	0.0077
95% gamma percentile (KM)	0.0101	99% gamma percentile (KM)	0.0156

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (57.26, α)	40.87	Adjusted Chi Square Value (57.26, β)	40.07
95% Gamma Approximate KM-UCL (use when n>=50)	0.00463	95% Gamma Adjusted KM-UCL (use when n<50)	0.00473

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.939	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.185	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.00325	Mean in Log Scale	-6.038
SD in Original Scale	0.00323	SD in Log Scale	0.764
95% t UCL (assumes normality of ROS data)	0.00425	95% Percentile Bootstrap UCL	0.00426
95% BCA Bootstrap UCL	0.00462	95% Bootstrap t UCL	0.0052
95% H-UCL (Log ROS)	0.00437		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-6.036	KM Geo Mean	0.00239
KM SD (logged)	0.773	95% Critical H Value (KM-Log)	2.211
KM Standard Error of Mean (logged)	0.167	95% H-UCL (KM -Log)	0.00443
KM SD (logged)	0.773	95% Critical H Value (KM-Log)	2.211
KM Standard Error of Mean (logged)	0.167		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0041	Mean in Log Scale	-6.001
SD in Original Scale	0.00513	SD in Log Scale	1.032
95% t UCL (Assumes normality)	0.00569	95% H-Stat UCL	0.00683

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use	
KM H-UCL	0.00443

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Heptachlor epoxide

General Statistics

Total Number of Observations	30	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	29
Number of Distinct Detects	1	Number of Distinct Non-Detects	5

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Heptachlor epoxide was not processed!

Toxaphene

General Statistics

Total Number of Observations	30	Number of Distinct Observations	22
Number of Detects	24	Number of Non-Detects	6
Number of Distinct Detects	19	Number of Distinct Non-Detects	3
Minimum Detect	0.13	Minimum Non-Detect	0.05
Maximum Detect	6.5	Maximum Non-Detect	2.5
Variance Detects	2.084	Percent Non-Detects	20%
Mean Detects	1.018	SD Detects	1.444
Median Detects	0.36	CV Detects	1.419
Skewness Detects	2.789	Kurtosis Detects	8.805
Mean of Logged Detects	-0.581	SD of Logged Detects	1.019

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.613	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.285	Lilliefors GOF Test
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.838	KM Standard Error of Mean	0.247
KM SD	1.319	95% KM (BCA) UCL	1.221
95% KM (t) UCL	1.257	95% KM (Percentile Bootstrap) UCL	1.252
95% KM (z) UCL	1.244	95% KM Bootstrap t UCL	1.605
90% KM Chebyshev UCL	1.578	95% KM Chebyshev UCL	1.913
97.5% KM Chebyshev UCL	2.378	99% KM Chebyshev UCL	3.292

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.766	Anderson-Darling GOF Test
5% A-D Critical Value	0.773	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.249	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.183	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.968	k star (bias corrected MLE)	0.875
Theta hat (MLE)	1.051	Theta star (bias corrected MLE)	1.163
nu hat (MLE)	46.47	nu star (bias corrected)	42
Mean (detects)	1.018		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.822
Maximum	6.5	Median	0.33
SD	1.346	CV	1.638
k hat (MLE)	0.57	k star (bias corrected MLE)	0.535
Theta hat (MLE)	1.442	Theta star (bias corrected MLE)	1.536
nu hat (MLE)	34.18	nu star (bias corrected)	32.1
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (32.10, α)	20.15	Adjusted Chi Square Value (32.10, β)	19.6
95% Gamma Approximate UCL (use when n>=50)	1.309	95% Gamma Adjusted UCL (use when n<50)	1.345

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.838	SD (KM)	1.319
Variance (KM)	1.74	SE of Mean (KM)	0.247
k hat (KM)	0.403	k star (KM)	0.385
nu hat (KM)	24.21	nu star (KM)	23.12
theta hat (KM)	2.077	theta star (KM)	2.175
80% gamma percentile (KM)	1.346	90% gamma percentile (KM)	2.382
95% gamma percentile (KM)	3.527	99% gamma percentile (KM)	6.416

Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (23.12, α)	13.18	Adjusted Chi Square Value (23.12, β)	12.75
95% Gamma Approximate KM-UCL (use when n>=50)	1.47	95% Gamma Adjusted KM-UCL (use when n<50)	1.52

Lognormal GOF Test on Detected Observations Only		
Shapiro Wilk Test Statistic	0.905	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.199	Lilliefors GOF Test
5% Lilliefors Critical Value	0.177	Detected Data Not Lognormal at 5% Significance Level
Detected Data Not Lognormal at 5% Significance Level		

Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.835	Mean in Log Scale	-0.975
SD in Original Scale	1.339	SD in Log Scale	1.249
95% t UCL (assumes normality of ROS data)	1.25	95% Percentile Bootstrap UCL	1.263
95% BCA Bootstrap UCL	1.4	95% Bootstrap t UCL	1.601
95% H-UCL (Log ROS)	1.578		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.006	KM Geo Mean	0.366
KM SD (logged)	1.281	95% Critical H Value (KM-Log)	2.849
KM Standard Error of Mean (logged)	0.242	95% H-UCL (KM -Log)	1.634
KM SD (logged)	1.281	95% Critical H Value (KM-Log)	2.849
KM Standard Error of Mean (logged)	0.242		

DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.862	Mean in Log Scale	-1.026
SD in Original Scale	1.34	SD in Log Scale	1.429
95% t UCL (Assumes normality)	1.277	95% H-Stat UCL	2.242

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use	
95% KM (Chebyshev) UCL	1.913

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ATTACHMENT B
U.S. EPA ON-LINE SCREENING LEVEL CALCULATOR OUTPUT

Site-specific
Recreator Equation Inputs for Soil

*** Inputted values different from Recreator defaults are highlighted.**

Variable	Recreator Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	11.911
A (VF Dispersion Constant - Mass Limit)	11.911	11.911
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.4385
B (VF Dispersion Constant - Mass Limit)	18.4385	18.4385
$City_{PEF}$ (Climate Zone) Selection	Default	Default
$City_{VF}$ (Climate Zone) Selection	Default	Default
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	209.7845
C (VF Dispersion Constant - Mass Limit)	209.7845	209.7845
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.194
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
ρ_b (dry soil bulk density) g/cm^3	1.5	1.5
ρ_b (dry soil bulk density - mass limit) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	1359344438
ρ_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	93.77
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.18
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.18
A_s (PEF acres)	0.5	0.5
A_s (VF acres)	0.5	0.5
A_s (VF mass-limit acres)	0.5	0.5
AF_{0-2} (skin adherence factor) mg/cm^2	0.2	0.2
AF_{2-6} (skin adherence factor) mg/cm^2	0.2	0.2
AF_{6-16} (skin adherence factor) mg/cm^2	0.07	0.07
AF_{16-30} (skin adherence factor) mg/cm^2	0.07	0.07
AF_{rec-a} (skin adherence factor - adult) mg/cm^2	0.07	0.07
AF_{rec-c} (skin adherence factor - child) mg/cm^2	0.2	0.2

Output generated 07OCT2019:19:26:32

Site-specific
Recreator Equation Inputs for Soil

*** Inputted values different from Recreator defaults are highlighted.**

Variable	Recreator Soil Default Value	Form-input Value
AT_{rec} (averaging time)	365	365
BW_{0-2} (body weight) kg	15	15
BW_{2-6} (body weight) kg	15	15
BW_{6-16} (body weight) kg	80	80
BW_{16-30} (body weight) kg	80	80
BW_{rec-a} (body weight - adult) kg	80	80
BW_{rec-c} (body weight - child) kg	15	15
$DFS_{rec-adj}$ (age-adjusted soil dermal factor) mg/kg	.	7915.103
$DFSM_{rec-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	.	19245.52
ED_{rec} (exposure duration - recreator) years	26	26
ED_{0-2} (exposure duration) year	2	2
ED_{2-6} (exposure duration) year	4	4
ED_{6-16} (exposure duration) year	10	10
ED_{16-30} (exposure duration) year	10	10
ED_{rec-c} (exposure duration - child) years	6	6
EF_{rec} (exposure frequency) days/year	.	44.231
EF_{0-2} (exposure frequency) days/year	.	7
EF_{2-6} (exposure frequency) days/year	.	14
EF_{6-16} (exposure frequency) days/year	.	36
EF_{16-30} (exposure frequency) days/year	.	72
EF_{rec-a} (exposure frequency - adult) days/year	.	54
EF_{rec-c} (exposure frequency - child) days/year	.	11.667
ET_{rec} (exposure time - recreator) hours/day	.	8
ET_{0-2} (exposure time) hours/day	.	8
ET_{2-6} (exposure time) hours/day	.	8
ET_{6-16} (exposure time) hours/day	.	8
ET_{16-30} (exposure time) hours/day	.	8
ET_{rec-a} (adult exposure time) hours/day	.	8
ET_{rec-c} (child exposure time) hours/day	.	8
THQ (target hazard quotient) unitless	0.1	1

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Site-specific
Recreator Equation Inputs for Soil

*** Inputted values different from Recreator defaults are highlighted.**

Variable	Recreator Soil Default Value	Form-input Value
$IFS_{rec-adj}$ (age-adjusted soil ingestion factor) mg/kg	.	2283.36
$IFSM_{rec-adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	.	6356.667
IRS_{0-2} (soil intake rate) mg/day	200	200
IRS_{2-6} (soil intake rate) mg/day	200	200
IRS_{6-16} (soil intake rate) mg/day	100	100
IRS_{16-30} (soil intake rate) mg/day	100	100
IRS_{rec-a} (soil intake rate - adult) mg/day	100	100
IRS_{rec-c} (soil intake rate - child) mg/day	200	200
LT (lifetime - recreator) years	70	70
SA_{0-2} (skin surface area) cm^2/day	2373	2373
SA_{2-6} (skin surface area) cm^2/day	2373	2373
SA_{6-16} (skin surface area) cm^2/day	6032	6032
SA_{16-30} (skin surface area) cm^2/day	6032	6032
SA_{rec-a} (skin surface area - adult) cm^2/day	6032	6032
SA_{rec-c} (skin surface area - child) cm^2/day	2373	2373
TR (target risk) unitless	1.0E-06	1.0E-06
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	4.69
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

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Site-specific

Recreator Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o $(mg/kg\text{-}day)^{-1}$	SF_o Ref	IUR $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)
Chlordane	12789-03-6	No	Yes	Organics	3.50E-01	U	1.00E-04	U	5.00E-04	U	7.00E-04	U	1	0.04	1	-
DDD, p,p`- (DDD)	72-54-8	No	No	Organics	2.40E-01	U	6.90E-05	U	3.00E-05	U	-		1	0.1	1	-
DDE, p,p'-	72-55-9	No	Yes	Organics	3.40E-01	U	9.70E-05	U	3.00E-04	U	-		1	-	1	-
DDT	50-29-3	No	No	Organics	3.40E-01	U	9.70E-05	U	5.00E-04	U	-		1	0.03	1	-
Dieldrin	60-57-1	No	No	Organics	1.60E+01	U	4.60E-03	U	5.00E-05	U	-		1	0.1	1	-
Endrin	72-20-8	No	No	Organics	-		-		3.00E-04	U	-		1	0.1	1	-
Heptachlor Epoxide	1024-57-3	No	Yes	Organics	9.10E+00	U	2.60E-03	U	1.30E-05	U	-		1	-	1	-
Toxaphene	8001-35-2	No	No	Organics	1.20E+00	U	3.20E-04	U	9.00E-05	U	-		1	0.1	1	-

Site-specific
Recreator Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

S (mg/L)	K_{oc}\ (cm^3/g)	K_d\ (cm^3/g)	HLC ($atm\text{-}m^3/mole$)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	Chemical Type	D_{ia}\ (cm^2/s)	D_{iw}\ (cm^2/s)	D_A\ (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor (m^3/kg)
5.60E-02	6.75E+04	4.05E+02	4.86E-05	1.99E-03	U	624.15	U	672	U	PEST	2.15E-02	5.45E-06	5.70E-09	1.36E+09	1.53E+06
9.00E-02	1.18E+05	-	6.60E-06	2.70E-04	U	623.15	U	935	U	PEST	4.06E-02	4.74E-06	-	1.36E+09	-
4.00E-02	1.18E+05	7.08E+02	4.16E-05	1.70E-03	U	609.15	U	914	U	PEST	2.30E-02	5.86E-06	3.00E-09	1.36E+09	2.11E+06
5.50E-03	1.69E+05	-	8.32E-06	3.40E-04	U	533.15	U	800	U	PEST	3.79E-02	4.43E-06	-	1.36E+09	-
1.95E-01	2.01E+04	-	1.00E-05	4.09E-04	U	603.15	U	905	U	PEST	2.33E-02	6.01E-06	-	1.36E+09	-
2.50E-01	2.01E+04	-	6.36E-06	2.60E-04	U	603.15	U	-		PEST	3.62E-02	4.22E-06	-	1.36E+09	-
2.00E-01	1.01E+04	6.06E+01	2.10E-05	8.59E-04	U	614.15	U	921	U	PEST	2.40E-02	6.25E-06	1.87E-08	1.36E+09	8.42E+05
5.50E-01	7.72E+04	-	6.00E-06	2.45E-04	U	656.15	U	-		PEST	2.08E-02	5.26E-06	-	1.36E+09	-

Site-specific

Recreator Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
3.20E+01	2.31E+02	1.02E+03	2.73E+01	1.17E+03	1.24E+04	1.00E+05	1.06E+03	2.70E+03	1.60E+04	2.16E+04	2.09E+03	2.73E+01 ca*
4.66E+01	1.35E+02	1.31E+06	3.46E+01	7.04E+01	2.97E+02	-	5.69E+01	1.62E+02	3.84E+02	-	1.14E+02	3.46E+01 ca**
3.29E+01	-	1.45E+03	3.22E+01	7.04E+02	-	-	7.04E+02	1.62E+03	-	-	1.62E+03	3.22E+01 ca*
3.29E+01	3.16E+02	9.34E+05	2.98E+01	1.17E+03	1.65E+04	-	1.10E+03	2.70E+03	2.13E+04	-	2.40E+03	2.98E+01 ca*
6.99E-01	2.02E+00	1.97E+04	5.19E-01	1.17E+02	4.94E+02	-	9.48E+01	2.70E+02	6.40E+02	-	1.90E+02	5.19E-01 ca
-	-	-	-	7.04E+02	2.97E+03	-	5.69E+02	1.62E+03	3.84E+03	-	1.14E+03	5.69E+02 nc
1.23E+00	-	2.16E+01	1.16E+00	3.05E+01	-	-	3.05E+01	7.03E+01	-	-	7.03E+01	1.16E+00 ca*
9.32E+00	2.69E+01	2.83E+05	6.92E+00	2.11E+02	8.90E+02	-	1.71E+02	4.87E+02	1.15E+03	-	3.42E+02	6.92E+00 ca*

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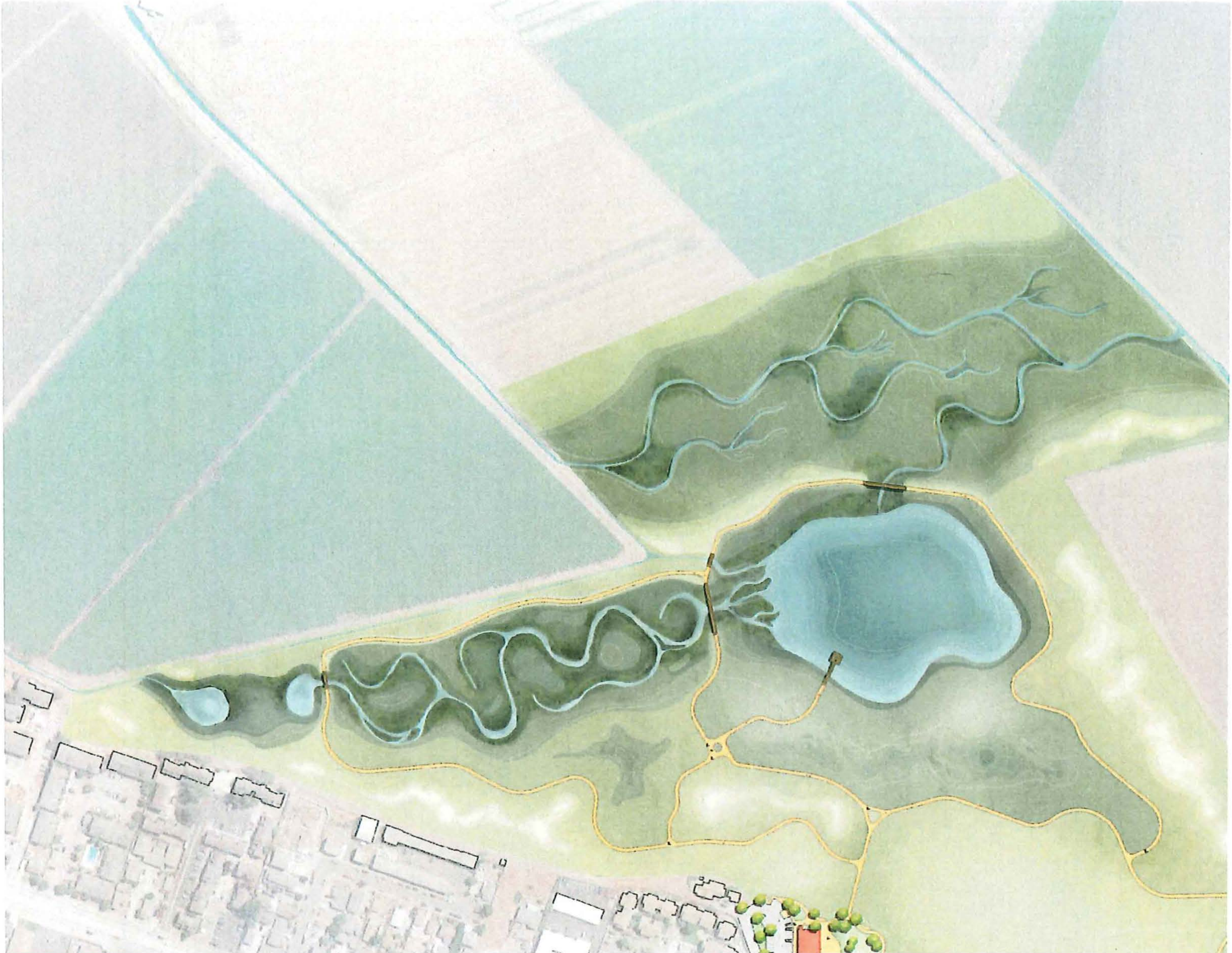


Limited Design Basis for Carr Lake Restoration Design

Balance Hydrologics

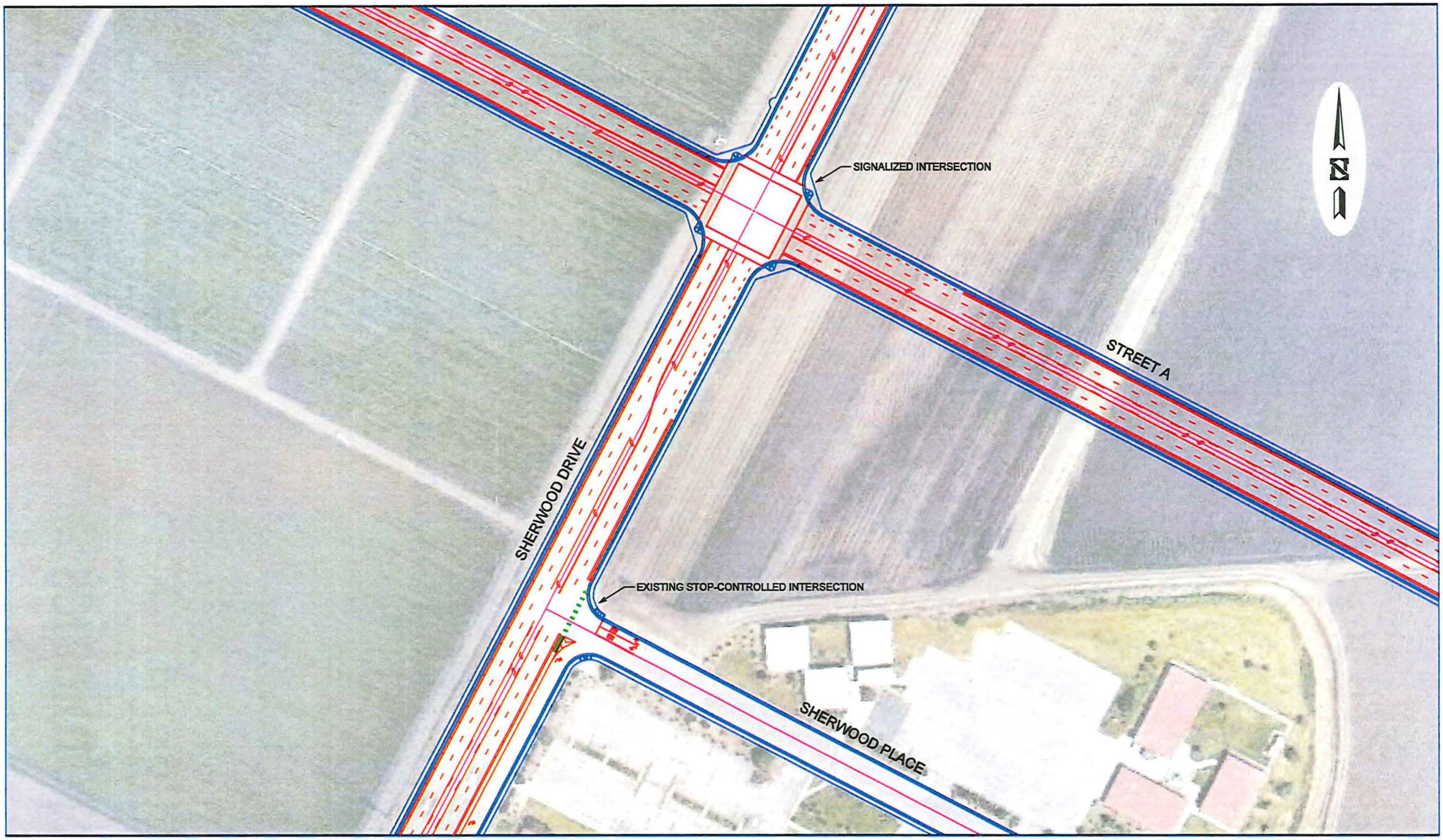
Prepared for

Big Sur Land Trust

BIG SUR LAND TRUST

23 March 2020

Exhibit 52



Hexagon Transportation Consultants, Inc.	4 North Second Street, Suite 400 San Jose, California 95113 Phone: (408) 971-6100 www.hextrans.com	PROPOSED ROADWAYS DETAIL CARR LAKE PROJECT SALINAS, CALIFORNIA	DESIGNED BY: M. POWELL DATE: 6/10/2020	GRAPHIC SCALE 0 100 150 200 1 INCH = 100 FEET

March 23, 2020

A REPORT PREPARED FOR:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1 INTRODUCTION

The Ikeda, Hibino and Higashi families have owned and farmed the approximately 480-acre Carr Lake lakebed properties (west of East Laurel Drive) for decades. In January 2017, Big Sur Land Trust (BSLT), a non-profit organization with a mission of land conservation, acquired approximately 73.1 acres of lakebed property from the Ikeda family. In 2017, BSLT began a community engagement process to co-create the property as a multi-benefit community park. BSLT, working with BFS Landscape Architects and Balance Hydrologics, developed conceptual designs for the park based on feedback and input from the community and stakeholders. This report accompanies the 30% restoration designs for Carr Lake in Salinas, California and will be updated to accompany the 50% and final designs. This report provides the analysis and rationale behind the design and should always accompany the plans whenever they are circulated.

1.1 Purpose

The purpose of this Design Basis Report is to describe the background information and analyses which have been used in the development of the restoration design. The 30% design represent the advancement of conceptual designs developed by BSLT with input from the community, as based on consideration of associated historical conditions, watershed geology and geomorphology, and hydrologic/hydraulic analyses.

1.2 Acknowledgements

The work and information presented in this report draws on information and efforts provided by several key individuals and stakeholders:

- BFS Landscape Architects
- Whitson Engineers
- California State University Monterey Bay ENVS 660 Graduate Class
- Fred Watson (CSUMB)
- Andrea Woolfolk (Elkhorn Slough National Estuarine Research Reserve)

1.3 Project Goals and Objectives

1.3.1 Restoration Goals

- Restore natural and self-sustaining creek and floodplain processes and functions;

- Promote, enhance, and restore naturally functioning habitat; and
- Provide an open space/park for residents of Salinas and vicinity to access a natural environment.

1.3.2 Restoration Objectives

- Improve water quality through enhancement of natural physical and biological processes and constructed water treatment infrastructure;
- Restore and enhance fish and wildlife habitat;
- Maintain or improve flood conveyance and capacity;
- Incorporate design elements that are adaptable and resilient under changing climate conditions; and
- Incorporate design elements that are conducive to public safety.

1.4 Available Data/Reports Reviewed

The following data, reports, and/or information were collected and/or reviewed for this project. Additionally, Appendix A of the Carr Lake Preliminary Hydrologic Constraints and Opportunities report includes a comprehensive annotated bibliography on Carr Lake.

- Topographic information: 1-ft contour topographic survey map of site (Whitson Engineers, 2019)
- Carr Lake Preliminary Hydrologic Constraints and Opportunities (Senter and others, Balance Hydrologics, 2017)
- Carr Lake Water Quality Issues and Treatment Options (Garrison and others, Balance Hydrologics, 2018)
- Hydrology and Water Quality of the Big Sur Land Trust Property in Carr Lake (CSUMB Class ENVS 660, 2019)
- Monterey County Water Resources Agency-Reclamation Ditch Watershed Assessment and Management Strategy Part A and B (Casagrande and Watson, 2006a; Casagrande and Watson, 2006b)
- Salinas Valley Sediment Sources (Watson and others, 2003)
- How Does Land Use Affect Sediment Loads in Gabilan Creek? (Casagrande, 2001)

- Salinas Valley Sediment Data from Central Coast Watershed Studies Water Quality Database (Watson, 2007)
- Historical maps and ecology (Compiled by Andrea Woolfolk at Elkhorn Slough National Estuarine Research Reserve)
- Approaches and Practices to Enhance Conditions in the Santa Rita Watershed (Ruttenberg and others, Balance Hydrologics, 2017)
- Bankfull Geometry for inland South Bay and Eastern Monterey Bay areas (Hecht and others, Balance Hydrologics, 2013)

1.5 Associated Technical Studies

The following studies related to the restoration design have been completed or are on-going for this project:

- Flow Frequency Analysis for Hospital Creek and Gabilan Creek (Salinas Hydrologic Model (long-term continuous model)) (Balance)
- Pond inundation model to evaluate hydroperiod of the wetland (Balance)
- Sediment loading analysis (Balance)
- Site reconnaissance to evaluate existing channel conditions (Balance)
- Streamflow gaging on Hospital and Gabilan Creeks (Balance)
- Hydraulic modeling to evaluate flood risk and hazard (Balance)
- Site Topographic Survey (Whitson)
- Parcel Boundary Alignment Survey (Whitson)
- California Rapid Assessment Method (CRAM) assessment (Central Coast Wetlands Group)
- Human Health Assessment (ToxRisk)
- Geo-technical Assessment (Kleinfelder)

2 EXISTING CONDITIONS

2.1 Historical Conditions

The Carr Lake basin within the City of Salinas, Monterey County, California is uniquely situated as one in a series of historical lakes along the western slope of the Gabilan Range in the Salinas Valley that flourished prior to European settlement and associated land use changes in the mid-1800's (**Figure 2-1**). Carr Lake is the biggest of these, sharing a common origin with former Smith, Heinz, Boronda, Vierra, Espinosa, Merritt and other valley-marginal lakes. During the wettest periods, the lakes were connected by Alisal Slough, a shallow channel network that drained to Tembladero Slough, ultimately discharging into the Pacific Ocean at Monterey Bay.

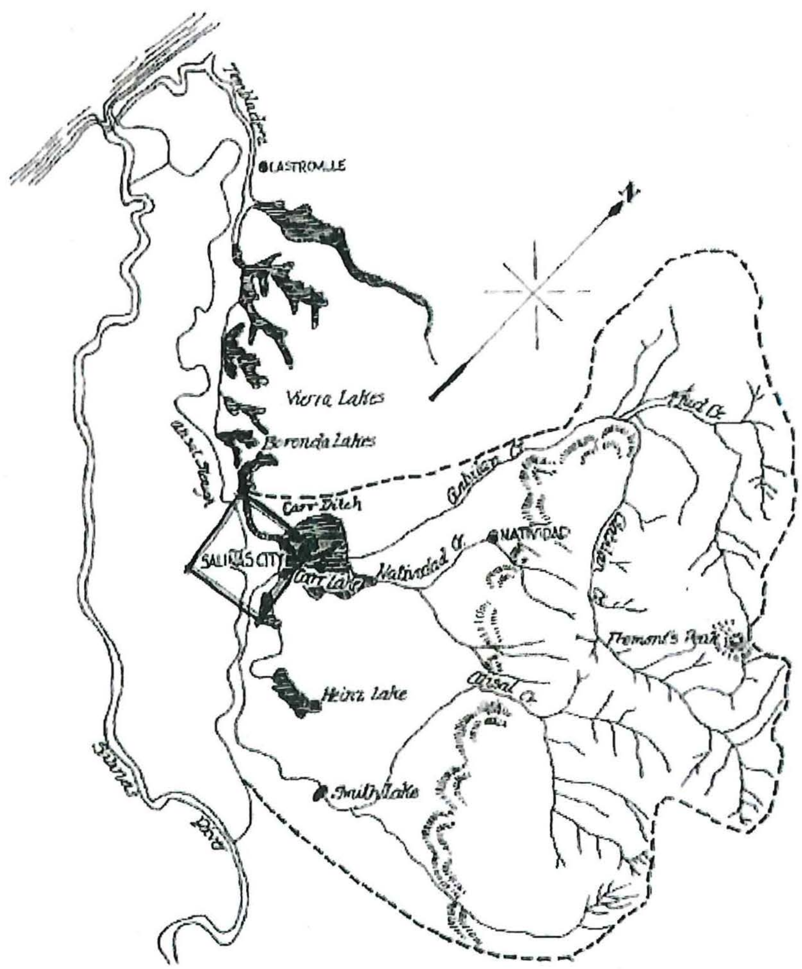

Figure 2-1 Depiction of historical lakes and streams. Source: Cameron and others, 2003, after Lou Hare's 1906 Carr Lake Sub-Watershed Map in Gorden, 1974.

Carr Lake is a depositional zone[1] for water and sediment discharge from three upstream watersheds: Gabilan, Natividad, and Alisal Creeks, that together comprise about 100 square miles. Collectively, these watersheds are defined for the purposes of this report as the Carr Lake watershed. Carr Lake historically oscillated between a shallow lake and swampy wetlands each rainy season, depending on annual variability in rainfall and runoff conditions. This can be seen in historical maps from the early 1900s, where Carr Lake is mapped as an extensive wetland and freshwater marsh (**Figure 2-2** and **Figure** 2-3). Based on historical accounts, the creek channels and lakes would overflow and flood surrounding land during storms with long duration or high intensities, or in wet years. In Mediterranean-climate dry-season conditions, lake levels receded to swampy conditions supporting a rich mixture of wetland and riparian plant species. Upstream, and within Carr Lake, Gabilan Creek was a dynamic system, with no singular main channel, where water migrated and flowed through extensive wetland and marsh areas. This can be seen in both the 1910 USGS map of the Salinas Valley (**Figure 2-2**) and the 1906 Survey Map for Improvement of Gabilan Creek by Lou Hare (**Figure 2-3**) where Gabilan Creek is mapped as a dispersed stream beginning approximately 1 to 1.5 miles upstream of Carr Lake. Over millennia, this interaction between water, sediment, and floodplains created the fertile soils in the lakebed and surrounding lowlands that are known for high agricultural productivity today.

[1] A depositional zone in hydrologic terms is where water and transporting sediments (organic and inorganic) may come to rest in relatively calm conditions. Lakes are natural depositional zones.

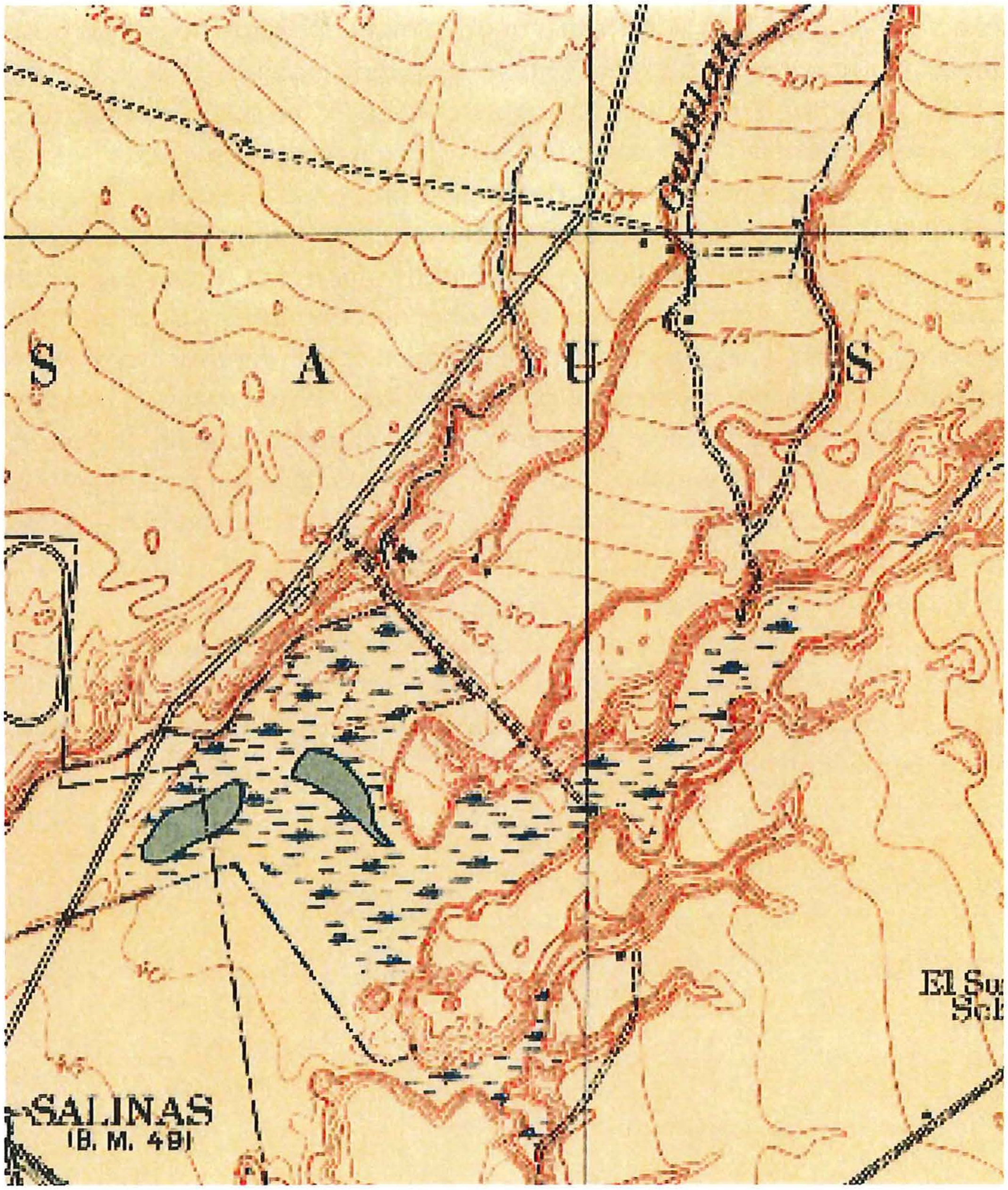

Figure 2-2 Topographic map of Salinas Valley, USGS 1910.

Over 100 years ago, European settlers started reclaiming the chain of lakes and surrounding floodplains for use as agricultural lands. At Carr Lake, farmers reclaimed and began to farm approximately 480 acres of newly-dried, organically rich, peat soils in the lakebed. The reclamation process entailed straightening channels, building ditches deeper and wider than existing shallow channels, and controlling the rate of flow at lake outlets so that flow could be regulated to drain the land during and after the wet season.

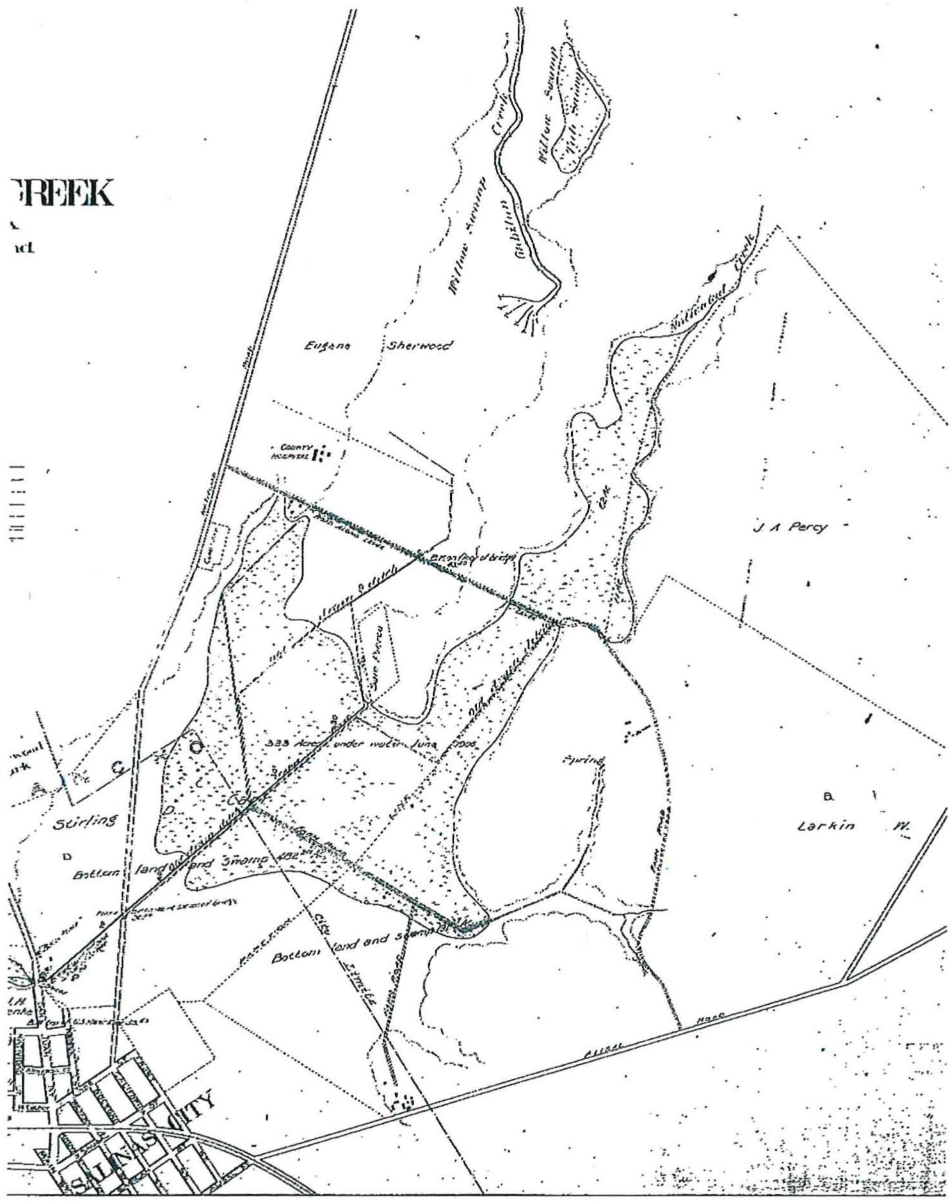

Figure 2-3 Map of improvement of Gabilan Creek, Lou Hare 1906.

In 1917, Reclamation District No. 1655 was formed to manage and maintain the reclamation and drainage of the chain of lakes and other swampy areas. The Reclamation Ditch ("Ditch") was built between 1917 and 1920 using the natural Alisal Slough drainage alignment between the lakes. Drainage from each lake was achieved by building lateral ditches to move water through and out of the lakebeds instead of allowing water to pond (Casagrande and Watson, 2006a). To facilitate drainage efficiencies into and out of Carr Lake, straight channels were created through the lakebed. The Ditch quickly began serving as a flood control system and recommendations for channel capacity improvements were issued as early as 1944 (Schaaf & Wheeler, 2006).

The Ditch conveys flows emanating from the Carr Lake watershed and downstream contributing areas (**Figure 2-4**). From a flood control perspective, Carr Lake provides the City of Salinas and other downstream properties with the most important flood attenuation function within the regionally significant Ditch drainage system. Monetary assessments generated from within the Monterey County Water Agency's (MCWRA) "Zone 9" are used to operate and maintain the Ditch. The Zone 9 assessment area boundaries were established in 1967 by the Monterey County Flood Control and Water Conservation District, a precursor to MCWRA. The MCWRA was legislated by the State of California in 1995 with the same authorities, limitations, rights and duties as its predecessor (Schaaf & Wheeler, 2006).

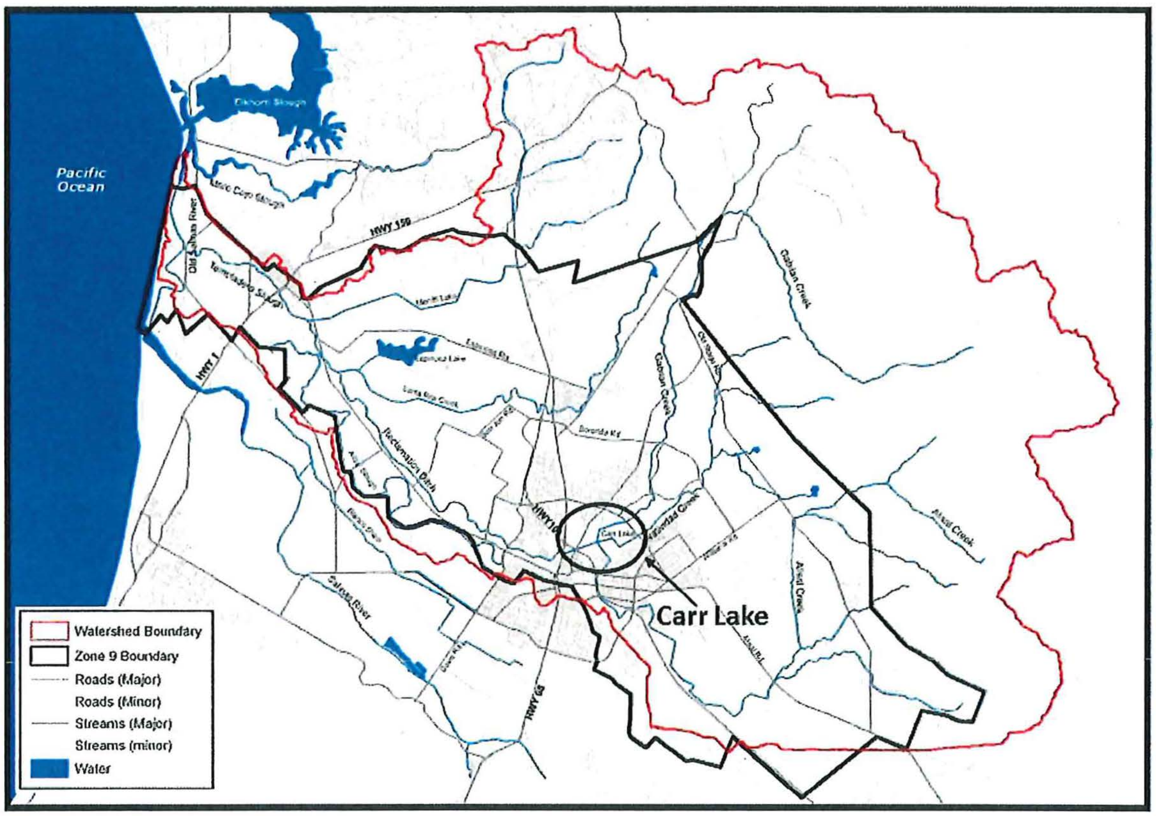

Figure 2-4 Carr Lake location within Zone 9 and Reclamation Ditch watersheds.
Source: Casagrande and Watson, 2006a.Present-Day Conditions

More than 100 years after initial land reclamation, Carr Lake continues to be used as productive agricultural land. The lakebed is now surrounded by the City of Salinas, and is bounded by East Laurel Drive, Highway 101, and local neighborhoods (**Figure 2-5**). The BSLT (formerly Ikeda) property is located in the northwestern part of Carr Lake. Hospital Creek is a sub-watershed in the Gabilan Creek watershed that drains a fully urbanized portion of Salinas directly into Carr Lake (Ballman and others, 2015). Hospital Creek joins with Gabilan Creek inside the lakebed at a corner of the BSLT property prior to the Gabilan Creek confluence with Natividad and Alisal Creeks at the "Four Corners", as shown in **Figure 2-5**. Lower Reclamation Ditch is the entire Ditch downstream of the Four Corners to Tembladero Slough (Ballman and others, 2015).

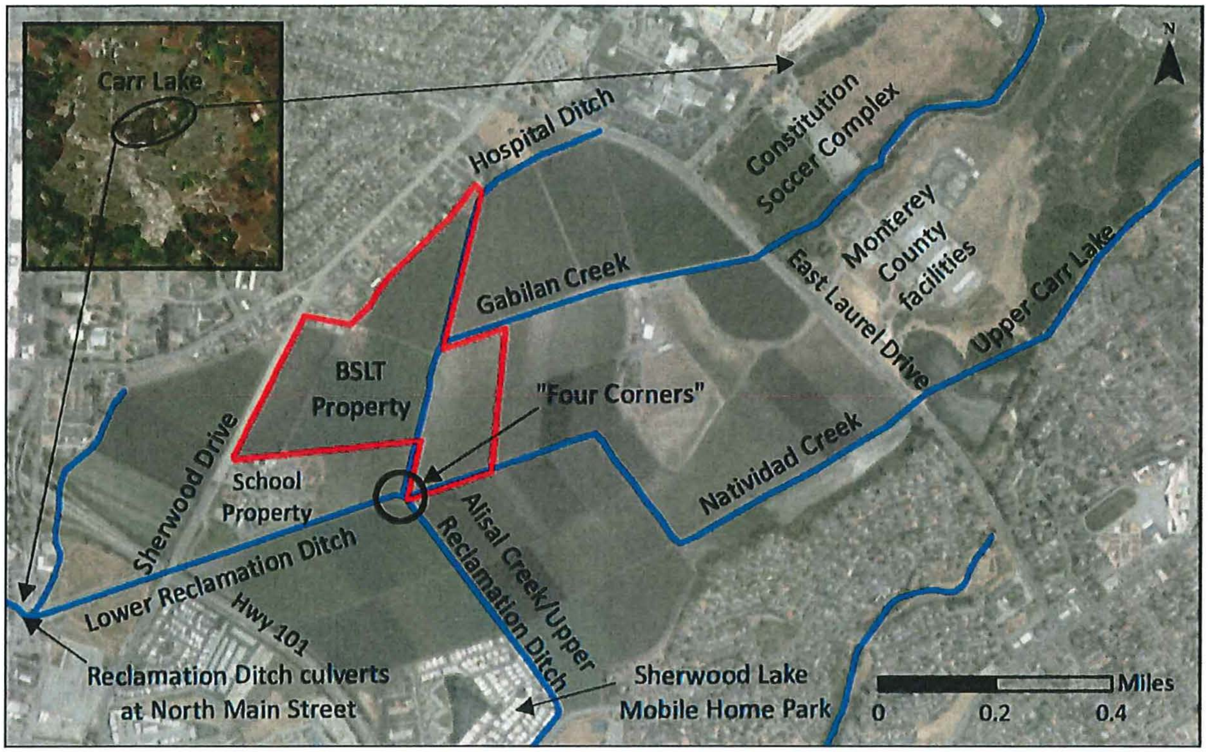

Figure 2-5 Geographic location of creeks and other facilities local to Carr Lake. BSLT property acquisition boundary outlined in red. Flowlines from National hydrography data set. Source: USGS, 2016a.

The creek corridors entering Carr Lake have remained as relatively open spaces directly upstream of East Laurel Drive. Constitution Soccer Complex is situated alongside and north of the Gabilan Creek corridor. A rehabilitated riparian zone and pond is located on the Natividad Creek corridor in the area also known as Upper Carr Lake. Monterey County government facilities are located on higher ground between the two creeks.

Sherwood Lake Mobile Home Park is built on the southern corner of the lakebed and is bounded on two sides by Alisal Creek as it approaches, makes a 90° turn, and enters the lakebed. Salinas Union High School District Property has multiple operational facilities on a northwestern portion of the lakebed between the BSLT property, Lower Reclamation Ditch, and Sherwood Drive. The Lower Reclamation Ditch passes under Highway 101 through a set of culverts, and then at North Main Street it passes through another set of culverts (culverts will be discussed in **Section 2.11**) that serve as the passive discharge management system for flood flows that originate in the Carr Lake watershed and which flow through the lakebed. The Ditch has become increasingly more important as the primary drainage way for Salinas as the City has grown. It currently directs about 90 percent of the annual stormwater runoff that passes through Salinas downstream and into Tembladero Slough (Ballman, 2009a).

2.3 Carr Lake Topography

In Carr Lake, existing topography in the cultivated fields is naturally flat (**Figure 2-6**) Agricultural fields have been leveled for farming, so where sloping exists, it is generally a smooth transition from one elevation to another. The lakebed varies in elevation from about 35 feet (NAVD88[2]) along the Natividad Creek channel corridor in the middle of the lakebed to as high as 45 feet on the northwest side of the lakebed. The BSLT property (outlined in red) has an elevation range of about 36 feet at the Gabilan channel and then rises to the northwest to over 45 feet near Sherwood Drive (**Figure 2-6**).

Contours along the edges of the lake boundary[3] show that much of the surrounding land is markedly higher and thus less prone to flooding. However, any structures within the lakebed, such as portions of Sherwood Lake Mobile Home Park, are susceptible to flooding during larger storm events. The Salinas Union High School District Property facilities (**Figure 2-5**) have been raised so that elevations are above 45 feet. Within Carr Lake there is upland terrace in the agricultural portion of lakebed, ranging from 60-70-feet in elevation, occupied by fields and farming facilities.

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[2] Elevations presented in this report and the accompanying plans are relative to the North American Vertical Datum (NAVD 1988, generally written as NAVD88).

[3] For the purposes of this report we define the lakebed to be the undeveloped area in Carr Lake that is currently being cultivated. This area is smaller than the historic lakebed.

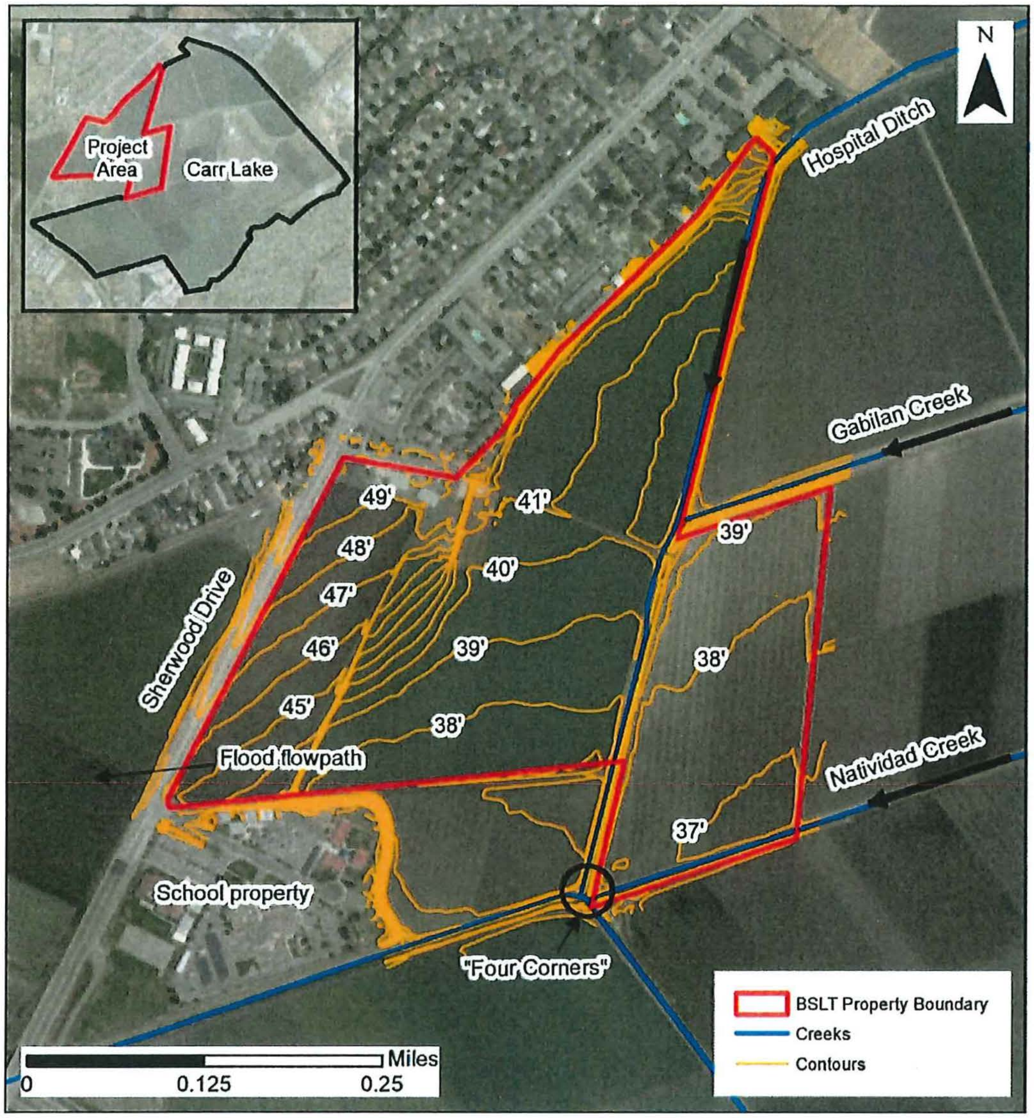

Figure 2-6 Topography of Big Sur Land Trust property in Carr Lake. Source: Whitson Topographic Survey, Summer 2019.

Within the lakebed, the channels themselves have very low longitudinal slopes. The Lower Reclamation Ditch from Four Corners to North Main Street has a 0.03% gradient (Ballman and others, 2015). The Natividad channel is particularly flat at a 0.004% gradient, while the Gabilan channel has a 0.02% gradient and Hospital Creek has a 0.15% gradient. The bottom of the ditches range from 3-4 feet below the surrounding fields. These flat conditions can negatively affect the ability for gravity-flow drainage to move flows out of the lakebed through the North Main Street culvert outlet, especially in the early stages of flood conditions.

2.4 Watershed Characteristics

The upper tributary watershed to Gabilan Creek is named Mud-Gabilan Creek which drains both Mud and Gabilan Creeks, the two primary channels that flow together to form Gabilan Creek (**Figure 2-7**). The Mud-Gabilan Creek watershed is a mountainous sub-watershed that drains the uppermost reaches of the Gabilan Range, including the slopes of Fremont Peak which rise to an elevation of about 3,100 feet (**Figure 2-8**). The two main tributaries join at an elevation of about 300 feet to form the lower main stem of Gabilan Creek. The highest elevation in the mainstem Gabilan Creek sub-watershed is about 1,140 feet above mean sea level, and the mainstem channel flows southwesterly into Carr Lake (**Figure 2-8**).

In contrast to the relatively undisturbed upper Gabilan Creek watershed, the Hospital Creek watershed is a highly urbanized watershed that flows through a series of storm drains upstream of Carr Lake. Hospital Creek enters Carr Lake through a culvert under East Laurel Drive approximately 1,100 feet upstream of the BSLT property.

A CSUMB graduate-level class calculated watershed areas in 2018 and found the watershed area of Gabilan Creek to be 43.7 square miles and the watershed area of Hospital Creek to be 0.76 square miles (CSUMB Class ENVS 660, 2019). The upstream storm drain network was included within the watershed delineation, resulting in watershed areas slightly different than previously reported by Balance. We have used the CSUMB watershed areas in our analyses, since they are more representative of the contributing watershed areas.

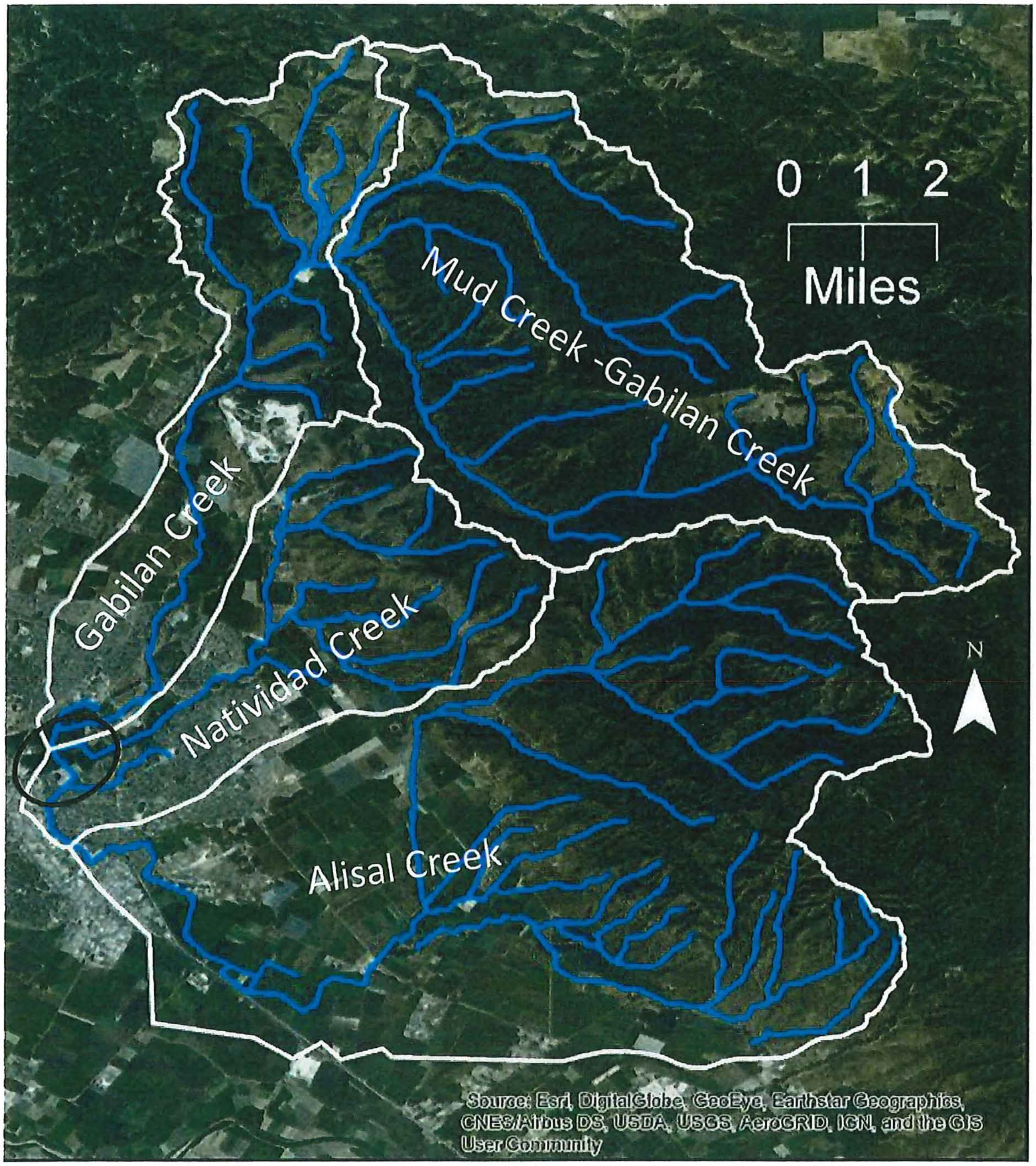

Figure 2-7 Watershed boundaries and the channel networks that drain to Carr Lake (circled). Source: National watershed boundary data set, USGS, 2016c.

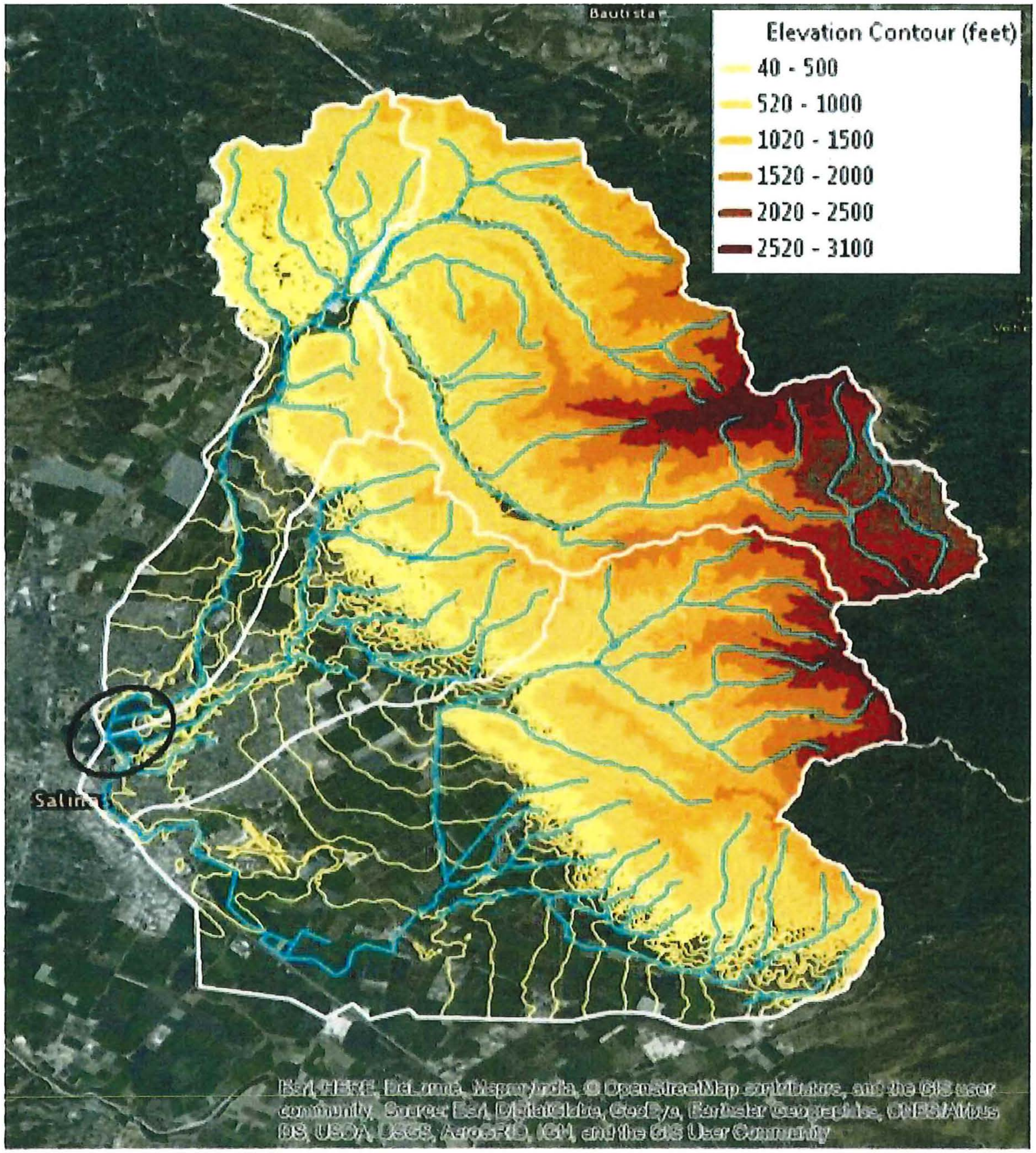

Figure 2-8 **Carr Lake watershed 20-foot elevation contours.** Wide contour interval spacing in the lowlands shows how flat agricultural fields contrast with much steeper uplands of the Gabilan Range, where narrow interval spacing produces solid coloration. See legend for elevation ranges. Source: USGS, 2016b.

2.5 Climate

The Mediterranean climate of coastal California consists of a warm, dry season with little to no rainfall from about June through September[4] each year. A cool, wet season from about October through May brings rainfall which can vary from light showers to atmospheric river downpours. Carr Lake and its sub-watersheds are thus most hydrologically active each rainy season. In dry season months under existing conditions, each creek may produce low flows that travel into and through Carr Lake. Most of this baseflow is produced by irrigation runoff. In years with higher rainfall in the prior wet season, baseflow from shallow groundwater sources may produce somewhat higher low flows in the creeks. Creek flows at higher elevations in Mud-Gabilan Creek generally persist year-round, but do not reach the lowlands (Casagrande and Watson, 2006a).

Climate change predictions for the central coast of California suggest that the climate may become drier interspersed with large flood events[5], however, existing conditions are already relatively dry. Average annual rainfall at Carr Lake is about 14 to 15 inches per year (**Figure 2-9**), and average annual rainfall in the upper watershed is approximately 23 inches. Mean annual rainfall in the entire watershed averages about 8 inches. This relatively low annual rainfall also reflects Carr Lake's watershed location within the rain shadow of the Santa Lucia Range situated to the west along the coast.

We obtained rainfall data from McPhails Peak rain gage (CDEC, 2019), located at an elevation of 3,383 feet, further inland about 10 miles southeast of the upper Gabilan Creek watershed along the Gabilan Range ridgeline. McPhails Peak receives an average annual rainfall of about 18 inches (**Figure 2-9**), similar to the watershed-averaged annual rainfall total for the Carr Lake watershed. Annual and daily cumulative rainfall rates from McPhails Peak provide a record of storms that likely deposited similar amounts of rain in the Carr Lake watershed.

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[4] The dry season can extend from April/May/June through September/October/November, depending on prevailing climate conditions. Likewise, the wet season can extend from October/November/December through March/April/May, depending on prevailing climate conditions.

[5] http://cal-adapt.org/tools/, accessed December 14, 2016. Development of the Cal-Adapt website was a key recommendation of the 2009 California Climate Adaptation Strategy, which has a mission to synthesize existing California climate change scenarios and climate impact research.

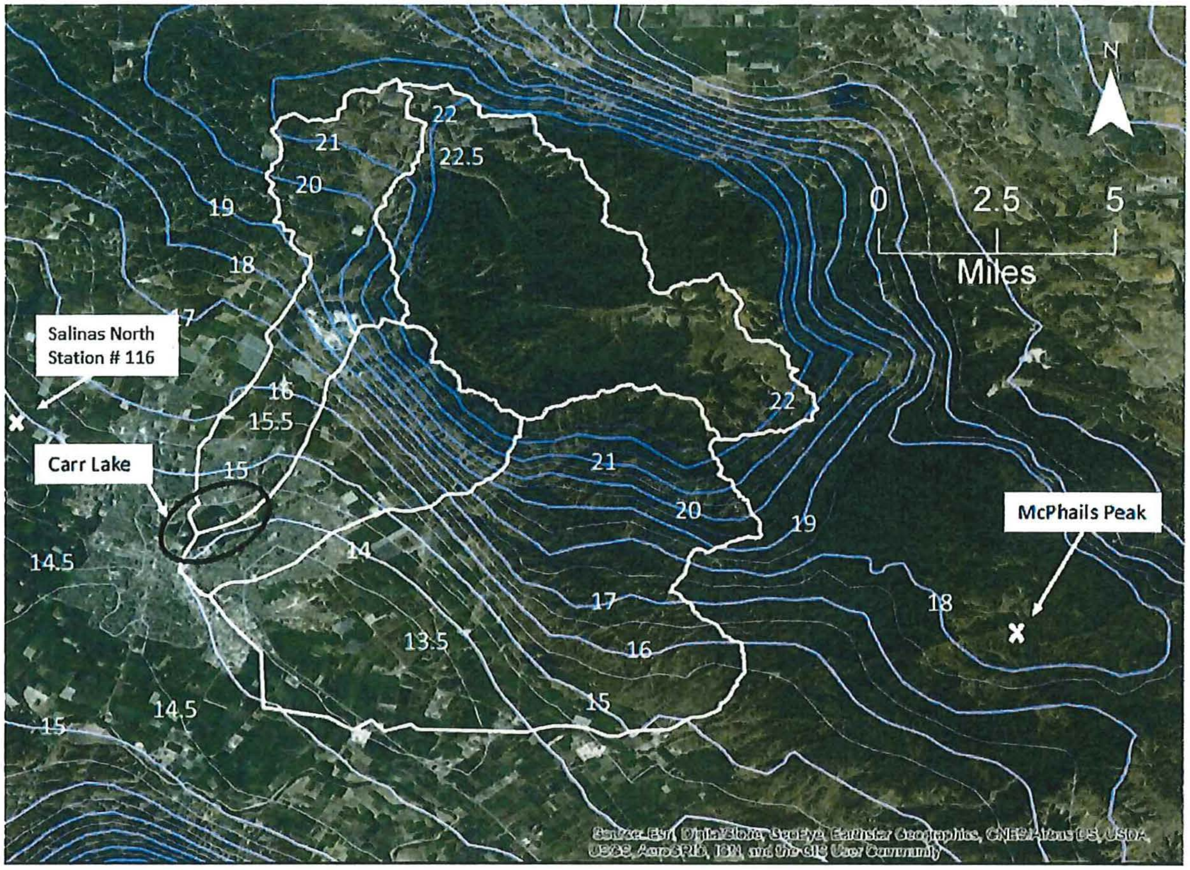

Figure 2-9 Carr Lake watershed, Salinas Valley isohyetal map (0.5-inch rainfall contours), and the location of the McPhails Peak and Salinas North Station #116 rain gages. Source: 30-year average rainfall contours from Prism, 2016.

The volume of rainfall in individual storm events, as well as peak rainfall intensities, varies considerably from storm to storm, from year to year, and even over small distances; these patterns are expected to continue in upcoming decades, so large flood events remain likely. Annual rainfall at McPhails Peak during 13 water years (WY)[6] (WY2005-WY2017; CDEC, 2019) ranged from a high of 35.3 inches in WY2006, about twice the annual average, to a low of 6.3 inches in WY2014, about one-third of the annual average of 16.6 inches (**Figure 2-10**, top). This 13-year average is about 10% lower than the Prism (2016)

[6] A water year (WY) is defined as October 1 through September 30 of the designation year; e.g. WY2016 contains the period October 1, 2015 through September 30, 2016.

rainfall data contour interval of 18-inches[7], likely influenced by the historic drought from WY2012 to WY2015, but nevertheless provides an indication of variability in conditions over time. The three highest average monthly rainfall totals in the data set were 4.4 inches in January, 3.2 inches in December, and 2.5 inches in February. Measurable rain was recorded at McPhails Peak on 14% of the days in the data set (an average of 51 days per year), with a range of 32 to 71 rain days per year. Daily rainfall totals exceeded one inch on average 3 days a year (range 0-8 days) and exceeded two inches on average one day a year (range 0-5 days) (**Figure 2-10**, bottom).

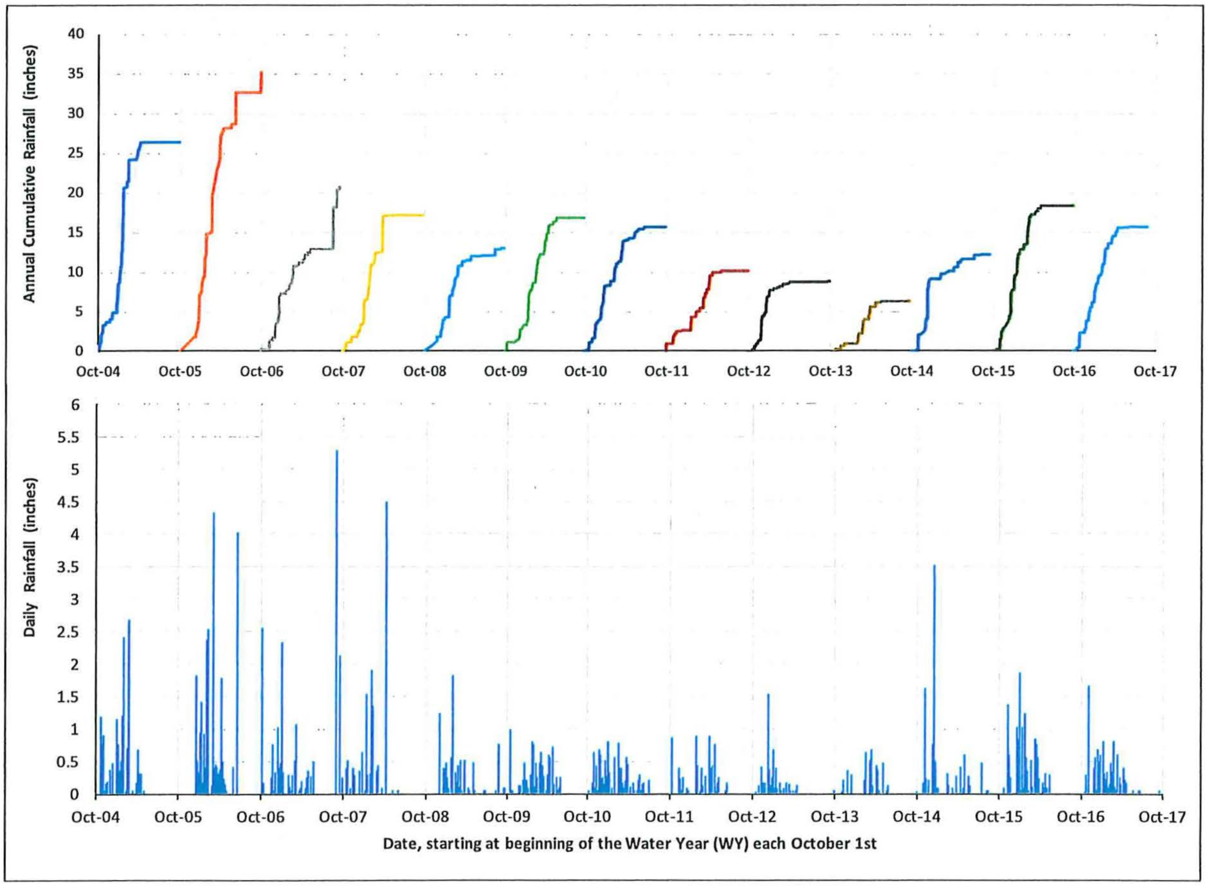

Figure 2-10 McPhails Peak annual cumulative rainfall (top) and daily rainfall (bottom). The station did not have data available after December 2017. Source: CDEC, 2019.

[7] Climate normals are based on 30-year records, as indicated by the Prism (2016) climate data which provides the most recent average rainfall conditions across the 30-year span 1981-2010. Conversely, rainfall data from CDEC can be obtained for various timeframes, and analyses may produce different results (i.e. WY2005-WY2016) from those of the climate normals record.

In addition to the McPhails Peak rain gage, we also used the CIMIS Salinas North station # 116 for analysis (See **Sections 2.6** and **2.10).** While this station is not located in the Carr Lake watershed, it is likely more representative of the local precipitation conditions because it is located at a similar elevation (61 feet) and receives a similar amount of annual rainfall (14.5 inches) (**Figure 2-9**). Precipitation data from this station is shown in **Figure 2-11**and **Table 2-1**.

2.6 Temperature and Evapotranspiration

Evapotranspiration and its interaction with temperature are important components of the hydrologic cycle that have a significant impact on the overall water balance of Carr Lake. A discussion of climate and hydrologic characteristics would not be complete without acknowledging the existing agricultural land use in the Carr Lake watershed and lakebed, and implications with respect to water supplies, most of which are obtained locally via groundwater extraction (see Groundwater **Section 2.13**).

Temperature, evapotranspiration, and precipitation data were obtained from the North Salinas CIMIS station #116 for the period WY2003 through WY2019 (**Figure 2-11**). Annual evapotranspiration rates range from about 33 to 43 inches per year, whereas annual rainfall (same data set as in **Table 2-1**) was no greater than 20 inches in any year. This indicates that the annual surface water deficit is large even with mild average annual temperatures of 54° Fahrenheit.

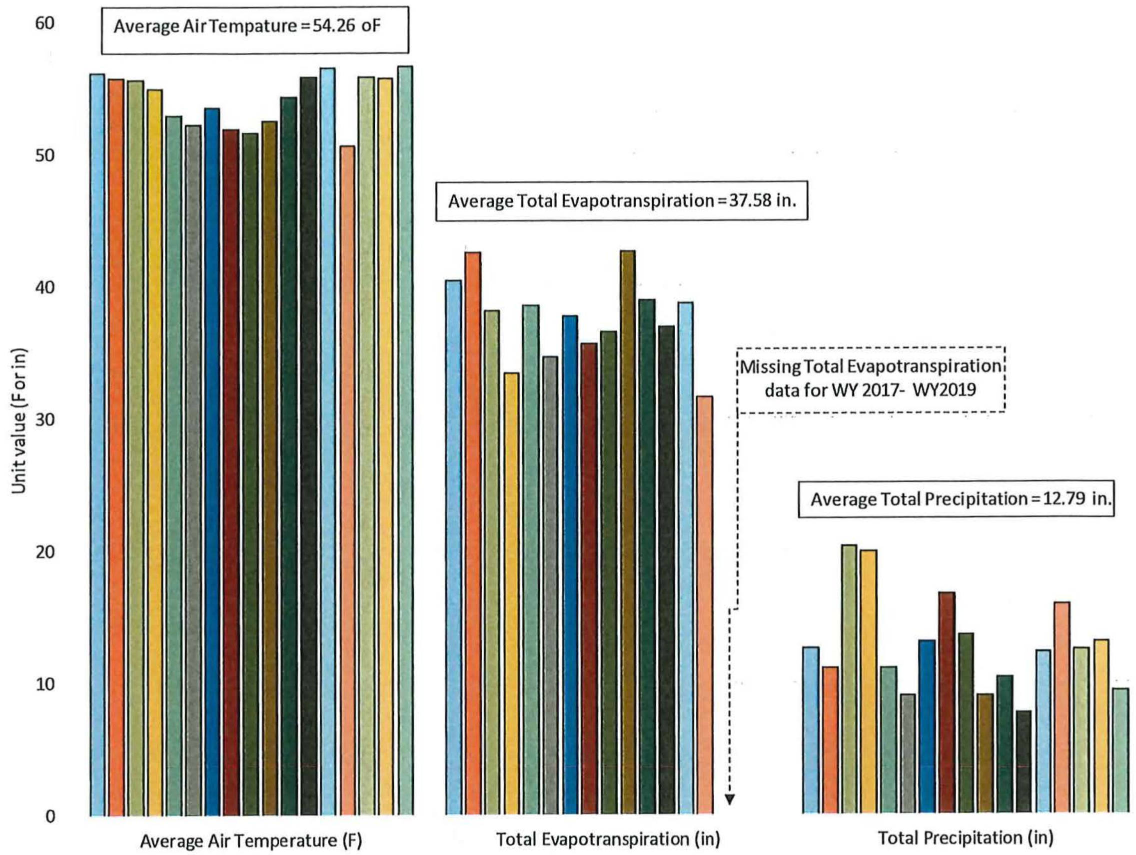

Figure 2-11 Annual temperature, evapotranspiration, and precipitation data. WY2003-WY2019 from left to right in each data set (colors used only to distinguish between years). Source: CIMIS station #116.

2.7 Geology

A depositional zone such as Carr Lake naturally reflects the upstream geology via sediments that were transported to the site and soils built from those sediments. Soils transmit precipitation and runoff into underlying geology at rates associated with specific characteristics of those soils, which may provide groundwater quality and recharge capacities.

Sequestration of sediment supply from the Gabilan Range in the Carr Lake lakebed is indicated on geologic maps as basin deposits (Qb,

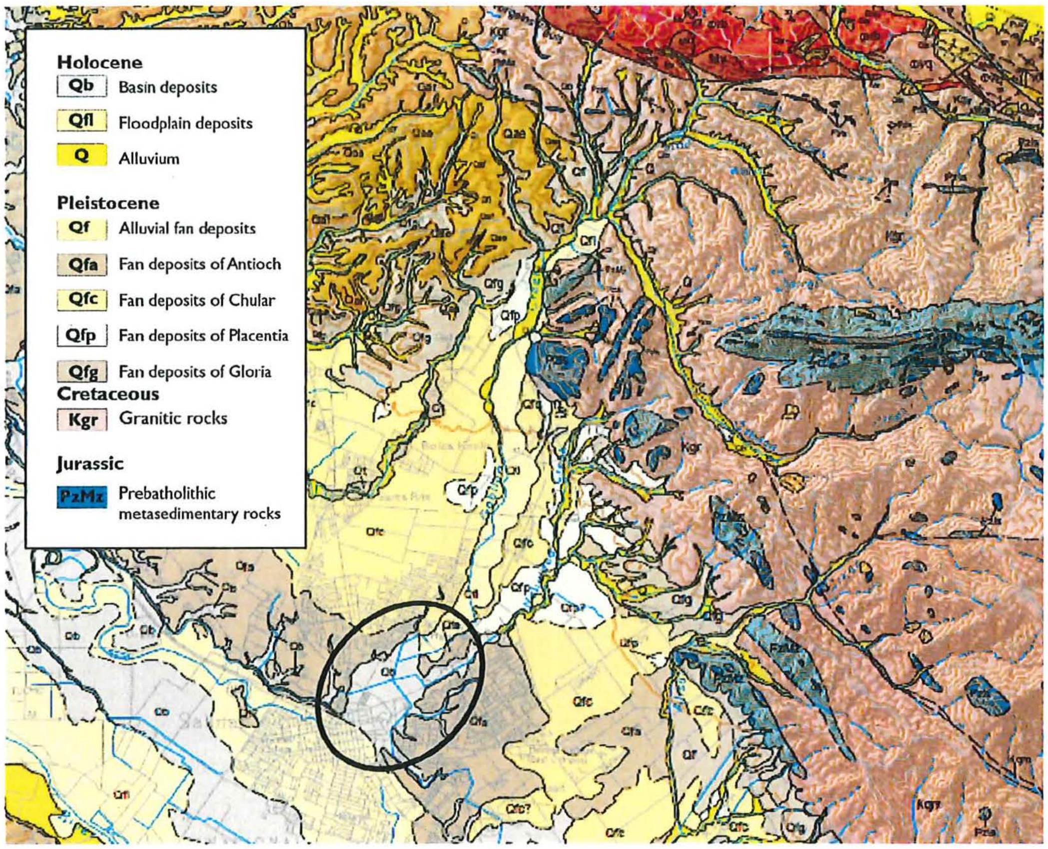

Figure 2-12) that were transported to the lakebed via streamflow during the Holocene[8]. To the north and south on both sides of the lakebed, older Antioch fan (Qfa) deposits are the result of extensive meandering of, and flooding from, the Salinas River over millennia since sea levels rose after late-Pleistocene glacially-driven depression of sea levels. Salinas River sediments were deposited to such an extent that Gabilan Range tributaries were dammed from flowing directly into the Salinas River, and each of the tributaries flowing westward from the Gabilan Range thus developed a lake or marsh along the eastern side of the terrace, such that in the lakebed, newer fine-grained sediments overlay older deposits. Upstream of the lakebed, Chular fan deposits (Qfc) and other deposits were transported downstream from the Gabilan Range and deposited along the lowlands (which are now either farmlands or developed land) and along the creek

[8] The Holocene era is defined as the geologic period from 10,000 years ago to present. The Pleistocene era is defined as the geologic period from 1.8 million years ago to 10,000 years ago.

channels. The soils that have developed from these eroded sediments form the base of the rich agricultural soils in production today.

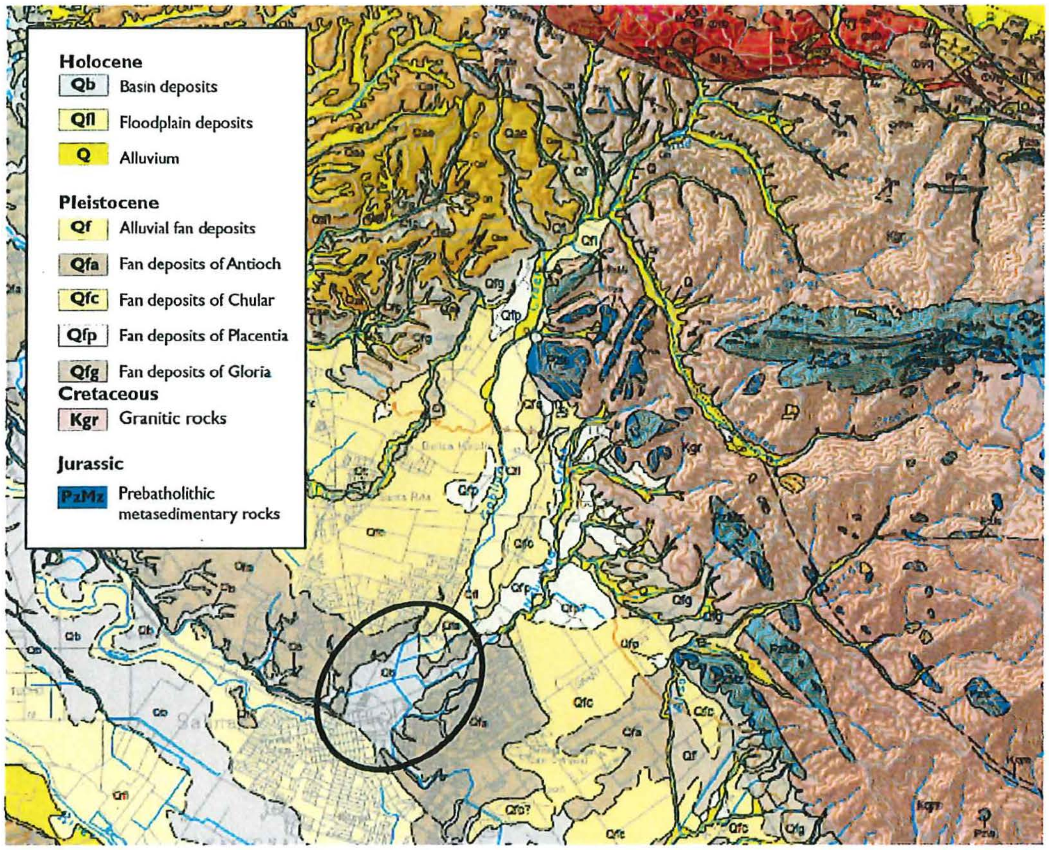

Figure 2-12 Geologic map of Carr Lake watershed. Carr Lake (circled) is a depositional zone characterized by basin deposits. Source: Wagner and others, 2002.

2.8 Soils

A historical soil survey and map published in 1925 (**Figure 2-13**; Carpenter and Cosby, 1925) provides the opportunity to examine the area from a historical perspective, after the City of Salinas was established and agricultural fields became dominant, but prior to expansion of the City that now surrounds Carr Lake. The map shows Carr Lake and environs prior to the Reclamation Ditch even though the map date is 1925, likely because the soils mapping work was done during the previous decade prior to the 1917-1920 Reclamation Ditch project.

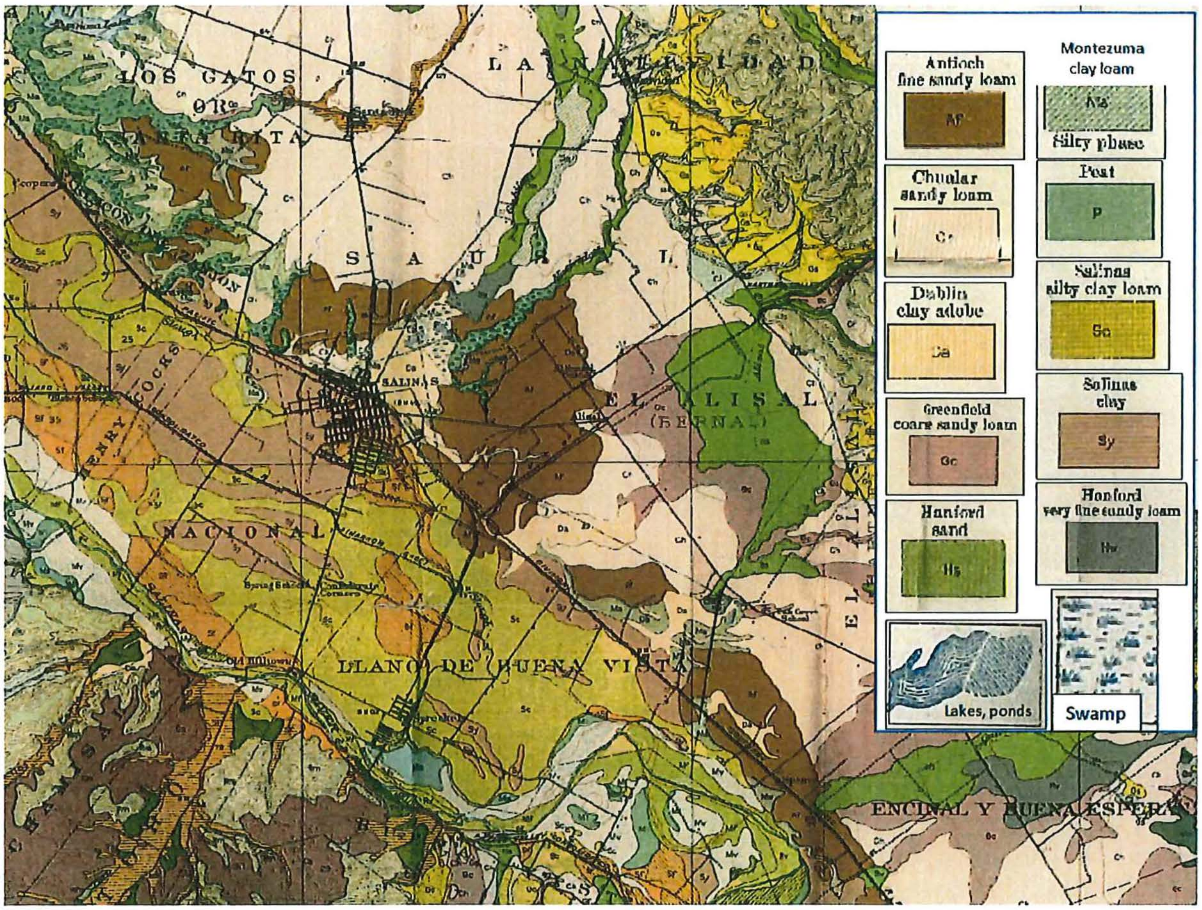

Figure 2-13 Soils map of Carr Lake watershed and environs. Source: Carpenter and Cosby, 1925.

The historical chain of lakes (**Figure 2-1, Figure 2-13**) were situated along the eastern flanks of the natural terrace that formed along the edge of the Salinas River floodplain from sediments deposited during flood flows. A conceptualized cross-section (**Figure** 2-14) illustrates how eastward- and westward-moving source materials have produced an intersection of Salinas River flood sediments and Gabilan Range sediments within Carr Lake. These geologic time-scale processes have produced sediments from Alisal, Natividad, and Gabilan Creeks that interfinger with those from the Salinas River.

Figure 2-14 shows that waters from the Gabilan Range cut through the Salinas overbank deposits (here Antioch fine clays, Af, generally equivalent to Qfa in **Figure 2-12**), with a remaining higher elevation terrace (see also **Figure 2-6**) in the lakebed today situated in between Gabilan and Natividad Creeks. In wet years, water would eventually spill from the lake system over low points in the terrace into Alisal Slough and flow downstream into

Tembladero Slough, along the way contributing to recharge of the Salinas groundwater basin. Conversely, during raging floods, the Salinas River would fill its entire, wide floodplain, and wash sediments over the terrace and into the chain of lakes. In either scenario, waters were likely to remain in the lakebed, nourishing wetlands and ponds as indicated in **Figure 2-13**, where ponding and swampy conditions were mapped in and upstream of Carr Lake.

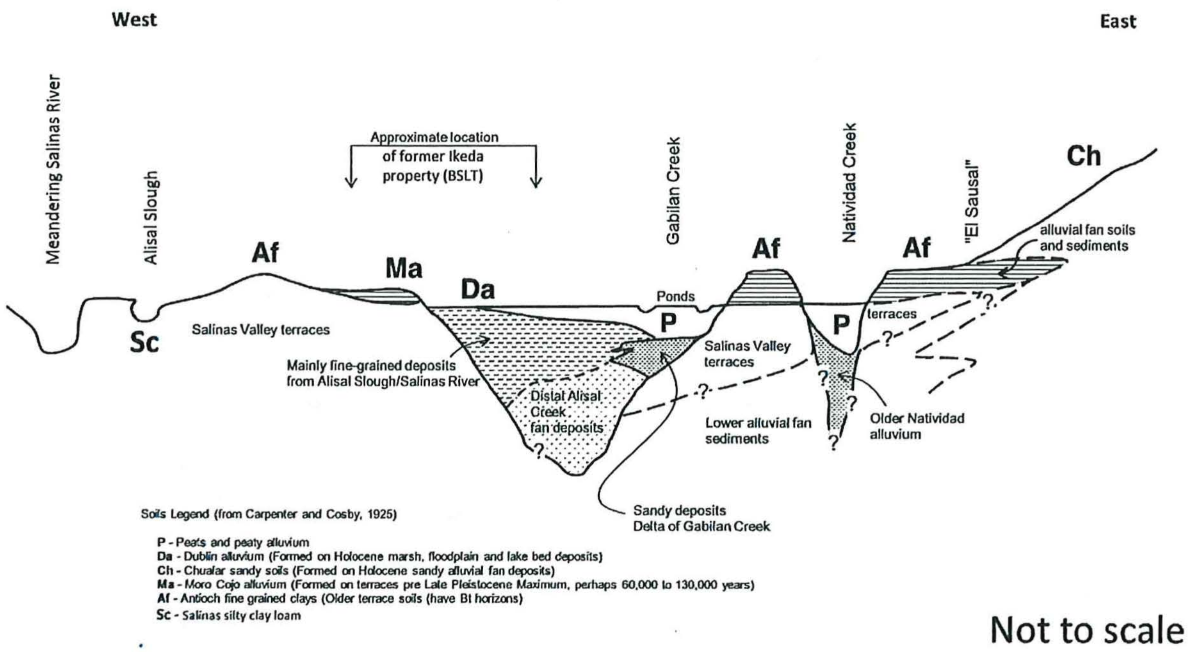

Figure 2-14 Generalized cross-section of soils and sediment deposits in Carr Lake and vicinity. Source: Hecht, 2017.

The Gabilan arm of the lakebed hosts the coarsest source materials that are likely interbedded with finer sediments. Larger flood events would carry the largest particles into the lakebed, while more typical floods would deliver the finer materials. The Natividad arm of the lakebed hosts peaty soils (P), most indicative of the historical swampy seasonality of the hydrologic environment which promoted layering of decaying organics onto the lakebed surface. Peat soils indicate that the smaller Natividad watershed likely transports less sediment into the lakebed than the Gabilan watershed.

The indication of "El Sausal" in large letters near the upstream edges of the lakebed on the 1925 mapping (**Figure 2-13**), and generalized as a location between the foothills and the lakebed on **Figure 2-14**, indicates the likelihood of water seeps which are likely the result of the sandy nature of Gabilan sediments promoting infiltration. Seeps would have formed in locations where porous and permeable fan deposits overlaid the Af terrace materials, such that shallow subsurface flows might emerge as wetted areas especially in years with average to wet winter precipitation. The implication of the loss of the seeps in recent years is likely attributed to groundwater pumping.

Loams vary across the watershed from clayey at Carr Lake and other lowland areas, to sandy and coarse sandy in the upper watershed. Loams are generally characterized by moderately high infiltration capacities that promote well drained soils. However, soils in the Carr Lake lakebed are classified as Hydrologic Soil Group[9] (HSG) C and D soils (NRCS, 2016; Monterey Soils, 2016; **Figure 2-15**) which indicate low to very low infiltration rates. The abundance of HSG C and D soils in the lower watershed suggest that there is potential for concentrated, flashy runoff conditions [10] during heavy or persistent rainstorms. The presence of HSG B soils in the upper watershed indicates higher infiltration rates, so runoff from high in the watershed will generally result in less runoff per unit of rainfall. Soils in upper watersheds generally have higher rates of recharge to groundwater than those in lowlands, particularly at headwater colluvial wedges (i.e. HSG B soils areas). Peat soils in the Natividad Creek arm are permeable until void spaces fill up. When peat soils are drained for use as agriculture land, aerobic microorganisms get to work decomposing, which leads to land subsidence, and which is likely to be playing a role in the waterlogged conditions along Natividad Creek inside the lakebed.

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[9] Hydrologic Soil Group A soils have the lowest runoff potential (more infiltration capacity) and Hydrologic Soil Group D soils have the highest runoff potential (less infiltration capacity).

[10] Flashy runoff conditions occur when streamflows react quickly and peak rapidly, as a result of land use changes such as conversion of natural lands to agricultural fields with more exposed soils and urban areas with more impermeable surfaces.

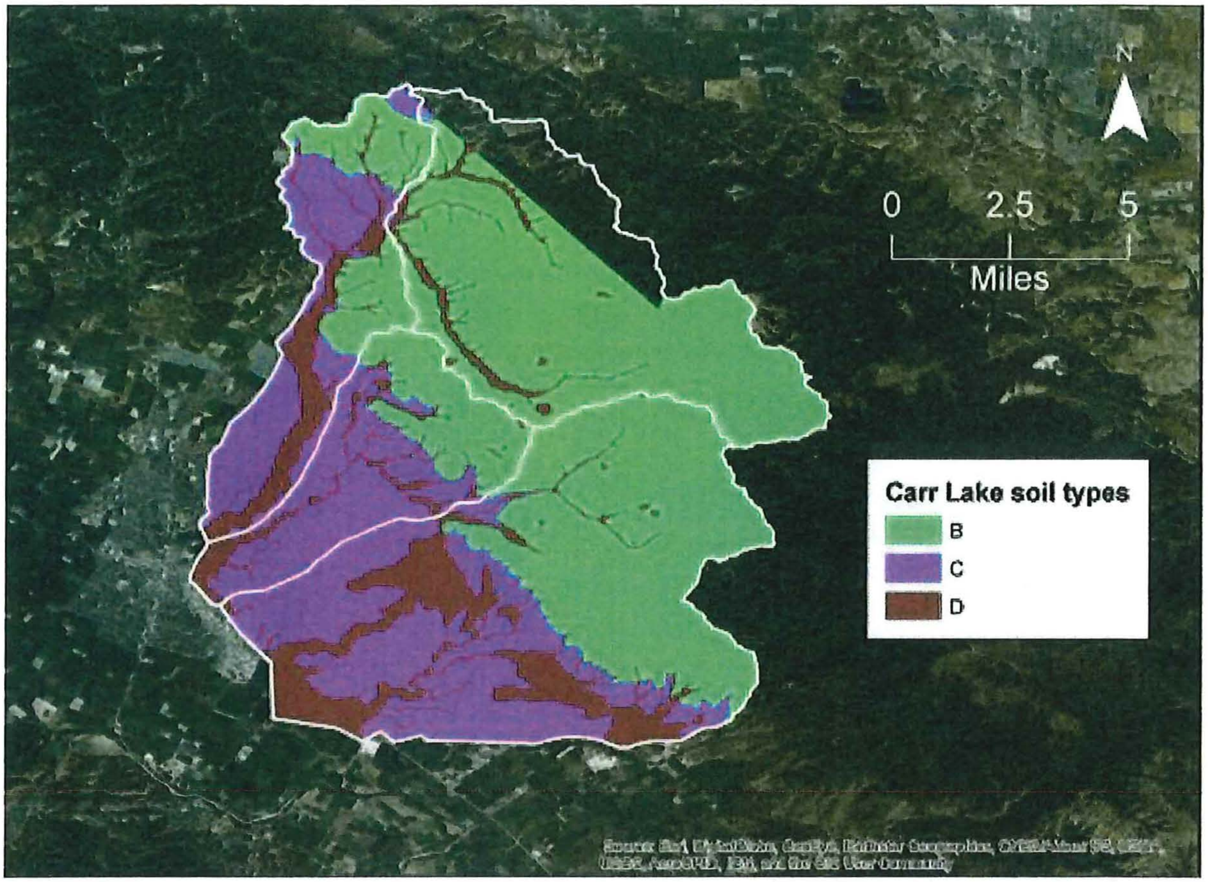

Figure 2-15 Hydrologic soil groups in the Carr Lake watershed. Source: NRCS, 2016.

2.9 Suspended Sediment Transport

Sediment supply to both Hospital and Gabilan Creek in the project reach is primarily limited to sand, silt, and clays and is typically deposited in the overbank historical lakebed areas as suspended sediment. Comparison of total suspended solid (TSS) data (**Figure** 2-16) between the two creeks, shows more suspended sediment in Gabilan Creek than in Hospital Creek during large flow events, while suspended sediment transport rates appear to be similar at low and intermediate flows. This relationship is consistent with the observed land use differences in the contributing watersheds for Hospital and Gabilan Creeks. The Hospital Creek watershed has a much higher percentage of urban land use, resulting is less fine sediment entering the creek via overland flow. Conversely, the Gabilan Creek has a higher percentage of pervious area including a large proportion of agricultural land, which produces much higher suspended sediment rates (**Figure 2-17**). The substrate in much of the contributing watershed is agricultural soil, and as a result most of the available sediment is either sand, silt, and clay. There is currently limited data available to quantify the amount of bedload transported through Gabilan and Hospital Creeks. During site visits we noted that more sand was deposited in Gabilan Creek upstream of the BSLT property, closer to where Gabilan Creek enters Carr Lake under East Laurel Dr. This may be due to the slightly higher gradient of Gabilan Creek in this section of Carr Lake, as well as the backwater conditions with Carr Lake (**Section 2.11**).

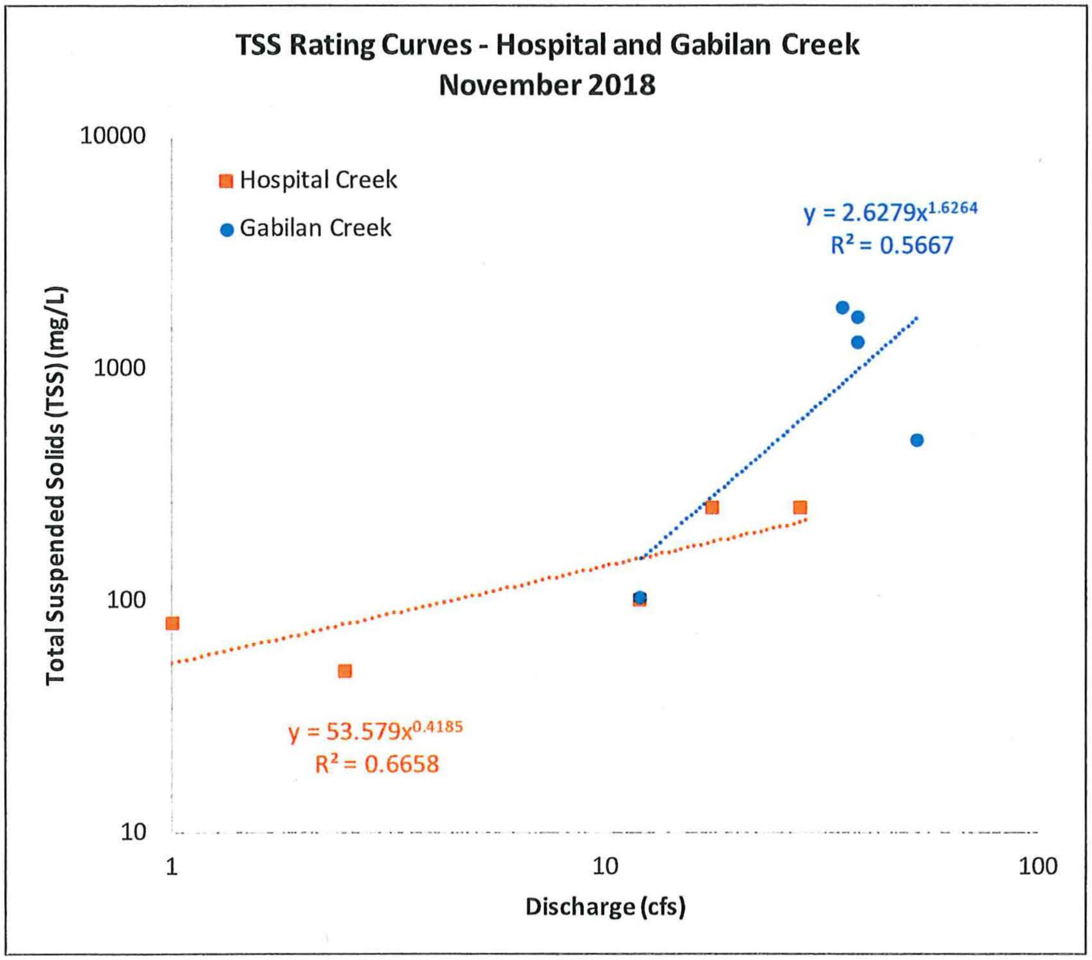

Figure 2-16 Total Suspended Solid (TSS) rating curves for Hospital and Gabilan Creeks. Inferred from CSUMB Class ENVS 660, 2019 for data collected over two storm events in November 2018. Discharge values estimated from plots in the report.

Figure 2-17 Mixing of clear urban runoff and turbid agricultural runoff. Photo taken November 29, 2018 at Coventry Street and Hyannis Circle by CSUMB students, from CSUMB Class ENVS 660, 2019.

2.10 Streamflow

Data from USGS gage #11152600 Gabilan Creek near Salinas, California (USGS, 2016d), is available for the Carr Lake watershed, with a period of record from October 1, 1970 to September 30, 2014[11]. It should be noted that this gage is located at Hebert Road (streamflow from a 34.7 square mile watershed) which is well north of Carr Lake and as a result, is characterized by the undeveloped portion of the watershed. This gage is useful for understanding the flow conditions of the upper watershed. Data from this gage was used to evaluate seasonal streamflow conditions, total annual flow, and flood frequency.

[11] USGS gage #11152600 Gabilan Creek near Salinas, California (2016d) has not collected data since October 2014, so ongoing information from this source is no longer available. Anomalies in the dataset were adjusted to provide a general correction for this study, but additional work would be needed to conduct a full quality assurance and check procedure on the existing gage data.

2.10.1 Seasonal Streamflow Conditions

The most recent 21 years of daily streamflow data and the annual peak discharge (depicted as triangles) are shown in **Figure 2-18** and include the two most recent hydrographs related to known flood conditions in WY1995 and WY1998. The streamflow record (**Figure 2-18**) indicates that peak streamflow varies relatively similarly to rainfall patterns at McPhails Peak[12] (**Figure 2-10**).

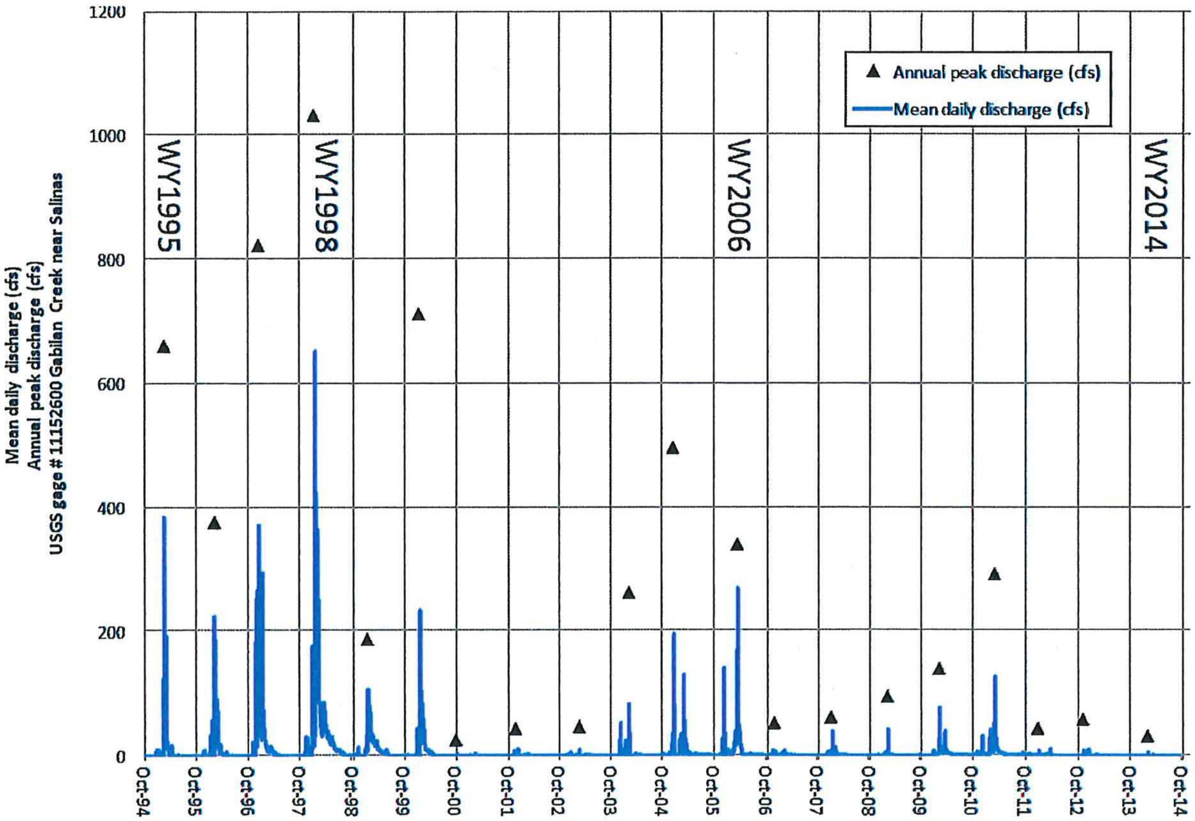

Figure 2-18 USGS stream gage # 11152600 Gabilan Creek near Salinas, California, mean daily and annual peak discharge flow record WY1995-WY2014. Source: USGS, 2016d.

Stream discharge within the Carr Lake watershed from infrequent larger storms can overwhelm the Reclamation Ditch conveyance system, resulting in flooded conditions in the Carr Lake lakebed as well as downstream (**Figure 2-19**). However, watershed response to rainfall can vary depending on rainfall intensity, frequency, magnitude, and duration. **Figure 2-18** shows that the annual peak discharge at the Gabilan stream gage

[12] No comparative analyses between the datasets were conducted for this study.

was greater than 600 cfs in WY1995, but less than the annual peak discharge in WYs 1997 and 1998. It is unknown what the Natividad and Alisal Creek contributions were to discharge rates into Carr Lake, but **Figure 2-19** reveals the result of the flood event in WY1995. Likewise, the flood event of WY1998 delivered a maximum discharge of over 1000 cfs at the Gabilan stream gage, so the lakebed was likely even more impacted than in WY1995.

Figure 2-19 Flooded Carr Lake lakebed, March 1995. Source: Casagrande and Watson, 2006a.

During the summer months the flow in Gabilan Creek and Hospital Creek is very low, going dry during certain periods. A study in 2014 found that summer outflows at the North Main Street outlet of Carr Lake averaged just 0.7 cfs over a five-month period in the middle of an extended drought (Ballman and others, 2015). Most of the gaged low flows in WY2014 were associated with discharges of unknown origin (most likely agricultural return flows[13]) entering the Carr Lake lakebed from Alisal Creek. During this time Gabilan Creek had standing, intermittent water in the lakebed for the duration of the dry-season study but little to no measurable discharge. This is consistent with our site observations from the summer and fall of 2019, where Hospital Creek had standing water, but no

[13] Agricultural return flows constitute drainage from agricultural fields as a result of irrigation practices rather than from precipitation events.

measurable discharge and Gabilan Creek had a flow of 0.35 cfs in July and an estimated flow of 0.1 cfs in October.

2.10.2 Total Annual Flow

Understanding the annual flow conditions at Carr Lake is important because Monterey County Water Resource Agency (MCWRA) and Monterey OneWater have an existing water right downstream of Carr Lake on the Reclamation Ditch. This water right is 600 ac-ft for each agency (1,200 ac-ft total). A simple ratio extrapolation from the contributing watershed area at the USGS Gabilan gage to the 100.4 square mile Carr Lake watershed area was used to estimate total annual flow for the entire watershed, under the assumption that runoff from the Alisal and Natividad watersheds is similar to that from the Gabilan watershed (**Table 2-1**). The response of the watershed to the precipitation events of WY1998 is remarkable in that total annual flow was over two times larger than any other WY and at least 10 times larger than 50% of years that were examined.

Table 2-1 Total annual flow in acre-feet, and annual precipitation near Carr Lake, by water year.

WY	USGS Gabilan gage, 36.7 sq mi	Carr Lake watershed*, 100.4 sq mi	CIMIS Salinas North station #116
1995	3,620	9,900	--
1996	4,222	11,550	--
1997	12,232	33,460	--
1998	25,577	69,970	--
1999	5,495	15,030	--
2000	4,376	11,970	--
2001	16	40	--
2002	140	384	--
2003	119	330	12.6
2004	1,263	3,460	11.1
2005	3,267	8,940	20.3
2006	5,130	14,030	19.9
2007	360	990	11.1
2008	520	1,420	9.0
2009	270	740	13.1
2010	1,765	4,830	16.7
2011	3,546	9,700	13.6
2012	341	930	9.0
2013	106	290	10.4
2014	12	30	7.7

* Total annual flow, ac-ft for the Carr Lake watershed is extrapolated from USGS Gabilan gage data.

2.10.3 Flood Frequency Analysis

We conducted a flood frequency analysis to predict peak discharge values that correspond to specific return periods or probabilities of specific peak flow rate on Gabilan Creek and Hospital Creek. For this project, we used two separate methods to calculate flow frequencies within the project area, which are outlined below.

Salinas Hydrology Model – Used for Hospital Creek and Gabilan Creek

Data for this analysis was provided from the long-term continuous-simulation Salinas Hydrology Model (SALINASHM) software package developed by Clear Creek Solutions, which is one of the approved models under the City's stormwater management guidelines (CASQA, 2003). The model uses long-duration hourly precipitation records to simulate site runoff and covers the time frame from Water Year 1978 to Water Year 2005, a total of 27 years. This period of record was selected as it includes a representative series (e.g. correct long-term average and appropriate number of dry and wet years).

We parametrized the SALINASHM for both the Gabilan Creek and Hospital Creek watersheds using acreages from the CSUMB report and land type information from the NRCS Web Soil Survey (CSUMB, 2019; NRCS, 2016). The extent of the urbanized area in Gabilan Creek is well documented in the CSUMB report (CSUMB, 2019). After running the model, peak discharge rates for the 2-, 5-, and 10-year design storm events were provided for Gabilan Creek and Hospital Creek at the location of the project site for the urbanized portions of the watersheds.

Because the SALINASHM program is only applicable for the urbanized portions of the watershed and large portions of the Gabilan Creek watershed are undeveloped, we looked to additional data sources (USGS stream gage data, see below) to make sure representative land use types were considered in this analysis.

USGS Stream Gage Data (USGS 11152600) – Used for Gabilan Creek

Data from the USGS Gabilan Creek near Salinas gage (USGS 11152600) was used in a Bulletin 17C type analysis (through USGS PeakFQ program) for the period of record (44 years of peak flow data). As previously noted, this gage is located well north of Carr Lake and as a result, is characterized by the undeveloped portion of the watershed. This analysis yielded peak discharge rates for the 2-, 5-, and 10-year design storm events for Gabilan Creek at the location of the project site for the unurbanized portion of the watershed. For this analysis, we considered three design storms (up to the 10-year event) for use in the restoration design process. We considered larger design storms (50- and 100-year) as part of the flooding analysis (see **Section 3.4** and **Appendix A**) for both existing and proposed conditions.

Design Flow Summary

In order to combine the results from both the urbanized and undeveloped portions of Gabilan Creek so that the flow frequency analysis was indicative of the entire watershed, we calculated a blended average of the results from both the SALINASHM model and the Bulletin 17C analysis for Gabilan Creek. Since the Gabilan Creek watershed upstream of the USGS gage likely has a markedly slower time of concentration[14] compared to the heavily urbanized watershed area downstream of the USGS gage, simply adding these two flow frequencies together would not be accurate due to the different runoff timing and patterns. As such, the reported values for Gabilan Creek are more heavily weighted to the USGS gage data, particularly at the 10-year level.

We used the blended methodology to calculate the peak discharge values shown in **Table 2-2.** These values were then used in the design of the Carr Lake restoration elements.

Table 2-2 Predicted peak discharge values for four recurrence periods for Gabilan Creek and Hospital Creek.

Design Storm	Peak Discharge *(cfs)*	
	Gabilan Creek	Hospital Creek
Q1.5	154	91
Q2	210	100
Q5	490	130
Q10	750	150

2.11 Flooding and FEMA Regulatory Considerations

The hydrologic cycle and existing land uses exert strong pressures on runoff and flood conditions within the Carr Lake watershed. Flood hazards common to growing communities are related to underlying watershed conditions, the degree of urbanization,

[14] Time of concentration is a concept used in hydrology to measure the response of a watershed to a rain event. It is defined as the time needed for water to flow from the most remote point in a watershed to the watershed outlet. The time of concentration is dependent on the land use of a watershed. For example, a more-urbanized watershed is generally faster than for less-urbanized watershed.

and the state of existing drainage infrastructure. Compared to historical conditions, the buildings, roads, and other impervious surfaces that exist in and around the City of Salinas have resulted in faster runoff conditions and higher peak flows that occur more quickly than prior to land use changes. Channelization of sloughs and streams, including the lower reaches of Gabilan, Natividad, and Alisal Creeks, also contributes to flashier runoff conditions. Furthermore, the Carr Lake watershed is the uppermost, and largest, contributing watershed in the greater MCWRA Zone 9 Reclamation Ditch watershed, which highlights the importance of the lakebed as a key focal point in attenuating floods and as the primary flood storage basin for the overall watershed. This also highlights the vulnerability of areas downstream that depend on Carr Lake to mitigate flood hazards associated with large and/or long duration storm events. The floods of WY1995 and WY1998 provide strong indications that improvements to the Reclamation Ditch system and its capabilities for flood control are overdue.

From a flood control perspective, maintenance of storage capacity within the lakebed is necessary for the growing region and has been an important ongoing consideration since the Reclamation Ditch was first constructed. This flood storage function is currently passively managed in an attempt to find a balance between flood elevations in the lakebed during large runoff events and downstream Reclamation Ditch capacity through the outflow capacity of the culvert array at Main Street west of Highway 101.

The importance of the lakebed's flood storage capacity has led to its designation as a Federal Emergency Management Agency floodway[15], that by definition, is required to accommodate the base flood elevation[16]. This designation comes with requirements that must be met regardless of changes in land use within the lakebed boundary, most specifically in regard to any type of encroachment that may limit the available storage volume in the lakebed.

An update of the County of Monterey Flood Insurance Study (FIS) was published in 2009 and coincided with the conversion of the Flood Insurance Rate Map (FIRM) panels to digital format. This was the first FEMA documentation for the Reclamation Ditch system to use the NAVD88 vertical datum. However, the underlying technical analysis for Carr Lake

[15] The designation of a regulatory floodway in FEMA terminology is defined as the portions of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood (see footnote 21) without cumulatively increasing the water surface elevations more than a designated height, typically one foot.

[16] In FEMA terminology, base flood elevation is defined as the flood elevation associated with the 1-percent chance flood event (the latter also commonly referred to as the "100-year flood").

was unchanged and continues to reflect the results of the hydrologic and hydraulic modeling that dates back to 1981. Modifications to the existing FEMA flood elevations are likely overdue and associated documentation would be required for any significant changes in land forms within the lakebed. Modeling and associated analyses may need to be compiled in an application for a Conditional Letter of Map Revision (CLOMR) followed by a Letter of Map Revision (LOMR) for changes to take effect for the FEMA FIRM. Both the CLOMR and LOMR would be subject to review and concurrence by the City of Salinas and the County of Monterey prior to the required review and approval by FEMA.

2.11.1 Flood Storage Capacity

Flood storage capacity within the Carr Lake lakebed is a primary functional control on the magnitude of flood peaks released to the downstream Reclamation Ditch channel. The ability of Carr Lake to hold flood waters has served the purpose of providing needed attenuation of flood flows routing through the Reclamation Ditch. The function of Carr Lake as a detention basin should not be compromised in any future land use scenario within the lakebed. However, the efficiency of Carr Lake in modulating flood flows could be greatly improved with updated operational control methods, perhaps most significantly with the adoption of off-channel flood storage capabilities, but also with outflow control reengineering. Restoration of more natural conditions in the creek channels, as proposed in this project, may also be beneficial in helping attenuate flood flows depending upon the design elements and channel configuration.

The very slight slope and flat configuration of the lakebed means that flood inflows spread out relatively broadly and consistently at a given elevation. This has two important consequences for flood flows. First, the lakebed water surface elevation stays shallow for an extended period at the beginning of flood conditions, so the amount of outflow is small to begin with and thus inflows exceed outflows at a faster rate than other more efficient outlet configurations would provide. Second, the same principles that apply to the extended period where lakebed water surface elevations remain shallow at the beginning of a flood event also apply to the end of a flood event. Therefore, once flooding has occurred in a section such as the Sherwood Lake Mobile Home Park, standing water can remain for days. Inefficiencies of the flood routing capacity of the lakebed combined with inefficiencies of the North Main Street culvert to move flows downstream as peak discharges recede have been noted in previous drainage and flood insurance studies for the City of Salinas and Monterey County.

2.11.2 Flood Routing Capacity

A major limiting factor for flood control in Salinas and in the Reclamation Ditch watershed is the conveyance limitation of the channel way downstream of Carr Lake during flood conditions. The Reclamation Ditch was originally built as a drainage way meant to route water out of the chain of lakes and surrounding swamplands so that these lands could be farmed. The dimensions of the Ditch were not envisioned to provide the capacity of a flood control system, so lands directly adjacent to the Ditch were not limited from development or private property acquisition. The City of Salinas has subsequently built up around the Ditch, with current property lines adjacent to the Ditch not amenable to easy expansion. At this time, no project has been identified or funding secured to make routing capacity changes throughout the system.

These conveyance limitations along with observed flooding issues suggest that significant increases in flood flow discharges from Carr Lake are not feasible, at least within certain critical flood control flow ranges such as the 100-year flood. However, the efficiency of Carr Lake for flood control could be improved by reconfiguring the North Main Street culvert to allow higher outflow discharges during smaller flood flows that would not overwhelm downstream conveyance capacities. This change would allow for more storage capacity to remain available early in large storm events, even if the topographic configuration of the lakebed were to remain in its existing condition.

It is important to note that the existing culverts at North Main Street were designed to limit outflow rate capacities during flood conditions, but in a static configuration. During typical low flow conditions, discharge from Carr Lake exits through a 36-inch diameter pipe positioned below much larger double 8-foot by 8-foot box culverts (**Figure 2-20**).

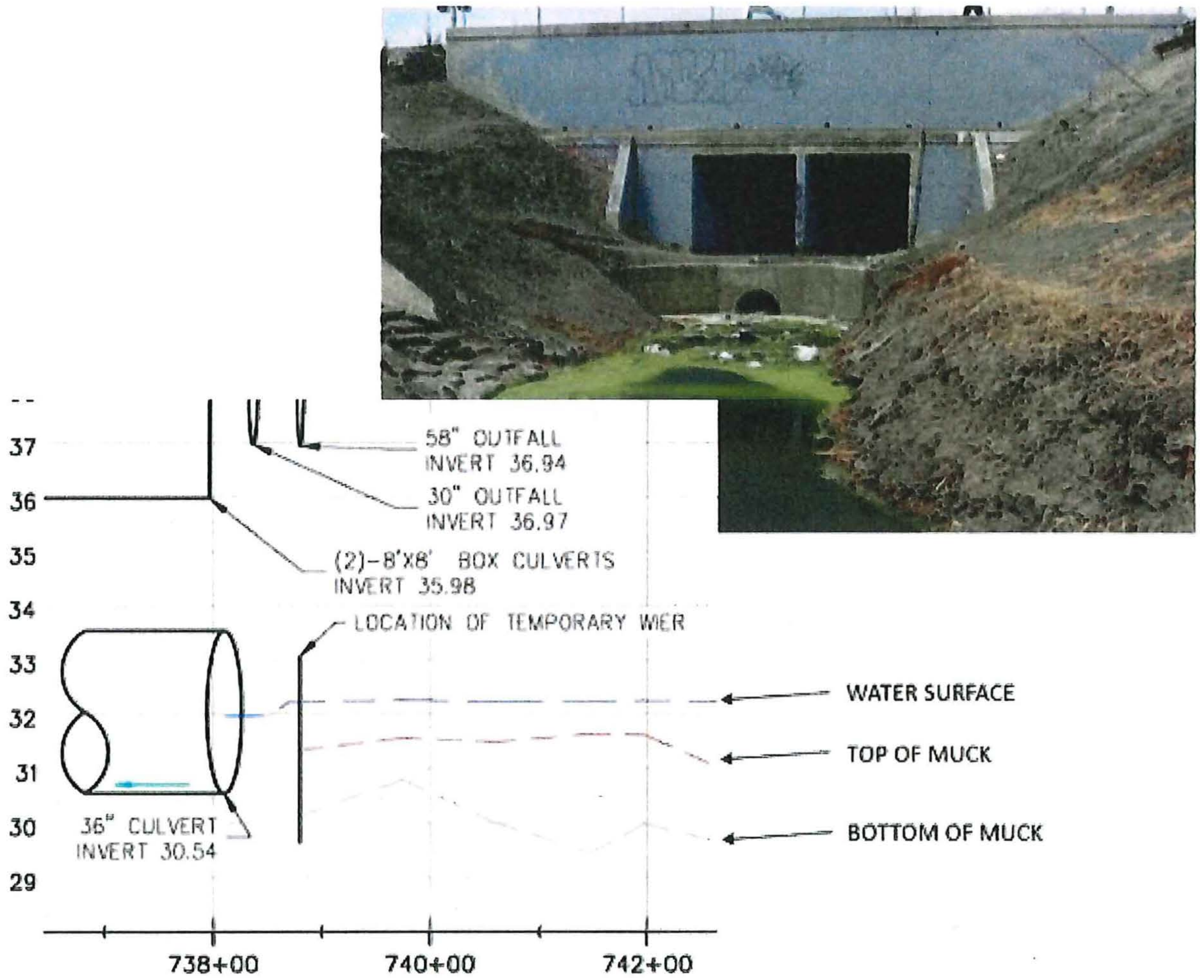

Figure 2-20 Carr Lake outlet configuration. Source: Ballman and others, 2015.

The current configuration limits outflows during small storms to the capacity of the existing 36-inch culvert at an invert elevation of 30.54 feet (**Figure 2-20**) until lakebed water surface elevations reach the bottom of the box culvert invert elevation of 35.98 feet. This means that water surface elevations within the Ditch will be over 5 feet deep at the outlet (35.98 - 30.54 = 5.44 feet deep) prior to an increase in outflow discharge. This creates a large volume of water that is limited to a maximum discharge in the range of 60-70 cfs through the lower 36-inch culvert. The same principles apply to the box culverts, which are less of an issue with significantly higher outflow capacity, but which are not engaged until the water surface elevations exceed 36 feet in the main lakebed. The modeling results for the existing conditions are further discussed in **Appendix A**.

2.11.3 Regulatory Floodway

An important Federal constraint on changes associated with land use in the lakebed is the designation of Carr Lake as a regulatory floodway. The 100-year base flood elevations are mapped on FEMA Flood Insurance Rate Map (FEMA FIRM, 2009) panels: 06053C0209G and 06053C0217G (**Figure 2-21**) that encompass all lakebed acreage west of East Laurel Drive. These maps show that all but a small portion of the BSLT property lies within a Zone AE Special Flood Hazard Area with a regulatory floodway overlay. The regulatory floodway is a particularly important designation as there are significant restrictions related to any encroachments within such floodways. As described in 44 CFR Part 60 Subpart A and City of Salinas Municipal Code Chapter 9, Article VI, encroachments (e.g. structures or fill) in regulatory floodways are typically allowed only if the encroachment does not result in any increase in the base flood elevations mapped by FEMA.

The regulatory requirement of no increase in the 100-year flood elevation is a known constraint under the acquisition of any properties within the lakebed. Any earthwork (including excavation and fill) would need to be reviewed in the context of the impact that it would have on base flood elevations. It is likely that any physical modifications subsequent to property acquisition in the lakebed will require an updated evaluation of flood elevations and storage capacities. This requirement is further complicated by more recent studies (Schaaf & Wheeler, 2002; RBF Consulting, 2007) which indicate that updates to better reflect current conditions would result in as much as 1.7-feet to 2.1-feet of increase in the 100-year flood elevation from that listed on the currently-effective FEMA FIRM map (**Figure 2-21**). If new data were used to update the FEMA map, base flood elevations could change significantly.

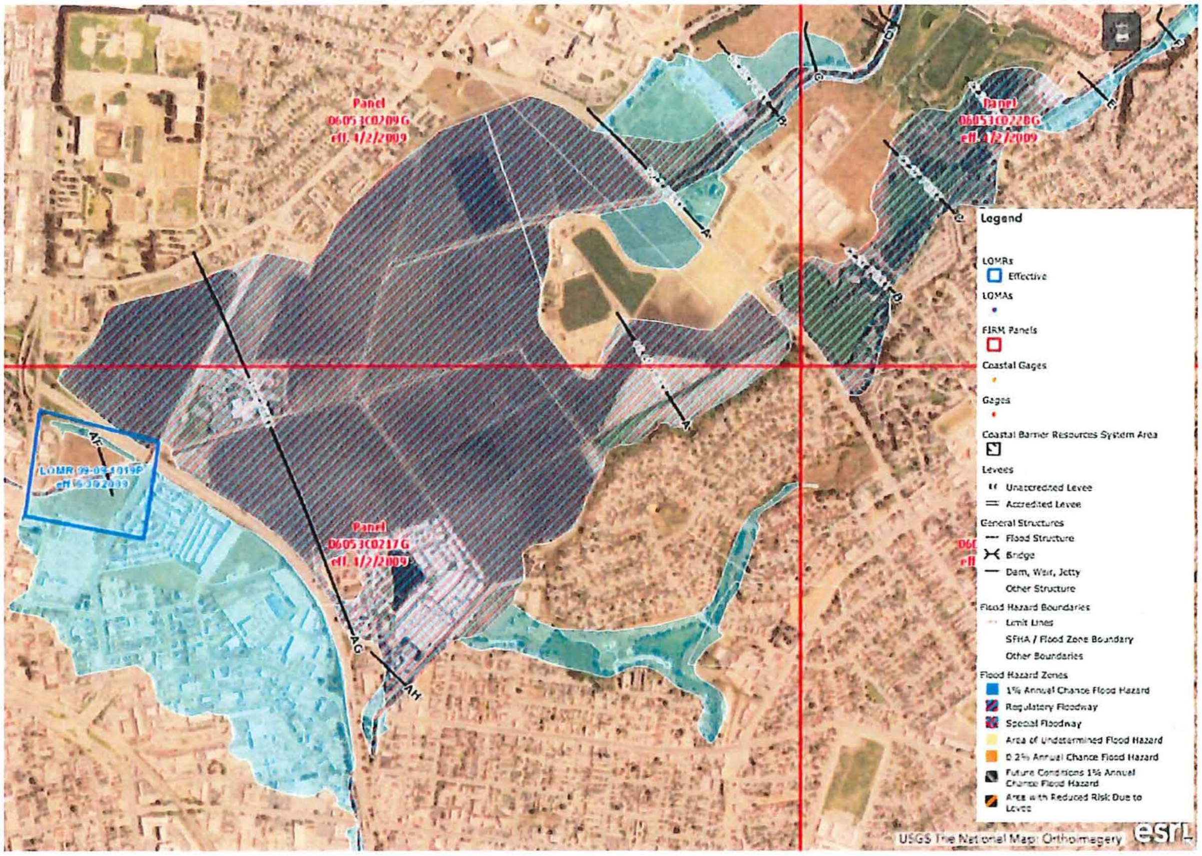

Figure 2-21 FEMA floodway, Carr Lake, Salinas, California. Source: FEMA FIRM, 2009.

2.12 Water Quality

Agricultural return flows from upstream field sources make up a portion of inflow to the Carr Lake lakebed throughout the year. In yearly dry-season summer conditions, such flows may constitute most or all of the flows entering Carr Lake (Ballman and others, 2015). Agricultural return flows and other anthropogenic activities carry various pollutants (**Table** 2-3) that are detrimental to water quality. These impacted flows come primarily from farmed lowlands in each sub-watershed to the Carr Lake lakebed and continue downstream through the Lower Reclamation Ditch. A surface water diversion is planned on the Reclamation Ditch downstream of the City for reuse as part of the Pure Water Monterey Groundwater Replenishment Project (DDA, 2016).

Reduction of the pollutants within Carr Lake prior to discharge downstream would benefit the planned recycling effort by providing cleaner water to treat and would provide improved water quality downstream in the Tembladero Slough for waters that are not diverted and recycled. Carr Lake historically functioned as a retention zone via ponding and as wetlands prior to being modified and farmed, so any efforts that could slow flows through Carr Lake would likely be beneficial to water quality in the lakebed and downstream.

The Casagrande and Watson (2006a) report contains a water quality assessment chapter to which readers are referred for information related to the effects of anthropogenic impacts to aquatic health across a range of water quality parameters, and for a partial bibliographic list of water quality documents that provide additional information relevant to the Northern Salinas Valley area (see Table 6.4 in Casagrande and Watson, 2006a).

Table 2-3 Listed 303(d) impairments to aquatic waters entering Carr Lake. Sources: CCRWQCB 2010 and 2012.

Pollutants impairing waterbodies that enter Carr Lake.

Creek	Ammonia (Unionized)	Escherichia coli (E. coli)	Fecal Coliform	Low Dissolved Oxygen	Nitrate	pH	Sediment Toxicity	Sodium	Temperature, water	Turbidity	Unknown Toxicity
Gabilan	x		x		x	x	x			x	x
Natividad	x	x		x	x	x	x		x	x	x
Alisal			x		x			x			

Pollutants include those categorized as nutrients, pathogens, toxicity, sediment, and miscellaneous

2.13 Groundwater

The Salinas Valley Groundwater Basin is a structural basin comprising sedimentary formations dating to the Miocene that overlie Mesozoic granitic rock. Marine shale and mudstone of the Monterey Formation generally form the base of water-bearing sediments, and sediments overlying this base compose the aquifers within the basin. The primary aquifers in the basin are largely of fluvial origin and have a classic sequence of thick, well-defined beds of sand and gravel separated by clay deposits.

The Salinas Valley Groundwater Basin is considered one hydrologic unit, which is divided into subareas based on different depositional environments. The northern Salinas Valley from the Monterey Bay up-valley to the town of Gonzales is divided into a west side 'Pressure Area' and the 'East Side Area' (**Figure 2-22**, inset). Sediment deposition during repeated sea-level fluctuations defines the Pressure Hydrologic Subarea. In general, massive blue clay beds of estuarine origin (aquitards) divide unconsolidated deposits into an upper aquifer (commonly referred to as the Pressure 180-Foot Aquifer), a lower aquifer (commonly referred to as the Pressure 400-Foot Aquifer), and a deep aquifer (commonly referred to as the Deep or 900-Foot Aquifer). Within the Pressure Subarea, all three aquifers are confined. Sequences of coarser sediments separated by brown clays of alluvial fan origin are found in the East Side Hydrologic Subarea. As a result of the alluvial fan deposition and transition to estuarine deposition, the aquifers are less differentiated and semi-confined in the East Side Subarea. The blue clay beds that form the principal aquitards in the Pressure Subarea are rare within the East Side Subarea, and the fluvially generated Pressure 180-Foot and Pressure 400-Foot Aquifers of the Pressure Subarea are not observed. East Side sediments, however, can be divided into zones that are generally equivalent (in time) to the Pressure 180-Foot and Pressure 400-Foot Aquifers (Chau and others, 2004).

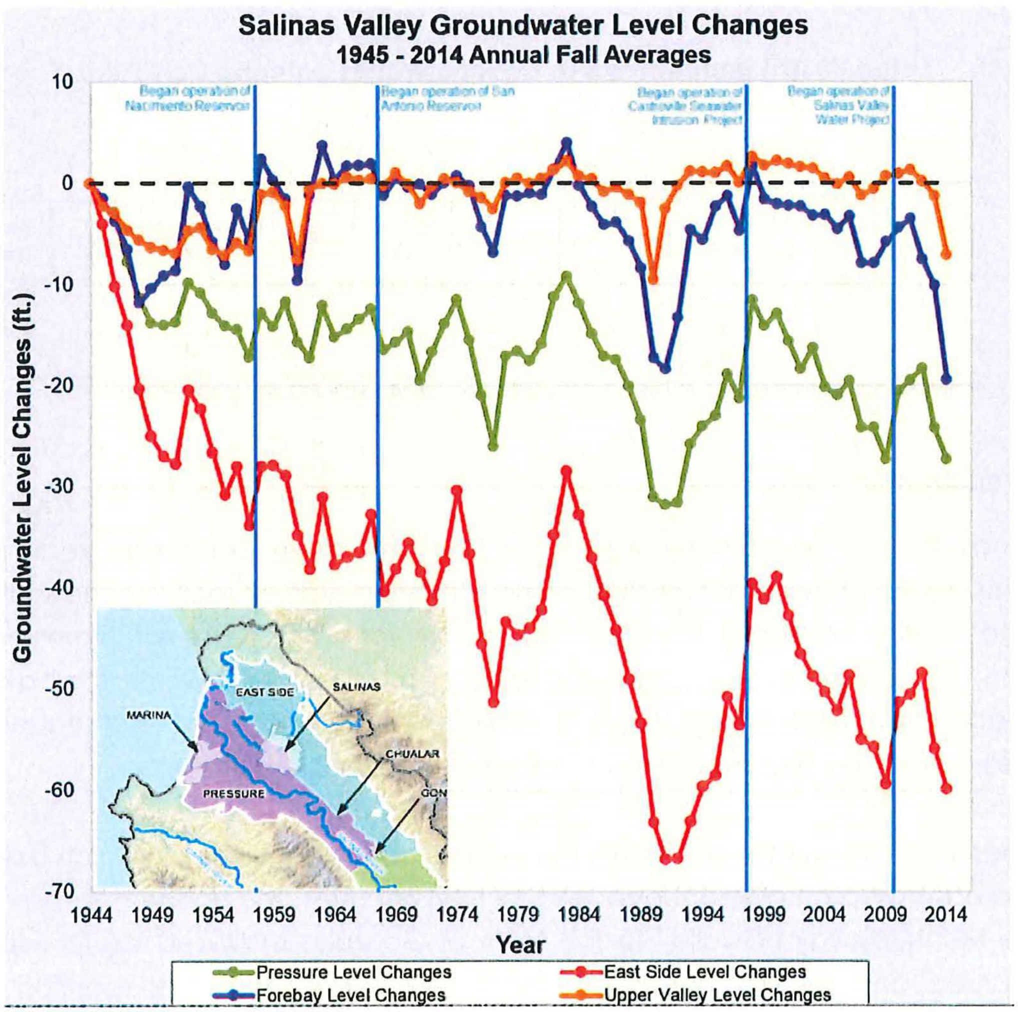

Figure 2-22 Groundwater elevations in northern Monterey County. Inset lower left shows East Side and Pressure aquifer boundaries. Source: MCWRA, 2014.

Carr Lake (and the other valley-marginal lakes) are located within the East Side Hydrologic Subarea. The existing well on the BSLT property was drilled to depth of 700 feet and intersected alternating sequences of sand and gravel deposits and brown clays, typical of East Side Area deposits. Lithologic information from other water-supply wells in the Carr Lake area also exhibit a similar, alluvial-fan related depositional characteristic (facies) (see lithologic logs illustrated in Woyshner and Riedner, 2011). These deep wells can yield many hundreds of gallons per minute (gpm). The existing well on the BSLT property has an estimated yield of 2,550 gpm on the well completion report, and pump tested at 1,176 and 737 gpm.

Depths to groundwater in the Salinas Valley have been documented as far back as 1901 (see Figure 2.5 in Casagrande and Watson, 2006a), signifying the importance of groundwater in the region for agricultural purposes. Groundwater elevations in the northern Salinas Valley have declined substantially from groundwater pumping, particularly in the East Side Area (**Figure 2-22**). Even though the Salinas Valley groundwater basin is partitioned into hydrologic subareas, the boundaries are zones of transition between the subareas where groundwater can move laterally between subareas. This connectivity is illustrated in **Figure 2-23** for the shallow (180-ft) aquifers and in **Figure 2-24** for the deeper (400-ft) aquifers. The broad, deep drawdown depression at both aquifer depths, depicted in the deepest groundwater contours centered east of Carr Lake, has induced groundwater flow from the Pressure Subarea, as well as from the Salinas River and from hydrologic subareas up-valley along the Salinas River corridor, into the East Side Area. This drawdown depression suggests vertical connectivity between aquifers and limited lateral confining conditions between the East Side Subarea and the other local subareas.

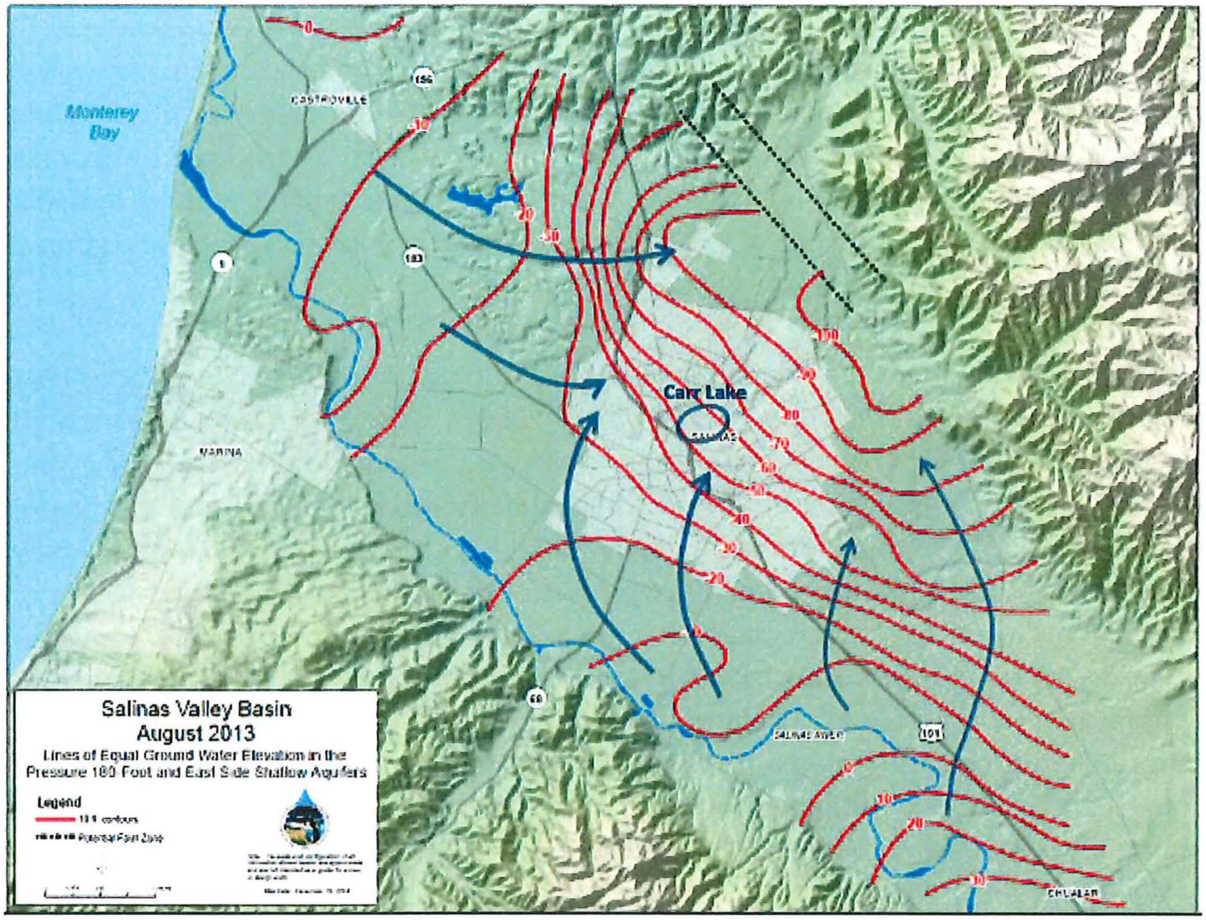

Figure 2-23 Groundwater Contours and Generalized Flowlines for Shallow Aquifers in the Carr Lake vicinity. Source: MCWRA, 2013.

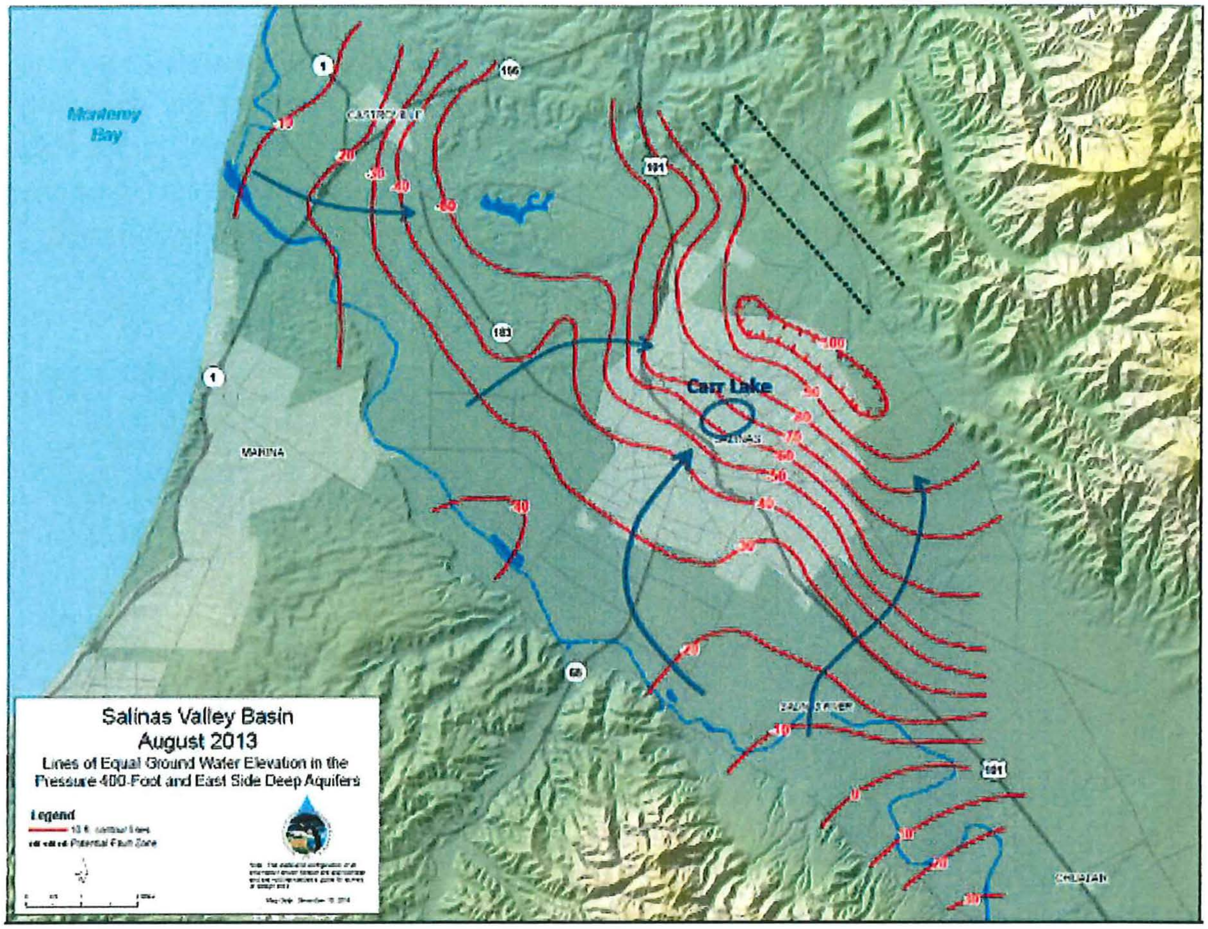

Figure 2-24 Groundwater contours and generalized flowlines for deep aquifers in the Carr Lake vicinity. Source: MCWRA, 2013.

The large groundwater storage declines in the basin, especially in the East Side Subarea, have created significant landward groundwater flow gradients toward the Gabilan Mountains, as indicated by generalized flowlines for shallow (**Figure 2-23**) and deep aquifers (**Figure 2-24**), and potentially, related seawater intrusion because subsurface flow gradients are not moving down-valley toward the ocean. The seawater intrusion maps (Montgomery and Associates, 2020, **Figure 2-25**) show that the front in the Pressure-180 Aquifer has advanced about 8 miles from the coast since the 1930's, and about 3.5 miles in the Pressure-400 Aquifer. The rate of seawater intrusion peaked during the period from 1997 to 1999 and has slowed since. Within the 400-Foot aquifer there was an increase in area of seawater intrusion between 2013 and 2015 (Montgomery and Associates, 2020, **Figure 2-25**). This increase in intruded area is likely a result of localized downward migration of high chloride groundwater from the 180-Foot aquifer to the 400-Foot aquifer (Montgomery and Associates, 2020). However, it may be that seawater intrusion in the Pressure-180 Aquifer is laterally constrained by a band of clay-rich less permeable overbank deposits (Chau and others, 2004) at about the location of Carr Lake and other valley-marginal lakes. As a result, seawater intrusion has not (yet) migrated into East Side Subarea aquifers, though the area continues to be potentially susceptible to seawater intrusion. Seawater intrusion is not present at the BSLT property well when drilled in 2007, or in water-quality results at other wells in the vicinity (Kulongoski and Belitz, 2007).

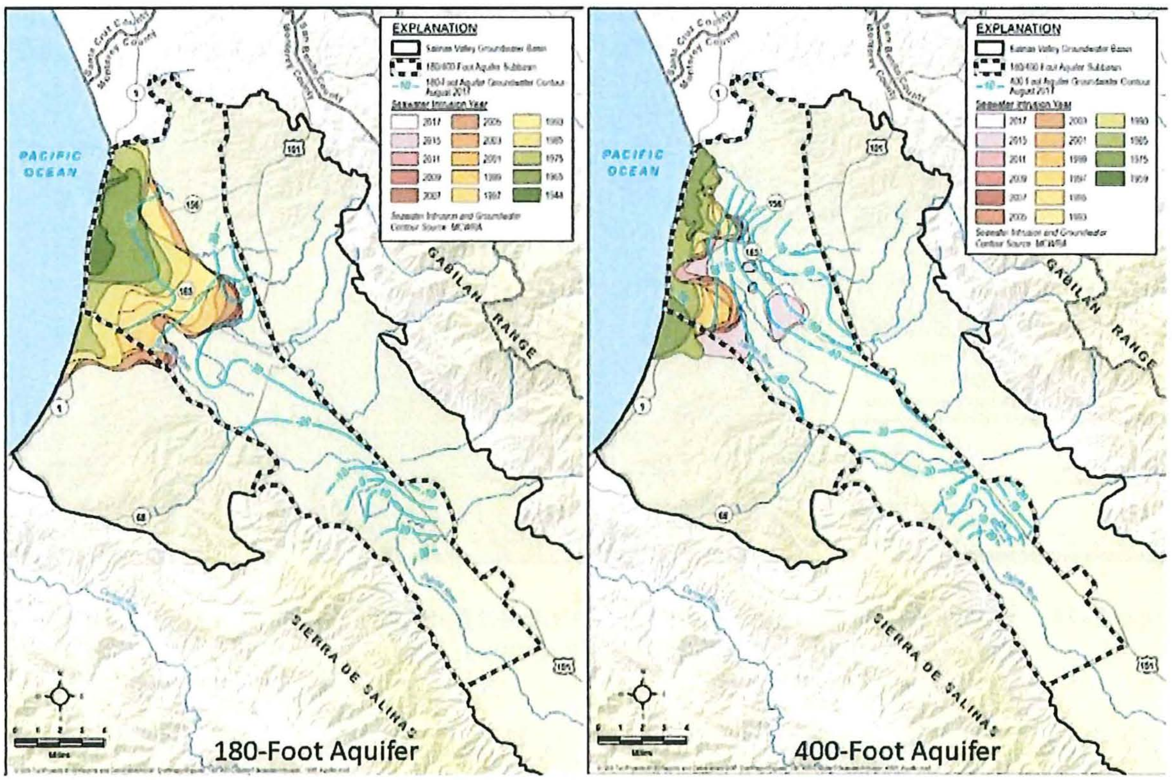

Figure 2-25 Historic seawater intrusion in the shallow 180-Foot Pressure aquifer and deep 400-foot Pressure aquifer. Source: Montgomery and Associates, 2020.

These hydrogeologic conditions and monitoring results coupled with downstream efforts to contain seawater intrusion such as the Salinas Valley Water Project (SVWP) and the Castroville Seawater Intrusion Project (CSIP), designed to improve groundwater recharge and decrease groundwater pumping in the CSIP service area, suggest that seawater intrusion is not a significant issue for planning potential uses of the BSLT property well, and, if managed properly, its use for restoration should not exacerbate seawater intrusion. MCWRA is developing the Salinas Valley Integrated Hydrologic Model in partnership with

USGS (MCWRA, 2016) as the next step in efforts to ensure adequate water supplies to farmers under changing climate conditions and continued needs for steady supplies of irrigation water, which should provide a large contribution to understanding the hydrogeology of the region. In January 2020 the Salinas Valley Basin Groundwater Sustainability Plan (GSP) was completed for the Salinas Valley 180/400-Foot aquifer subbasin. The GSP outlines the sustainable management criteria for the 180/400-Foor subbasin to achieve groundwater sustainability by 2040, as required by the Sustainable Groundwater Management Act (SGMA, 2014).

2.13.1 Groundwater Recharge

With the advent of large-scale groundwater pumping over the past 50 years, recharge to East Side Area aquifers is primarily from subsurface flow from the sub-basins to the south and west. However, given that aquifers in the East Side Hydrologic Subarea are less differentiated and only semi-confined by clay units or unconfined, groundwater recharge may be locally significant. The notion that groundwater recharge in the East Side Subarea historically occurred largely through percolation from small streams that flow from the Gabilan Range, and to a lesser degree directly from precipitation during wet years, is supported by soil types and infiltration capacities of the stream corridors and upper watershed areas. The highest potential for groundwater recharge in the watershed is along Gabilan Creek for much of its length upstream of the lakebed. The Soil Agricultural Groundwater Banking Index (SAGBI), a California state-wide suitability index for groundwater recharge on agricultural land (O'Geen and others, 2015), provides support that local recharge capabilities are present especially along the Gabilan Creek corridor upstream of Carr Lake (**Figure 2-26**). Growers can employ practices in production fields and on farm edges to maximize rainwater infiltration and recharge groundwater in these areas (Smith and others, 2017).

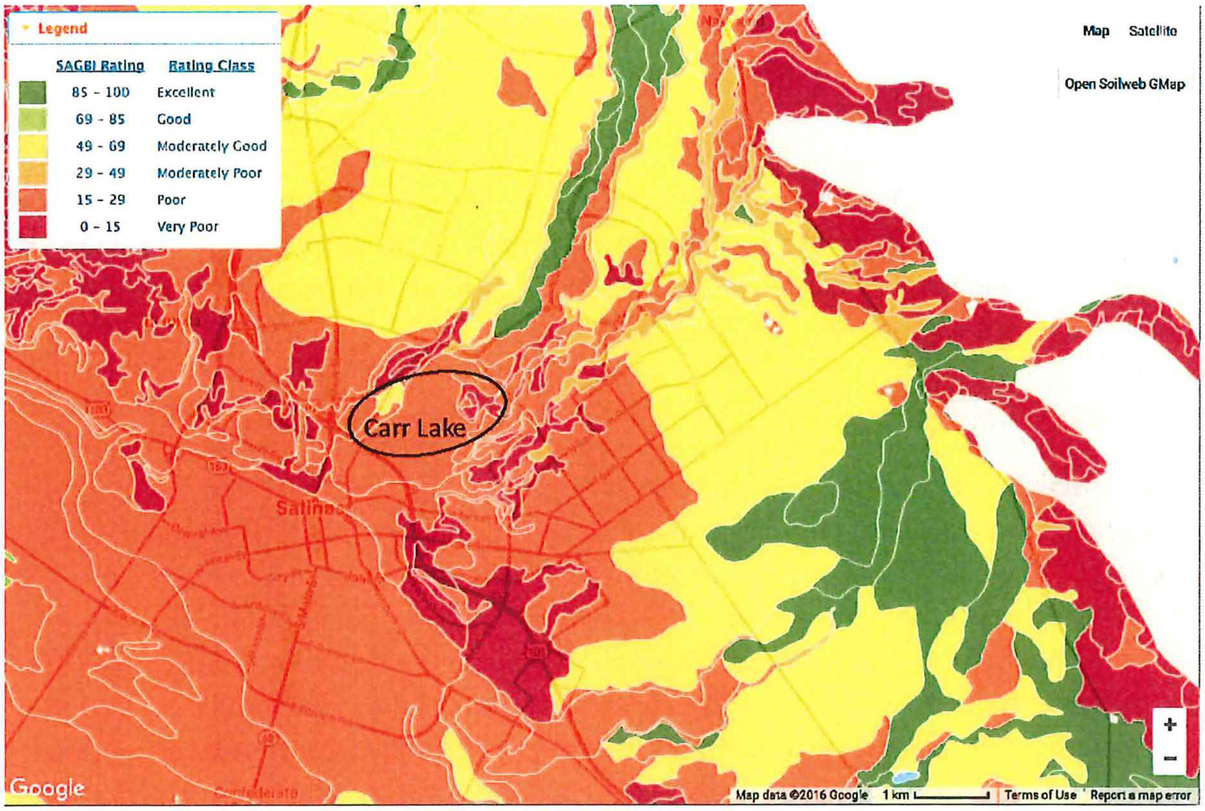

Figure 2-26 The Soil Agricultural Groundwater Banking Index (SAGBI). Based on five major factors critical to successful agricultural groundwater banking: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. Source: Online interactive map at https://casoilresource.lawr.ucdavis.edu/sagbi/.

At Carr Lake, however, groundwater recharge potential ranges mostly from poor to very poor in and around the lakebed (O'Geen and others, 2015; **Figure 2-26**). Infiltration tests on the Constitution Soccer fields north and east of East Laurel Drive characterized rates as poor with an average of 0.25 inches/hour primarily attributed to high fines content of the soils (HKA, 2013). A small area at the western extent of the lakebed near the intersection of Natividad Road and Sherwood Drive is identified as moderately good recharge capability. This area may include the highest elevation portions of the BSLT property. Slowing runoff processes in part by reconfiguring portions of the Carr Lake lakebed could increase the amount of water that may percolate into the local groundwater aquifer, but this potential would require further study. In some years, a portion of the agricultural fields adjacent to the Natividad Creek flowline in the lakebed remain waterlogged and therefore are not planted; this condition may be due to a combination of locally shallow groundwater and/or land subsidence as a result of breakdown in the peaty soils in this area and would therefore not be consistent with enhanced infiltration.

2.14 Existing Habitat

Gabilan Creek is listed as critical steelhead trout (*Oncorhynchus mykiss)* habitat, has a definite run or population of steelhead and has evidence of regular reproduction in the last ten years (as of 2008) (NOAA, 2004; Becker and Reining, 2008). The existing ditched channels provide little habitat due to limited vegetation, channel variation, substrate, and temperatures.

2.15 Summary of Existing Conditions

Following our discussion of existing conditions, we present a summary of existing conditions which have degraded or otherwise impaired the desired function of the project area in **Table 2-4**.

Table 2-4 Summary of existing conditions and restoration objectives for Big Sur Land Trust property in Carr Lake.

	Existing Condition	Cause	Effect	Restoration Objective
Geomorphology (Channel Form)	Straightened agricultural ditches	Modification for drainage and agriculture	No riparian vegetation and minimal habitat; minimal flood capacity	Restore geomorphic floodplain and wetland dynamics and habitat, similar to the historical ecologic conditions
Flooding	Limited flood storage capacity	Limitations on Carr Lake outlet configuration and Reclamation Ditch capacity	Frequent and prolonged inundation of existing infrastructure	Enhance, or maintain, off-channel flood storage capacity
Water Quality	Watershed land use	Agricultural runoff and trash accumulation	Poor water quality	Retain and slow flows in Carr Lake to promote settling and infiltration of contaminants
Groundwater	Declining regional water table	Base flows routed efficiently through ditches; groundwater pumping	Groundwater recharge limited to large and long-duration inundation events	Retain flows for potential infiltration

3 CARR LAKE RESTORATION DESIGN

The restoration design is based on input from a robust community engagement process involving stakeholders and community groups, as well as an analysis of historical conditions and includes design elements to achieve the project objectives. The 30% design and the proposed restoration elements are shown in **Figure 3-1** (see also attached 30% design documents). The location of the project within an urban area and the nature of the project being a community park requires a balance of restoration elements that are also conducive to public safety and amenity enhancement. It is also necessary to identify project opportunities and constraints to help evaluate feasibility and guide the final design of restoration elements presented below.

Figure 3-1 Proposed restoration project (30% design) on the Big Sur Land Trust property in Carr Lake.

3.1 Design Opportunities

We find it helpful to identify site opportunities where design elements may serve multiple objectives or facilitate restoration of stream functions. Based on our assessment, we have identified the following opportunities:

1. Open Space

   The BSLT property is 73.1 acres of open space with minimal infrastructure. The amount of space available allows for dynamic channel and wetland restoration similar to historical ecological conditions.

2. High Ground

   The approximately 6.5 acres that are located outside of the floodway (while still located on the project property), provide an opportunity to install infrastructure for a more traditional park for the community.

3. Multiple Waterways

   There are two existing channels that run through the BSLT property, which increases the capacity for channel restoration. There could be an additional benefit to lower Natividad Creek, which borders the BSLT property, particularly when the channel is backwatered.

4. Cooperation with Adjacent Landowners

   The BSLT has a positive relationship with the adjacent property owners, who continue to farm portions of Carr Lake. On-going communication with these property owners will be a critical component of a successful project.

5. Public Education and Access

   The location of Carr Lake in the center of Salinas provides a unique opportunity to create a nature-based open space park. The proximal location will allow for the community to easily access more natural environments and provide an opportunity for continued environmental education as well as a space for community gathering.

6. Public Engagement

   With the assistance of the BSLT and community partners, the design process has included several public meetings which have engaged the local community, highlighting the community's enthusiasm for the proposed open space and restoration elements.

7. Ease of Construction Access

   The project is proximate to roads and trails and would allow for relatively easy access.

8. Improve Water Quality

   Gabilan Creek is listed as a 303(d) impaired stream. Reduction of the pollutants within Carr Lake prior to discharge downstream will provide improved water quality downstream in the Tembladero Slough for waters that are not diverted and recycled. Carr Lake historically functioned as a retention zone via ponding and as wetlands prior to being modified and farmed, so any efforts that could slow flows through Carr Lake would likely allow for increased nutrient and sediment retention, with associated benefits to Carr Lake and downstream areas.

9. Improve Habitat

   The proposed project has the potential to restore complex ecological habitat to an area that has been largely devoid of habitat while being farmed over the past century.

10. Climate Change Benefits

    The proposed project has the potential to provide climate change benefits by increasing wetland, riparian, and upland restoration areas. Given the uncertainty of climate change the proposed project is designed to be adaptive to changing conditions, such as creating sediment management areas to manage sediment deposition that occurs as a result of changing flow conditions.

3.2 Design Constraints

Identification of site-specific constraints is a critical step to help establish restoration feasibility and a basis for design. Based on available background information described above, site assessment, and conversations with stakeholders, we have identified the following site constraints. The designs attempt to incorporate elements that avoid, minimize, or mitigate these constraints, but it should be noted that not all constraints can be avoided.

1. Hydrology

   The restoration design must account for the full range of flood flows. Carr Lake provides important flood capacity and detention for the City of Salinas and the lower valley to Castroville. Proposed in-channel or restoration features should not increase flood elevations, locally or regionally.

   Monterey County Water Resource Agency (MCWRA) and Monterey OneWater have an existing water right downstream of Carr Lake on the Reclamation Ditch. This water right is 600 ac-ft for each agency (1,200 ac-ft total). The proposed project should not impact this downstream water right.

2. Geomorphology

   The project is located in an active and historical seasonal lake and marsh system, part of the historical Salinas River floodplain system, and proposes to restore active tributary channel dynamics in many locations. Erosion, aggradation and channel migration are natural processes in this environment. Sediment deposition will occur in constructed depressions, such as the treatment wetland and the seasonal wetland. Currently, MCWRA maintains the existing Hospital and Gabilan Creeks by regularly removing sediment from the channels. The proposed design will similarly require on-going maintenance or advance planning to manage sediment deposition.

3. Soils

   The soil type and associated infiltration rate will impact the hydroperiod of the seasonal wetland. Additionally, the soil type will also determine the potential for groundwater infiltration and recharge at the project site.

4. Existing Channel Elevations

   The existing Hospital and Gabilan Creeks were dredged in the early 1900's to drain Carr Lake to create land that was suitable for agriculture. Due to the location of the BSLT property within Carr Lake, and infrastructure such as culverts upstream and downstream of the proposed project, the proposed creek alignments must meet the existing channel bed elevations both upstream and downstream of the project site. As a result, the existing ditches and therefore the proposed channels are at a lower elevation than they would have been during historical conditions when there may not have been well defined channels within Carr Lake.

5. Fish Passage

   Gabilan Creek is listed as critical steelhead (*Onchorhychus mykiss)* habitat (NOAA, 2004). As such, the proposed project should not impair fish passage through the project reach.

6. Property Ownership

   The adjacent landowners continue to actively farm the neighboring fields. The location of project features were confined to the property owned by BSLT and proposed restoration must consider any potential impact to the adjacent fields. For example, the adjacent fields drain to the existing Hospital and Gabilan Creeks. In addition to surface runoff there are also existing tile drains from these fields. Further, the proposed restoration also cannot negatively impact the flood duration and inundation on the adjacent fields.

7. Public Safety

   The restoration project will be part of a nature-based community park. As such, the design should consider elements of public safety, such as steep slopes, dense vegetation, and potential interpretive and educational opportunities.

8. Earthwork Balance

   Due to the nature of the proposed project, there will be more excavated material than fill throughout the project site during construction. The off-haul or placement of excavated material will be considered within the project design.

9. Road Alignment

   The 2002 Salinas General Plan includes a concept for a proposed arterial road through Carr Lake. The potential development and location of this road could impact the proposed project.

10. Site Maintenance

    On-going site maintenance is a component of restoration projects, particularly those that are accessible to the public. Required maintenance can vary depending upon the project scope and should be considered in the project design.

11. Phasing

    Project costs and other logistical constraints may require the project to be implemented in phases.

3.3 Design Elements

3.3.1 Gabilan Creek (Dynamic Multi-Thread Channel)

Historically, Gabilan Creek was a dispersed stream network within Carr Lake. In recognition of the historical conditions, Gabilan Creek is proposed to be a dynamic, multi-thread stream, which will flow across an inset floodplain. The bottom elevation of the channel was set to match the existing elevations of Gabilan Creek and Natividad Creek upstream and downstream, respectively, of the proposed project reach. The inset floodplain is designed to create a corridor within which Gabilan Creek can easily inundate and, if necessary, migrate through over time. The elevation of the inset floodplain is designed to be inundated by flows every one to two years (Q1.5; see **Table** 2-2). To further encourage floodplain inundation and channel migration, some of the channel threads will be discontinuous or dissipate into multiple distributary channels. A distributary channel branches off the main channel into smaller channels, where water ultimately disperses and no longer flows through a defined channel. The distributary channels allow water to more easily access and spread throughout the inset floodplain, which will encourage channel migration and the formation of new channels. This dynamic stream will create a riparian corridor, ultimately creating and enhancing fish and wildlife habitat.

We anticipate that sediment dynamics in the multi-threaded channel network will evolve in response to hydrologic and sediment inputs from upstream. During very large storm events which inundate the majority of the Carr Lake area, we expect suspended sediment to settle out over the entirety of the proposed Gabilan Creek channel system during backwatered hydraulic conditions, when flows are likely not high enough to transport bedload. As flows recede and can be effectively conveyed out of Carr Lake, we expect velocities to increase, thereby allowing the multi-thread network to maintain self-cleaning low flow channels which may migrate and avulse within the floodplain area in response to sediment deposition patterns or vegetation growth.

3.3.2 HOSPITAL CREEK (FRESHWATER MARSH)

Hospital Creek is designed to be similar to a freshwater marsh ecosystem, where water moves slowly through the system. To further increase the residence time of water in the project reach, backwater channels were incorporated into the design. An increased residence time will allow water to infiltrate into the soil and give plants time to naturally filter water, which will aid in further improving the water quality of this highly-urban watershed. At the mouth of the channel, flow will disperse across a delta as it enters into the seasonal wetland.

3.3.3 TREATMENT WETLAND (INCLUDING TRASH CAPTURE)

Treatment Wetland

A treatment wetland water quality feature is included in the design at the upstream end of the restored Hospital Creek reach of the project area. Treatment wetlands are typically in-stream constructed basins that have two permanent pools, separated by a vegetated high-marsh area (see **Figure 3-2**) and typically have the ability to function over a range of storm frequencies (CASQA, 2003).

Using these elements, treatment wetlands are designed to mimic the natural infiltration, nutrient cycling, habitat, and a myriad of other important ecological functions provided by natural wetlands (EPA, 2018b). Specifically, they are designed to remove pollutants and improve water quality from stormwater runoff flows. Pollutant removal in treatment wetlands occurs from many processes, including microbial and chemical decomposition, volatilization, sedimentation, sorption, photodegradation, plant update, and vertical diffusion in soils and sediments (Kadlec and Wallace, 2009). Treatment performance is a function of wetland to watershed ratio, wetland treatment design, area hydrology, hydraulic residence time[17], and source pollutants.

Having a lower design flow rate can result in longer hydraulic residence time, which is preferred particularly at the start of a rainy season, since the "first flush" volume of stormwater runoff will generally contain the highest concentrations of pollutants. The design of the treatment wetland considers both non-stormwater urban flows and first flush

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[17] Residence time is a term used to describe the amount of time that a pollutant spends traveling through a delineated flow path.

principles. Typical hydraulic residence times and associated treatment performance of stormwater wetlands are shown in **Table 3-1**.

Table 3-1 Pollutant removal through treatment wetlands. Source: [1] Kadlec and Wallace (2009), and [2] CWP (2007).

Wetland Removal based on Hydraulic Loading Rate			
Constituent	Wetland HLR [1] *(cm/day)*	Pollutant Reduction Median [1] *(%)*	[2] *(%)*
TSS	7.1	68	72
Total Phosphorous	5.6	41	48
Sol Phosphorous	--	--	25
Total Nitrogen	--	30	24
Nitrogen Compound	--	--	67
Copper	5.2	49	47
Lead	5.2	74	42
Zinc	5.2	60	--
Bacteria	--	--	78

HLR: Hydraulic Loading Rate - is a means of nominalized treatment wetlands, by cacluating the design flow divided by the area of the wetland.

The Carr Lake Project is an ideal location for incorporation of a treatment wetland, with significant potential to restore natural water quality treatment functions while still mimicking the natural environment and providing aesthetic value. In addition to providing water quality benefits, constructed treatment wetlands can also provide habitat, and detention (to attenuate peak runoff rates) for a range of storm events.

The proposed treatment wetland, which is located at the upstream end of the restored Hospital Creek portion of the project, has a total footprint of approximately 1 acre, and specific design aspects where water first moves into a forebay (ponded area) then shallowly flows through a vegetated high marsh, then into an afterbay (second deeper ponded area), and ultimately outfalls into Hospital Creek. The different elements associated with this design provide topographic complexity which encourages settling and plant diversity. The forebay is a small pond that is used to remove coarse sediment, and the afterbay is typically a permanent pool with the purpose of treating the water quality volume. Road access and ramps will be incorporated into the design for facilitation of routine maintenance activities.

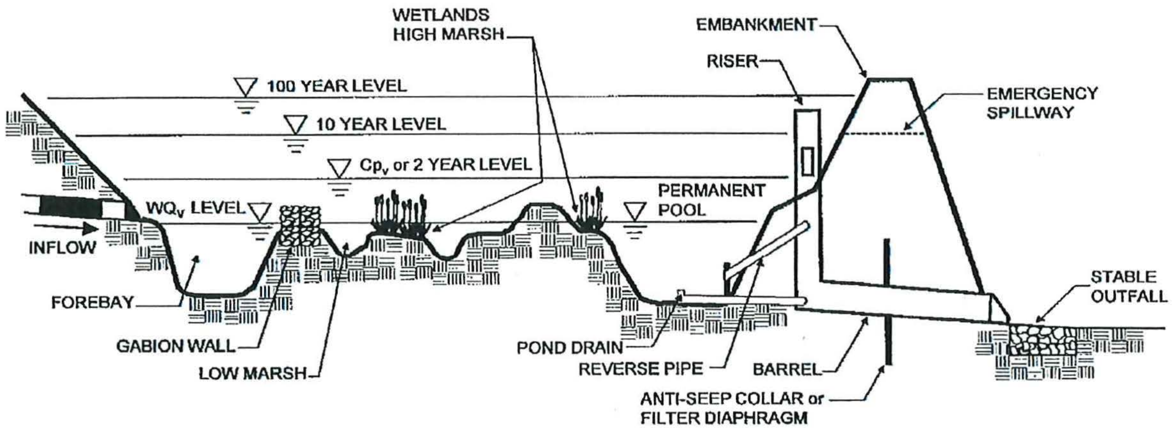

Figure 3-2 Conceptual profile of treatment wetland design. Source: CASQA (2003).

Trash Capture

A trash capture structure will be installed in the treatment wetland forebay and is designed to catch debris that is delivered to the project area from the upstream urban watershed of Hospital Creek. This location was chosen so that a substantial amount of the trash in Hospital Creek is captured prior to entering the restored portion of Hospital Creek, and to concentrate the collected trash to one easily accessible location for ease of maintenance.

The following criteria/parameters will be considered during future iterations of the trash capture design:

1. Sized to treat at least the peak flowrate resulting from a one-year, one-hour design storm;
2. Cannot bypass trash below the design storm under maximum operational loading conditions; and
3. Traps all particles that are 5 mm or greater up to the design flow.

The final design of the proposed engineered trash capture system will be determined in future design iterations, but it will likely be a rack, net or box collection system that would pick up trash suspended or floating in the water column. A boom element may also be considered. As mentioned above, in-stream trash capture devices require some continued maintenance to function properly, but the chosen location should provide an efficient location for required maintenance.

3.3.4 Seasonal Wetland

A seasonal wetland is designed at the end of the Hospital Creek system and will receive water from the upstream freshwater marsh ecosystem. The seasonal wetland mimics the historical conditions of Carr Lake, which had variable extents of open water dependent upon seasonal rainfall patterns. The design of the size and placement of the seasonal wetland considered two primary questions:

1. Hydrologic sufficiency – Is the size of the seasonal wetland appropriate to maintain ponding (open water) past the rainy season?
2. Sediment deposition – What ongoing maintenance can be expected to preserve storage capacity and hydrologic function?

To answer the first question, we leveraged a hydrologic water balance model previously developed by Balance to evaluate the hydroperiod of pond and wetland resources, called Pond-IT (Pond Inundation and Timing). This model uses publicly available historical and projected climate datasets to evaluate the range of wetland inundation (or hydroperiod) over a range of hydrologic conditions, including, but not limited to dry, average, or wet years, and over decades of projected climate changes.

The hydroperiod of the seasonal wetland will depend on the balance of hydrologic inputs (rainfall, watershed runoff, groundwater) and outputs (infiltration, evapotranspiration). The proposed seasonal wetland would provide 28.8 acre-feet of storage. Total annual runoff in Hospital Creek exceeded 28.8 acre-feet in either December or January for every year in the period of hydrologic analysis (1989 – 2008). We expect the hydroperiod of the seasonal wetland will be highly dependent on the amount of infiltration into the historic lakebed sediments. Lakebed sediments typically have relatively low infiltration rates, but these low rates may represent significant volumetric losses of ponded water over the dry season, resulting in a wetland which dries each summer. Further, infiltration may evolve over time; post-construction infiltration may be higher after the ground surface is mechanically graded and compacted, but over time fine sediment will likely accumulate on the wetland bottom, slowing infiltration. Infiltration testing of the proposed wetland area is currently underway and will be incorporated into future iterations of the seasonal wetland design.

To address sediment deposition concerns, we propose the construction of the seasonal wetland on Hospital Creek, which has a significantly lower suspended sediment supply compared to Gabilan Creek (**Section 2.9**). We also propose that the seasonal wetland be constructed on Hospital Creek downstream of the proposed treatment wetland, which will markedly reduce sediment accumulation in the seasonal wetland. We will complete a settling basin analysis for the treatment wetland to quantify the rate of sediment deposition. The results of this analysis will be incorporated into future design iterations. Placement of the seasonal wetland on Hospital Creek will also maintain channel transport processes and fish passage on Gabilan Creek. Overflow of the seasonal wetland during moderate storm events will be into Gabilan Creek, which will ultimately drain to the Ditch, just downstream of the confluence with Natividad Creek at the end of the project reach.

As noted above, Carr Lake provides flood storage upstream of the Reclamation Ditch during large storms. We have historically observed mixing of suspended sediment supply over the whole Carr Lake area. As a result, sedimentation rates in the seasonal wetland may also be a function of the number and frequency of large storm events which may transport suspended sediment supplied from the entirety of Carr Lake.

Lastly, the constructed side slopes of the seasonal wetland will be gradual to minimize fall risk when the wetland is dry.

3.3.5 Existing Drainage Ditches (For Agricultural Runoff)

To provide drainage for the runoff from the adjacent agricultural fields (that are not on the project property), the existing Hospital and Gabilan Creeks will remain in their current alignment to drain agricultural runoff.

The ditches will be separated from the enhanced stream channels by berms at the upstream end. Downstream of the berms, water will be directed to the existing ditches through surface runoff and through existing tile drains from the adjacent fields. Water will then flow in the ditches towards the confluence of the Hospital and Gabilan ditches, and ultimately to the seasonal wetland which will provide additional water quality improvements to the agricultural runoff.

Leaving these drainage ditches in place will provide an outlet for the agricultural runoff, and the downstream seasonal wetland will provide additional filtration for agricultural runoff and will aid in improving the water quality.

3.4 Flooding Considerations

To understand the potential flood impacts of the proposed project, we completed a hydraulic modeling analysis of the existing and proposed conditions. Here we include a brief summary of the modeling results. A more detailed description of the hydraulic modeling can be found in **Appendix A.**

3.4.1 Existing Conditions Results

Modeled estimates of maximum water surface elevations in Carr Lake are 43.2 and 47.4 feet during the 10- and 100-year flood events as shown on the stage hydrographs included as

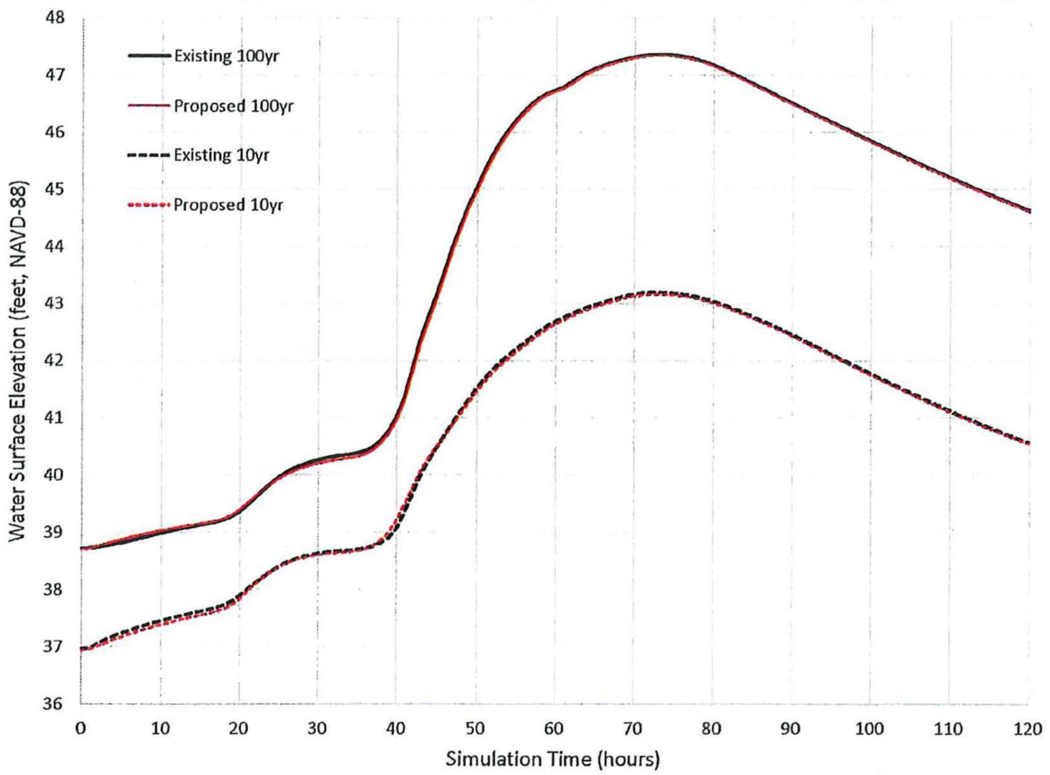

Figure 3-3. Peak flow rates discharged from Carr Lake are estimated as 680 and 1,350 cfs for the 10- and 100-year flood events as shown on the hydrographs included as

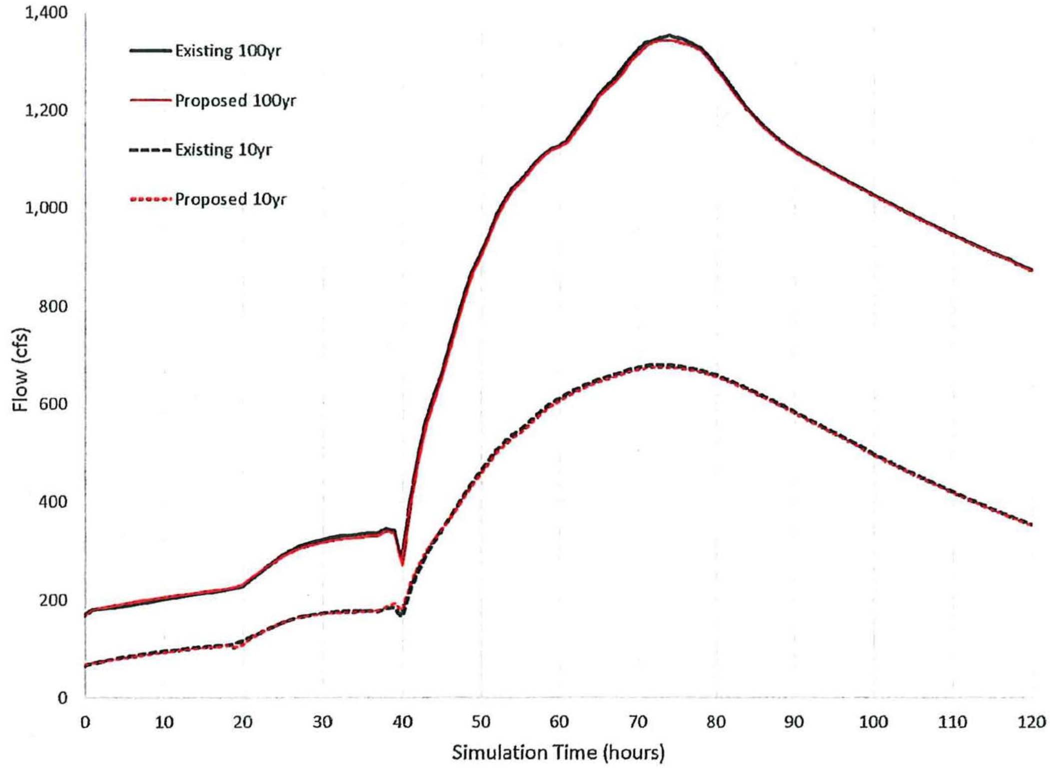

Figure 3-4. Spatial plots of existing conditions maximum flood depths and water surface elevations are in **Appendix A**. These values compare to a currently-effective flood elevations of 42.8 and 46.6 feet for the 10- and 100-year events.

3.4.2 Proposed Conditions Results

Proposed Conditions Results

Maximum water surface elevations within Carr Lake are modeled to be 0.02 feet lower during both the 10- and 100-year floods as a result of the proposed project as shown on

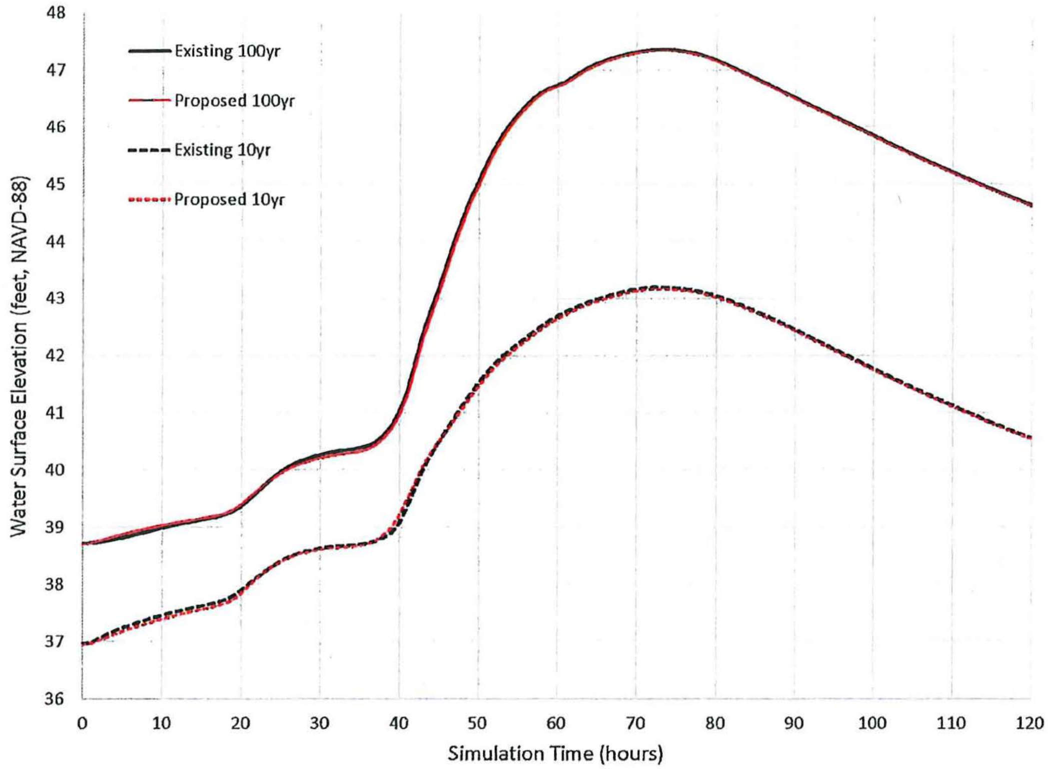

Figure 3-3. Peak flow rates discharged from Carr Lake are modeled to be 4 and 10 cfs lower for the 10- and 100-year floods as a result of the proposed project as shown on

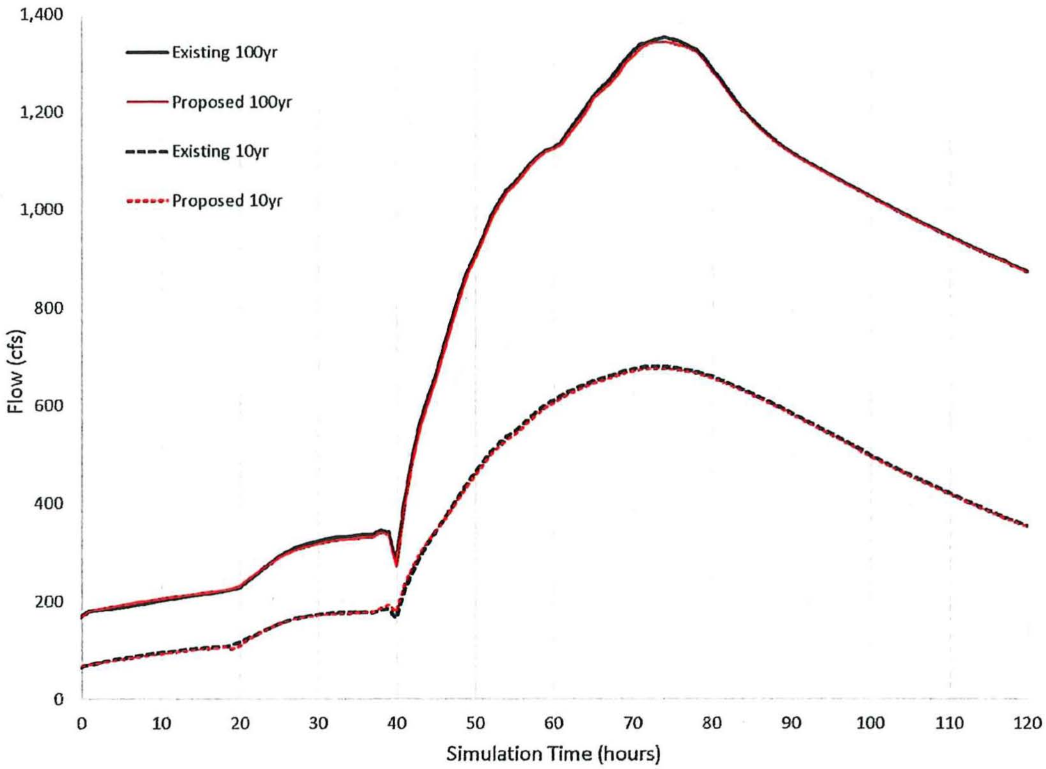

Figure 3-4. Spatial plots of proposed conditions maximum flood depths and water surface elevations are included in **Appendix A.**

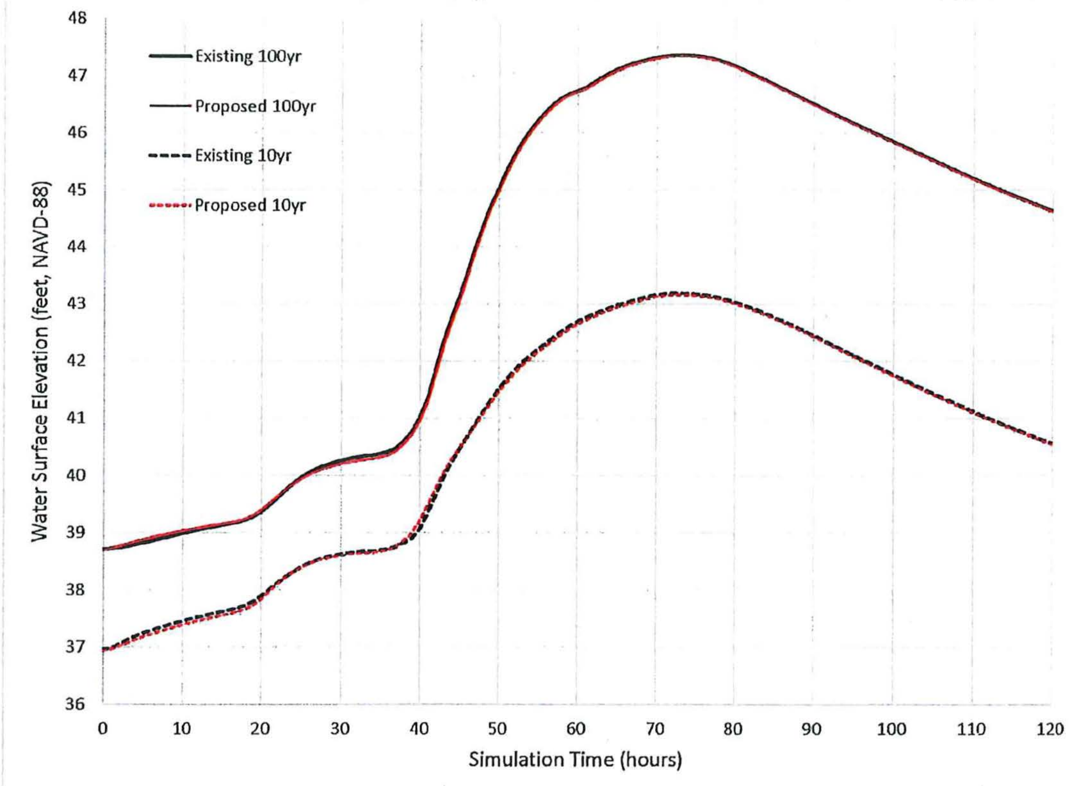

Figure 3-3 Modeled stage hydrographs at the confluence of the tributaries within Carr Lake.

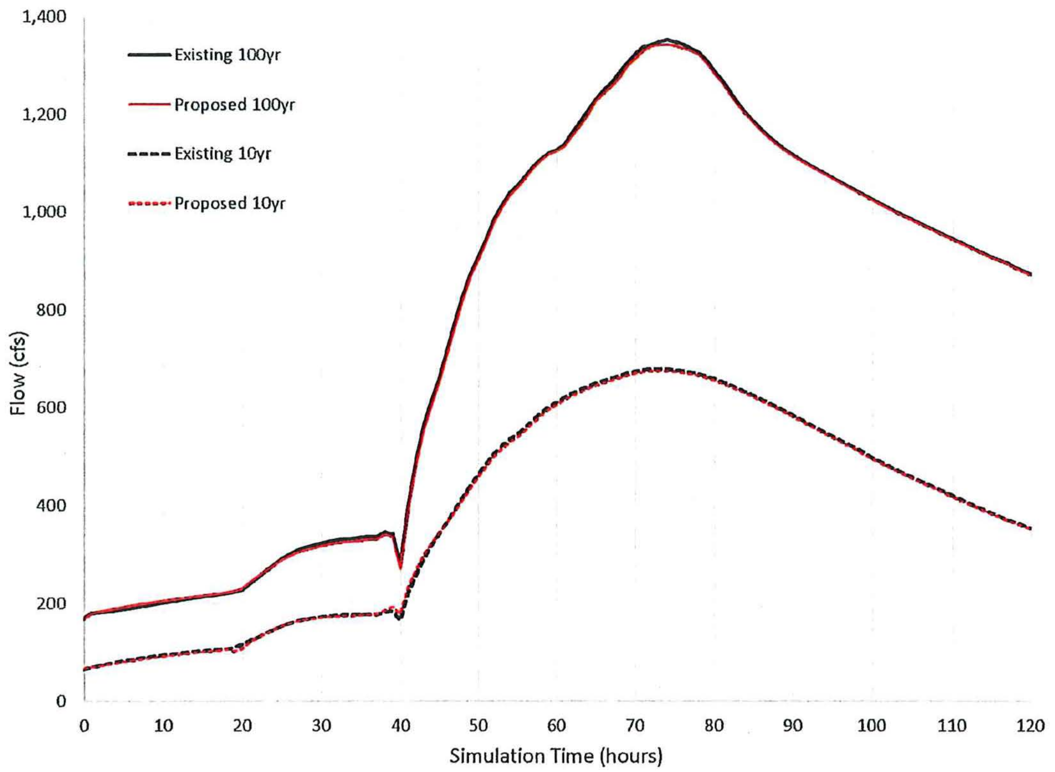

Figure 3-4 Modeled flow hydrographs at the Main Street crossing.

3.5 On-going Maintenance

Project maintenance will be an important element of the proposed project design and implementation. For the project to function as intended, we foresee a moderate amount of required on-going maintenance.

- Sediment removal: Sediment will need to be removed from the treatment wetland and from the seasonal wetland as sediment accumulates within these deeper ponded bodies of water. The recurrence interval of this maintenance will be further determined by our on-going sediment analyses (See **Section 4.**)
- Vegetation clearing: For safety reasons, it may be advantageous to occasionally thin willows and remove dense vegetation to increase visibility at the site. Vegetation maintenance will also be important for mosquito abatement purposes.

4 NEXT STEPS

The following analysis are on-going and will be completed as part of the 50% design:

- Sediment basin settling analysis

  We will conduct a sediment basin settling analysis to evaluate how much sediment will likely be deposited in the treatment wetland and the seasonal wetland during different water year types. This information will help inform how frequently maintenance and sediment removal may need to occur on these features.

- Updates to pond modeling

  We will create a model to evaluate the potential hydroperiod of the seasonal wetland, which will include climate change considerations.

- Stormwater feature sizing and optimization

  In future design phases, we will finalize the sizing and optimization of the stormwater features including the treatment wetland (and the associated outlet structure), and the trash capture structure.

- Updates to the flood modeling with design revisions

  We will update the flood model and evaluate the results based on the updates and revisions to the design during the 50% design process.

5 LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice in surface water and groundwater hydrology existing in Central Coast California for projects of similar scale at the time the investigations were performed. No other warranties, expressed or implied, are made.

As is customary, we note that readers should recognize that interpretation and evaluation of subsurface conditions and physical factors affecting the hydrologic context of any site is a difficult and inexact art. Judgments leading to conclusions and recommendations are generally made with an incomplete knowledge of the conditions present. More extensive or extended studies is anticipated to reduce inherent uncertainties.

We have used standard environmental information such as precipitation, hydrology, topographic mapping, and soil mapping, and work by previous investigators in our, in conformance with local custom. New information or changes in regulatory guidance could influence the plans or recommendations, perhaps fundamentally. As updated information becomes available, the interpretations and recommendations contained in this report may warrant change. To aid in revisions, we ask that reviewers advise us of new plans, conditions, or data of which they are aware.

Concepts, findings and interpretations contained in this report are intended for the exclusive use of BSLT under the conditions presently prevailing except where noted otherwise. Their use beyond the boundaries of the site could lead to environmental or structural damage, and/or to noncompliance with water-quality policies, regulations or permits.

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APPENDIX A

Carr Lake Restoration Design: Hydraulic Modeling (Existing and Proposed Conditions)

MEMO

To: Rachel Saunders, Big Sur Land Trust

From: Eric Reidner

Date: December 19, 2019

Subject: Carr Lake Restoration Design: Hydraulic Modeling (Existing and Proposed Conditions)

This flood impacts assessment section presents hydraulic modeling developed to assess the existing flood hazard in and around Carr Lake and to provide an estimate of the effects of the proposed project on peak water surface elevations within and flood flow releases from the lake. Included below are summaries of the modeling approach, existing conditions modeling assumptions, existing condition results, proposed conditions modeling assumptions, and proposed conditions results.

Modeling Approach

Modeling developed for this task was derived from the UNET model detailed in the Zone 9 and Reclamation Ditch Drainage System Operations Study, dated May 1999 prepared by Schaaf & Wheeler for the Monterey County Water Resources Agency (MCWRA). The MCWRA UNET model is an unsteady-state one-dimensional hydraulic model that extends across 20 miles of channel within the Reclamation Ditch system from the Pacific Ocean upstream through Carr Lake. Flood hydrographs routed through the UNET model were calculated using a HEC-1 hydrologic model parameterized with a 72-hour design storm rainfall distribution and the Curve Number methodology.

A relatively small subset of the UNET model, from the Reclamation Ditch at Boronda Road upstream to Alisal Creek at John Street, was used for this assessment and updated to run using the HEC-RAS version 5.0.7 hydraulic model. Within Carr Lake and along the upstream tributary channels, one-dimensional channel cross sections were replaced with a two-dimensional grid as shown on the model workmap included as **Figure 1**.

Simulations were completed for both existing and proposed project conditions, and for the 10- and 100-year flood events.

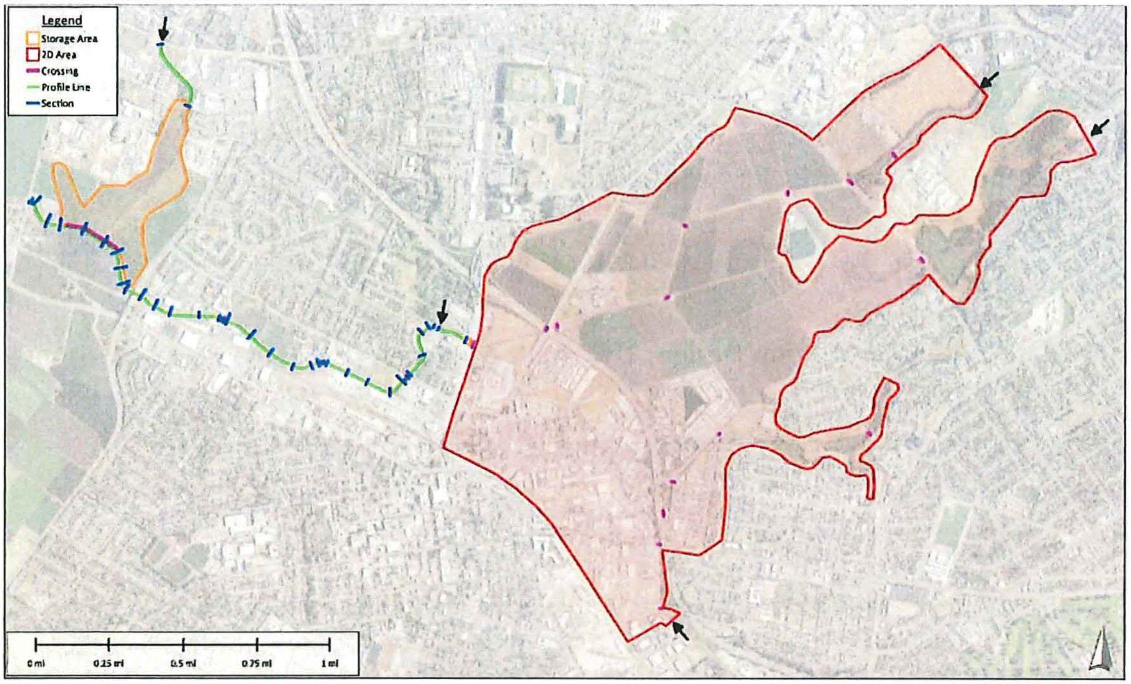


Figure 1 HEC-RAS model work map

Existing Conditions Modeling Assumptions

A number of assumptions were used in the hydraulic model with several of the most important summarized below:

One-dimensional channel cross sections. The model includes 42 cross sections along the Reclamation Ditch between the Boranda Road and Main Street crossings. Cross section parameters were taken from the UNET model, approximately georeferenced, with elevations converted from NGVD-29 to NAVD-88 using a conversion factor of +2.75 feet.

Two-dimensional area. Carr Lake and the upstream tributary channels were defined in the model using a 2D flow area containing over 26,000 cells. Cell sizes vary but are generally 60- by 60-feet within the overbank areas and 15- by 15-feet along the channels. 2D Cells are oriented along the channels and controlling elevation features such as levees and roadways using breaklines. Manning's 'n' values are defined across the 2D flow area by zone with the channel areas set to 0.035 and overbank areas set to 0.05.

The model terrain covered by the 2D area, and shown on **Figure 2**, was developed using topographic mapping across the project site collected by Whitson Engineers in 2019, topographic mapping along Gabilan Creek upstream from East Laurel Drive collected by Whitson Engineers in 2011, spot elevations along the tributaries through Carr Lake collected by Whitson Engineers in 2014, and LiDAR data dated 2010.

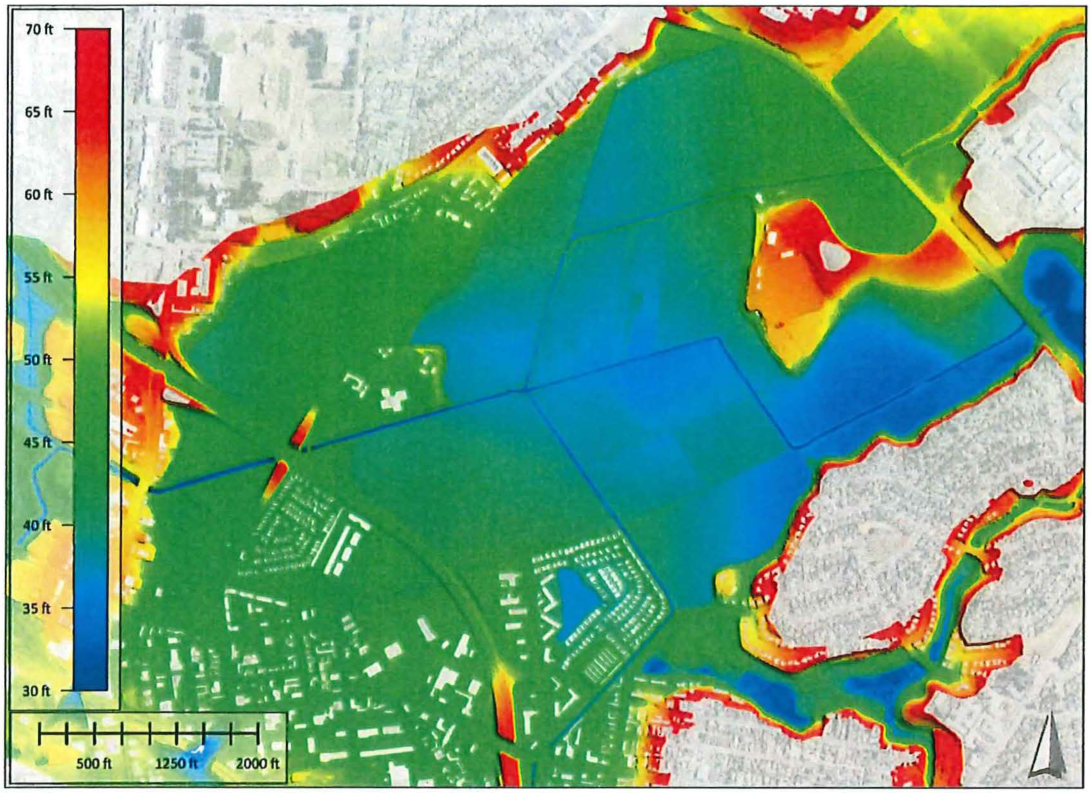


Figure 2 Existing conditions model terrain

Channel crossings. Five channel crossings are included along the one-dimensional reach at Victor Street, Rico Street, West Rossi Street, Main Street, and the connection between the Reclamation Ditch and Markley Swamp storage area. Crossings were parameterized consistent with the UNET model, except at Main St where the invert elevations of the 8- by 8-foot box culverts were lowered 1.17 feet to reflect spot elevation data surveyed by Whitson Engineers. 14 additional channel crossings are included within the 2D flow area and parameterized consistent with the UNET model. Crossings not included in the UNET model were parameterized using best available survey information and field measurements.

Inflow boundary conditions. Inflow hydrographs taken from the 10- and 100-year UNET simulations are applied to the model at the 5 locations highlighted on **Figure 1**. The UNET model includes a combined inflow hydrograph for Gabilan and Natividad Creeks that was portioned by watershed area.

Downstream boundary condition. The outlet boundary condition applied to the downstream most cross section along the one-dimensional channel reach was defined using a rating curve, with the stage-flow relation parameterized from the UNET model output.

Initial conditions. Consistent with the UNET model, initial water levels across Carr Lake are set assuming equilibrium conditions resulting from a constant baseflow.

Existing Conditions Results

Modeled estimates of maximum water surface elevations in Carr Lake are 43.2 and 47.4 feet during the 10- and 100-year flood events as shown on the stage hydrographs included as **Figure 3**. Peak flow rates discharged from Carr Lake are estimated as 680 and 1,350 cfs for the 10- and 100-year flood events as shown on the hydrographs included as **Figure 4**. Spatial plots of existing conditions maximum flood depths and water surface elevations are **included at the end of this report.**

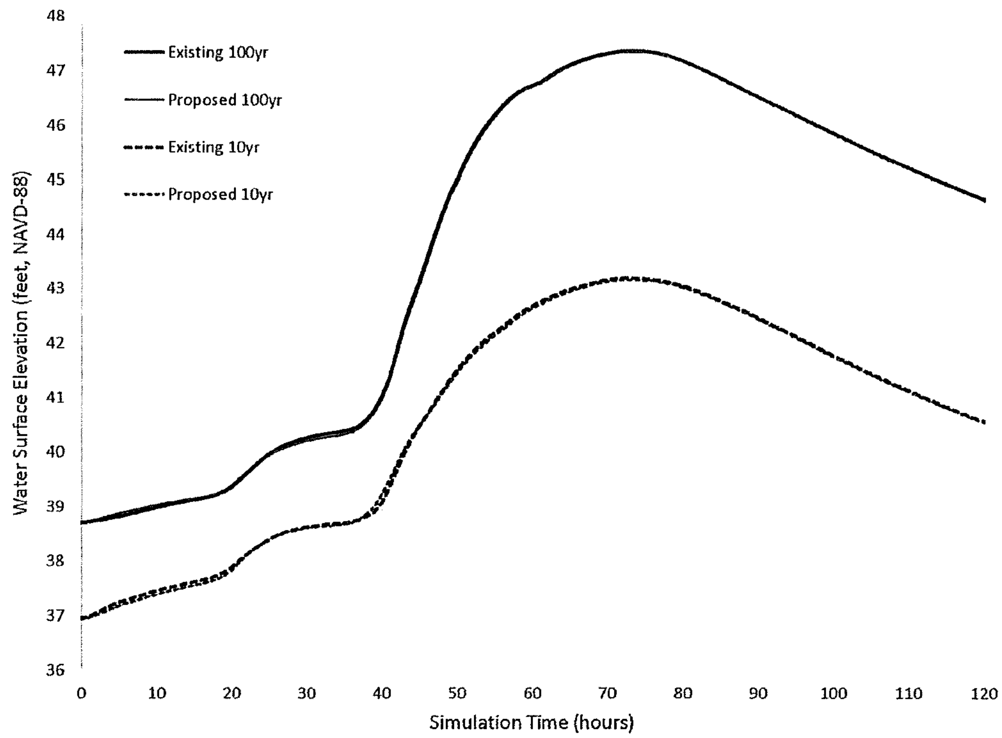


Figure 3 **Modeled stage hydrographs at the confluence of the tributaries within Carr Lake**

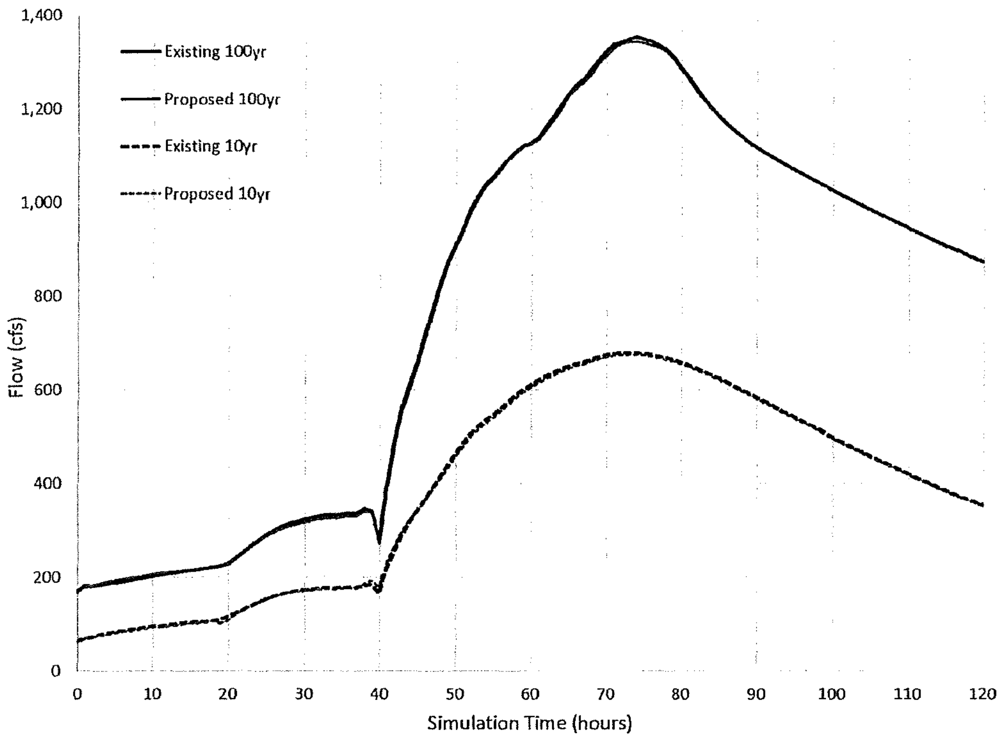


Figure 4 Modeled flow hydrographs at the Main Street Crossing

Proposed Conditions Modeling Assumptions

The proposed project conditions model scenario is identical to the existing conditions scenario with the following exceptions:

Model terrain. The proposed conditions model terrain was updated to reflect the project grading plan shown on the attached **Figure 5.**

Channel crossing. The channel crossing located within the project area was deleted from the model.

Breaklines. Breaklines were updated within the project area to align with the proposed channel and berm locations.

Manning's 'n'. Channel areas parameterized with an 'n' value of 0.035 were updated within the project area to align with the proposed channel locations.

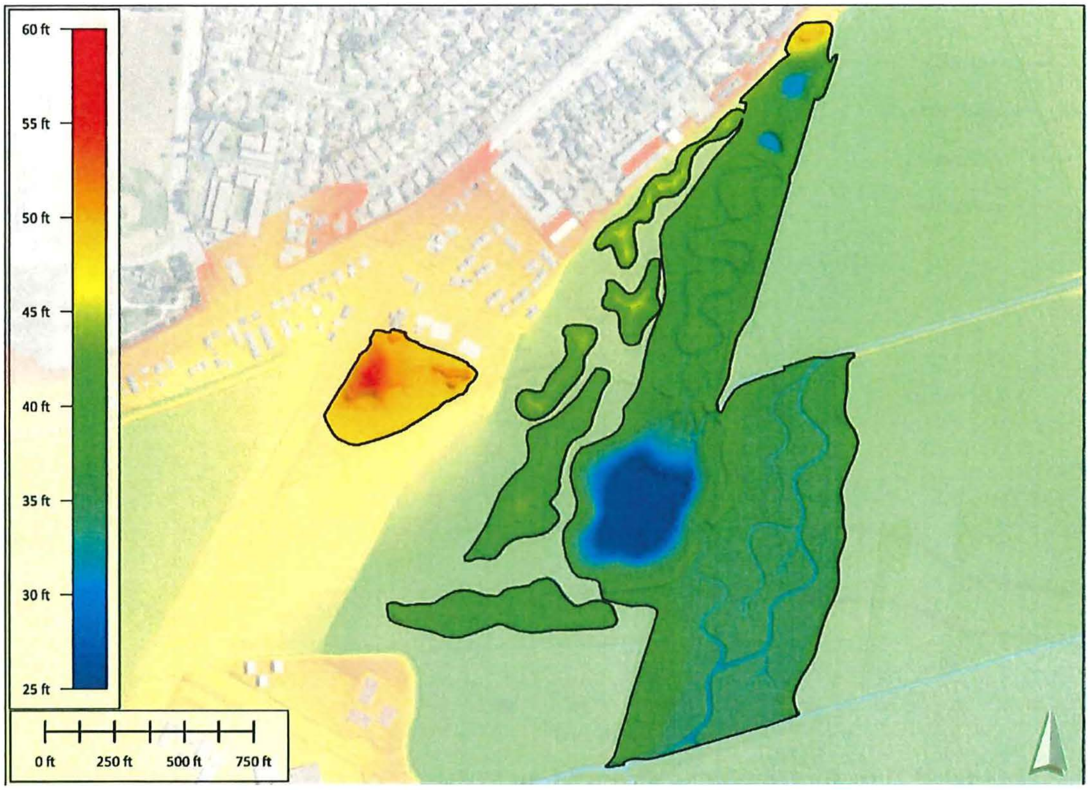
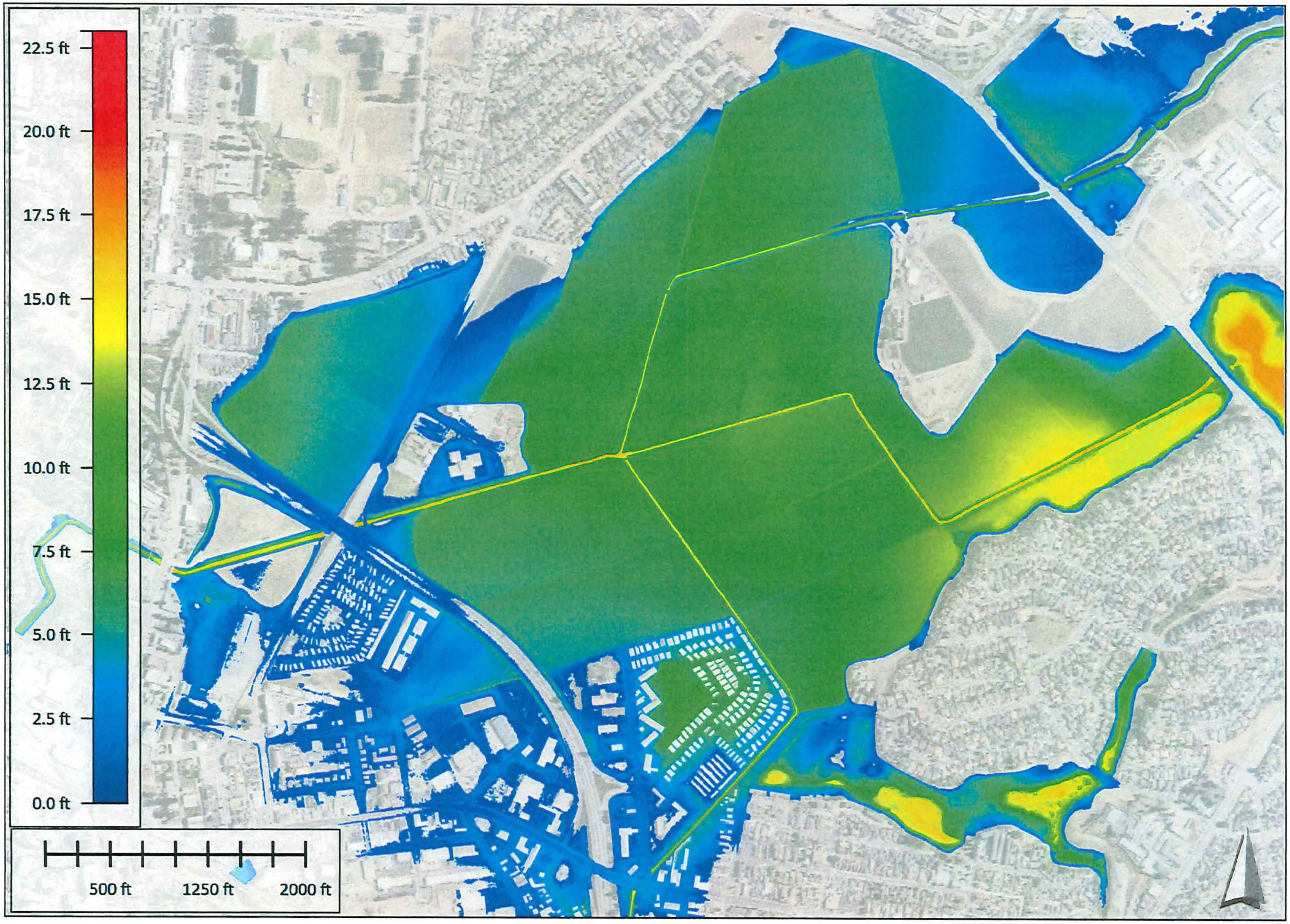


Figure 5 **Project grading plan incorporated into the proposed conditions model terrain**

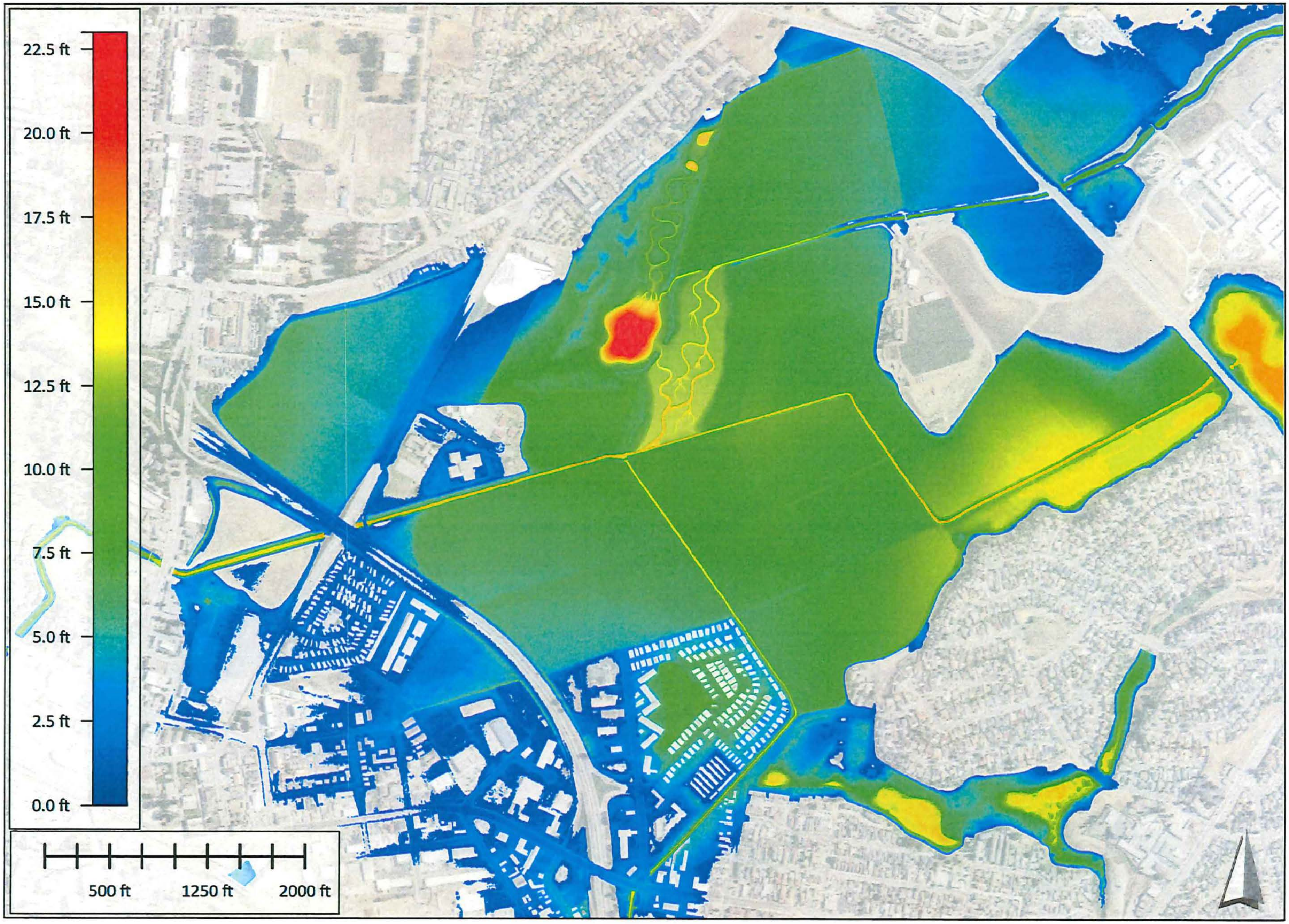
Proposed Conditions Results

Maximum water surface elevations within Carr Lake are modeled to be 0.02 feet lower during both the 10- and 100-year floods as a result of the proposed project as shown on **Figure 3**. Peak flow rates discharged from Carr Lake are modeled to be 4 and 10 cfs lower for the 10- and 100-year floods as a result of the proposed project as shown on **Figure 4**. Spatial plots of proposed conditions maximum flood depths and water surface elevations are included are **included at the end of this report.**

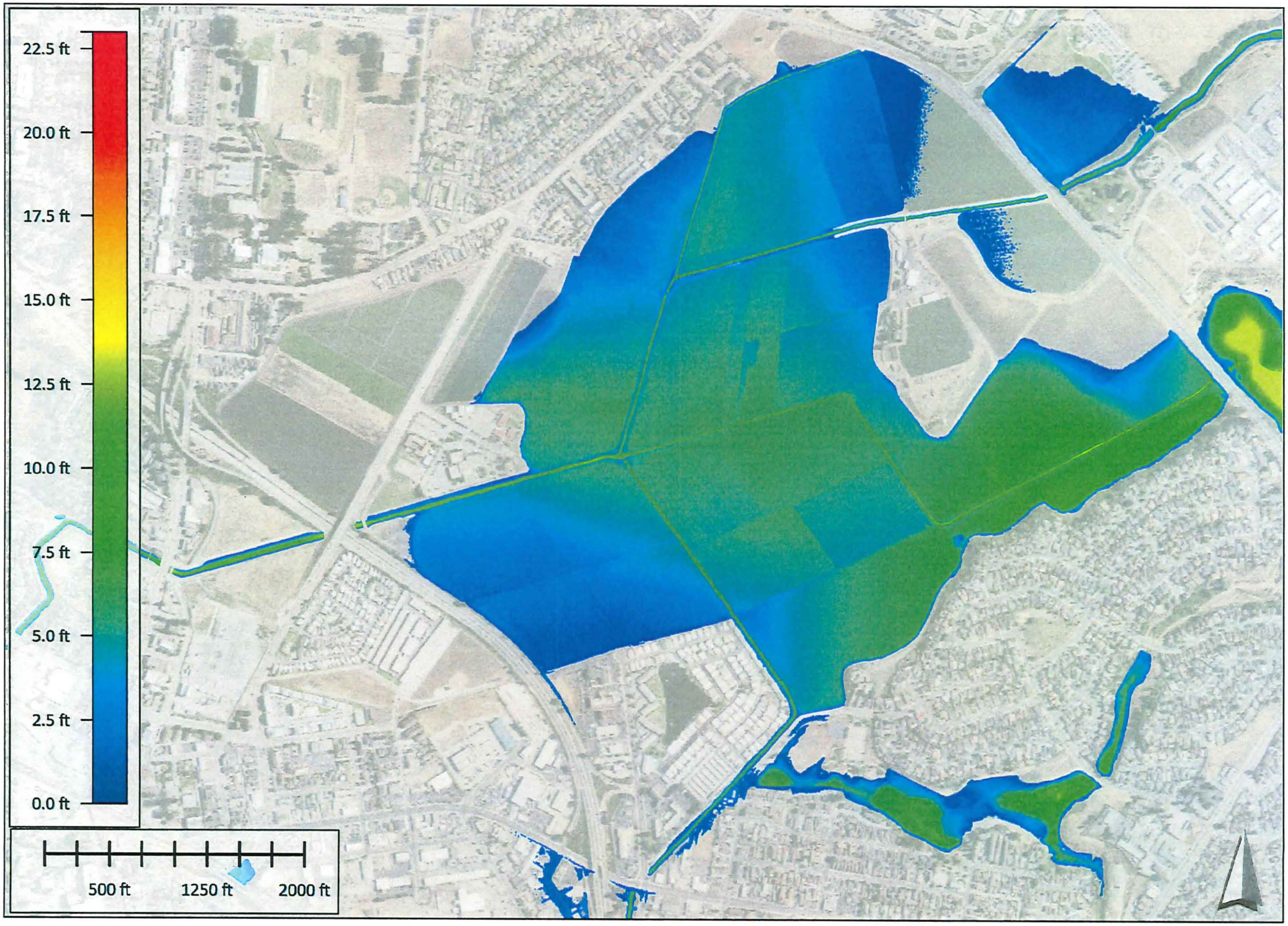
Enclosures: Attachment A – Figures of Existing and Proposed Conditions



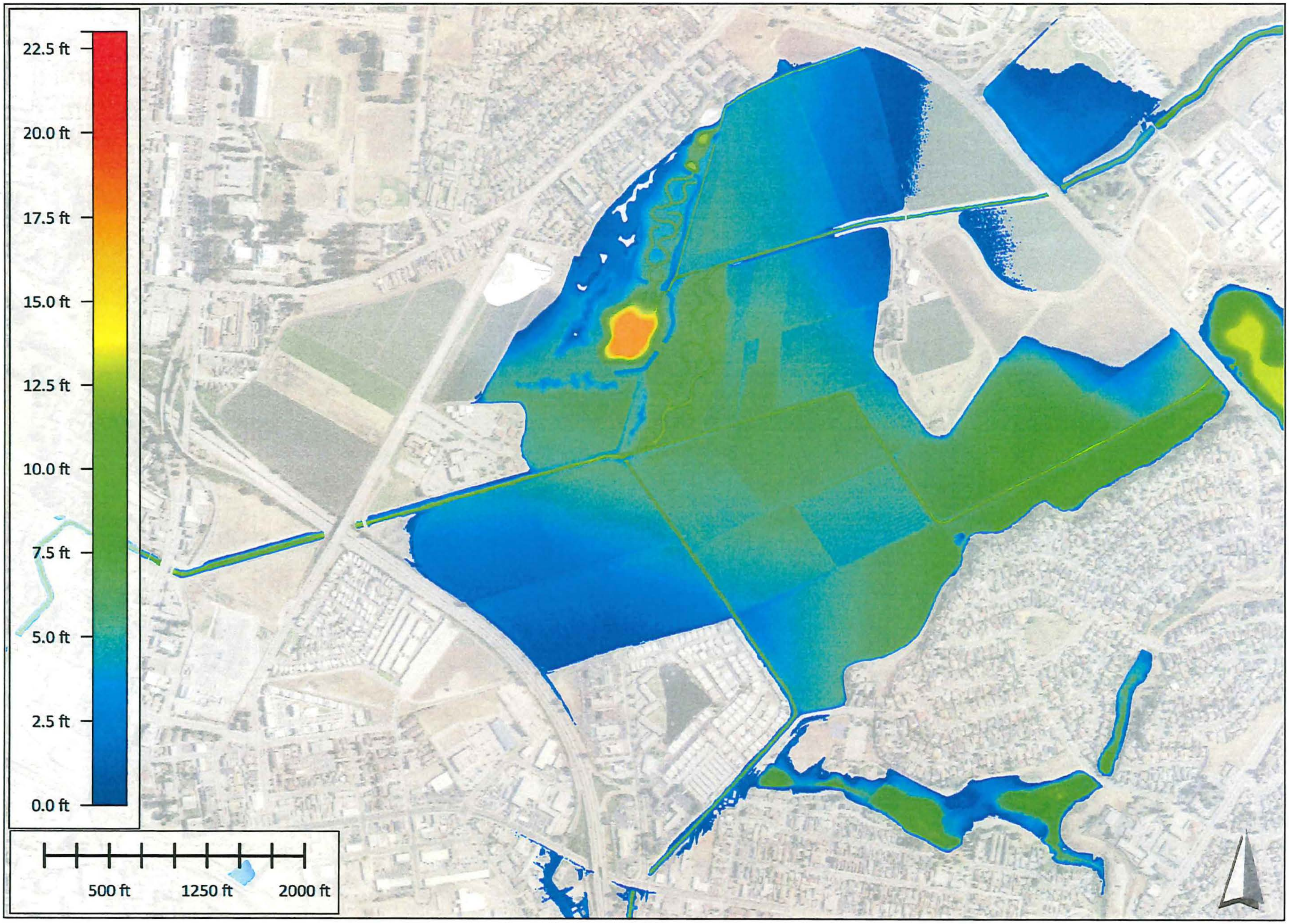
Maximum Flood Depths, Existing Conditions, 100-year Flood



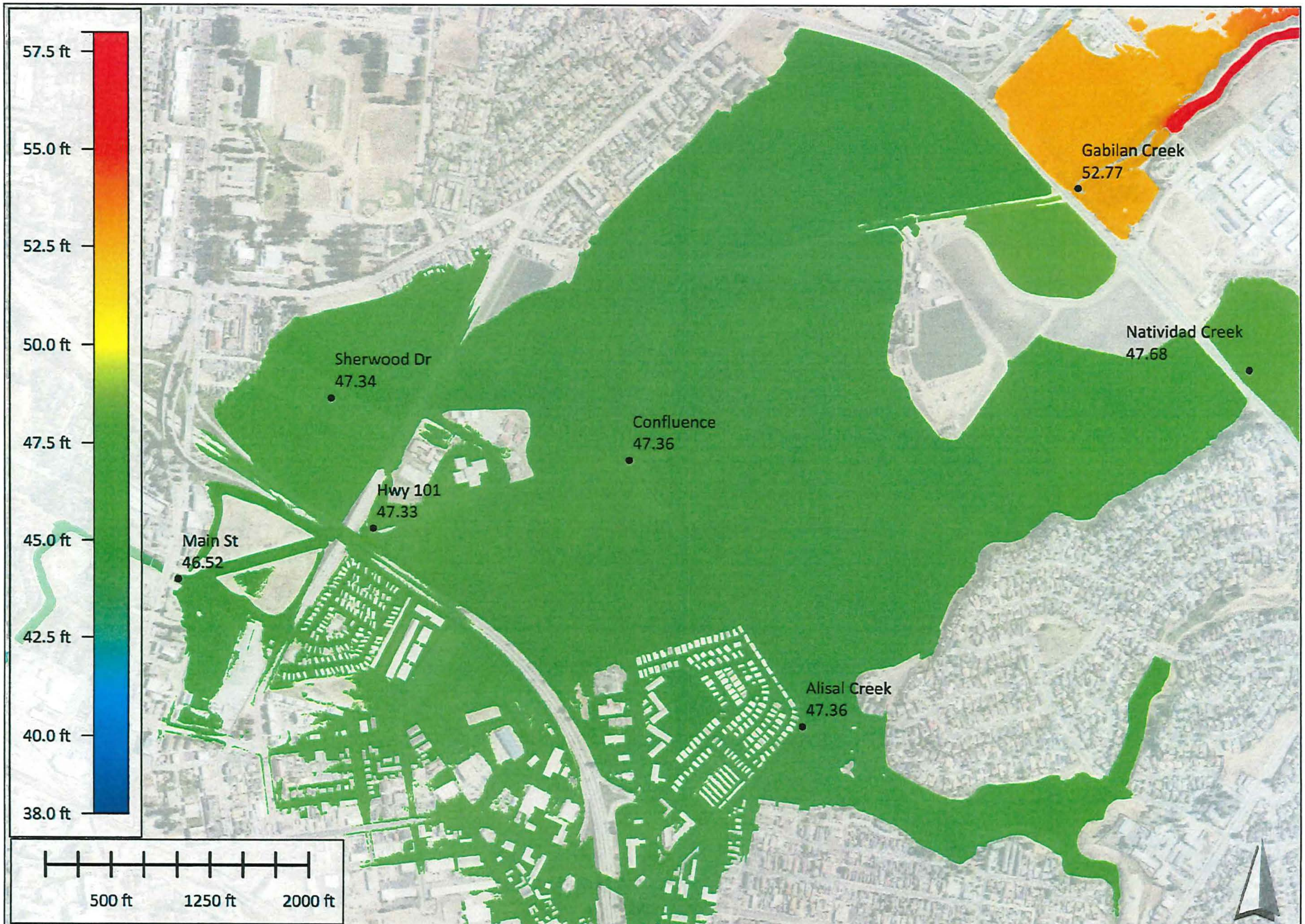
Maximum Flood Depths, Proposed Conditions, 100-year Flood



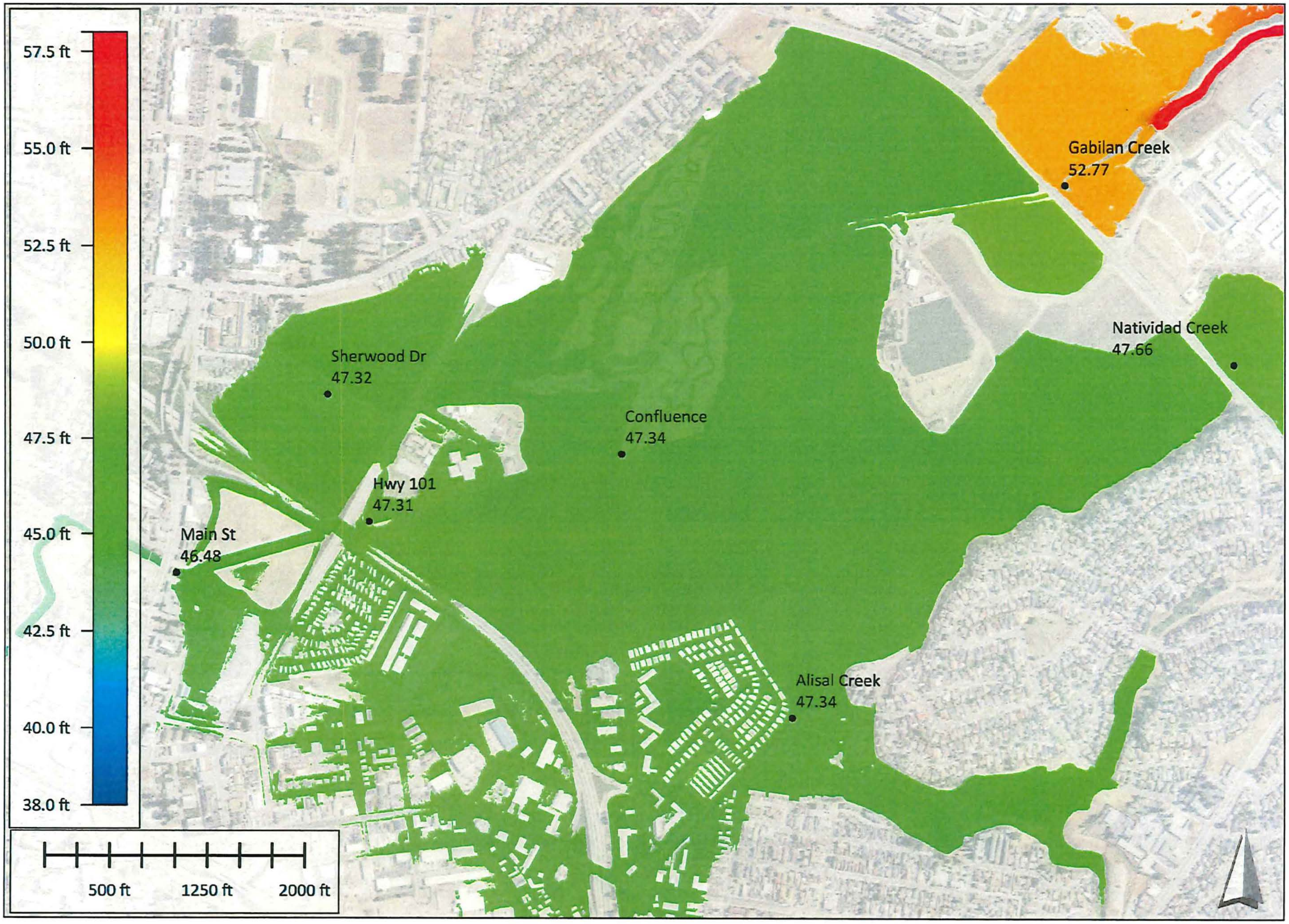
Maximum Flood Depths, Existing Conditions, 10-year Flood



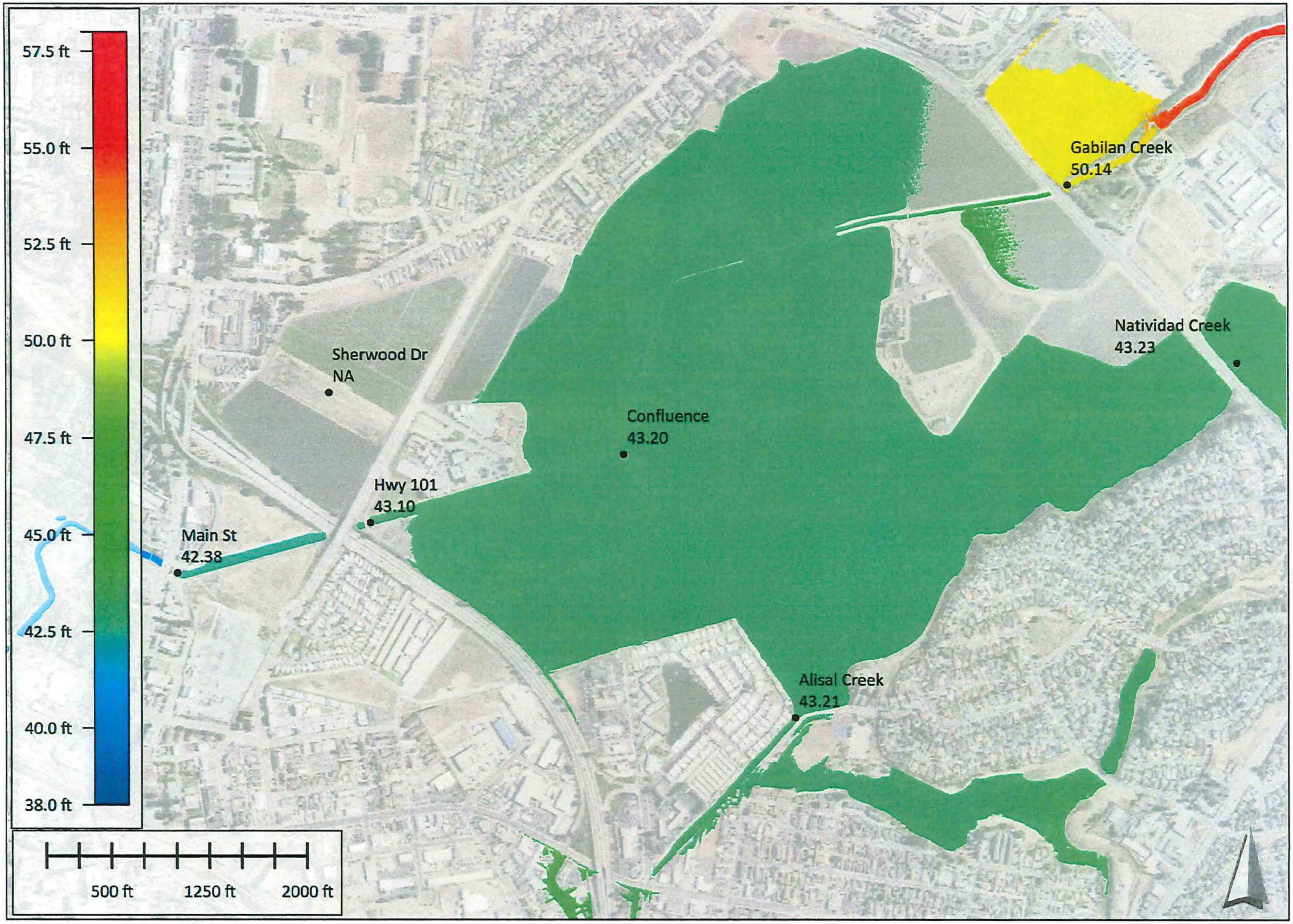
Maximum Flood Depths, Proposed Conditions, 10-year Flood



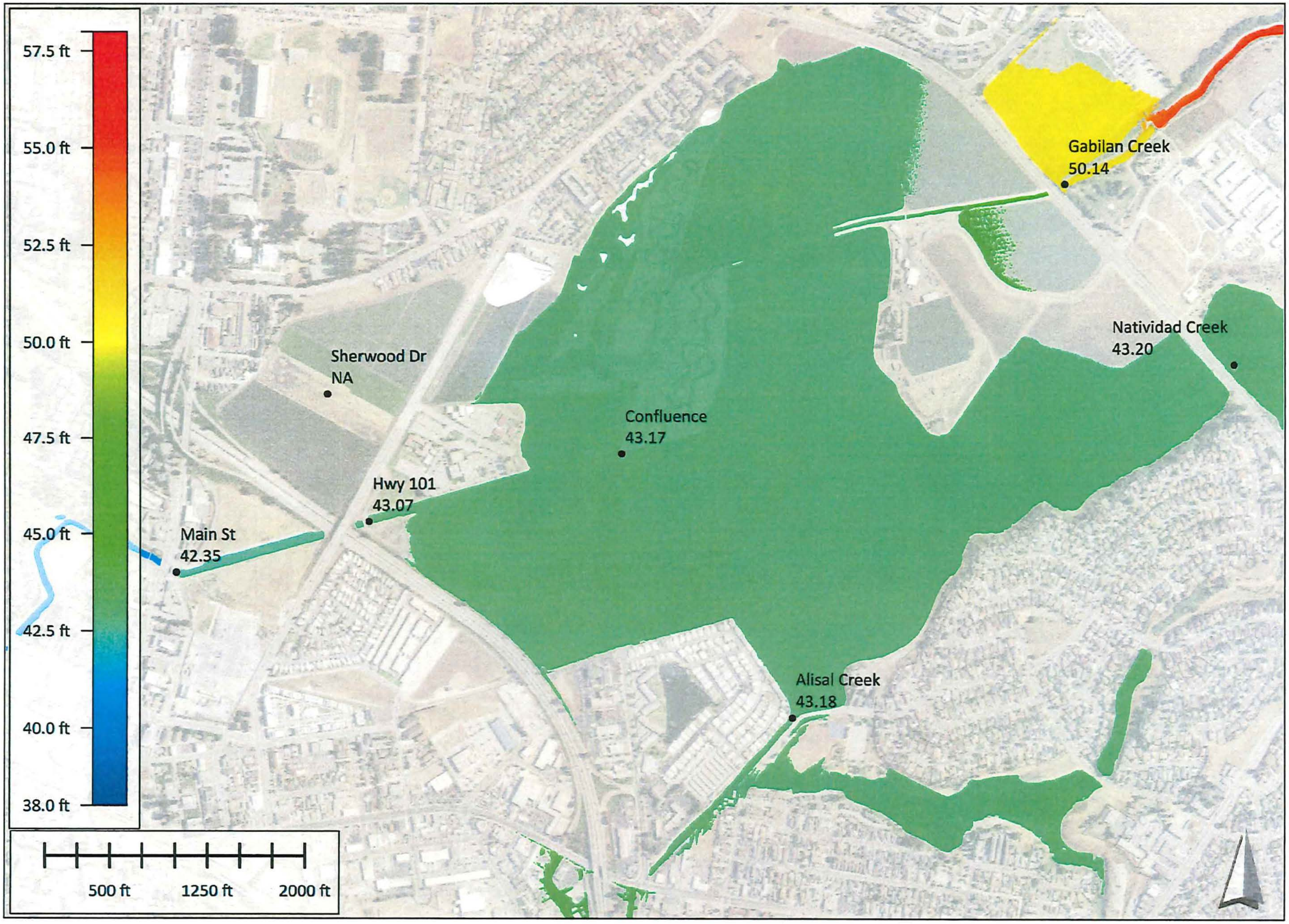
Maximum Water Surface Elevations, Existing Conditions, 100-year Flood



Maximum Water Surface Elevations, Proposed Conditions, 100-year Flood



Maximum Water Surface Elevations, Existing Conditions, 10-year Flood



Maximum Water Surface Elevations, Proposed Conditions, 10-year Flood

Modeled Maximum Water Surface Elevations at Key Locations within Carr Lake

	Maximum Water Surface Elevations					
	100-year			10-year		
Location	Existing	Proposed	Change	Existing	Proposed	Change
	ft	*ft*	*ft*	*ft*	*ft*	*ft*
Main Street	46.52	46.48	-0.04	42.38	42.35	-0.03
Hwy 101	47.33	47.31	-0.02	43.10	43.07	-0.03
Sherwood Drive	47.34	47.32	-0.02	-	-	-
Confluence	47.36	47.34	-0.02	43.20	43.17	-0.03
Gabilan Creek	52.77	52.77	0.00	50.14	50.14	0.00
Natividad Creek	47.68	47.66	-0.02	43.23	43.20	-0.03
Alisal Creel	47.36	47.34	-0.02	43.21	43.18	-0.03

END OF REPORT
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CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

ALAMEDA
COLUSA
CONTRA COSTA
DEL NORTE
HUMBOLDT
LAKE
MARIN
MENDOCINO
MONTEREY
NAPA
SAN BENITO
SAN FRANCISCO
SAN MATEO
SANTA CLATA
SANTA CRUZ
SOLANO
SONOMA
YOLO

Northwest Information Center
Sonoma State University
150 Professional Center Drive, Suite E
Rohnert Park, California 94928-3609
Tel: 707.588.8455
nwic@sonoma.edu
http://www.sonoma.edu/nwic

September 24, 2020

File No.: 20-0485

Tom Wiles, Project Planner
City of Salinas
Community Development Department
65 W. Alisal Street, 2nd Floor
Salinas, CA 93901

re: GPA 2020-001, RZ 2020-001, SPR 2020-006 / 618 Sherwood Dr, Salinas / Big Sur Land Trust - Rachel Saunders

Dear Mr. Tom Wiles,

Records at this office were reviewed to determine if this project could adversely affect cultural resources. **Please note that use of the term cultural resources includes both archaeological sites and historical buildings and/or structures. The review for possible historic-era building/structures, however, was limited to references currently in our office and should not be considered comprehensive.**

Project Description: Create a 6-acre neighborhood park that offers a variety of amenities and recreational opportunities. Restore and enhance 67-acres of land to improve wetland and riparian fish and wildlife habitat with public and maintenance access via trails. Improve water quality through enhancement of natural physical and biological processes and constructed storm water treatment green infrastructure. Maintain or improve flood conveyance and capacity.

Previous Studies:

XX Study # 43489 (Billat & Supernowicz 2013), included approximately 10% of the proposed project area within its architectural survey, and identified no cultural resources. *See recommendation below.*

Archaeological and Native American Resources Recommendations:

XX The proposed project area has the possibility of containing unrecorded archaeological site(s). A study is recommended prior to commencement of project activities.

XX We recommend lead agency contact the local Native American tribe(s) regarding traditional, cultural, and religious heritage values. For a complete listing of tribes in the vicinity of the project, please contact the Native American Heritage Commission at (916) 373-3710.

SB 18

XX As per Senate Bill 18 (Chapter 905, Statutes of 2004), local governments are required to consult with California Native American tribes prior to making certain planning decisions and to provide notice to tribes at certain key points in the planning process. These consultation and notice requirements apply to adoption and amendment of general plans (defined in Government Code §65300 et seq.). Each time a local

Exhibit 53

government considers a proposal to adopt or amend the general plan, they are required to contact the appropriate tribes identified by the Native American Heritage Commission.

Built Environment Recommendations:

XX The 1912 and 1940 USGS Salinas 15' quad depicts a building in the proposed project area. The 1947 photo revised 1984 USGS Salinas 7.5' quad depicts four buildings in the proposed project area. Since the Office of Historic Preservation has determined that any building or structure 45 years or older may be of historical value, it is recommended that prior to commencement of project activities, a qualified professional familiar with the architecture and history of Monterey County conduct a formal CEQA evaluation.

Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area. Additionally, Native American tribes have historical resource information not in the California Historical Resources Information System (CHRIS) Inventory, and you should contact the California Native American Heritage Commission for information on local/regional tribal contacts.

The California Office of Historic Preservation (OHP) contracts with the California Historical Resources Information System's (CHRIS) regional Information Centers (ICs) to maintain information in the CHRIS inventory and make it available to local, state, and federal agencies, cultural resource professionals, Native American tribes, researchers, and the public. Recommendations made by IC coordinators or their staff regarding the interpretation and application of this information are advisory only. Such recommendations do not necessarily represent the evaluation or opinion of the State Historic Preservation Officer in carrying out the OHP's regulatory authority under federal and state law.

For your reference, a list of qualified professionals in California that meet the Secretary of the Interior's Standards can be found at http://www.chrisinfo.org. If archaeological resources are encountered during the project, work in the immediate vicinity of the finds should be halted until a qualified archaeologist has evaluated the situation. If you have any questions please give us a call at (707) 588-8455.

Sincerely,

Jillian Guldenbrein
Researcher

cc: Big Sur Land Trust – Rachel Saunders
rsaunders@bigsurlandtrust.org

City of Salinas
DEVELOPMENT ENGINEERING (PW) • 65 West Alisal Street • Salinas, California
SALINAS RICH IN LAND | RICH IN VALUES
Phone: (831) 758-7251 • www.cityofsalinas.org

ENGINEER'S REPORT

DATE: 10/15/2020
PLANNER: Thomas Wiles
OWNER/APPLICANT: Big Sur Land Trust
PURPOSE: SPR2020-006 & RZ2020-001
LOCATION: 618 Sherwood Dr

DEVELOPMENT PROPOSAL: Carr Lake restorage and park development on 73.1 acres.
RECOMMENDATION: Revisions Required

SWDS CATEGORY: Pending
SWDS THRESHOLD: Pending
NPDES CATEGORY: High Priority

DEVELOPMENT REVIEW: *30% Development Review Plan Check prepared by BFS landscape architects, dated 9/14/2020 and Balance Hydrologics, Inc and Preliminary Storm Water Control Plan, prepared by Whitson Engineers, dated August 14, 2020,*

1. FEMA Floodplain – The proposed work is in a Special Flood Hazard Area, regulatory floodway, Zone AE, base flood elevation (BFE) 47-ft (NAVD88) per Flood Insurance Rate Map (FIRM) panel 06053C 0217G and 06053C 02109G, effective 4/2/2009 and newly determined Zone X, Case No. 20-09-1994A. The improvement plans should clearly provide the area defined by Whitson Engineers.

   Per Salinas Municipal Code, Chapter 9, Article VI and 44 CFR 60, any earth moving within the regulatory floodway, cannot result in an increase to the base flood elevation. The improvement plans must clearly show how this regulation is to be met.

   Plans must reference the SFHA and the regulatory floodway as part of the topographic map and the improvement plans. The landscape plans identify the base flood elevation (BFE) as 46.8 while the exhibit provided to FEMA identifies the BFE as 46.6. Confirm and provide consistent information. Add the FEMA references to the cover sheet and the topographic sheets.

2. SWCP – Attachment F, review possibilities of providing treatment closer to the source as required by the City's NPDES permit. Table 4.1, it is understood that this is a formatted spreadsheet, but city development standards require a factor of safety of 2 for all SCM types. This must be account for either in the factor of safety or in the infiltration rate. Table 4.2 footnote indicates a porosity of 0.4. A porosity of 0.35 is recommended consistent with the pond tables in Attachment G. Table 6, add the 100-year peak flow comparison as required per Section 12.b of the City Design Standards. Table 7 and Section V, add source control BMPs and O&M items for the Carr Lake Restoration Area.

3. SWPPP Compliance – (L-1.0) Update to provide total disturbed area. Revise wet season to meet city NPDES permit and updated area table to indicate total area of impervious surfaces.

4. Permit Compliance – The project proposes a reroute and diversion of the existing Hospital Creek and Gabilan Creek, applicant shall be responsible to secure any permits required by the US Army Corps of Engineers, Regional Water Quality Control Board, Monterey County Water Resource

Exhibit 54

Agency or any other agency that may claim jurisdiction to the creeks.

5. Site Plan – The following items must be reviewed with progression of the site plan and improvement plans.
   a. Access is proposed from Sherwood Drive into a small parking lot. The applicant shall clearly show a raised median to limit and restrict left turn movements in and out of the parking lot. Applicant shall coordinate with limits of the raised median with the Traffic and Transportation Division of Public Works.
   b. Clearly identify the base flood elevation on all cross sections and profiles.
   c. The boardwalk and pier are proposed well below the base flood elevation. How does the project propose to maintain the wooden structure if this may periodically be submerged underwater?
   d. [General Condition] All effort must be made to remove fencing, particularly chain link fencing from the regulatory floodway.
   e. How can the treatment forebay be accessed for maintenance?
   f. The civil plans show limited areas as "limit of restoration grading". Additional grading is required for construction of the trails and crossings. Show limits of all grading.
   g. Provide install street trees along the entire frontage consistent with City Standards at a maximum 60-ft spacing.
   h. [General Condition] The project shall reconstruct any damaged curb, gutter and sidewalk along the property frontage.
   i. [General Condition] The project shall confirm the existing curb ramp at Sherwood Dr and Sherwood Pl meets current Caltrans standards. Project shall reconstruct curb ramp if necessary.
6. [General Condition] Traffic Analysis – It should be noted the proposed new alignments of Constitution Extension, Bernal Extension and Kern Extension increases the centerline miles of the future roads. This will result in an increased cost to the City. Revised cost estimates will be required when the Traffic Impact Plan and Traffic Fee Ordinance are updated.
7. Hydrologic Report – Section 2.10.2, provide reference to water rights information. Section 2.11, include a discussion of the 2017 Flood Insurance Study. Section 2.11.1, provide references to "previous drainage and flood insurance studies for the City of Salinas and Monterey County". Section 3.1, (2) revise high ground area consistent with LOMA submitted for FEMA review. Section 3.5, maintenance responsibilities must be defined along with maintenance funding sources. Appendix A, Existing Conditions Modeling Assumptions – Conversion factor vary based on location. What location or method was used for the +2.75-ft conversation factor?
8. Development Impact Fees – The project is proposing to reduce the overall building areas. Development impact fees are assessed based on building areas. With no increase in building areas, no development impact fees will be assessed for traffic and public facilities. Sewer impact fees and tree impact fees will be reviewed at building permit.

GENERAL PLAN AMENDMENT/REZONING

1. As discussed with Rachel Saunders and in an effort to align the goals of the project with floodplain management goals of the City, a request has been made to establish the Carr Lake Restorage Area as a designated Open Space area consistent with Activity 420 of the Community Rating System's Floodplain Coordinator's Manual, Open Space Preservation. The goals of this activity is to provide open space areas that are preserved in their natural state; have been restored to a condition approximating their pre-development natural state; or have been designated as worthy of preservation for their natural benefits. Designation may be made by zoning or deed restrictions.

CITY OF SALINAS
Reviewed By:

Adriana Robles

Adriana Robles, P.E, CFM
Senior Civil Engineer/Interim City Engineer
adrianar@ci.salinas.ca.us
(831) 758-7194

CARR LAKE RESTORATION AND PARK PROJECT
MITIGATION MONITORING AND REPORTING PROGRAM
618 SHERWOOD DRIVE
(GENERAL PLAN AMENDMENT 2020-001, REZONE 2020-001, & SITE PLAN REVIEW 2020-006)

Mitigation Number	Nature of Mitigation	Result after Mitigation	Party Responsible for Implementing	Party Responsible for Monitoring: Method to Confirm Implementation	Timing for Implementation
AES-1 Aesthetics	A photometric lighting plan shall be submitted for review and approval to the Community Development Department demonstrating compliance with City Standards with regards to light and glare.	Minimize light impacts to adjacent properties.	Applicant, or Successor in Interest.	Community Development Department – Current Planning Division.	Prior to issuance of a building permit.
AG-1 Agricultural Resources	A Notice of Right to Farm Agreement shall be recorded on the project site. Recordation of the Notice of Right to Farm Agreement shall be coordinated with the Public Works Department (200 Lincoln Avenue, 831-758-7241).	Minimize impacts to adjacent agricultural uses.	Applicant, or Successor in Interest.	Public Works Department – Community Development Department.	Prior to issuance of a building permit.
AQ-1 Air Quality	During construction, the applicant or successor in interest shall: a) Limit grading to 8.1 acres per day, and limit grading and excavation to 2.2 acres per day. b) Provide watering trucks on site to maintain adequate soil moisture during grading and water graded/excavated areas at least twice daily, thus minimizing dust generation. In addition, the water trucks shall be used to wash down trucks and tractors, including earth loads, prior to entering public roadways. c) Prohibit all grading activities during periods of high wind. d) Maintain a minimum of two feet for freeboard for all haul trucks. e) Cover all trucks hauling dirt, sand, or loose materials. f) Cover inactive storage piles. g) Enforce a 15-mph speed limit for all unpaved surfaces when visible dust clouds are formed by vehicle movement. h) Place gravel base near site entrances to clean tires prior to entering public roadways.	Minimize air quality impacts.	Applicant, or Successor in Interest.	Community Development Department – Permit Services Division.	During construction phase.
AQ-2 Air Quality	Consult with the Monterey Bay Air Resources District regarding the potential need for a diesel health risk assessment and shall mitigate diesel impacts to a less than significant level in accordance with the Air District requirements.	Minimize air quality impacts.	Applicant, or Successor in Interest.	Community Development Department – Permit Services Division.	During construction phase.
AQ-3	All applicable permits from the Monterey Bay	Minimize air	Applicant, or	Community	During

Exhibit 55

Air Quality	Air Resources District shall be obtained for building demolition and construction.	quality impacts.	Successor in Interest.	Development Department – Permit Services Division.	construction phase.
BIO-1 Biological Resources	The following measures shall be implemented to protect adjacent retained herbaceous riparian/wetlands and downstream waters from inadvertent impacts during construction and to mitigate for impacts to on-site wetland and riparian resources temporarily impacted by the project. a. Prior to construction, obtain all necessary permits from regulating agencies, such as the US Army Corps of Engineers (USACE), California Department of Fish and Game (CDFW), Regional Water Quality Control Board (RWQCB), and City of Salinas; b. Install temporary construction fencing at the edge of the construction area to prevent inadvertent impacts to herbaceous riparian/wetlands located outside the project area. This fencing should remain in-place until all project construction is complete; c. Install erosion control measures/construction Best Management Practices (BMP's) during construction to prevent any inadvertent impacts to downstream sections of Gabilan Creek, Hospital Ditch, or nearby Natividad Creek. Such measures shall include use of silt fencing, straw wattles, and seeding/revegetation of disturbed area with a native erosion control seed mix prior to the onset of the winter rainy season; d. Implement features of the Restoration Plan that pertain to the restored creeks, including erosion control seeding, planting of native wetland species, and allowing recruitment of other native wetland and riparian plant species. Monitor plan implementation and success of revegetation for a five (5) year period after construction; e. Control occurrences of invasive, non-native plant species. Monitor removal and control measures for a five (5) year period after construction; f. All refueling, maintenance, and staging of equipment and vehicles will occur at least 100-feet from any riparian habitat or water body, unless protective spill measures are implemented; g. The number of access routes, number and size of staging areas, and the total area of the activity shall be limited to the minimum necessary to achieve the project goal. These	Minimize impacts on biological resources.	Applicant or successor in interest.	Community Development Department – Current Planning Division and Public Works Department – Development Engineering Division	Prior to issuance of a building or grading permit or during construction, as applicable.

	areas shall be outside of the riparian/wetland areas; h. To control erosion during and after project implementation, the Applicant or successor-in-interest shall implement BMP's, as may be identified by the RWQCB; and i. Restore areas of temporary impacts with an appropriate assemblage of native riparian, wetland, and upland vegetation suitable for the areas of temporary impacts.				
BIO-2 Biological Resources	To avoid impacts to migratory birds and raptors that may be present in the project area, it is preferable that ground disturbance (including stripping, vegetation removal, grading, and excavation) shall be schedules for the period of September 1 to February 1 of any given year. If project activities during the nesting season (February 1 through September 1) of protected raptors and other avian species are unavoidable and are scheduled during the nesting season, a focused survey for active nests of such birds shall be conducted by qualified biologist within three (3) days prior to the beginning of project activities. Surveys shall be conducted in all suitable habitat located at project work sites, in staging, storage and soil stockpile areas, and along transportation routes. The minimum survey radii surrounding the work area shall be the following: i) 250 feet for passerines; ii) 500 feet for other small raptor such as accipiter's; and iii) 1,000 feet for larger raptors such as buteos. Surveys shall be conducted at the appropriate times of day, and during appropriate nesting times and shall concentrate on areas of suitable habitat. If a lapse in project activities of seven (7) days or longer occurs, another focused nesting bird survey will be required before project activities can be reinitiated. If nesting bords are identified during pre-construction surveys, an appropriate buffer shall be imposed within which no construction activities or disturbance will take place (generally 300 feet in all directions). A qualified biologist shall be on-site during work re-initiation in the vicinity of the nest offset to ensure that the buffer is adequate and that the nest is not stressed or abandoned to comply with the Fish and Game Code (FGC) of California and the federal Migratory Bird Treaty Act (MBTA) of 1918. No work shall proceed in the vicinity of an active nest until such time as all young	Minimize impacts to biological resources.	Applicant or successor in interest.	Community Development Department – Current Planning Division and Public Works Department – Development Engineering Division.	Prior to construction.

	are fledged, as determined by the qualified biologist, or until after September 1 (when young are assumed fledged).				
BIO-3 Biological Resources	The following measures shall be implemented to avoid, minimize and mitigate for impacts to special status wildlife species during project construction: a. Prior to construction, obtain all necessary permits and authorizations from CDFW, Service and NMFS. b. Implement all avoidance, minimization and mitigation measures as outlined by regulating agencies; c. The following measures shall be implemented to avoid, minimize and mitigate potential impacts to listed California red-legged frog and California tiger-salamander (listed species): 1. At least 30 days prior to the onset of activities, the Applicant or Project Proponent shall submit the name(s) and credentials of qualified biologists to the United States Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW). The Applicant or Project Proponent shall submit the name(s) and credentials of the biologists who would conduct activities specified in the following measures. No project activities shall begin until proponents have received written approval from the USFWS and CDFW that the biologist(s) is qualified to conduct the work. 2. A USFWS and CDFW-approved biologist shall survey the work site no more than 48-hours before the onset of activities. If species are found, the approved biologist shall relocate the animals to any area of suitable habitat either upstream or downstream and well away from the project work area. Only USFWS and CDFW-approved biologists shall participate in activities associated with the capture, handling, and moving of listed species. 3. Before any activities begin on a project, a USFWS and CDFW-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of listed species and its habitat, the importance of the species and its habitat, general measures that are being implemented to conserve the species as they relate to	Minimize biological resource Impacts.	Applicant or successor in interest.	Community Development Department – Current Planning Division and Public Works Department – Development Engineering Division.	Prior to and during construction phase, as applicable.

	the project, and the boundaries within which the project may be accomplished. Brochures, books, and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. 4.A USFWS and CDFW-approved biologist shall be present at the work site until such time as all removal of the listed species, instruction of workers, and habitat disturbance have been completed. After this time, the contractor or permittee shall designate a person to monitor on-site compliance with all minimization measures. The USFWS and CDFW-approved biologist shall ensure that this individual receives training outlined in above No. 3 of Mitigation Measure BIO-3 and in the identification of California red-legged frogs and California tiger salamander. The monitor and the USFWS and CDFW-approved biologist shall have the authority to halt any action that might result in impacts that exceed the levels anticipated by the United States Army Corps of Engineers (USACE) and USFWS during review of the proposed action. If work is stopped, the USACE and USFWS shall be notified immediately by the USFWS and CDFW-approved biologist or on-site biological monitor. 5.During project activities, all trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas. 6.All refueling, maintenance, and staging of equipment and vehicles shall occur at least 20 meters from any riparian habitat or water body. The permittee shall ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the permittee shall prepare a plan to allow a prompt and effective response to any accidental spills. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur. 7.A USFWS and CDFW-approved				

	biologist shall ensure that the spread or introduction of invasive exotic plant species shall be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project areas shall be removed. 8. Project sites shall be revegetated with an appropriate assemblage of native riparian, wetland, and upland vegetation suitable for the area. A species list and restoration and monitoring plan shall be included with the project proposal for review and approval by the USFWS and USACE. Such a plan must include, but not be limited to, location of the restoration, species to be used, restoration techniques, time of the year the work will be done, identifiable success criteria for completion, and remedial actions if the success criteria are not achieved. 9. The number of access routes, number and size of staging areas, and the total area of the activity shall be limited to the minimum necessary to achieve the project goal. Routes and boundaries shall be clearly demarcated, and these areas shall be outside of riparian and wetland areas. 10. Work activities shall occur during periods specified by above listed permitting agencies. 11. To control erosion during and after project implementation, the Applicant shall implement best management practices, as may be identified by RWQCB. 12. Where the work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than five (5) millimeters (mm) to prevent the listed species from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow shall be removed in a manner that would allow flow to resume with the least disturbance to the substrate. d. The following measures shall be implemented to avoid and minimize potential impacts to steelhead and chinook				

	salmon (listed species): 1.During construction, a USFWS or National Marine Fisheries Service (NMFS)-approved biologist shall remove from within the project area, any individuals of exotic species, such as bullfrogs, crayfish, and centrarchid fishes that are encountered. 2.A dewatering structure shall be installed and water will be directed away from the instream work area through a minimum 10-inch diameter pipe. Water will be diverted downstream into a reach of creek below the work area. The project's engineering plans will identify the diversion structure, cross-section diagram, diversion pipe location, and dewatering plan details. 3.Dewatering activities may require the temporary relocation of fish and larval or neotonic salamanders. In case any fish are found on the project site, the following measures will be implemented to minimize potential fish mortality during relocation activities: a. Block nets will be placed at the upper and lower extent of the diversions to ensure that salmonids upstream and downstream do not enter the areas proposed for dewatering. Keep the intake/inlet screened for the duration of construction to prevent fish passage into the diversion pipe. b. If electrofishing techniques are utilized during fish relocation activities, activities will comply with NMFS' Backpack Electrofishing Guidelines (June 2000) available at http://www.fwspubs.org/doi/suppl/10.3996/112016-JFWM-083/suppl_file/fwma-08-01-30_reference+s02.pdf. c. Field supervisors and crew members must have appropriate training and experience with electrofishing techniques. Training for field supervisors can be acquired from programs such as those offered from the U.S. Fish and Wildlife Service – National Conservation Training Center (Principles and Techniques of Electrofishing course). d. A crew leader having at least 100 hours of electrofishing experience in the field using similar equipment must train the crew. The crew leader's				

	experience must be documented and available for confirmation; such documentation may be in the form of a logbook. e. Electrofishing may not be performed if water temperatures exceed 18-Celsius, or could reasonably be expected to rise above this temperature during the activities. f. At least one (1) assistant shall aid the biologist during the electrofishing by netting stunned fish and other aquatic vertebrates. g. Each electrofishing session must start with all equipment settings (voltage, pulse width, and pulse rate) set to the minimums needed to capture fish. These setting should be gradually increased only to the point where fish are immobilized and captured, and not allowed to exceed the specified maxima: Voltage = 100V (Initial) – 400V (Max); Pulse width = 500 mS (Initial) – 5 mS (Max); Pulse rate = 30 Hz (Initial) – 70 Hz (Max). h. A minimum of three (3) passes with the electrofisher will be utilized to ensure maximum capture probability of salmonids within the area proposed for dewatering, unless the number of fish captured in the second pass is less than 10-percnt of the first pass. In that case, two (2) passes are adequate. If fish are present on any pass, a minimum of 20 minutes will separate the beginning of each pass through the project reach to allow time for fish that are not captured to become susceptible to the electrofishing again. i. All captured fish will be held in water with temperatures not greater than ambient in-stream temperatures. If cooling is uses, water temperatures will be maintained not more than three (3) degrees Celsius less than ambient in-stream temperatures. All captured fish will be held in well-oxygenated water, with a dissolved oxygen level of not less than seven (7) parts per million. j. Prior to release, the following information shall be recorded: 1) list fish species, 2) visual determination of age, 3) describe injuries and fatalities by age class, 4) document successfully relocated fish by age class for each				

	relocation site, and 5) document date and time of release of fish to each relocation site. k. Fish shall be subject to the minimum handling and holding times required. All captured fish will be allowed to recover from electrofishing and other capture gear before being returned to the stream. All captured fish will be processed and released prior to any subsequent electrofishing pass or netting effort. l. All captured fish will be released in the best available habitat in closest proximity to the work area, preferably upstream of the block nets to facilitate redistribution into dewatered areas following construction activities.				
CU-1 Cultural Resources and TCR-1 Tribal and Cultural Resources	In the event that cultural materials are encountered during grading/construction, all work shall cease until the find has been evaluated and mitigation measures put in place for the disposition and protection of any find pursuant to Public Resources Code Section 21083.2.	Ensure protection of on-site cultural resources.	Applicant, or Successor in Interest.	Public Works Department and Community Development Department.	During construction phase.
CU-2 Cultural Resources and TCR-2 Tribal and Cultural Resources	A qualified archaeologist and a representative from an applicable Tribal Cultural Nation shall monitor initial ground-disturbing activities associated with project elements located in the traditional park area (the historic lake shoreline) in a manner outlined in the Archaeology Monitoring Plan to be developed prior to construction. The cost of all related monitoring shall be covered by the Applicant or successor-in-interest.	Ensure protection of on-site cultural resources.	Applicant, or Successor in Interest.	Public Works Department and Community Development Department.	During construction phase.
TR-1 Transportation	The proposed project is required to install a raised median on Sherwood Drive as shown in the "Road Alignment and Driveway Study for Carr Lake Restoration and Park Development in Salinas, CA" (Road Alignment Study) from Hexagon Transportations Consultants Incorporated dated September 11, 2020. The project includes two new driveways onto Sherwood Drive which could create substantial hazards. The project is required to install a raised median, otherwise the impact would be significant and unavoidable. To maintain consistency with the existing General Plan, no structures can be built within the proposed alternative alignment of Bernal Road Extension, as shown in the Road Alignment Study. To maintain consistency with the existing General Plan and to allow for the analysis of whether future development of the Bernal	Minimize transportation impacts.	Applicant, or Successor in Interest.	Public Works Department and Community Development Department.	During construction phase.

	Road Extension is needed a "No-Build Agreement" shall be recorded on the project site which will prohibit the construction of permanent structures or facilities (e.g., structures or parking lots) within the area of the proposed alternative alignment. The "No-Build Agreement" will be entered into by the City and the Applicant, or its successor in interest, prior to the issuance of grading or building permit from the City.				

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CITY OF SALINAS

POLICE DEPARTMENT MEMORANDUM

DATE: July 24, 2020

TO: Tom Wiles, Senior Planer

FROM: Sergeant Kendall Gray

SUBJECT: 2020-001, 618 Sherwood Dr. (Carr Lake)

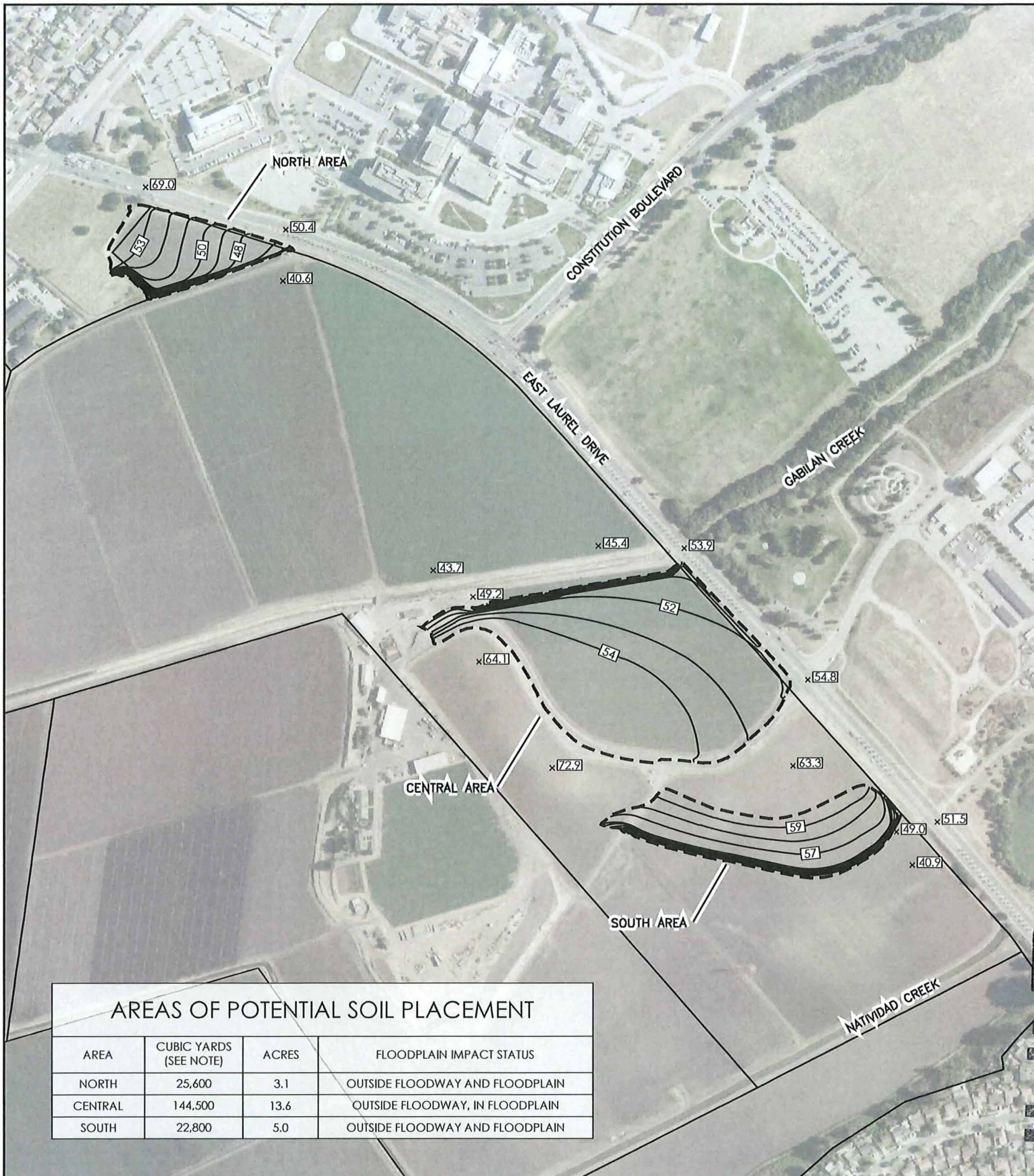
I have reviewed the proposed plans for the rezoning of existing agricultural fields to a "multi-benefit" park and open space by Big Sur Land Trust for 2020-001. The proposed park includes a playground, benches, play courts, skate spot, restrooms, dog play area and parking.

The Salinas Police Department does not object to the approval of 2020-001 subject to the following recommendations:

- The hours, lighting, closure of restrooms / parking lots and applicable municipal enforcement codes be consistent with existing City of Salinas Parks and Recreation Department regulations / procedures with proper signage stating such.

Sgt. Kendall Gray

Exhibit 56



AREAS OF POTENTIAL SOIL PLACEMENT

AREA	CUBIC YARDS (SEE NOTE)	ACRES	FLOODPLAIN IMPACT STATUS
NORTH	25,600	3.1	OUTSIDE FLOODWAY AND FLOODPLAIN
CENTRAL	144,500	13.6	OUTSIDE FLOODWAY, IN FLOODPLAIN
SOUTH	22,800	5.0	OUTSIDE FLOODWAY AND FLOODPLAIN

Exhibit 57

NOTE

THE DISPOSAL ESTIMATES SET FORTH IN THE LEGEND FOR EACH AREA ARE BASED ON THE FINISHED GRADES NOTED ON THIS FIGURE. THE FINAL GRADES AND SOIL QUANTITIES FOR EACH AREA MAY CHANGE AND WILL BE DETERMINED IN COORDINATION WITH THE PROPERTY OWNER.

Balance Hydrologics, Inc.

Draft Potential Soil Placement Areas

0' 250' 500' 1000'

SCALE: 1" = 500'

N

218095 spoils area workmap DJ.dwg 4/25/2021 16:48