# *Carmel River Floodplain Restoration and Environmental Enhancement Project*

**March 2019**

## Technical Studies that are Bound Separately

## Volume IV:
## Water Quality Report

**Prepared By:**
Denise Duffy & Associates, Inc.
947 Cass Street, Suite 5
Monterey, CA 94940

**Prepared For:**

United States Fish and Wildlife Service

Monterey County Resource Management Agency

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# Water Quality Assessment Report

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**November 2016**

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Carmel River Floodplain Restoration and Environmental Enhancement Project, Monterey County

**November 2016**


Prepared By: _____ Date: _____

Josh Harwayne, Senior Project Manager
(831) 373-4341 x25
Denise Duffy & Associates, Inc.
947 Cass Street, Monterey, CA 93940
Consultant

Approved By: _____ Date: _____

Professional Content Reviewer, Title
Phone Number
Office Name
Cooperating Agency Name

Approved By: _____ Date: _____

Management Content Reviewer, Title
Phone Number
Office Name
Cooperating Agency Name

# Executive Summary

This water quality assessment report evaluates how the Carmel Floodplain Restoration and Environmental Enhancement Project (Proposed Project or Project) may affect the water quality and beneficial uses of adjacent surface and ground water resources. The Project Study Report (PSR) for the Proposed Project was sighed on 11/2/2010 and the project is therefore subject to the requirements contained within the Caltrans 1999 NPDES Permit Order No. 99-DWQ.

The Project would: 1) remove approximately 1,470 feet of the south bank levee to allow the lateral dispersal of floodwater onto the south overbank area and Project site; 2) restore approximately 100 acres of historic native coastal floodplain habitat on existing agricultural land to allow the site to function as part of the historical Carmel River floodplain and to provide additional habitat to the lower Carmel River ecosystem; 3) create an approximately 23 acre agricultural preserve to achieve the goal of preserving the agricultural heritage of the Project area in a manner that is compatible with adjacent habitat; and 4) replace a segment of SR 1 with a 360-foot causeway to provide floodwater conveyance under the highway, provide connectivity with the Carmel Lagoon, and reduce flood hazards to SR 1.

Waterbodies adjacent to the Project site include the Carmel River and the Carmel Lagoon. Beneficial uses of the Carmel River, as identified by the Regional Water Quality Control Board, Central Coast Region in the Water Quality Control Plan for the Central Coast Basin (Basin Plan), include: Cold Fresh Water Habitat (COLD); Spawning, Reproduction and/or Early Development of fish (SPWN); and Migration of Aquatic Organisms (MIGR). The Carmel River, specifically the South Arm of the Carmel Lagoon, is the receiving waterbody of the Proposed Project.

The Project would result in approximately 0.32 acres of new imperious surface with the construction of the causeway. Construction of the causeway would allow for a longitudinal connection between the restored floodplain and the Carmel Lagoon. The restoration of the floodplain as part of the Proposed Project would improve ground water recharge and water quality through natural floodplain processes. Additionally, the Proposed Project would reduce flooding risk to SR1 and neighboring developed areas. Appropriate mitigation, avoidance, and minimization measures would be implemented during and following construction of the Proposed Project to reduce potential impacts to water quality. Overall, the Proposed Project would improve the quality of water entering the lower Carmel River. The Project, including the causeway, would have a net beneficial effect on water quality.

The Proposed project would require the following permits, reviews, and approvals: Section 401 Certification or Waiver from the Central Coast Region Water Quality Control Board; Section 1602 Streambed Alteration Agreement with California Department of Fish and Wildlife; and coverage under the State's General Construction Permit form the State Water Resources Control Board. These permits, approvals and reviews would be obtained before construction of the Proposed Project.

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# 1. Introduction

## 1.1 Project Description

The Monterey County Resource Management Agency (County) and the Big Sur Land Trust (BSLT), a 501(c)(3) non-profit organization, have partnered on the Carmel River Floodplain Restoration and Environmental Enhancement Project (herein referred to as the "Proposed Project" or "Project") to improve flood control and to restore native riparian and floodplain habitat and hydrologic function to a portion of the lower floodplain along the Carmel River, the majority of which is currently agricultural fields. The key components of this Project would address the long standing problems of floodplain habitat loss and flood management while providing important habitat for several wildlife species and retaining agricultural resources.

### 1.1.1. No Project Alternative

The no project alternative proposes maintaining the existing SR1 embankment, levees, and agricultural uses of the Project site as it currently is. Presently the Project site is used for agricultural activities and provides very little, low quality, habitat for wildlife species. Additionally, the existing configuration of the project site offers little flood relief to the developed area, north of the proposed project site, and leaves the highway at risk of being overtopped by flood waters during flood events

### 1.1.2. Build Alternative

The Proposed Project consists of two interdependent Project components: the Floodplain Restoration and the Causeway. The Floodplain Restoration Component consists of 1) removing approximately 1,470 linear feet of non-engineered earthen levees on the south side of the Carmel River channel; 2) grading to elevate approximately 23 acres of existing farmland above the 100-year floodplain elevation to create an agricultural preserve; 3) grading on approximately 100 acres to restore the site's ecological function as a floodplain by creating the hydrogeomorphic characteristics necessary to support floodplain restoration activities; and 4) implementation of the Restoration Management Plan, which includes restoration of a mosaic of native habitats across the site in two phases, restoration maintenance and monitoring to ensure the success of the revegetation specific to compensatory mitigation requirements.

The Causeway Component consists of replacing a portion of the State Route (SR) 1 roadway embankment with a 360-foot long causeway section in order to accommodate flood flows that enter into the south overbank area as a function of the removal of portions of the levees, as described above, and to restore hydrologic and habitat connectivity between the Project site and the south arm of Carmel Lagoon. The Project would result in the reconnection and restoration of approximately 100 acres of historic floodplain.

### 1.1.3. **Alternatives Considered, but Rejected**

A Preliminary Hydraulic Analyses of Proposed Design Alternatives (Balance, 2007a) considered potential conceptual design elements to meet the goals and the objectives of the project. The report concluded that a project should include an optimized combination of alternatives including increased conveyance under Highway 1 at the south overbank in combination with a lowered south overbank levee.

A Design Alternatives Analysis (Balance, 2007b) was prepared subsequent to the preliminary analysis and considered two project alternatives. One of the alternatives was identified as the preferred and is detailed above as the Build Alternative. A second design alternative was considered that presented a less ambitious Highway 1 design component at the cost of reduced project benefits from a flood control and habitat perspective. Revisions to Highway 1 at the south overbank crossing were still proposed as part of the alternative, but at a reduced scale that required four (4) 4-foot by 10-foot box culverts in place of the causeway. This alternative would have required much less highway and utility work, and so would have had significantly smaller impacts and cost. A necessarily smaller portion of the south overbank levee would have been removed as part of this alternative. In order to keep the balance between additional flows routed through the south overbank, while not increasing overtopping at Highway 1, the density of the vegetation within the restored areas of the Odello property would have needed to have been closely monitored. Vegetation allowed to grow too thick in this area would have had the potential to significantly reduce conveyance in the south overbank, increasing flooding risk in the developed areas to the north, while too little vegetation would have allowed for flows in the overbank area which would have been greater than the capacity of the box culverts, resulting in increased risk of floodwaters overtopping of Highway 1. This alternative was rejected because it would not meet the goals and objectives of the project: it would provide substantially less than the desired hydraulic capacity, and would provide much less habitat restoration compared to the Proposed Project.

## 1.2 Approach to Water Quality Assessment

The purpose of the Water Quality Assessment Report (WQAR) is to fulfill the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), and to provide information, to the extent possible, for National Pollution Discharge Elimination System (NPDES) permitting. The document includes a discussion of the proposed project, the physical setting of the project area, and the regulatory framework with respect to water quality; it also provides data on surface water and groundwater resources within the project area and the water quality of these waters, describes water quality impairments and beneficial uses, and identifies potential water quality impacts/benefits associated with the proposed project, and recommends avoidance and/or minimization measures for potentially adverse impacts.

The analysis contained in this document is based on results of several reports prepared for this Proposed Project, including the following:

- Floodplain Information, Carmel River, Monterey County (U.S. Army Corps of Engineers, May 1967);
- Carmel River: Reach 2 Conceptual Enhancement Plan (Philip Williams & Associates, September 27, 2000);
- Preliminary Hydraulic Analyses of Proposed Design Alternatives along the Lower Carmel River (Balance Hydrologics, 2007a);
- Design Alternatives Analysis for Floodplain Restoration at the Odello Property (Balance Hydrologics, 2007b);
- Hydraulic Modeling Summary (Balance Hydrologics, 2008a);
- Supplemental Analyses for Floodplain Restoration at the Odello Property, Lower Carmel River Valley (Balance Hydrologics, 2008b);
- Preliminary Geotechnical Investigation (Kleinfelder, 2008);
- Preliminary Foundation Report (Kleinfelder, Feb 24, 2015)
- Carmel River Floodplain Restoration and Environmental Enhancement Project Natural Environmental Study (Denise Duffy & Associates, 2015);
- Preliminary Hydraulic Report – Floodplain Overflow Bridge Crossing (Avila & Associates, May 5, 2015); and
- Carmel River Floodplain Restoration and Environmental Enhancement Project 35% Design Basis Report (Balance Hydrologics, Inc. May 20, 2015)

### 1.2.1 NPDES Permit

The new Caltrans Permit Order No. 2012-0011-DWQ, effective July 1, 2013 states, under the Project Planning and Design section, that the new permit requirements only apply to new and redevelopment projects that have not completed the project initiation phase. As the Project's Project Study Report (PSR) was signed on November 2, 2010, the Project is grandfathered under the new Caltrans NPDES Permit (Order 2012-0011 DWQ). Therefore, the Proposed Project will be subject to the requirements contained within the Caltrans 1999 NPDES Permit Order No. 99-DWQ.

### 1.2.2 Risk Assessment

Two preliminary risk level assessments were done for the Proposed Project (Appendix A). Using the Construction General Permit (CGP) mapping method, the Proposed Project has a risk level 3. A risk level 3 is undesirable in that, all risk level 3 projects with more than 30 acres of Disturbed Surface Area (DSA) are required to perform a pre- and post-construction Bioassessment of the receiving waterbody for the Project. A custom method risk level assessment was performed and showed the project to be a risk level 2. The custom method uses the USDA NRCS Soil Survey mapping showing soils within the Project area to have a soil erodibility factor (K-factor) of 0.24. See Appendix A for more information. At Plans, Specifications and Estimates (PS&E) it is suggested that a custom method weighted LS be calculated, as this project is relatively flat. Additional Data for this alternative is provided in Table 1.

**Table 1. Additional Alternative 1 Data**

| | |
|---|---|
| Cut/Fill Slope Area | 4H:1V or flatter (with the exception of proposed rock slope protected slopes) |
| Disturbed Surface Area | 135 acres |
| Net Impervious Surface Change[1] | 14,000 sq. ft. new impervious surface |
| Construction General Permit Risk Level | 2 (using a custom method) |

[1] Replaced Impervious Surfaces (RIS) is not added to NNI for TBMP consideration purposes per NPDES Grandfathering clause for pre July 1, 2013 approved Project Initiation Document (PID) projects

# 2. Regulatory Setting

## 2.1 Federal Laws and Requirements

**Clean Water Act**

In 1972 Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the waters of the United States (U.S.) from any point source unlawful unless the discharge is in compliance with a NPDES permit. Known today as the Clean Water Act (CWA), Congress has amended it several times. In the 1987 amendments, Congress directed dischargers of storm water from municipal and industrial/construction point sources to comply with the NPDES permit scheme. Important CWA sections are:

- Sections 303 and 304 require states to promulgate water quality standards, criteria, and guidelines.

- Section 401 requires an applicant for a federal license or permit to conduct any activity, which may result in a discharge to waters of the U.S., to obtain certification from the State that the discharge will comply with other provisions of the act. (Most frequently required in tandem with a Section 404 permit request. See below).

- Section 402 establishes the NPDES, a permitting system for the discharges (except for dredge or fill material) of any pollutant into waters of the U.S. Regional Water Quality Control Boards (RWQCB) administer this permitting program in California. Section 402(p) requires permits for discharges of storm water from industrial/construction and Municipal Separate Storm Sewer Systems (MS4s).

- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the U.S. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

The objective of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

USACE issues two types of 404 permits: Standard and General permits. For General permits there are two types: Regional permits and Nationwide permits. Regional permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to authorize a variety of minor project activities with no more than minimal effects.

There are also two types of Standard permits: Individual permits and Letters of Permission. Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of USACE's Standard permits. For Standard permits, the USACE decision to approve is based on compliance with U.S. Environmental Protection Agency's (EPA) Section 404 (b)(1) Guidelines (U.S. EPA CFR 40 Part 230), and whether permit approval is in the public interest. The 404(b)(1) Guidelines were developed by the U.S. EPA in conjunction with USACE, and allow the discharge of dredged or fill material into the aquatic system (waters of

the U.S.) only if there is no practicable alternative which would have less adverse effects. The Guidelines state that USACE may not issue a permit if there is a least environmentally damaging practicable alternative (LEDPA), to the proposed discharge that would have less effects on waters of the U.S., and not have any other significant adverse environmental consequences. Per Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures have been followed, in that order. The Guidelines also restrict permitting activities that violate water quality or toxic effluent standards, jeopardize the continued existence of listed species, violate marine sanctuary protections, or cause "significant degradation" to waters of the U.S. In addition, every permit from the USACE, even if not subject to the 404(b)(1) Guidelines, must meet general requirements. See 33 CFR 320.4.

## 2.2 State Laws and Requirements

### California Fish and Game Code

The California Fish and Game Code (Sections 1600-1607) authorizes the California Department of Fish and Wildlife (CDFW) to enter into streambed alteration agreements with applicants to develop mitigation measures for projects that would obstruct the flow or alter the bed, channel, or bank of a river or stream in which there are fish or wildlife resources, including intermittent and ephemeral streams.

### California Coastal Act

The California Coastal Act (Coastal Act) was enacted by the State Legislature in 1976 to provide long-term protection of the state's 1,100-mile coastline for the benefit of current and future generations. Development activities, which are broadly defined by the Coastal Act to include (among others) construction of buildings, divisions of land, and activities that change the intensity of use of land or public access to coastal waters, generally require a coastal permit from either the California Coastal Commission (CCC) or the local government. The Coastal Act includes specific policies (see Division 20 of the Public Resources Code) that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works.

### Porter-Cologne Water Quality Control Act

California's Porter-Cologne Act, enacted in 1969, provides the legal basis for water quality regulation within California. This Act requires a "Report of Waste Discharge" for any discharge of waste (liquid, solid, or gaseous) to land or surface waters that may impair beneficial uses for surface and/or groundwater of the State. It predates the CWA and regulates discharges to waters of the State. Waters of the State include more than just waters of the U.S., like groundwater and surface waters not considered waters of the U.S. Additionally, it prohibits discharges of "waste" as defined and this definition is broader than the CWA definition of "pollutant". Discharges under the Porter-Cologne Act are permitted by Waste Discharge Requirements (WDRs) and may be required even when the discharge is already permitted or exempt under the CWA.

The State Water Resources Control Board (SWRCB) and RWQCBs are responsible for establishing the water quality standards (objectives and beneficial uses) required by the CWA, and regulating discharges to ensure compliance with the water quality standards. Details regarding water quality standards in a project area are contained in the applicable RWQCB Basin Plan. In California, Regional Boards designate beneficial uses for all water body segments in their jurisdictions, and then set criteria necessary to protect these uses. Consequently, the water quality standards developed for particular water segments are based on the designated use and vary depending on such use. In addition, the SWRCB identifies waters failing to meet standards for specific pollutants, which are then state-listed in accordance with CWA Section 303(d). If a state determines that waters are impaired for one or more constituents and the standards cannot be met through point source or non-source point controls (NPDES permits or Waste Discharge Requirements), the CWA requires the establishment of Total Maximum Daily Loads (TMDLs). TMDLs specify allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed.

**State Water Resources Control Board and Regional Water Quality Control Boards**

The SWRCB adjudicates water rights, sets water pollution control policy, and issues water board orders on matters of statewide application, and oversees water quality functions throughout the state by approving Basin Plans, TMDLs, and NPDES permits. RWCQBs are responsible for protecting beneficial uses of water resources within their regional jurisdiction using planning, permitting, and enforcement authorities to meet this responsibility.

- **National Pollution Discharge Elimination System (NPDES) Program**

  **Municipal Separate Storm Sewer Systems (MS4)**
  Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of storm water dischargers, including MS4s. The U.S. EPA defines an MS4 as "any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over storm water, that are designed or used for collecting or conveying storm water." The SWRCB has identified the Department as an owner/operator of an MS4 pursuant to federal regulations. The Department's MS4 permit covers all Department rights-of-way, properties, facilities, and activities in the state. The SWRCB or the RWQCB issues NPDES permits for five years, and permit requirements remain active until a new permit has been adopted.

  The Department's MS4 Permit, contains three basic requirements:

  1. The Department must comply with the requirements of the CGP (see below);

  2. The Department must implement a year-round program in all parts of the State to effectively control storm water and non-storm water discharges; and

  3. The Department storm water discharges must meet water quality standards through implementation of permanent and temporary (construction) Best Management

Practices (BMPs) to the Maximum Extent Practicable, and other measures as the SWRCB determines to be necessary to meet the water quality standards.

To comply with the permit, the Department developed the Statewide Storm Water Management Plan (SWMP) to address storm water pollution controls related to highway planning, design, construction, and maintenance activities throughout California. The SWMP assigns responsibilities within the Department for implementing storm water management procedures and practices as well as training, public education and participation, monitoring and research, program evaluation, and reporting activities. The SWMP describes the minimum procedures and practices the Department uses to reduce pollutants in storm water and non-storm water discharges. It outlines procedures and responsibilities for protecting water quality, including the selection and implementation of BMPs. The proposed project will be programmed to follow the guidelines and procedures outlined in the latest SWMP to address storm water runoff.

**Construction General Permit**

Construction General Permit (Order No. 2009-009-DWQ, as amended by 2010-0014-DWG), adopted on November 16, 2010, became effective on February 14, 2011. The permit regulates storm water discharges from construction sites which result in a DSA of one acre or greater, and/or are smaller sites that are part of a larger common plan of development. For all projects subject to the CGP, applicants are required to develop and implement an effective Storm Water Pollution Prevention Plan (SWPPP). In accordance with the Department's Standard Specifications, a Water Pollution Control Plan (WPCP) is necessary for projects with DSA less than one acre.

By law, all storm water discharges associated with construction activity where clearing, grading, and excavation results in soil disturbance of at least one acre must comply with the provisions of the CGP. Construction activity that results in soil disturbances of less than one acre is subject to this CGP if there is potential for significant water quality impairment resulting from the activity as determined by the RWQCB. Operators of regulated construction sites are required to develop storm water pollution prevention plans; to implement sediment, erosion, and pollution prevention control measures; and to obtain coverage under the CGP.

The CGP separates projects into Risk Levels 1, 2, or 3. Risk levels are determined during the planning and design phases, and are based on potential erosion and transport to receiving waters. Requirements apply according to the Risk Level determined. For example, a Risk Level 3 (highest risk) project would require compulsory storm water runoff pH and turbidity monitoring, and pre- and post-construction aquatic biological assessments during specified seasonal windows, under certain circumstances.

**Section 401 Permitting**

Under Section 401 of the CWA, any project requiring a federal license or permit that may result in a discharge to a water of the United States must obtain a 401 Certification, which certifies that the project will be in compliance with State water quality standards. The most common federal permit triggering 401 Certification is a CWA Section 404 permit, issued by USACE. The 401 permit certifications are obtained from the

appropriate RWQCB, dependent on the project location, and are required before USACE issues a 404 permit.

In some cases the RWQCB may have specific concerns with discharges associated with a project. As a result, the RWQCB may issue a set of requirements known as Waste Discharge Requirements (WDRs) under the State Water Code (Porter-Cologne Act) that define activities, such as the inclusion of specific features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. WDRs can be issued to address both permanent and temporary discharges of a project.

## 2.3 Regional and Local Requirements

**Monterey County General Plan/Carmel Area Land Use Plan**

The Monterey County General Plan and Carmel Area Land Use Plan provide policies regarding hydrology and drainage issues.

**Monterey County Code Chapter 16.08**

Chapter 16.08 of the Monterey County Code identifies rules and regulations to control all grading, including excavations, fills and embankments, and establishes the procedures for the issuances of grading permits. Chapter 16.08 is intended to minimize erosion as a result of ground disturbing activities

**Monterey County Code Chapter 16.16**

Chapter 16.16 of the Monterey County Code identifies rules and regulations to control development within the floodplain. Chapter 16.16 is intended to promote public health, safety, and general welfare, and to minimize public and private losses due to flood conditions. Chapter 16.16 consists of regulations to 1) restrict and/or prohibit uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities; 2) require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction; 3 control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters; 4) control filling, grading, dredging, and other development which may increase flood damage; and, 5) prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

**Anti-degradation Policy**

An anti-degradation policy (SWRCB Resolution No. 68-16) was adopted by the SWRCB. The policy requires that where water quality is better than the objectives established in the Basin Plan the water quality shall be maintained unless otherwise specified by the provisions of the Resolution.

### Monterey County NPDES Permit Requirements

A portion of the Proposed Project, outside of the SR1 right of way, is located within Monterey County's MS4 area (Monterey County Urban area C). Less than 2,500 sq. ft. of impervious area will be created and/or replaced within the County's MS4 area, and therefore the project elements within the County's MS4 area will not be subject to the Phase II Permit's Post Construction Requirements (Resolution No. R3-2013-0032, "Approving Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region").

# 3. Affected Environment

## 3.1 Introduction

This section provides a description of the environmental characteristics within the Project Site. Topics covered in this section include geography, soils, hydrology, and biological communities.

## 3.2 General Setting

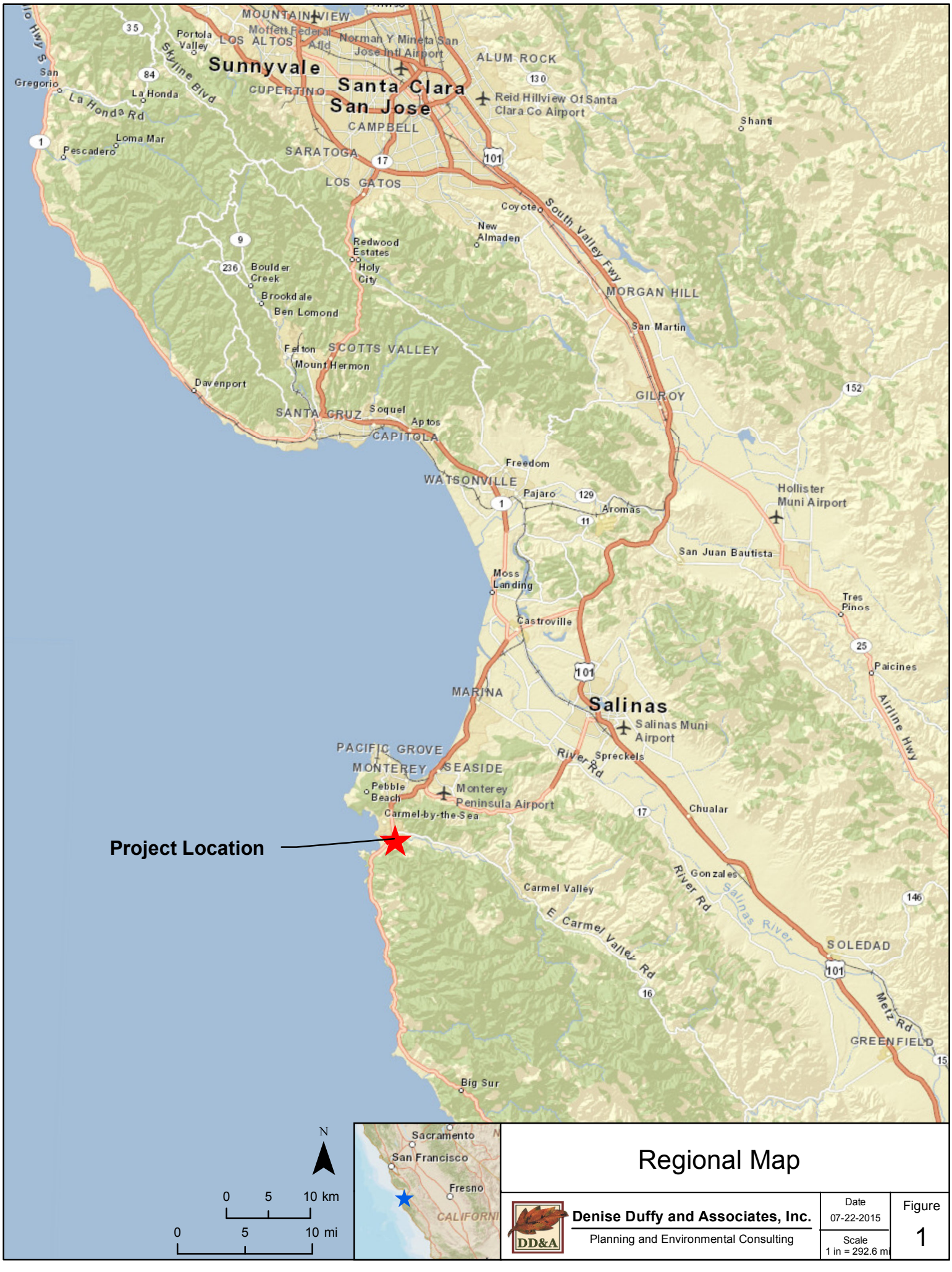
The Proposed Project is located in an unincorporated area of Monterey County (Figure 1). The Project site is located adjacent to the downstream end of the Carmel River and includes a portion of SR 1.

### 3.2.1. Population and Land Use

The Project site is bounded by the Carmel River Lagoon and State Park lands to the west, the main channel of the Carmel River and the Crossroads Shopping Center to the north, and Monterey Peninsula Regional Park District land to the south and east (Palo Corona Regional Park) (Figure 2). Neighboring land uses include native grasslands used for cattle grazing in Palo Corona Regional Park, residential land uses, commercial land uses, and recreational uses. The existing SR 1 Carmel River Bridge is also immediately north of the Project site. According to the Carmel Area Land Use Plan, the Project site is designated for Medium Density Residential, Resource Conservation, and Agricultural Preservation.

### 3.2.2. Topography

The Project site lies within the Coast Ranges Geomorphic Province, a discontinuous series of northwest-southeast trending mountain ranges, ridges and intervening valleys characterized by complex folding and faulting. The Project site consists of older floodplain deposits associated with the Carmel River. These deposits were characterized by Kleinfelder (2008) as consisting of unconsolidated, heterogeneous, moderately sorted silt and sand with discontinuous and relatively thin lenses of clay and silty clay. Large amounts of gravel may also be present. The Project site also historically contained a large area of imported fill, approximately 130,000 cubic yards, commonly referred to as the "Blister." Roughly 105,000 cubic yards of the Blister was used to construct a raised agricultural road on-site in 2005. Levees on the south bank of the Carmel River extend for approximately 4,100 feet on-site. Portion of these levees would be removed in connection with the Proposed Project. Site topography is relatively flat with the site's elevation ranging between 16 and 34 feet.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Denise Duffy and Associates, Inc.
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# Project Location

**Denise Duffy and Associates, Inc.**
Planning and Environmental Consulting

Date 07-22-2015
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Figure 2

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### 3.2.3. **Hydrology**

#### 3.2.3.1. Regional Hydrology

The Proposed Project is located at the downstream end of the Carmel River, approximately one mile from its terminus in Carmel Bay; Carmel Bay is located within the Monterey Bay National Marine Sanctuary and is considered an Area of Special Biological Significance[1] by the SWRCB. The Carmel River has a total length of approximately 35 miles and drains approximately 164,000 acres. The Carmel River represents a relatively large watershed, with a total watershed area of approximately 256 square miles. The Project site's location within the Carmel River Watershed and Carmel Bay sub-basin is depicted in **Figure 3.**

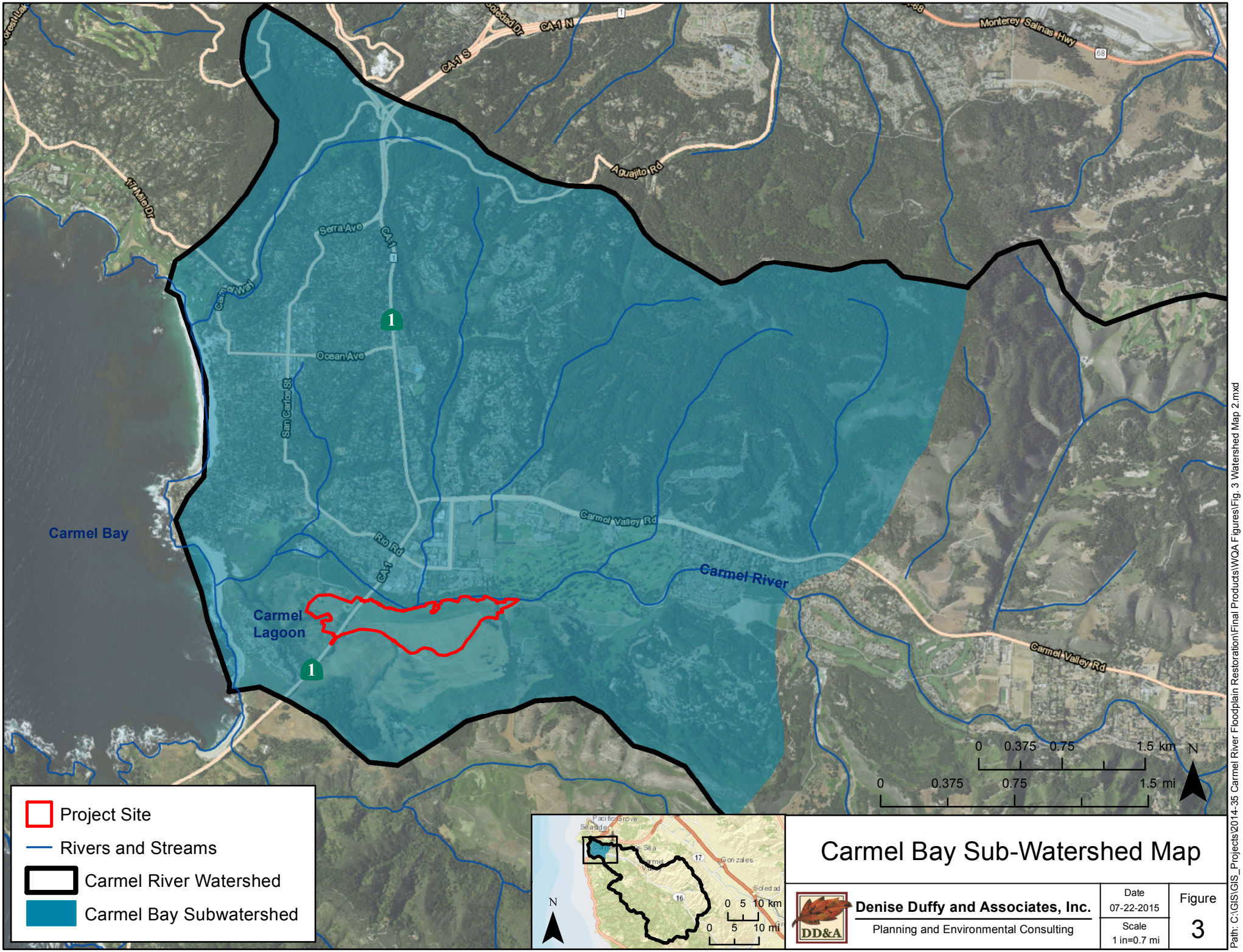
The Carmel River Watershed is located within the California Coast Ranges Geomorphic Province. The entire drainage area of the watershed is located on the western slopes of the Sierra De Salinas. The northwesterly flowing Carmel River originates approximately 35 miles upstream from Carmel Bay at an elevation of 3,500 feet above sea level. The major tributary to the Carmel River is the Tularcitos Creek. Most of the river's watershed (approximately 65%) is upstream of the confluence with this tributary. Its larger tributaries include Garzas Creek, San Clemente Creek, Pine Creek, Danish Creek, Cachagua Creek, and the Miller Fork. The upper reaches of the Carmel River flow northwesterly, generally following the trend of the fault block structure of the Coast Ranges, to a confluence with Tularcitos Creek. The lower reach flows in a more westerly direction through Carmel Valley and into the Pacific Ocean at Carmel Bay. According to the Monterey Peninsula Water Management District (MPWMD), average annual runoff (from 1962 to 2006) is 78,190 acre-feet. Stream flow in the Carmel River is directly attributed to rainfall; average annual precipitation is 18 to 20 inches. Accordingly, Carmel River flows are subject to large seasonal and annual variation in terms of total volume and peak discharge.

The Carmel River represents one of the primary sources of water supply for the Monterey Peninsula. Until 2015, the California American Water Company owned and operated two dams at the headwaters of the Carmel River; the San Clemente and the Los Padre. Up until 2015, when the San Clemente was removed, these two dams worked together to regulate winter and summer flows to the lower reaches and retain winter runoff in order to provide surplus water to accommodate summer demand. The Los Padre dam will continue to perform these functions at a significantly reduced capacity.

#### 3.2.3.2. Local Hydrology

The Proposed Project site is located within the Carmel Bay Sub-Watershed of the Carmel River Watershed; the Project site is located at the lowest 1.5 miles of the sub-watershed. The existing drainage pattern of the Carmel River has been substantially altered as a result of human activity, primarily as a result of the construction of levees along both banks of the main

[1] California Public Resources Code Section 36700 f) "Areas of special biological significance" are a subset of state water quality protection areas, and require special protection as determined by the State Water Resources Control Board pursuant to the California Ocean Plan adopted and reviewed pursuant to Article 4 (commencing with Section 13160) of Chapter 3 of Division 7 of the Water Code and pursuant to the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (California Thermal Plan) adopted by the state board.




# Carmel Bay Sub-Watershed Map

**Denise Duffy and Associates, Inc.**
Planning and Environmental Consulting

Date 07-22-2015
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Figure 3

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channel. These levees were constructed in order to confine small and moderate flow events to the main channel and minimize flooding hazards to the north and south overbank areas. The levees have considerably restricted the ability of the main channel to interact with its adjacent floodplain; the levees limit the lateral dispersal of floodwater into the floodplain.

#### 3.2.3.2.1. Precipitation and Climate

The Project site has a Mediterranean climate, characterized by hot, dry summers and cool, wet winters. The rainy season in this region typically occurs from October 15 to April 15. The 24-hour precipitation for the 2-, 5-, and 10-year storm events are 2-, 3-, and 3.5-inches respectively (NOAA).

#### 3.2.3.2.2. Surface Streams

The Carmel River is directly adjacent to the north of the Project Site, and the Carmel Lagoon is directly adjacent to the west (Figure 4). Earthen levees separate the main channel of the Carmel River from Project site. Some flow from the Carmel River occasionally reaches the project site during large flood events.

A model of the existing system was created by Balance Hydrologics (2008a). The model indicated that there is a distinct possibility of scour and loss of the roadway at the overflow location for floods on the order of the 100-year event due to high local velocities. Additionally, the model predicted high velocity flow (in excess of 10 fps) within the Carmel River.

#### 3.2.3.2.3. Floodplains

The Proposed Project is located in the Southern Carmel River Floodplain (south floodplain) within the Federal Emergency Management Agency (FEMA) 100-year flood boundary. The Project site does not currently experience dry season flows. Within the Project site there is an existing highway embankment, approximately five to eight feet high, which transverses the south floodplain. Culverts in the SR 1 embankment are likely sufficiently sized to accommodate runoff from the surrounding areas, but have an insignificant capacity compared to the flood flows in both existing and proposed conditions.

The Project site was historically a part of the Carmel River floodplain; however, the construction of on-site earthen levees in the 1930s effectively isolated the main channel from this portion of the floodplain. A portion of this levee system exists along the Northern edge of the Project site, altering the hydrologic function of the south floodplain, particularly during moderate and large storm events. The levees have reduced the Project site's capacity to function as a natural floodplain. The existing conditions of the site have limited the ability of the site to provide flood relief to the developed areas located north of the Carmel River. The disassociation between the main channel and the south floodplain has limited the lateral disbursement of water during high flow events and confined flows to the main channel, resulting in decreased flooding within the site and an increased flood risk to developed areas within the watershed. Minor flood control projects have been implemented since 1995 to allow minimal increased discharge into the south overbank area during large flood events; however,


# Adjacent Waterbodies

**Denise Duffy and Associates, Inc.**
Planning and Environmental Consulting

Date: 07-22-2015
Scale: 1 in=0.2 mi
Figure: 4

Path: C:\GIS\GIS_Projects\2014-35 Carmel River Floodplain Restoration\Final Products\WQA Figures\Fig. 4 Surface Streams Map.mxd

the existing levees still remain significant obstacles to the dispersal of floodwater into the south overbank area.

The Proposed Project site is located in an area that is subject to periodic flooding. In 1995, following significant flooding of the entire lower Carmel River flood plain, a "notch" was created in the levee at the upstream end of the project area to allow water from the Carmel River to enter the south floodplain during flood events. Along with various other improvements in the north floodplain, the "notch" is believed to have been instrumental in preventing significant damage during the 1998 floods. During a 100-year flood event it is estimated that the south floodplain, in its current state, conveys only 7,140 cfs of the total river discharge of 22,700 cfs. Once floodwaters enter the south floodplain via the "notch", the floodwaters which are conveyed through the south floodplain must overtop the SR 1 existing embankment, as the culverts in the SR1 embankment have a very limited capacity. The SR 1 embankment obstructs flow through the south floodplain and during large flood events creates a backwater situation that elevates upstream water surface elevations, which increase flooding depths within the entire floodplain, including the main river channel and the developed north floodplain.

#### 3.2.3.2.4. Municipal Supply

There are no drinking water reservoirs or recharge facilities within the project limits.

#### 3.2.3.3. Groundwater Hydrology

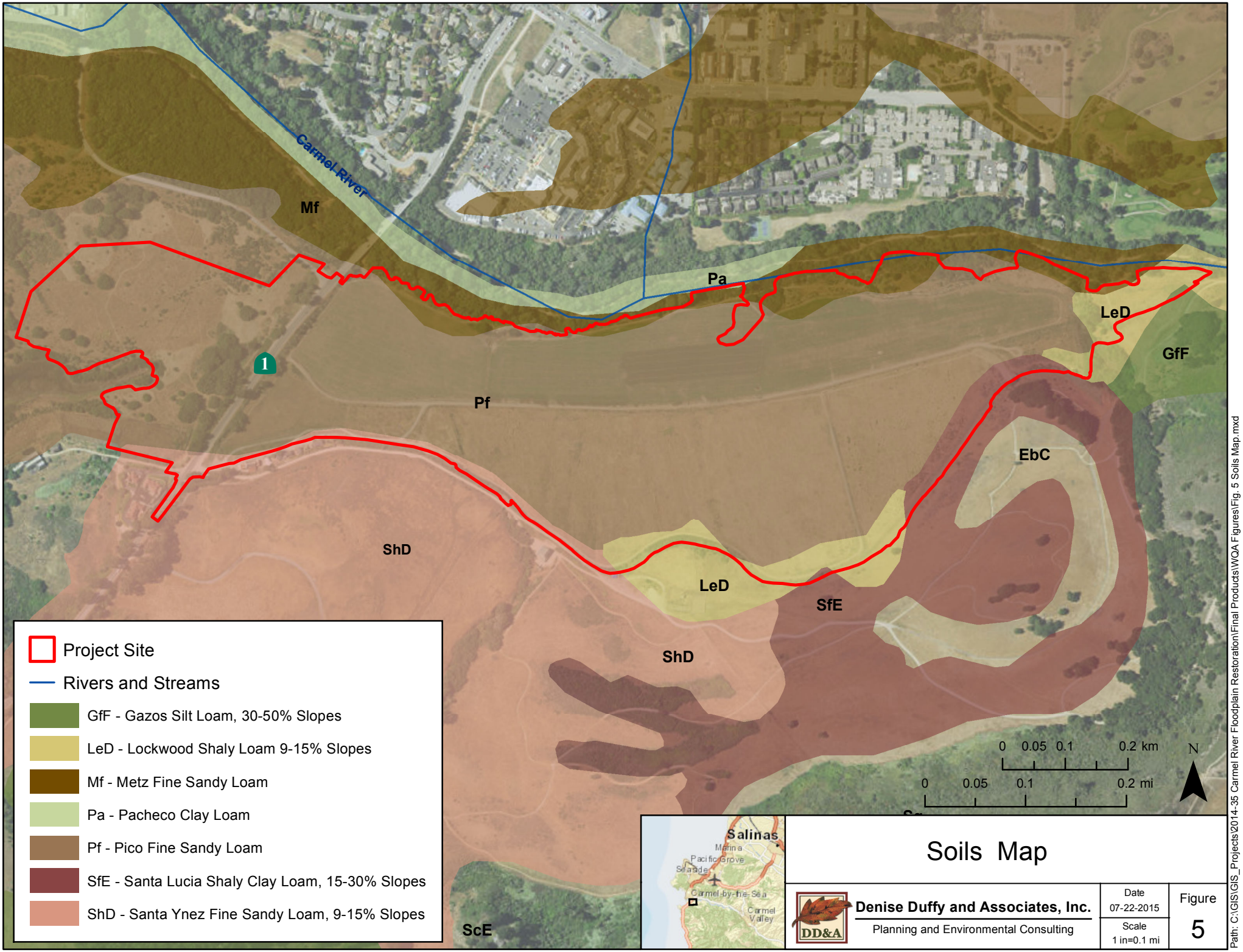
During a geotechnical investigation on August 31, 2008, groundwater was encountered approximately 10 feet below grade, at an estimated 19.2 feet above mean sea level (Kleinfelder, 2015).

### 3.2.4. **Geology/Soils**

#### 3.2.4.1. Soil Erosion Potential

On-site soils are classified in the Monterey County Soil Survey (USDA-SCS 1978). Soil is generally defined as the unconsolidated mixture of mineral grains and organic material that covers the land surfaces of the earth. Soils can develop on unconsolidated sediments and weathered bedrock. Soils at the site vary based upon the topography of the site. Soils at the site consist of mostly disturbed soils. Sources of current and historic ground disturbance are due mostly to agricultural activities. As shown on **Figure 5**, the Monterey County Soil Survey indicates seven mapping units within the project area. The mapping units are:

- **Gazos Silt Loam (GfF), 30-50% slopes.** These soils are located on the eastern boundary of the site on property owned by the Monterey Peninsula Regional Park District. The Gazo series consists of well drained soils on hills. These soils formed in material underlain by sandstone and shale. Permeability is moderate and the available water capacity is five (5) to eight (8) inches. Runoff is rapid and the erosion hazard is moderate to high. These soils are generally found on slopes of 15 to 50 percent.




# Soils Map

Denise Duffy and Associates, Inc.
Planning and Environmental Consulting

Date 07-22-2015
Scale 1 in=0.1 mi
Figure 5

Path: C:\GIS\GIS_Projects\2014-35 Carmel River Floodplain Restoration\Final Products\WQA Figures\Fig. 5 Soils Map.mxd

- **Lockwood Shaly Loam (LeD), nine (9) – 15%.** These soils are located along the southern boundary of the site, as well as the eastern site boundary on property owned by the Monterey Peninsula Regional Park District. The Lockwood serious consists of well drained soils that formed in alluvium that was derived from siliceous shale. These soils are on alluvial fans and coastal terraces. Permeability is moderately slow. The available water capacity in these soils is six (6) to eight (8) inches. Runoff is medium and the erosion hazard is considered moderate. This is considered a strongly sloping soil that is located on alluvial fans and terraces.

- **Metz Fine Sandy Loam (Mf).** These soils are located along the northern boundary of the site along the Carmel River Corridor. The Metz series consists of somewhat excessively drained soils that formed in alluvium that was derived mostly from sedimentary rocks on floodplains. Permeability is moderate, but becomes rapid at a depth of more than 48 inches. The available water capacity is four (4) to six (6) inches. Runoff is slow and the potential erosion hazard is considered slight. If unprotected, these soils are, however, subject to wind erosion.

- **Pacheco Clay Loam (Pa).** These soils are located along the north western boundary of the site adjacent to the Carmel River. The Pacheco series consists of poorly drained soils that formed on floodplains in alluvium derived from sedimentary rock. Slopes are zero (0) to two (2) percent. Permeability is moderately slow and these soils water capacity is 10 to 12 inches. Runoff is very slow and erosion is not considered a problem.

- **Pico Fine Sandy Loam (Pf).** This soil type is the dominate soil type on-site. The Pico series consists of well drained soils that formed on the floodplains in alluvium derived from sedimentary rock. Slopes are zero (0) to two (2) percent. Permeability is moderately rapid. The available water capacity is 7.5 to nine (9) inches. Runoff is slow and the erosion hazard is considered slight. If unprotected, these soils, however, are subject to wind erosion.

- **Salinas Clay Loam, (SbA), zero (0)-two (2)% slopes.** A small area of this soil type is located in the south-west corner of the site. The Salinas series consists of well drained soils that formed in mixed alluvium from sedimentary and granitic rock. Slopes are zero (0) to nine (9) percent. Permeability is moderately slow. The available water capacity is 10 to 12 inches. Runoff is slow; the erosion hazard is considered slight.

- **Santa Lucia Shaly Clay Loam, (SfE), 15-30% slopes.** A small band of this soil type is located along the southeastern boundary of the site; The Santa Lucia series consists of well drained soils on uplands. These soils formed in material underlain by hard shale of the Monterey Formation. Slopes are 28 to 75 percent. Permeability is moderate. The available water capacity is two (2) to 5.5 inches. Runoff is medium and the erosion hazard is moderate.

- **Santa Ynez Fine Sandy Loam, (ShD), 9-15% slopes.** On-site soils consisting of the Santa Ynez series are located along the southwestern boundary. These soils occupy a relatively small portion of the site. The Santa Ynez series consist of moderately well

drained soils that formed on terraces in alluvium deprived from sandstone and granitic rock. Slopes are two (2) to 30 percent. Permeability is very slow. The available water capacity is three (3) to five (5) inches. Runoff is slow or medium; the erosion hazard is considered slight to moderate.

The erosive potential of on-site soils ranges from low to moderate. **Figure 6** identifies the potential for erosion hazards on the site and surrounding vicinity. In general, the majority of soils are classified as having a low erosion potential. If left unprotected, these soils, however, may be subject to wind and/or water erosion.

### 3.2.5. **Biological Communities**

#### 3.2.5.1. Aquatic Habitat

While no aquatic habitat is present within the Project boundaries, the Camel River is directly adjacent to the northern edge of the Project site, the Carmel Lagoon is located along the eastern edge of the Project site, and River Pond on Palo Corona Regional Park is located to the east of the Project site.

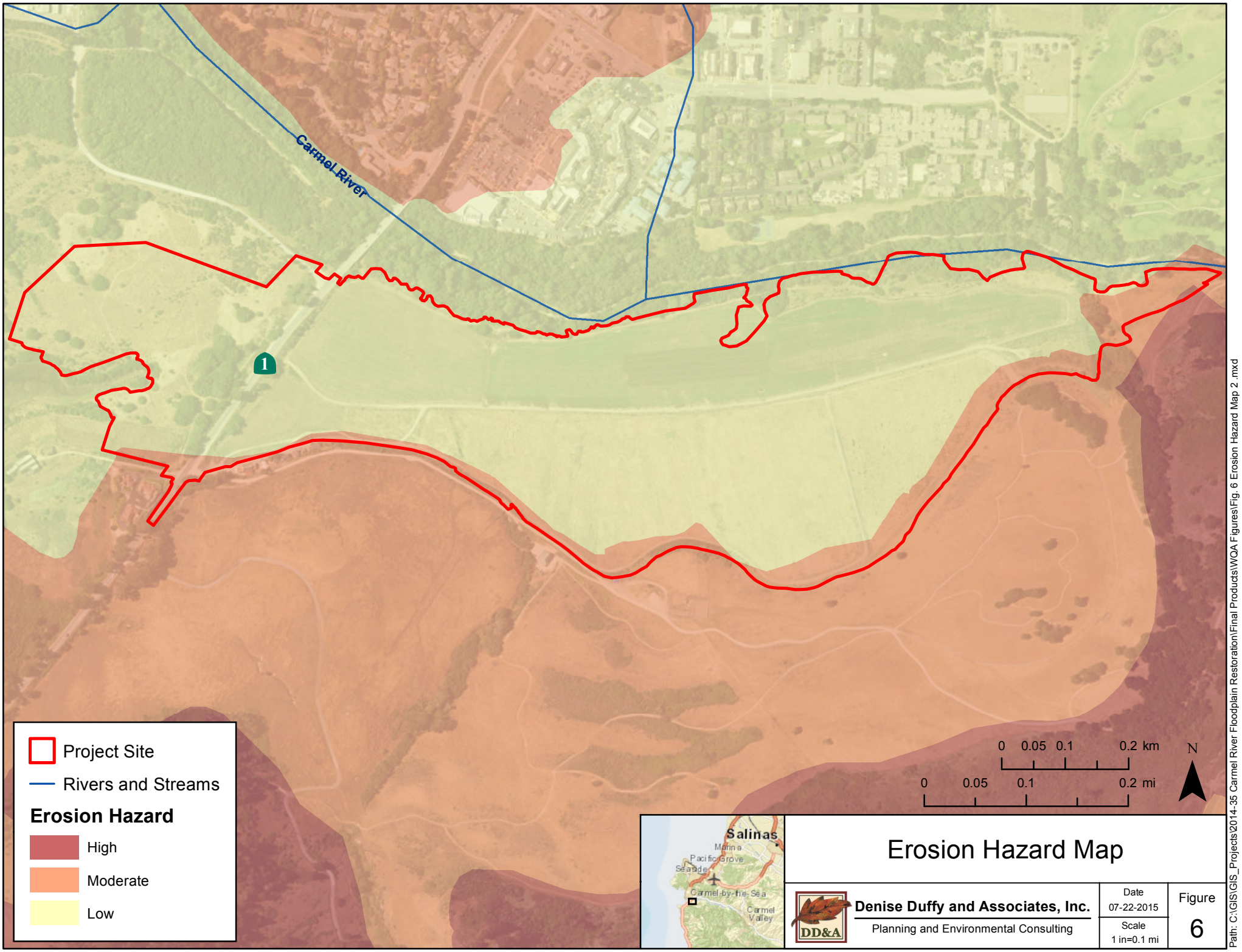
##### 3.2.5.1.1. Special Status Species

Several special-status wildlife species are known, or have a potential to occur within or immediately adjacent to the Project site: sensitive bat species, Monterey dusky-footed woodrat (*Neoto*ma *macrotis luciana*), California legless lizard (*Anniella pulchra*), western pond turtle (*Emys marmorata*), California red-legged frog (CRLF, *Rana draytonii*), Coast Range newt (*Taricha torosa torosa*), South-Central California Coast steelhead (*Oncorhynchus mykiss*), raptors, and other sensitive avian species.

The Carmel Lagoon, located immediately adjacent to the Project site, is within an area identified as essential fish habitat (EFH) for various life stages of fish species managed with the Pacific Groundfish and Coastal Pelagic Fisheries Management Plans (FMPs). In addition, the Carmel Lagoon is within an area designated as a coastal estuary Habitat Areas of Particular Concern (HAPC) for various federally managed fish species within the Pacific Groundfish FMP. Although these areas are present immediately adjacent to the Project site, no EFH is present within the Project site.

##### 3.2.5.1.2. Stream/Riparian Habitats

The Project site supports two types of riparian habitat: riparian forest and riparian scrub. Portions of the riparian forest are degraded due to historic and on-going agricultural activities. Approximately 5.8 acres of riparian habitat is present within the Project boundary, including 4.4 acres of intact riparian forest, 0.6 acre of degraded riparian forest, and 0.8 acre of riparian scrub. The riparian forest in these degraded areas is less densely vegetated and has an understory of non-native invasive weed species, such as poison hemlock (*Conium maculatum*), and annual grasses (Denise Duffy & Associates, 2015).




# Erosion Hazard Map

**Denise Duffy and Associates, Inc.**
Planning and Environmental Consulting

Date: 07-22-2015
Scale: 1 in=0.1 mi
Figure: 6

Path: C:\GIS\GIS_Projects\2014-35 Carmel River Floodplain Restoration\Final Products\WQA Figures\Fig. 6 Erosion Hazard Map 2.mxd

Riparian areas provide habitat for many wildlife species, particularly birds and herpetofauna. Special-status wildlife species that may be present within the riparian habitat include CRLF, Monterey dusky-footed woodrat; California legless lizard; western pond turtle; Coast range newt; special-status bat species; nesting raptors, including white-tailed kite (*Elanus leucurus*), sharp-shinned hawk (*Accipiter striatus*), and (*Accipiter cooperii*); and riparian avian species, including tricolored blackbird (*Agelaius tricolor*). Riparian habitat is considered a sensitive habitat and impacts are regulated by a number of state regulatory agencies including CDFW, CCC, and the RWQCB.

The existing SR1 embankment creates a partial barrier to wildlife movement to and from the Carmel Lagoon. Berms along the Carmel River, SR1, and ongoing ranching activities currently preclude connectivity through the historic floodplain between the riparian habitat and wetlands of the Carmel River and Carmel Lagoon.

#### 3.2.5.1.3. Wetlands

Emergent marsh is present, adjacent to the Project site, in the South Arm of the Carmel River Lagoon. Wetland habitat associated with River Pond is also present to the east of the Project site.

#### 3.2.5.1.4. Fish Passage

The current configuration of the Project site does not support fish passage, as the Project site does not typically receive flows and the existing SR1 embankment acts as a barrier, except in extreme flood events where the Carmel River overtops SR 1.

## 3.3Water Quality Objectives/standards and Beneficial Uses

### 3.3.1. Surface Water Quality Objectives/standards and Beneficial Uses

Beneficial uses of the surface water from the Carmel River include the following: municipal and domestic supply (MUN); agricultural supply (AGR); industrial service supply (IND); groundwater recharge (GWR); freshwater replenishment (FRESH); water contact recreation (REC1); non-contract water recreation (REC2); commercial and sport fishing (COMM); warm fresh water habitat (WARM); cold water habitat (COLD); wildlife habitat (WILD); preservation of biological habitats of special significance (BIOL); rare, threatened, or endangered species; migration of aquatic organisms (RARE); and spawning, reproduction, and/or early development (SPWN) (RWQCB-CCR, 2016). General water quality objectives exist for each of the beneficial uses identified. Surface water quality objectives have also been identified for the Carmel River (Table 2).

**Table 2. Surface water quality objectives for the Carmel River**

| Constituent | Objective[1] (mg/L) |
|---|---|
| Total Dissolved Solids (TDS) | 200 |
| Chloride (Cl) | 20 |
| Sulfate ($SO_4$) | 50 |
| Boron (B) | 0.2 |
| Sodium (Na) | 20 |

[1] These surface water quality objectives are annual mean values characterizing a large area of the water body and may not be directly related to the objective indicated

### 3.3.2. Groundwater Quality Objectives/standards and Beneficial Uses

Beneficial uses of the ground water from the Carmel River include the following: municipal and domestic supply (MUN); agricultural supply (AGR); industrial service supply (IND) (RWQCB-CCR, 2016). No ground water quality objectives have been established for the Carmel River

## 3.4 Existing Water Quality

### 3.4.1. Regional Water Quality

The Central Coast Watershed Studies Team (CCoWS) monitored water quality in the Carmel Lagoon between 2004 and 2007. Salinity, dissolved oxygen, and temperature in the lagoon vary seasonally and with depth. The topography and lack of mixing in the lagoon creates a layer of isolated salt water in the bottom of the South Arm of the Lagoon. The lack of mixing can also result in anoxic conditions below the halocline. The depth at which the halocline occurs fluctuates seasonally with changes in freshwater input. The Carmel River near the lagoon typically ceases to flow during the summer months and a slow input of groundwater provides some freshwater in the Lagoon (Perry et al. 2007). The Lagoon does become well mixed on occasion, when the Lagoon has breached the sand bar and fresh water input is adequate. Large precipitation events and/or disturbance of sediment on the bottom of the Lagoon can lead to increases in turbidity (Larson et al. 2006).

### 3.4.2. List of Impaired Waters

Carmel River is not listed on the 2010 303(d) list of impaired waters and no TMDLs are required.

### 3.4.3. Areas of Special Biological Significance (ASBS)

The Carmel River is a tributary to the Carmel Bay. Carmel Bay is Area of Special Biological Significance (ASBS) #34. Carmel Bay ASBS is located approximately one mile downstream of the proposed project site.

# 4. Environmental Consequences

## 4.1 Introduction

This section discusses the potential environmental consequences related to water quality associated with the implementation of the Proposed Project (the build alternative) as well as measures and practices to reduce effects to water quality.

## 4.2 Potential Impacts to Water Quality

The Proposed Project is intended to improve the quality of water entering the Carmel River Lagoon by providing additional storage and filtration for sediment and nutrients. Floodplains provide important water quality benefits by providing additional storage and filtration capacity. These benefits include the filtration of nutrients, moderation of temperature, reduction of sediment loads and sedimentation, and process of organic and chemical wastes. The Proposed Project, when considered in its entirety, would result in a number of potential water quality effects by 1) increasing nutrient storage and exchange between the main river channel and the restored floodplain; 2) converting dissolved inorganic nitrogen into atmospheric nitrogen as part of natural processes; and, 3) supporting the decomposition of organic and chemical materials (Balance Hydrologics, 2015). Overall, the Proposed Project would improve the quality of water entering the lower Carmel River. The Project, including the causeway, would have a net beneficial effect on water quality. The Proposed Project would not increase stormwater flows.

### 4.2.1. Anticipated changes to the Physical/Chemical Characteristics of the Aquatic Environment

#### 4.2.1.1. Substrate

Without vegetation or hardening materials, the local substrate is loose, coarse and highly mobile. Existing vegetation would be preserved to the maximum extent possible; however, some vegetation removal is unavoidable. To stabilize the geometry of the distributary channels while vegetation cover is reestablished and to minimize erosion upstream of the lagoon the design recommends a layer of cobble bed fill material line the bottom of the channels. The layer of cobble bed fill material would be 2-feet thick and line the bottom of the distributary channels from approximately 100 feet upstream of the causeway, downstream to the lagoon. This material would consist of rounded cobbles and gravel consistent with the existing bed in the main channel of the Carmel River in the vicinity of SR 1 and would emulate the substrate that would be expected to occur in relic channels on the floodplain (Balance Hydrologics, 2015).

#### 4.2.1.2. Currents, Circulation or Drainage Patterns

One of the primary objectives associated with the Proposed Project is to improve the site's capacity to function as a floodplain and restore the site's hydrologic connectivity with the

Carmel River and surrounding floodplain. The Project is intended to increase the site's capacity to accommodate floodwaters, as well as restore the site's longitudinal connectivity with the Carmel River Lagoon and adjacent floodplain. The Project would result in a higher proportion of flood flow attainment in the restored floodplain. Flows within the restored floodplain would be conveyed under the causeway and into the south arm of the Carmel Lagoon. The restored floodplain would not experience continuous flow year round. The Proposed Project is designed[2] such that substantial inundation of the floodplain is not expected when flows in the Carmel River are lower than the two- to five-year event[3]. In most years, direct rainfall and runoff from the local watershed area will be the only sources of water for the restored floodplain (Balance Hydrologics, 2015).

Balance Hydrologics, Inc. completed a proposed conditions model by revising the existing conditions model to include the proposed floodplain restoration activities, removal of portions of the existing levees, and the proposed causeway. Hydrologic modeling of 50-year and 100-year flood events in post-project hydraulic conditions was conducted. The methodology and assumptions used to evaluate post-project conditions included the following. In order to account for the removal of the levees between the main channel and south overbank reaches, the south overbank cross-sections upstream from SR 1 were merged into the cross-sections contained within the main channel reach. Cross-sections within the south overbank areas were adjusted to reflect the proposed grading plan and Manning's 'n' values were increased along the floodplain to account for an increased density of vegetation that would result from the planting of native vegetation in connection with the Project. The proposed causeway was also incorporated into the model by replacing the existing inline structure within the south overbank reach with a bridge. Two causeway designs are being considered, a slab bridge with 16-inch diameter piers and a box girder bridge with 4.5-foot diameter piers (Avila & Associates, 2015).

Modeling of the Proposed Project, including all components, indicated that discharge in the south overbank area would increase to 10,500 cfs during the 50-year event and to 13,000 cfs during the 100-year event. The increase in flood discharge to the south overbank area would decrease flood discharge in the main channel and lead to lower water surface elevations in Carmel River. The model predicted that water elevations upstream of the proposed causeway would be reduced by as much as 6.9 feet during these flood events. This reduction in water surface elevation would largely result from the enhanced/restored floodplain, which would restore the hydrologic connectivity of the site with the main channel of the Carmel River thereby conveying a larger portion of overall flood flows in the river. As a result, the elevation of flood flows in the main channel adjacent to the developed north bank during flood events would be lowered. Furthermore, velocities in much of the north floodplain and the main channel of the Carmel River are expected to decrease from the Rancho Cañada Golf Course downstream. Water surface elevations downstream of the proposed causeway would increase as much as 1.3 feet during flood events, as a result of the change in the flow distribution and hydraulics (Avila & Associates, 2015). The Proposed Project would not adversely affect floodplain dynamics.

[2] The exact location and elevation of the notches in the levee will be determined during the final design.
[3] The five year event was estimated based on annual peak flows for Water Years 1963 through 2007.

Flow velocities within the south floodplain, during a flood event, are predicted to become more uniform compared to existing conditions. On the upstream or eastern end of the Project site, velocity would decrease as flows would no longer be focused through the notch created in the levee and around the south side of the "Blister". Downstream or on the western end of the Project site, velocity would increase as the causeway (a 360 foot long overflow bridge) would enhance conveyance and floodwaters would no longer pool behind the SR 1 embankment. Localized areas of high velocity (contraction scour) are predicted around the abutments of the proposed causeway. Rock slope protection is proposed at the abutments in order to protect the roadway embankments. The bridge abutment design includes analysis of embankment wash-out.

The proposed design of the restored floodplain would include two distributary channels, one to the north and one to the south. Some separation between the distributary channels would be created by areas of high ground within the project site. The confluence of distributary channels would be upstream of the proposed causeway. The proposed design would also incorporate a multi-channel configuration where the Proposed Project connects with the South Arm of the Carmel Lagoon. The multi-channel design would reduce the potential for erosion where the floodplain transitions to the lagoon (Balance Hydrologics, 2015).

Agricultural ditches located at the toe of slope near the eastern end of the agricultural field would be restored as part of an intermittent drainage corridor. The intermittent drainage corridor would receive runoff from the adjacent area and flow west, between the agricultural preserve and Palo Corona Regional Park. The intermittent drainage corridor would include a sinuous low flow channel and a series of three boulder steep-pools. The intermittent drainage corridor would join the south distributary channel upstream of the final sediment sequestration area. Additionally, a gently sloping area would be created within the Project site, adjacent to River Pond, over which sheet flow would be conveyed to the southern distributary channel within the restored floodplain (Balance Hydrologics, 2015).

The agricultural preserve would be elevated above the 100-year floodplain. The agricultural preserve would be sloped such that runoff from the preserve would drain to a water quality pond. The water quality pond would allow the runoff to settle and percolate (Balance Hydrologics, 2015).

#### 4.2.1.3. Suspended Particulates (Turbidity)

Floodplains provide important water quality benefits by providing additional storage and filtration capacity. These benefits include the reduction of sediment loads through sedimentation, and supporting the decomposition of organic and chemical materials. The Proposed Project may increase sediment transport to the South Arm of the Carmel Lagoon by restoring hydrologic connectivity with the floodplain; however, the increased frequency of flood flows to the South Arm of the Carmel Lagoon would also result in periodic scouring of sediment deposits as part of natural floodplain processes.

During construction, effective combinations of temporary and permanent erosion and sediment controls will be used. Temporary storm water best management practices will be coordinated

through the contractor with Caltrans construction personnel to effectively manage erosion from DSA by implementing a SWPPP.

#### 4.2.1.4. Oil, Grease and Chemical Pollutants

The Proposed Project has historically been used for agricultural production. Hazardous materials (i.e. pesticides, fertilizers, diesel fuel, etc.) may have historically been used on-site in connection with past agricultural activities. Overall, the Project would reduce the extent of on-site agricultural activities as compared to historic use of the site.

#### 4.2.1.5. Temperature, Oxygen, Depletion and Other Parameters

Any existing tendency for the lagoon to fill with sediment may either be made worse or reversed by the Restoration component of the Proposed Project. There is the potential that enhanced flood flows could increase the amount of sediment to the South Arm of the Carmel River through the restored longitudinal connection and remobilization of sediment deposits on the restored floodplain. However, enhanced flood flows could also periodically scour away deposited sediment and promote channel network expansion by increasing velocities through the Lagoon. Occasional scouring flood flows could improve water quality in the lagoon by removing accumulated organic matter on the bottom (which can reduce dissolved oxygen levels or grow pathogens) and reducing winter salinity stratification (Balance Hydrologics, 2015).

#### 4.2.1.6. Flood Control Functions

Pre- and post-project hydraulic modeling was completed in order to evaluate the Project's potential to reduce flooding hazards. Modeling of the conditions created by implementation of the Proposed Project by Balance Hydrologics, Inc. predicted a decrease in water surface elevations in the main river channel and north floodplain associated with the 50-year and 100-year event (Avila & Associates, 2015). A decrease in water surface elevations within the main channel and the north floodplain would significantly reduce the flood risk for the existing structures within the north floodplain, and would make it substantially easier to improve existing levees, floodwalls, and drainage infrastructure to protect the north overbank areas from floods as large as the 100-year event. The Proposed Project, including all Project components/actions, would improve floodplain hydrology and reduce the occurrence of flooding in the developed north overbank areas. Flooding depths would nominally increase at some locations within undeveloped south overbank floodplain, as is consistent with the objectives of the Proposed Project.

#### 4.2.1.7. Erosion and Accretion Patterns

Temporary loss of bank stabilizing vegetation where segments of the levee will be removed, as part of the restoration component of the project, may enhance the lateral redistribution of the substrate into the channel as flows erode the banks of the remnant levee sections (Balance Hydrologics, 2015). Appropriate measures will be incorporated to prevent post-project levee erosion.

Balance Hydrologics (2015) completed detailed geomorphic modeling of the restored floodplain environment. A channel evolution model was used to predict long-term sediment transport and bed change. The model predicted that after multiple, moderately large events (i.e. the 10-year event) over a 50-year timespan, without armoring the upstream most end of the floodplain would tend to erode one to three feet, with additional degradation occurring at the change in floodplain slope located approximately 1,000 feet upstream of the causeway. Under the same conditions, the model also predicts aggradation below the causeway and downstream into the lagoon. For much larger flood (i.e. the 50-year event), the model predicts less aggradation as larger events have the capacity to flush the lagoon of sediment.

Several sediment sequestration elements have been incorporated into the design of the restoration to prevent the accretion of sediment in the South Arm of the Carmel Lagoon, including a gentle slope and multiple sequestration depressions. These features would provide an opportunity for floodwaters on the floodplain to shed excess sediment before reaching the South Arm of the Carmel Lagoon.

#### 4.2.1.8. Aquifer Recharge/Groundwater

Overall, the Proposed Project, in its entirety, would improve groundwater recharge. Sediment sequestration depressions and other geomorphic features will support groundwater recharge in the floodplain by retaining a portion of the floodwater and runoff from the local watershed areas.

#### 4.2.1.9. Baseflow

The Proposed Project would enhance recharging of the local aquifer, which has been identified as a factor in preserving freshwater input to the Carmel Lagoon System during the summer months when flow in the Carmel River often ceases.

### 4.2.2. **Anticipated Changes to the Biological Characteristics of the Aquatic Environment**

#### 4.2.2.1. Special Aquatic Sites

As identified above, implementation of the Proposed Project will result the restoration of the site's longitudinal connectivity with the Carmel River Lagoon and adjacent floodplain. The Carmel Lagoon includes areas of wetlands and other waters, and has been identified as critical habitat for federally listed species as well as EFH. The Proposed Project would result in enhanced flood flows reaching the South Arm of the Carmel Lagoon. The Proposed Project is intended to improve the quality of water entering the Carmel River Lagoon by providing additional storage and filtration for sediment and nutrients. The Proposed Project would result in erosion and sedimentation on- and off-site as part of natural floodplain processes.

#### 4.2.2.2. Habitat for Fish and Other Aquatic Organisms

Restoring the connection between the floodplain and the Carmel River by removing sections of the existing levees will expose the floodplain to a regime of more frequent inundation which has the potential to result in both beneficial and adverse impacts to local wildlife and vegetation. Removal of levees will tend to result in the restoration of a diverse physical structure within the floodplain. Spatial variation in sedimentation and channelization will create of a mosaic of topographical features within the floodplain that will differ with respect to inundation frequency and duration, sediment texture and thickness, and depth to groundwater. These conditions will promote the rapid establishment of floodplain vegetation and create habitat.

The variety of habitat created by the interaction between floodplains and river systems has many benefits including, fostering primary productivity and supporting the reproductive cycle of various fish species. The Proposed Project will re-establish a more natural flow regime, which will benefit native fish and other aquatic organisms adapted to the episodic inundation of the floodplain.

##### 4.2.2.2.1. Fish Passage (Beneficial Uses)

During flooding, fish may use areas of the restored floodplain as refugia. Stranding of fish on the floodplain in isolated ponds is not expected to be an issue. The potential for fish stranding was addressed in the design of the sediment sequestration depressions. Each depression will contain a clear flow outlet so that fish can sense the when the floodwaters are receding and vacate the floodplain. Furthermore, fish stranding is unlikely due to the high degree of longitudinal flow connectivity, timing of juvenile hatching and migration, and short duration of flood flows through the Project area (Balance Hydrologics, 2008c).

#### 4.2.2.3. Wildlife Habitat

Willow plantings will be strategically placed between the distributary channels in order to provide a root network and bank stability. Overall, restoration of the transition zone will greatly supplemented by many acres of new riparian vegetation. The ecological synergy of the transition zone with the existing Carmel River riparian corridor will naturally be further leveraged by the main channel-floodplain connectivity provided upstream and restoration of flood flows under the causeway (Balance Hydrologics, 2015).

##### 4.2.2.3.1. Wildlife Passage (Beneficial Uses)

The Proposed Project would result in increased flow conveyance and habitat connectivity between the restored floodplain and the Carmel River Lagoon. The increased connection would likely improve wildlife passage.

#### 4.2.2.4. Endangered or Threatened Species

Two federally threatened species are known to occur within or immediately adjacent to the Project site: CRLF and South-Central California Coast steelhead. The Project will result in the temporary disturbance of approximately 1.0 acre of South-Central California Coast steelhead critical habitat. Although critical habitat for these species will be temporarily disturbed, the Project will provide increased habitat and significantly improved habitat values over time.

#### 4.2.2.5. Invasive Species

Invasive plant species may be spread or introduced during construction of the Proposed Project. The Restoration Management Plan (H.T. Harvey & Associates, 2015) prepared for the Proposed Project includes control strategies for invasive plant species.

Occurrences of American bullfrog (*Rana catesbeiana*), an invasive aquatic species in California, are known from the Carmel Lagoon. The California Department of Parks and Recreation (State Parks) has made a number of efforts to control American bullfrog populations in the lagoon (Carmel River Watershed Conservancy, 2014; State Parks, 2009). American bullfrogs typically require permanent to semi-permanent water to complete their breeding cycle. Substantial inundation of the restored floodplain is not expected when flows in the Carmel River are lower than the two-year event[4]. Direct rainfall and runoff from surrounding areas will be the only sources of water for the restored floodplain in most years (Balance Hydrologics, 2015). The hydro period of floodplain features, including sediment sequestration depressions and the water quality pond associated with the agricultural preserve, will likely be insufficient to support successful bullfrog breeding.

Striped bass (*Morone saxatilis*) have also been found in Carmel Lagoon (D.W. Alley, 2014). No new habitat for these species would be created by the Proposed Project, given the short duration and infrequency of flows within the restored floodplain.

### 4.2.3. Anticipated Changes to the Human Use Characteristics of the Aquatic Environment

#### 4.2.3.1. Existing and Potential Water Supplies; Water Conservation

There are no municipal drinking water reservoirs within the Project limits. The Proposed Project area is not in a location used by a local water district for water conservation. No private wells would be relocated as a result of this project. Private wells within and adjacent to the Proposed Project site may benefit from enhance recharging of the local aquifer as a result of the Project.

#### 4.2.3.2. Recreational or Commercial Fisheries

There are no anticipated changes to recreational or commercial fisheries.

[4] The final design of the Proposed Project will determine the specifics.

#### 4.2.3.3. Other Water Related Recreation

There are no anticipated changes to other water related recreation.

#### 4.2.3.4. Aesthetics of the Aquatic Ecosystem

The Proposed Project would benefit the aesthetic of the aquatic ecosystem by restoring the site's hydrologic and ecologic value as part of the floodplain.

#### 4.2.3.5. Parks, National and Historic Monuments, National Seashores, Wild and Scenic Rivers, Wilderness Areas, etc.

No national monuments, historic monuments, national seashores, wild and scenic rivers, or wilderness areas will be impacted by the Proposed Project.

Palo Corona Regional Park borders the project site to the south and to the east. A network of maintenance access roads is included in the design of the Proposed Project. The maintenance access roads have the ability to function as dirt trails, if desired, and would connect to dirt trail/ maintenance roads on Palo Corona Regional Park. Additionally, a clearance of a minimum of 10 feet has been provided underneath the causeway[5], near the north abutment, for a future trail connection between the east and west portions of the floodplain.

#### 4.2.3.6. Traffic/Transportation Patterns

The Proposed Project would not result in any long-term or operational impacts on traffic circulation. Compared to the existing facilities, the Proposed Project would not increase the traffic volume or capacity. The existing SR 1 embankment acts as barrier, which has resulted in floodwater overtopping SR 1. Construction of the causeway would reduce flood hazards to traffic during high flow events, as water would be conveyed beneath the causeway.

#### 4.2.3.7. Energy Consumption or Generation

No energy consumption or generation uses in the aquatic environment will be impacted by the proposed project.

#### 4.2.3.8. Navigation

There are no anticipated impacts to navigation as a result of the Proposed Project.

#### 4.2.3.9. Safety

The Proposed Project would improve safety by reducing flood hazards to the developed areas located north of the Carmel River. Additionally, the proposed causeway would reduce the extent of flood hazards to SR 1 by replacing a segment of SR 1 with an elevated causeway. The

[5] The final clearance under the causeway will be decided in the final design.

proposed causeway would 1) improve floodwater conveyance, including accommodating increased flows associated with the removal of portions of the existing south bank levees; 2) restore the longitudinal connectivity between the restored floodplain and Carmel River Lagoon and adjoining floodplain west of SR 1; and, 3) reduce existing flooding hazards to SR 1 under existing conditions by redirecting flow under SR 1.

### 4.2.4. **Short Term Impacts During Construction**

#### 4.2.4.1. Physical/Chemical Characteristics of the Aquatic Environment

Project-related construction activities would require the use of hazardous materials (e.g., fuel for construction equipment, oil, solvents, or paints). The implementation of standard BMPs, a project-specific SWPPP, and other erosion control measures as required pursuant to Monterey County Code Chapter 16.08 and Caltrans Standard Specifications, would help prevent the risk of accidental release of hazardous materials into the environment. Moreover, use of hazardous materials in connection with Project construction would be temporary in nature and subject to existing regulatory requirements pertaining to the use and disposal of such materials. Prior to commencement of construction activities, the contractor shall prepare a Hazardous Materials Spill Response Plan, which details the protocol to follow in the event that a hazardous material is released into the environment.

#### 4.2.4.2. Biological Characteristics of the Aquatic Environment

Construction of the proposed project would result in temporary affects to water quality in connection with Project grading. The construction would not violate any water quality standards or waste discharge requirements.

#### 4.2.4.3. Human Use Characteristics of the Aquatic Environment

The temporary disturbance of the riparian vegetation, associated with the construction of the Proposed Project would impact the aesthetics of the aquatic ecosystem.

### 4.2.5. **Long-Term Impacts During Operation and Maintenance**

#### 4.2.5.1. Physical/Chemical Characteristics of the Aquatic Environment

Restoration of the site's hydrologic characteristics as part of the floodplain would improve existing water quality as part of natural floodplain processes. The restoration of floodplain features, in combination with levee removal and causeway construction, would result in erosion and sedimentation on- and off-site as part of natural floodplain processes. The restored portion of the site would provide additional storage and filtration for sediments and nutrients by increasing the function of the site as a floodplain. The Proposed Project would have a beneficial effect on water quality. The storage of floodwater on-site and their eventual filtration would reduce sediment and nutrient loads thereby improving water quality.

The Proposed Project would reduce agriculture activities within the Project site to a 23 acres agricultural preserve. This reduction would lessen current impacts to the aquatic environment, associated with agricultural activities. Agricultural activities on the proposed agricultural preserve could adversely affect water quality. Agricultural runoff, which typically includes elevated levels of nutrients and sediment, is known to adversely affect water quality. Additionally, the water quality pond included in the Project design would capture runoff from the agricultural preserve, allowing it to settle and percolate. Potential effects associated with on-site agricultural activities, are not anticipated to be substantial. The Proposed Project would not involve the on-going use or storage of hazardous materials.

#### 4.2.5.2. Biological Characteristics of the Aquatic Environment

Portions of the Project site will be actively revegetated according to the Restoration Management Plan (H.T. Harvey & Associates, 2015). The remainder of the site will be restored passively. Revegetation implementation will establish a mosaic of habitats across the site, including willow and cottonwood riparian forest, mixed riparian forest, coastal scrub, and grassland. This mosaic will provide a diverse array of foraging, breeding, and nesting habitats for birds and other wildlife.

#### 4.2.5.3. Human Use Characteristics of the Aquatic Environment

The Proposed Project would enhance the aesthetic of the aquatic ecosystem by restoring the site's hydrologic and ecologic value as part of the floodplain.

## 4.3 Impact Assessment Methodology

The Proposed Projects alternatives were assessed for their potential to impact the physical/chemical, biological and human use characteristics in the aquatic environment during construction (short-term), operations and maintenance (long -term). Since no improvements are proposed in the No-Build Alternative, no short-term impacts are anticipated.

## 4.4 Alternative-Specific Impact Analysis

The No-Build Alternative would result in no disturbed soil area and no increased impervious surface. The No-Build Alternative would result in the Project site continuing to provide little wildlife habitat and little flood protection for the developed areas north of the Project site.

Impacts associated with the Build Alternative are identified above.

## 4.5 Cumulative Impacts

The Proposed Project would result in an increase of only 14,000 sq. ft. (approximately 0.32 acres) of imperious surface, and no net increase in stormwater runoff. The Proposed Project, when considered in its entirety, would result in a number of potential water quality benefits by 1) increasing nutrient storage and exchange between the main river channel and the restored floodplain; 2) converting dissolved inorganic nitrogen into atmospheric nitrogen as part of

natural processes; and, 3) supporting the decomposition of organic and chemical materials. Overall, the Proposed Project would improve the quality of water entering the lower Carmel River. The Project, including the causeway, would have a net beneficial effect on water quality.

# 5. **Avoidance and Minimization Measures**

The following is a list of avoidance and minimization measures to reduce water quality impacts associated with the Proposed Project:

WQ-1: In order to reduce downstream sedimentation, bank stabilization measures shall be implemented immediately following levee removal as part of the Restoration component. Applicable measures may include the re-vegetation of levee margins and/or physical control measures, as well as other standard BMPs related to erosion control. The remnant levees shall be monitored as part of on-going site monitoring to ensure that post-construction erosion is minimized. Adaptive management practices shall be implemented to the extent necessary in consultation with the project engineer. Prior to the issuance of any grading permit for levee removal, final grading plans shall include bank stabilization measures, subject to the review and approval of the County of Monterey Water Resources Agency, Department of Public Works, and Building Inspection Department.

WQ-2: Prior to commencement of construction activities, the contractor shall prepare a Hazardous Materials Spill Response Plan, which details the protocol to follow in the event that a hazardous material is released into the environment. This plan shall be maintained on the Project Site, and all personnel working on the Project Site shall be notified of its location

WQ-3: A SWPPP shall be prepared and implemented. The SWPPP shall identify the sources of pollutants that may affect the quality of stormwater and include the construction site BMPs. Additional non-stormwater BMPs will also be implemented. BMP's will included, but are not limited to, scheduling to minimize active DSAs during rainy season and preserving existing vegetation to the maximum extent feasible.

WQ-4: A Restoration Management Plan (RMP) has been prepared for the project that includes specific guidance for revegetation and monitoring of compensatory mitigation areas concurrent with the construction of the project, as well as more general guidance for other areas that will be restored subsequent to the project’s construction.

# 6. **References**

Caltrans Division of Design Stormwater homepage for guidance and tools (Project Risk Level, Estimating for CGP, Erosion Prediction software, etc.): http://www.dot.ca.gov/hq/oppd/stormwtr/index.htm

Caltrans Division of Environmental Analysis Storm Water Homepage: http://www.dot.ca.gov/hq/env/stormwater/

Caltrans Standard Environmental Reference (SER) Volume I

- For wetlands, hydromorphic method and water assessment information, see Chapter 15 - Waters of the U.S. and the State: http://www.dot.ca.gov/ser/vol1/sec3/natural/ch15wetland/ch15wetland.htm

- For hydraulic studies and floodplain encroachment information, see Chapter 17 - Floodplains: http://www.dot.ca.gov/ser/vol1/sec3/special/ch17flood/chap17.htm

- For Coastal Zone permits information, see Chapter 18 - Coastal Zone: http://www.dot.ca.gov/ser/vol1/sec3/special/ch18coastal/chap18.htm

Balance Hydrologics, Inc. 2015. *Anticipated Changes Downstream Base Flood Elevations Due to the Carmel River Floodplain Restoration and Environmental Enhancement Project*, August 26, 2015

Caltrans Storm Water Quality Handbook Project Planning and Design Guide (PPDG): http://www.dot.ca.gov/hq/oppd/stormwtr/swdr2010/PPDG%20July%202010%20r2.pdf

Caltrans Stormwater Quality Practice Guidelines: http://pd.dot.ca.gov/env/stormwater/html/practice_guidelines.htm

Caltrans Water Quality Planning Tool: http://www.water-programs.com/wqpt.htm

Carmel Area Land Use Plan. 1983

Monterey County General Plan. 2010

National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS). Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule. Federal Register, Vol. 70(170). Pp. 52487-52627. 2005.

Regional Water Quality Control Board website and Basin Plans: http://www.swrcb.ca.gov/plans_policies/

State Water Resources Control Board Storm Water Program, 2009-0009-DWQ Construction General Permit: http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

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[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the California Red-legged Frog; Final rule. Federal Register, Vol. 75(51). Pp. 12816-12959.

[USFWS] U.S. Fish and Wildlife Service. 2014. National Wetlands Inventory Wetland Mapper. Available online at: http://www.fws.gov/wetlands/Data/Mapper.html

## 6.1 Works Cited

Avila & Associates. 2015. *Preliminary Hydraulic Report – Floodplain Overflow Bridge Crossing the Carmel River, Carmel, California*, May 5, 2015

Balance Hydrologics, Inc. 2007a. *Preliminary Hydraulic Analyses of Proposed Design Alternatives along the Lower Carmel River*, January 2007

Balance Hydrologics, Inc. 2007b. *Design Alternatives Analysis for Floodplain Restoration at the Odello Property, Lower Carmel River Valley, County of Monterey, California*, May 2007

Balance Hydrologics, Inc. 2008a. *Hydraulic Modeling Summary*, August 29, 2008

Balance Hydrologics, Inc. 2008b. *Supplemental Analyses for Floodplain Restoration at the Odello Property, Lower Carmel River Valley*, June 2008

Balance Hydrologics, Inc. 2008c. *Projected long-term bed elevation at the proposed Highway 1 causeway restoration, Carmel River, Monterey County California*, September 2008

Balance Hydrologics. 2015. *Carmel River Floodplain Restoration and Environmental Enhancement Project 35% Design Basis Report*, May 20, 2015.

Carmel River Watershed Conservancy. 2014. Environmental management projects and programs in the Carmel River Watershed. Available online: http://carmelriverwatershed.org/wp-content/uploads/2014/03/Projects_Programs_Update_Feb_2014_Final_Draft_140312.pdf

[D.W. Alley] D.W. Alley & Associates, Aquatic Biology. 2014. Fishery analysis for the Carmel River Lagoon Biological Assessment Report. Available online: http://www.co.monterey.ca.us/planning/major/EPB%20and%20Scenic%20Road%20Protection/Fisheries%20Report.pdf

[RWQCB-CCR] Regional Water Quality Control Board, Central Coast Region. 2016. Water Quality Control Plan for the Central Coast Basin. Available online: http://www.waterboards.ca.gov/centralcoast/publications_forms/publications/basin_plan/current_version/2016_basin_plan_r3_complete.pdf

Denise Duffy & Associates, Inc. 2015. *Carmel River Floodplain Restoration and Environmental Enhancement Project Natural Environmental Study,* September 2015.

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Kleinfelder West Inc. 2008. *Preliminary Geotechnical Report, Proposed Carmel River Causeway, US Highway 1, Carmel, California*.

Kleinfelder, Inc. 2015. *Preliminary Foundation Report, Proposed Carmel River Causeway, US Highway 1, Carmel, California*, February 24, 2015

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Perry W, Watson F, Casagrande J, Hanley C. 2007. Carmel River Lagoon Enhancement Project: water quality and aquatic wildlife monitoring, 2006-7. Available online: http://ccows.csumb.edu/crlep/reports/CRLEP_Final_070815.pdf

Philip Williams & Associates. 2000. *Carmel River: Reach 2 (Eastwood/Big Sur Land Trust Property): Conceptual Enhancement Plan,* September 2000.

[State Parks] California Department of Parks and Recreation. 2009. *2009 Carmel River Enhancement Project report*.

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[USDA-SCS] U.S. Department of Agriculture – Soil Conservation Service. 1978. Soil Survey of Monterey County, California. In cooperation with the University of California Agricultural Experiment Station.

## 6.2 Preparer(s) Qualifications

Josh Harwayne
Masters of Arts, Ecology and Systematic Biology (coursework)
Bachelors of Science, Botany

Shaelyn Hession
Masters of Science, Coastal and Watershed Science & Policy
Bachelors of Science, Environmental Science, Technology & Policy

# Appendix A
## Risk Level Assessment

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# PROJECT FACT SHEET

| RISK LEVEL DETERMINATION | | Information Source |
|---|---|---|
| **Project Identifier/EA :** | 05-1400-0043-0 (05-1F6500) | |
| **Project Description:** | Carmel River Flood Plain Improvements | |
| **Dist-County-Route:** | 05-MON-1 | |
| **Regional Water Board:** | Region 3, Central Coast | |
| **MS4 Area:** | NA | |
| **Begin PM:** | 71.9 | |
| **End PM:** | 72.3 | |
| **Mid Project Latitude:** | 36.5361 | Postmle Web Tool |
| **Mid Project Longitude:** | 121.9124 | Postmle Web Tool |
| **Mid Project Postmile:** | | Postmle Web Tool |
| **Begin Construction:** | 9/15/2017 | |
| **End Construction:** | 9/15/2018 | |
| **DSA (Acres):** | 130.00 | |
| **Total Project Area (Acres):** | TBD | |
| **Total Imperv Before Const(Acres):** | TBD | |
| **Total Imperv After Const(Acres):** | TBD | |
| **Slope Ratio/Percent Grade:** | | |
| **Average Length of Slopes:** | | |
| **Project Engineer:** | Nathan Milam | |
| **Project Landscape Architect:** | ? | |

| Risk Level Components | w/GIS Map Method for Sediment Risk (A) | w/Individual Method for Sediment Risk (B) | |
|---|---|---|---|
| R factor | 53.88 | 53.88 | EPA/NPDES Calculator |
| K factor & soil category | 0.37 | 0.24 | NRCS website for online soil surveys |
| LS factor | 3.87 | 3.87 | SWRCB Risk Determination Worksheet |
| Soil loss(ton/acre) | 77.15 | 50.04 | SWRCB Risk Determination Worksheet |
| Sediment Risk (low, med, or High | High | Medium | SWRCB Risk Determination Worksheet |
| Receiving Water | Carmel River | Carmel River | |
| 303(d) listed for sediment | no | no | |
| Beneficial uses for: | | | |
| Cold | Yes | Yes | |
| Spawn | Yes | Yes | |
| Migratory | Yes | Yes | |
| Receiving Water Risk (low or high) | High | High | |
| Combined Risk Level (1, 2, or 3) | Level 3 | Level 2 | |

**Prepared By: Pete Riegelhuth** **Date: 8/10/2015**
**Checked By:** **Date:**

# SEDIMENT RISK WORKSHEET (A)

| Project Identifier/ EA: | 05-0000-0085-0 (05-0H8230 |
|---|---|
| | **Entry** |

**A) R Factor**

Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.

http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm

| R Factor Value | 53.88 |
|---|---|

**B) K Factor (weighted average, by area, for all site soils)**

The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.

Site-specific K factor guidance

| K Factor Value | 0.37 |
|---|---|

**C) LS Factor (weighted average, by area, for all slopes)**

The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.

LS Table

| LS Factor Value | 3.87 |
|---|---|

| Watershed Erosion Estimate (=RxKxLS) in tons/acre | 77.150772 |
|---|---|
| **Site Sediment Risk Factor**<br>Low Sediment Risk: < 15 tons/acre<br>Medium Sediment Risk: >=15 and <75 tons/acre<br>High Sediment Risk: >= 75 tons/acre | **High** |

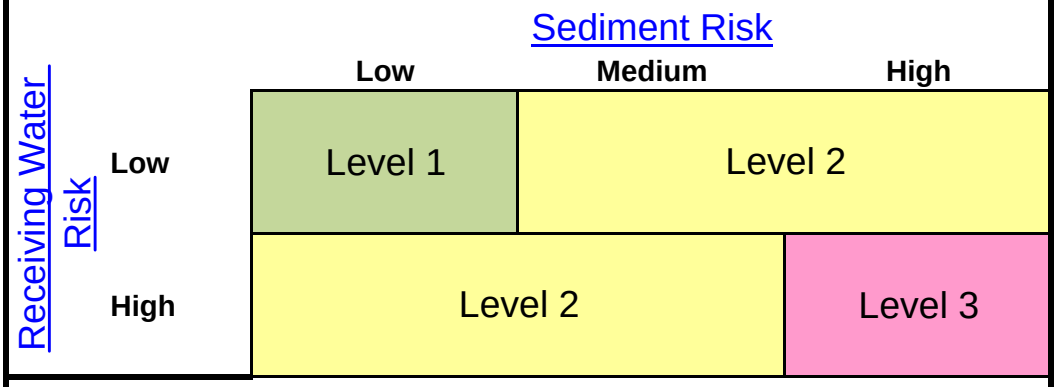
**Prepared By:**
**Checked By:**

# RECEIVING RISK (A)

| Project Identifier/EA: | 05-1400-0043-0 (05-1F6500) | |
|---|---|---|
| | **Entry** | **Score** |
| **A. Watershed Characteristics** | **yes/no** | |
| A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed water body impaired by sediment**? For help with impaired water bodies please check the attached worksheet or visit the link below:<br>2006 Approved Sediment-impaired WBs Worksheet<br>http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml<br>**OR**<br>A.2. Does the disturbed area discharge to a water body with designated beneficial uses of SPAWN & COLD & MIGRATORY?<br>http://www.ice.ucdavis.edu/geowbs/asp/wbguse.asp | **yes** | **High** |

# COMBINED RISK (A)

**Project Identifier/EA: 05-1400-0043-0 (05-1F6500)**




**Project Sediment Risk:** **High**

**Project RW Risk:** **High**

**Project Combined Risk:** **Level 3**

# SEDIMENT RISK WORKSHEET (B)

| Project Identifier/ EA: | 05-1400-0043-0 (05-1F6500) |
|---|---|
| | Entry |

**A) R Factor**

Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.

http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm

| R Factor Value | 53.88 |
|---|---|

**B) K Factor (weighted average, by area, for all site soils)**

The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.

Site-specific K factor guidance

| K Factor Value | 0.24 |
|---|---|

**C) LS Factor (weighted average, by area, for all slopes)**

The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.

LS Table

| LS Factor Value | 3.87 |
|---|---|

| Watershed Erosion Estimate (=RxKxLS) in tons/acre | 50.04 |
|---|---|
| **Site Sediment Risk Factor**<br>Low Sediment Risk: < 15 tons/acre<br>Medium Sediment Risk: >=15 and <75 tons/acre<br>High Sediment Risk: >= 75 tons/acre | **Medium** |

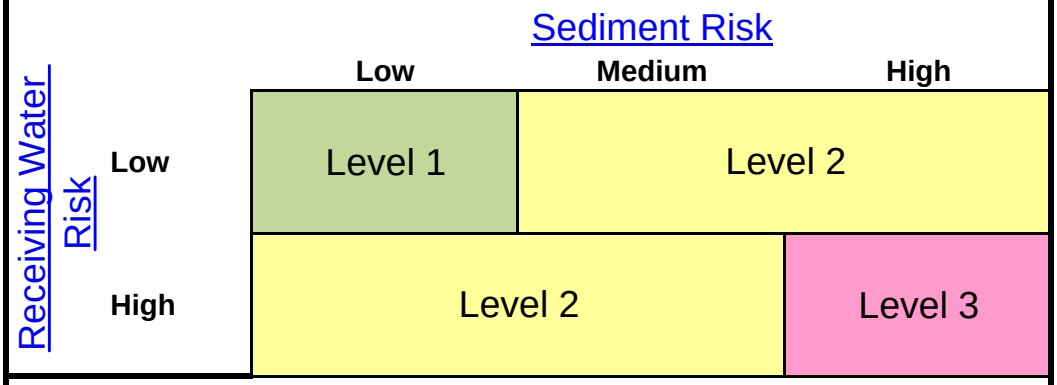
**Prepared By:**
**Checked By:**

# RECIEVING WATER RISK (B)

| Project Identifier/EA: | 05-1400-0043-0 (05-1F6500) | |
|---|---|---|
| | **Entry** | **Score** |
| **A. Watershed Characteristics** | **yes/no** | |
| A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed water body impaired by sediment**? For help with impaired water bodies please check the attached worksheet or visit the link below:<br>2006 Approved Sediment-impaired WBs Worksheet<br>http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml<br>**OR** | **yes** | **High** |
| A.2. Does the disturbed area discharge to a water body with designated beneficial uses of SPAWN & COLD & MIGRATORY?<br>http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp | | |

# COMBINED RISK LEVEL (B)

**Project Identifier/EA: 05-1400-0043-0 (05-1F6500)**




**Project Sediment Risk:** Medium

**Project RW Risk:** High

**Project Combined Risk:** Level 2

# WEIGHTED AVERAGE K FACTOR

| Unit Symbol | Rating | Percent | Value |
|---|---|---|---|
| CnA | 0.24 | 85.5 | 20.52 |
| PcE | 0.24 | 6.2 | 1.49 |
| SbC | 0.37 | 8.4 | 3.11 |
| | | | 0.00 |
| | | | 0.00 |
| | | | 0.00 |
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| | | | 0.00 |
| | | | 0.00 |
| **Weighted Average K Factor:** | | | **0.25** |

## Owner Info

| | |
|---|---|
| Contact First Name: | |
| Contact Last Name: | |
| Title: | |
| Phone: | |
| E-mail: | |

## Site Info

| | |
|---|---|
| Site Name - (6 No. EA, County, District) | |
| City: | |
| County: | |
| Regional Board: | Region 3, Central Coast |
| State Zip: | |
| Total Site Size: | |
| Latitude: | 36.5361 |
| Longitude: | 121.9124 |
| Total DSA: | 130 |
| Impervious Before Constsrution: | TBD |
| Mile Post Marker: | 0 |
| Is construction part of larger Project of Development? | |
| Name of plan of development: | |
| Percent of Total disturbed: | #DIV/0! |
| Impervousness After Construction: | TBD |
| Type of Construction: | Transportation |

## Additional Site Info

| | |
|---|---|
| Regulatory Status: | |
| Receiving Water Information: | |
| Site Discharge - Indirectly to waters of the US | |
| Storm drain system - Enter owner's name: | NA |
| Directly to waters of the US | |
| Name of receiving water: | Carmel River |

## Risk

| | |
|---|---|
| A) R Sediment Risk | 53.88 |
| B) K Factor Value | 0.37 |
| C) LS Factor | 3.87 |
| Receiving Water Risk: | High |

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