California Regional Water Quality Control Board
San Diego Region

Sediment TMDL for Los Peñasquitos Lagoon

DRAFT
STAFF REPORT
June 13MayFebruary 159, 2012

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Sediment TMDL
Los Peñasquitos Lagoon

Draft
Staff Report

Adopted by the
California Regional Water Quality Control Board
San Diego Region
on _______________, 201x

Approved by the
State Water Resources Control Board
on _______________, 201x
and the
Office of Administrative Law
on _______________, 201x
and the
United States Environmental Protection Agency
on _______________, 201x

Cover Photograph by Cathryn Henning

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City of Del Mar

City of Poway
County of San Diego
Caltrans
Los Peñasquitos Lagoon Foundation
California State Parks
San Diego Coastkeepers
Coast Law Group
Tetra Tech, Inc., led by Stephen Carter, P.E. and Clint Boschen
US Environmental Protection Agency

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Abbreviations:

BAT:	Best Available Technology
BMP:	Best Management Practice
CWA:	Clean Water Act
CFR:	Code of Federal Regulations
EFDC:	Environmental Fluids Dynamic Code
EMC:	Event Mean Concentration
LA:	Load Allocation
LSPC:	Loading Simulation Program in C++
MLS:	Mass Loading Station
MOS:	Margin of Safety
MS4:	Municipal Separate Storm Sewer System
NPS:	Non-point Source Pollution
NPDES:	National Pollutant Discharge Elimination System
SANDAG:	San Diego Association of Governments
TBELs:	Technology Based Effluent Limitations
TMDL:	Total Maximum Daily Load
TSS:	Total Suspended Solids
TWAS:	Temporary Watershed Assessment Stations
US EPA:	United States Environmental Protection Agency
USGS:	Unites States Geological Survey
WQOs:	Water Quality Objectives
WLA:	Wasteload Allocation
WDRs:	Waste Discharge Requirements
WQBELs:	Water Quality Based Effluent Limitations (WQBELs)

Acknowledgements

This TMDL was developed as part of a third party effort. Many dedicated professionals contributed to this Staff Report through their service as a member of on the Stakeholder Advisory Group (SAG)third party stakeholder group for this TMDL project. This project was funded in part by the City of San Diego to provide technical support from Tetra Tech, Inc., in developing the Technical Support Document, which provided the foundation for this TMDL. In addition, the SAG third party stakeholder group reviewed issues for scientific peer review, raised important policy issues, and assisted with drafting the Staff Report. The California Regional Water Quality Control Board, San Diego Region, would like to thank the individuals who participated in the third party stakeholder group served on the SAG for their significant contributions to this project.

Members of the Stakeholder Advisory Group during a field visit to Los Peñasquitos Lagoon. (Pictured from left: Jay Shrake, Roshan Sirimanne, Clint Boschen, Kelly Barker, Charles Cheng, Ken Johansson, Ruth Kolb, Cheryln Cac, JuEdith GuttierrezCity of San Diego Employee, Cathryn Henning, Malik Tamimi, Mike Hastings.)

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Executive Summary

This staff report supports tentative Resolution No. R9-2012-0033, which will amend the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan) to incorporate the sediment Total Maximum Daily Load (TMDL) for Los Peñasquitos Lagoon (Lagoon). The Basin Plan amendment will incorporate the TMDL, associated wasteload allocations, and required load reductions into the Basin Plan. This TMDL addresses the Clean Water Act section 303(d) sediment impairment for the Lagoon.

Water Quality Impairment of Los Peñasquitos Lagoon

Los Peñasquitos Lagoon is one of the few remaining and irreplaceable coastal lagoons in southern California providing valuable estuarine habitat as well as numerous other important beneficial uses. Over the course of the 20th century, the Lagoon has incurred a number of anthropogenic disturbances which, cumulatively have resulted in excessive sedimentation and the gradual degradation and loss of the estuarine habitat.

As required by section 303(d) of the Clean Water Act, the Lagoon was placed on the 1996 List of Water Quality Limited Segments due to sedimentation and siltation loads that exceeded water quality objectives. The beneficial uses that are most sensitive to increased sedimentation are estuarine habitat (EST) and preservation of biological habitats of special significance (BIOL). Estuarine uses of the Lagoon may include preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (such as marine mammals or shorebirds). Other beneficial uses listed in the Basin Plan for the Lagoon include contact water recreation, non-contact water recreation, wildlife habitat, rare, threatened or endangered species, marine habitat, migration of aquatic organisms, spawning, reproduction and/or early development, and shellfish harvesting.

Impacts associated with increased and rapid sedimentation include: reduced tidal mixing within Lagoon channels, degraded and (in some casesareas) net loss of saltmarsh vegetation, increased vulnerability to flooding for surrounding urban and industrial developments, increased turbidity associated with siltation in Lagoon channels, and constricted wildlife corridors.

The water quality objective for sediment is contained in the Basin Plan. The Basin Plan states, “The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.”

Numeric Target

The sediment water quality standard applies to sediment loading to the Lagoon and the accumulation of sediment in the Lagoon. The minimum protective target would be to reduce watershed sediment loads to non-anthropogenic levels and return the Lagoon to non-anthropogenic conditions with consideration given to background loading and other factors that also lend to impairment of beneficial uses. The numeric targets are calculated upon the historic condition (mid-1970s) when the sediment water quality standard was once met.

A historic coverage for the Los Peñasquitos watershed was developed for this period using US Geological Survey topographic maps from the 1970s. This land-use distribution was used to calculate the watershed numeric target using the LSPC watershed model. This historic (mid-1970s) sediment load of 12,360 tons per critical wet period (211 days), or 58.6 tons per day, represents the sediment TMDL watershed numeric target.

An analysis of the vegetation types present in the Lagoon was developed for the mid-1970s using historic aerial photographs from which the Lagoon numeric target was calculated (see Linkage Analysis, Section 7). The Lagoon numeric target is expressed as an increasing trend in the total area of tidal saltmarsh and non-tidal saltmarsh toward 346 acres. This target acreage represents 80 percent of the total acreage of tidal and non-tidal saltmarsh present in 1973.

Sources and Responsible Parties

Sources of sediment include erosion of canyon banks, exposed soils, bluffs, scouring stream banks, and tidal influx. Some of these processes are exacerbated by anthropogenic disturbances, such as urban land development within the watershed. UrbanLand development transforms the natural landscape by exposing sediment and converting pervious surfaces to impervious surfaces, which increases the volume and velocity of runoff resulting in scouring of sediment, primarily below storm water outfalls that discharge into canyon areas. Sediment loads are transported downstream to the Lagoon during storm events causing deposits on the salt flats and in Lagoon channels. These sediment deposits have gradually built-up over the years due to increased sediment loading and inadequate flushing, which directly and indirectly affects Lagoon functions and salt marsh characteristics.

There are two broad categories of sediment sources to the Lagoon: 1) watershed sources, and 2) the Pacific Ocean. The watershed sources consist of all point and non-point sources of sediment in the watershed area draining to Los Peñasquitos Lagoon. The total sediment contribution from all watershed sources is presented as the total wasteload allocation (WLA). The sediment contributions from the Pacific Ocean are considered a background source and are presented as the Load Allocation (LA). Hence, the responsible parties were assigned the total WLA and are jointly responsible for meeting the wasteload reductions required in this TMDL project. Responsible parties include the following: Phase I Municipal Separate Storm Sewer Systems (MS4s) copermittees (the County of San Diego, City of San Diego, City of Del Mar, and City of Poway), Phase II MS4s permittees, Caltrans, general construction storm water NPDES permittees, and general industrial storm water NPDES permittees.

Linkage Analysis

Reducing watershed sediment loads from the year 2000 levels to historic levels is a necessary component for restoring and providing long-term protection of the Lagoon's beneficial uses. Deposition of watershed sediment contributes to elevation increases within the Lagoon, leading to an increase in height relative to mean sea level. Elevation is a critical variable that determines the productivity, diversity, and stability of saltmarshes. The long-term existence of the saltmarsh depends on the success of the dominant plants, such as *Sarcoconia pacifica* (also referred to as *Salicornia virginica*) and *Frankenia salina*, and their close relationship to sediment supply, sea level change, and tidal range.

Reduced sediment loading consistent with the watershed numeric target will encourage the establishment of native vegetation in degraded areas. To represent the linkage between source contributions and receiving water response, models were developed to simulate source loadings and transport of sediment into the Lagoon. The models provide an important tool to evaluate year 2000 conditions, to evaluate historic conditions, and to calculate TMDL load reductions.

The Lagoon was capable of assimilating these historic sediment loads under historic Lagoon conditions. Because the Lagoon has evolved through time and accumulated over 40 years of watershed sediment loads, it cannot be assumed that the Lagoon, in the year 2010 conditions, can assimilate the same historic sediment loads. Evaluation of the extent of vegetation types in the Lagoon provides the necessary tool to assess how the Lagoon responds to watershed sediment load reductions and to establish a target Lagoon condition under which the Lagoon can again assimilate the historic sediment loads.

TMDL, Allocations and Reductions

TMDL = 12,360 tons per year

The maximum load of sediment that Los Peñasquitos Lagoon can receive from all sources and still meet the sediment water quality objective is 12,360 tons per year.

Wasteload Allocations to Watershed = 2,580~~1,962~~ tons/year

A wasteload allocation (WLA) of 2,580~~1,962~~ tons/year was assigned to the responsible parties. Collective wasteload reductions are required of the responsible parties.

Load Allocations to Ocean = 9,780 tons/year

The ocean was assigned a load allocation (LA) of 9,780 tons/year. Because the ocean is a natural background source, load reductions are not required of the ocean.

Margin of Safety = ~~I~~implicit ~~618 tons/year~~

Conservative assumptions were used in selecting the TMDL numeric targets and implementation activities to provide an implicit margin of safety. ~~An explicit margin of safety (MOS) of 5 percent accounts for model uncertainties arising from acquiring representative total suspend solid, bank erosion, and bed load transport data.~~

The TMDL results are summarized in Tables ES-1 and ES-2.

Table ES-1. TMDL summary

Source	**Critical Wet Period Load (tons)**	**Daily Load (tons)**
Watershed contribution (WLA)	2,580~~1,962~~	12.2~~9.3~~
Ocean boundary (LA)	9,780	46.4
Margin of Safety (MOS)	~~618~~ implicit	~~2.9~~ implicit
TMDL	12,360	58.6

Table ES-2. Year 2000 vs. historical loads and percent reduction

Source	**Year 2000 Load (tons)**	**Historical (mid-1970s) Load (tons)**	**Load Reduction (tons)**	**Percent Reduction Required**
Watershed contribution (WLA)	7,719	2,580~~1,962~~	5,139~~757~~	67~~5~~%
Ocean boundary (LA)	5,944	9,780	+3,836 (increase)	+39% (increase)
Total	13,663	12,360	1,303	10%

Implementation of TMDL

The responsible parties must develop a Load Reduction Plan that will establish a watershed-wide, programmatic, adaptive management approach for implementation. The plan will include a detailed description of implementation actions, as identified and planned by the responsible parties, to meet the requirements of this TMDL. All responsible parties are responsible for reducing their sediment loads to the receiving waterbody or demonstrating that their discharges are not causing exceedances of the wasteload allocation.

Monitoring Program

Monitoring is required to assess progress towards achieving the wasteload and load allocations and numeric targets. Furthermore, the monitoring program must be capable of monitoring the effectiveness of implementation actions to improve water quality and saltmarsh habitat and remediation actions to remove sediment from the Lagoon.

Compliance Schedule

Full implementation of the TMDL for sediment must be completed within 20 years from the effective date of the Basin Plan amendment. This timeline takes into consideration the planning needs of the responsible parties ~~and other stakeholders~~ to establish a Load Reduction Plan, time needed to address multiple impairments, and provides adequate time to measure temporal disparities between reductions in upland loading and the corresponding Lagoon water quality response.

1 Introduction

The California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) is the California state agency responsible for water quality protection in the southwest portion of the state of California. It is one of nine Regional Water Boards in California, each generally separated by hydrological boundaries. Each Regional Water Board consists of nine governor-appointed members who serve four-year terms. The San Diego Water Board, under its federally designated authority, administers the Clean Water Act (CWA) within the San Diego Region. In accordance with the CWA, the San Diego Water Board has adopted the *Water Quality Control Plan for the San Diego Region (9)* (Basin Plan) that specifies water quality standards for waters in the San Diego Region and implementation measures to enforce those standards.

Section 305(b) of the CWA mandates biennial assessment of the nation's water resources to identify and list waters not meeting their water quality standards. These waters are listed in accordance with CWA section 303(d); and the list is commonly referred to as the 303(d) list. The CWA requires states to establish a priority ranking for impaired waters and to develop and implement Total Maximum Daily Loads (TMDLs) or alternatives to address the impairments. A TMDL is a written, quantitative assessment of water quality problems and contributing pollutant sources. It identifies one or more numeric targets for restoring beneficial uses based on applicable water quality standards, specifies the maximum pollutant load that can be discharged and still meet water quality standards, allocates pollutant loads among sources in the watershed, and provides a basis for taking actions needed to meet the numeric target(s) and water quality standards.

The Los Peñasquitos Lagoon (Lagoon) is currently listed on the 303(d) list for sedimentation/siltation because the narrative sediment water quality objective is not being met. Sedimentation within the Lagoon impacts numerous beneficial uses, primarily those associated with protection of native habitats that depend on tidal inundation and/or salinity levels in non-tidal soils. Sedimentation increases elevations within the Lagoon, which leads to an increase in height relative to mean sea level. Elevation is a critical variable that determines the productivity, diversity, and stability of saltmarshes. The long-term existence of the saltmarsh depends on the success of the dominant plants, such as *Sarcoconia pacifica* ~~(also referred to as *Salicornia virginica*)~~ and *Frankenia salina*, and their close relationship to sediment supply, sea level change, soil salinity, and tidal range (US EPA, 2005).

The San Diego Water Board proposes to amend its Basin Plan to incorporate a TMDL and implementation plan to address sedimentation problems adversely affecting water quality in the Lagoon. This TMDL Staff Report describes the scientific and technical basis for confirming sediment impacts, developing numeric targets, determining sediment sources, and establishing wasteload and load allocations. Compliance with the TMDL will be assessed by monitoring the Lagoon and contributing watershed.

For the technical portion of this TMDL, the San Diego Water Board relied on the report prepared by Tetra Tech entitled, *Los Peñasquitos Lagoon Sediment/Siltation TMDL* (Technical Support Document, Attachment 1).

2 Problem Statement

Under section 303(d) of the Clean Water Act (CWA), states are required to identify waters whose beneficial uses have been impaired due to specific constituents. Los Peñasquitos Lagoon was placed on the Section 303(d) list of Water Quality Limited Segments in 1996 for sedimentation and siltation with an estimated 469 acres affected. The Lagoon is subject to the development of a total maximum daily load (TMDL) (US EPA, 2009).

The Lagoon is an estuarine system that is part of the Torrey Pines State Natural Reserve. In addition to its marine influence, the Lagoon receives freshwater inputs from an approximately 60,000-acre watershed comprised of three major canyons (Carroll Canyon, Los Peñasquitos Canyon, and Carmel Canyon). Given the status of "Natural Preserve" by the California State Parks, the Lagoon is one of the few remaining native saltmarsh lagoons in southern California, providing a home to several endangered species (California State Parks, 2009). The Lagoon is ecologically diverse, supporting a variety of plant species, and provides nursery grounds and habitat for numerous bird, fish, and small mammal populations. The Lagoon also serves as a stopover for the Pacific Flyway, offering migratory birds a safe place to rest and feed, as well as providing refuge for coastal marine species that use the Lagoon to feed and hide from predators.

The San Diego Basin Plan states, "The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses." Beneficial uses listed in the Basin Plan for the Lagoon include contact water recreation; non-contact water recreation (although access is not permitted in most areas per California State Parks); preservation of biological habitats of special significance; estuarine habitat; wildlife habitat; rare, threatened or endangered species; marine habitat; migration of aquatic organisms; spawning, reproduction and/or early development; and shellfish harvesting. The beneficial uses that are most sensitive to increased sedimentation are estuarine habitat and preservation of biological habitats of special significance. Estuarine uses may include preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (such as marine mammals or shorebirds).

Impacts associated with increased and rapid sedimentation include: reduced tidal mixing within Lagoon channels, degraded and (in some cases) net loss of saltmarsh vegetation, increased vulnerability to flooding for surrounding urban and industrial developments, increased turbidity associated with siltation in Lagoon channels, and constricted wildlife corridors.

The Los Peñasquitos Lagoon Enhancement Plan and Program (1985), San Diego Basin Plan (1994), and Clean Water Act section 303(d) highlight sedimentation as a significant impact associated with urban development and a leading cause in the rapid loss of saltmarsh habitat in the Lagoon. Sediment reduction is a management priority.

The Lagoon's 565 acres include 262 acres of tidal saltmarsh (including salt panne, tidal channels, and mudflats) and non-tidal saltmarsh and 132 acres of freshwater marsh, herbaceous wetland, and woody riparian (for example southern willow scrub and mulefat scrub) habitats. The remaining 171 acres of saltmarsh and brackish marsh vegetation are impaired by excessive sedimentation, which converted the coastal saltmarsh to *Lolium* perenne infested non-tidal saltmarsh, freshwater marsh, and woody riparian habitats (California State Parks, 2011). The environmental processes that support wetland habitats in the Lagoon have been altered by urban development in three ways:

1) Increase in the volume and frequency of freshwater input,
2) Increase in sediment deposition, and
3) Decrease in the tidal prism.

These factors have led to decreases in tidal and non-tidal saltmarsh habitats and increases in freshwater habitats and the abundance of non-native species.

3 Background Information

This section describes the Los Peñasquitos watershed and Lagoon and provides background information on the impairment.

3.1 Los Peñasquitos Watershed Description

The Los Peñasquitos watershed is located in central San Diego County (Figure 1). Both the watershed and Lagoon are included in the Peñasquitos Hydrologic Unit (HU 906). In addition to the Los Peñasquitos watershed, the Peñasquitos HU includes Mission Bay and other coastal tributaries. The Los Peñasquitos watershed is 93 square miles (approximately 60,000 acres) and includes portions of the City of San Diego, City of Poway, City of Del Mar, and San Diego County (Figure 2). There are also several major road corridors and a railway within the watershed.

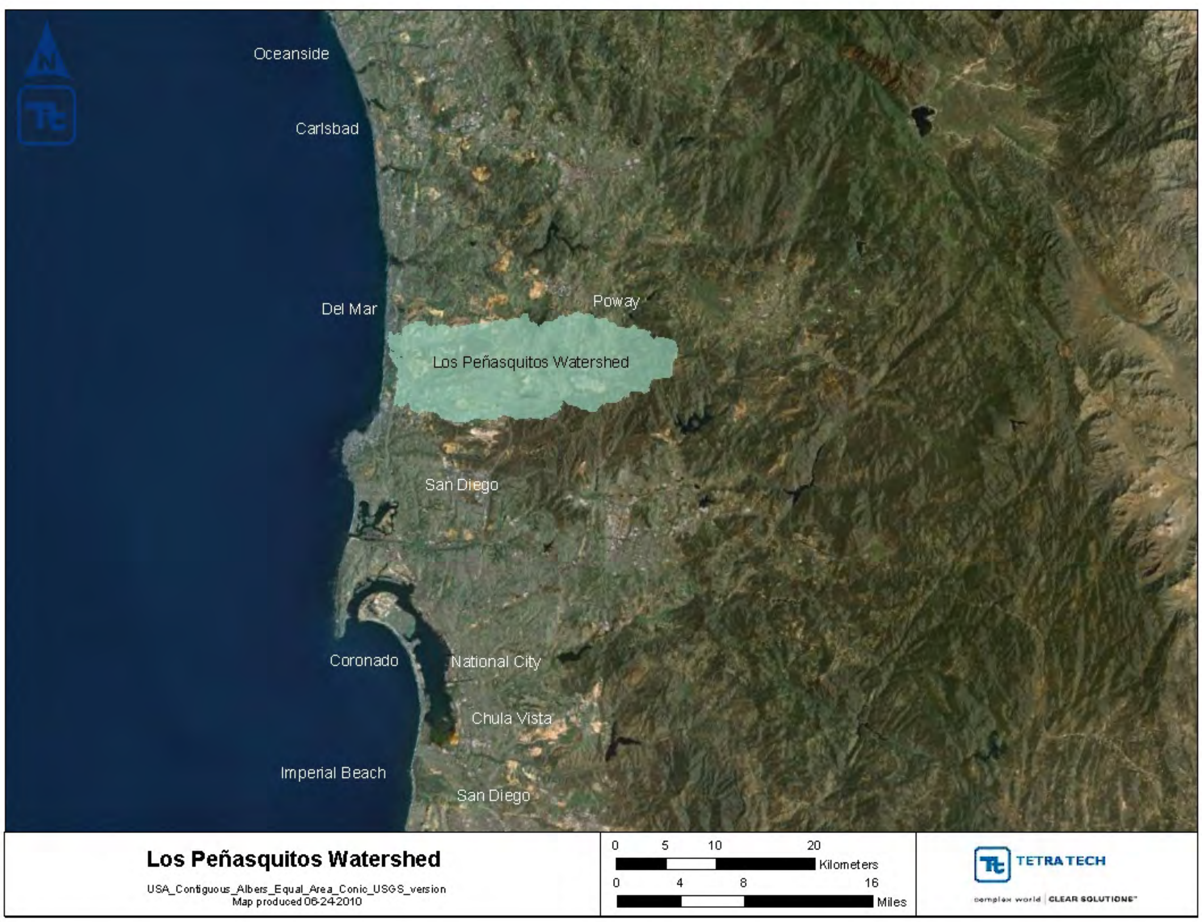

Figure 1. Location of the Los Peñasquitos watershed.

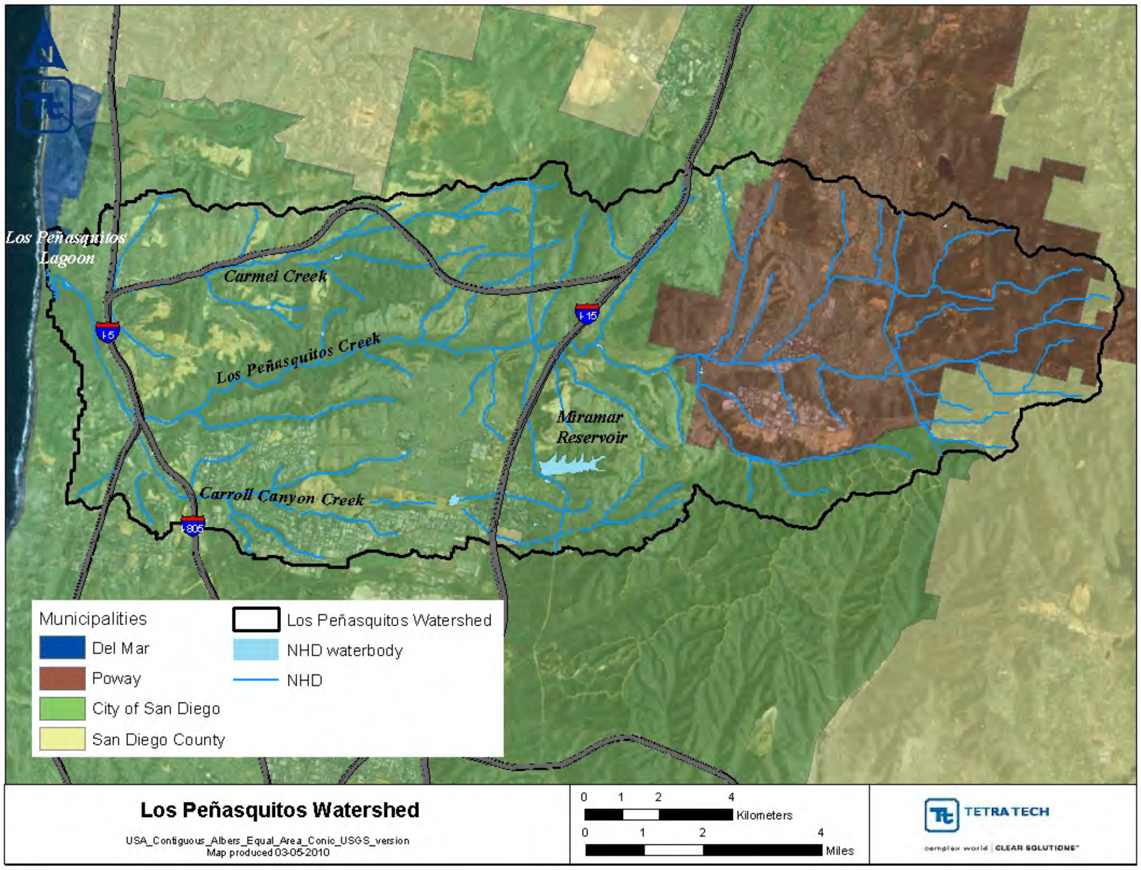

Figure 2. Municipalities and major roads within the Los Peñasquitos watershed.

The climate in the Los Peñasquitos watershed is like that of the entire San Diego Region, which is generally mild with annual temperatures averaging around 65°F near the coastal areas. Average annual rainfall ranges from nine to eleven inches along the coast. There are three distinct seasons in the San Diego Region. The summer dry season occurs from late April to mid-October. The winter season occurs from mid-October through early April and has two types of weather: 1) winter dry weather, and 2) wet weather. The winter wet weather season accounts for 85 to 90 percent of the annual rainfall.

Three major streams drain the watershed and flow into the Lagoon (Figure 2). Los Peñasquitos Creek is the largest catchment draining 59 square miles (approximately 37,760 acres) in the central portion of the watershed. Carroll Canyon Creek is the second largest catchment draining 18 square miles (approximately 11,520 acres) in the southern portion of the watershed. Carmel Creek is the smallest of the three catchments draining the remaining 16 square miles (approximately 10,240 acres) in the northern, coastal area. Los Peñasquitos Creek and Carroll Canyon Creek converge prior to entering the Lagoon. Miramar Reservoir drains 1 square mile (approximately 640 acres) of the Carroll Canyon Creek watershed. Miramar Reservoir retains imported drinking water and does not discharge downstream. Watershed elevation rises from sea level to 2,600 feet in the headwaters.

3.2 Los Peñasquitos Land Use and Population

Development within the Lagoon during the late 1800s and early 1900s altered Lagoon hydrology and set the stage for the Lagoon's vulnerability to impacts associated with intense development of the watershed that began in the mid-1970s. In 1888 a railway was constructed across the Lagoon on an elevated earthen berm just west of the current alignment of Sorrento Valley Road. This railway alignment was later abandoned and replaced in 1924. The new alignment of the railway line was placed on an elevated earthen berm that bisects the Lagoon, effectively cutting off several of the Lagoon's historic tidal channels. Both railway berms obstructed storm water flows from the watershed and facilitated sediment deposition in the southeastern portion of the Lagoon. Realignment of historic Highway 101 in the 1930s also modified the Lagoon's hydrology by realigning and fixing the ocean inlet under the southern bridge resulting in more frequent inlet closures.

In 1966 the upper Los Peñasquitos subwatershed was 9 percent urbanized (White and Greer, 2002); however, by 1975, the watershed experienced significant urbanization with agricultural areas being converted to urban uses, specifically in the Poway and Mira Mesa areas (City of San Diego, 2005). From 1966 to 1999, the acreage of urbanized land within the upper Los Peñasquitos Creek watershed increased by 290 percent (White and Greer, 2002), and by 2000, the 54 percent of the Los Peñasquitos watershed was developed. Additional highway infrastructure was built in and around the Los Peñasquitos watershed to accommodate the increasing population growth. Realignment of Sorrento Valley Road (ca. 1966), Carmel Valley Road (1983), segments of the I-5 freeway (1994), and the State Route 56 overpass (1995) impacted the surrounding watershed.

To decrease impacts from road infrastructure, Sorrento Valley Road was converted to a bike path in 2003 and a new U.S. Highway 101 bridge was constructed over the Lagoon mouth in August 2005. To mitigate for impacts from State Route 56 and several other projects for the City of San Diego, the 27-acre El Cuervo Norte wetlands restoration project was created in the Peñasquitos Canyon Preserve. The El Cuervo Norte wetlands were designed to provide over 24 acres of southern willow scrub, oak-sycamore woodland and freshwater marsh habitat. The project consisted of approximately 9 acres of wetland creation, 14.3 acres of wetlands enhancement, 2 acres of upland native buffer, and 1.3 acres of park access road and a San Diego Gas & Electric power pole maintenance area (Dudek, 2010).

Land use associated with the mid-1970s time period is illustrated in Figure 3. Land-use/land cover data for the Los Peñasquitos watershed were not available for this period, therefore, a historical coverage was developed based on the location and type of structures that are shown in USGS topographic maps from the 1970s (primarily the La Jolla quadrangle – dated 1975).

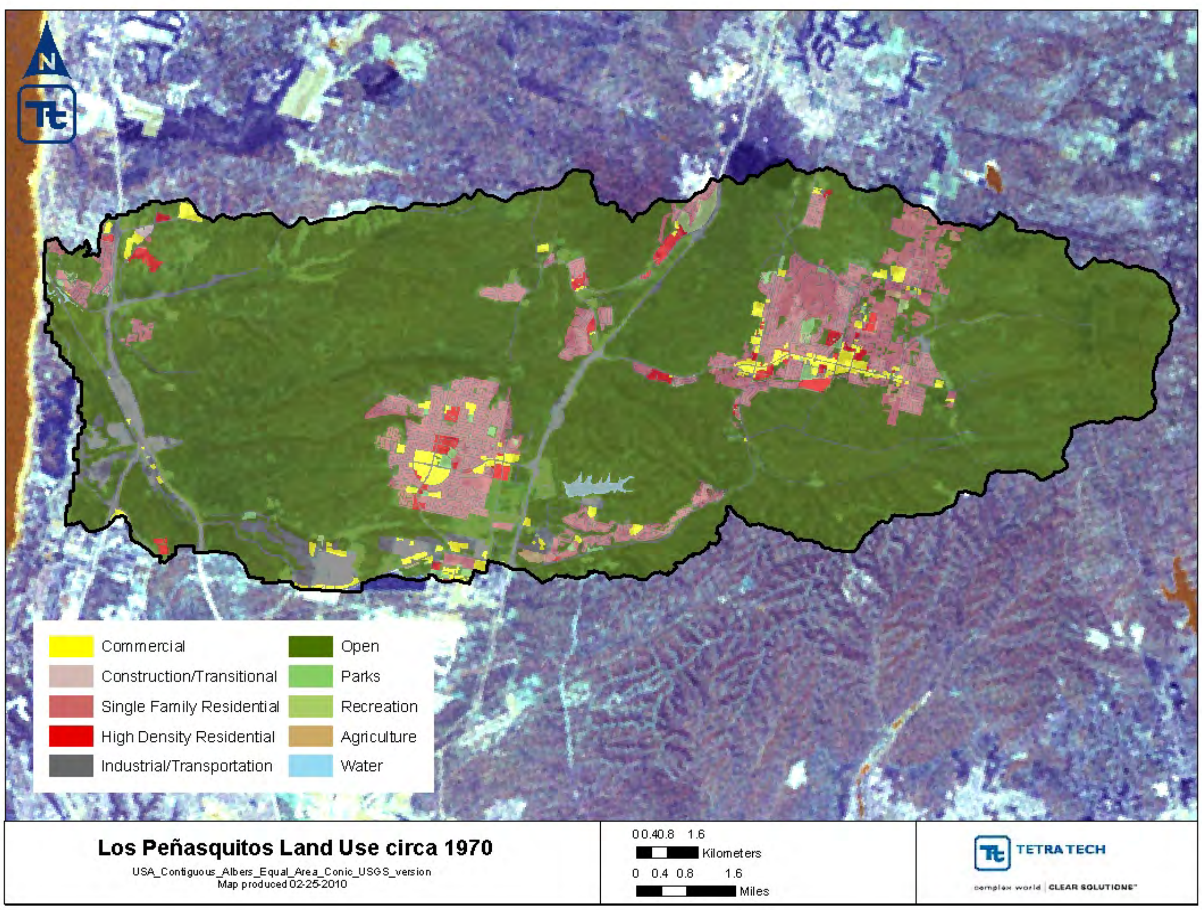

Figure 3. Historic land use in the Los Peñasquitos watershed (1970s).

Data detailing land use in the Los Peñasquitos watershed is available through the San Diego Association of Governments 2000 land-use coverage and is presented in Figure 4. Approximately 54 percent of the watershed has been developed, with 46 percent of that area classified as impervious. The largest single land-use type in the Los Peñasquitos watershed is open space (approximately 25,500 acres), followed by low density residential development (approximately 14,250 acres) and industrial/transportation (approximately 11,660 acres). Land use differences between the year 2000 and the historical time period are shown in Table 1.

To further characterize the land use changes, population trends are illustrated in Figure 5. Figure 5 depicts the expansive population growth from 1970 to 2010 in the San Diego region facilitated by intense development throughout the region.

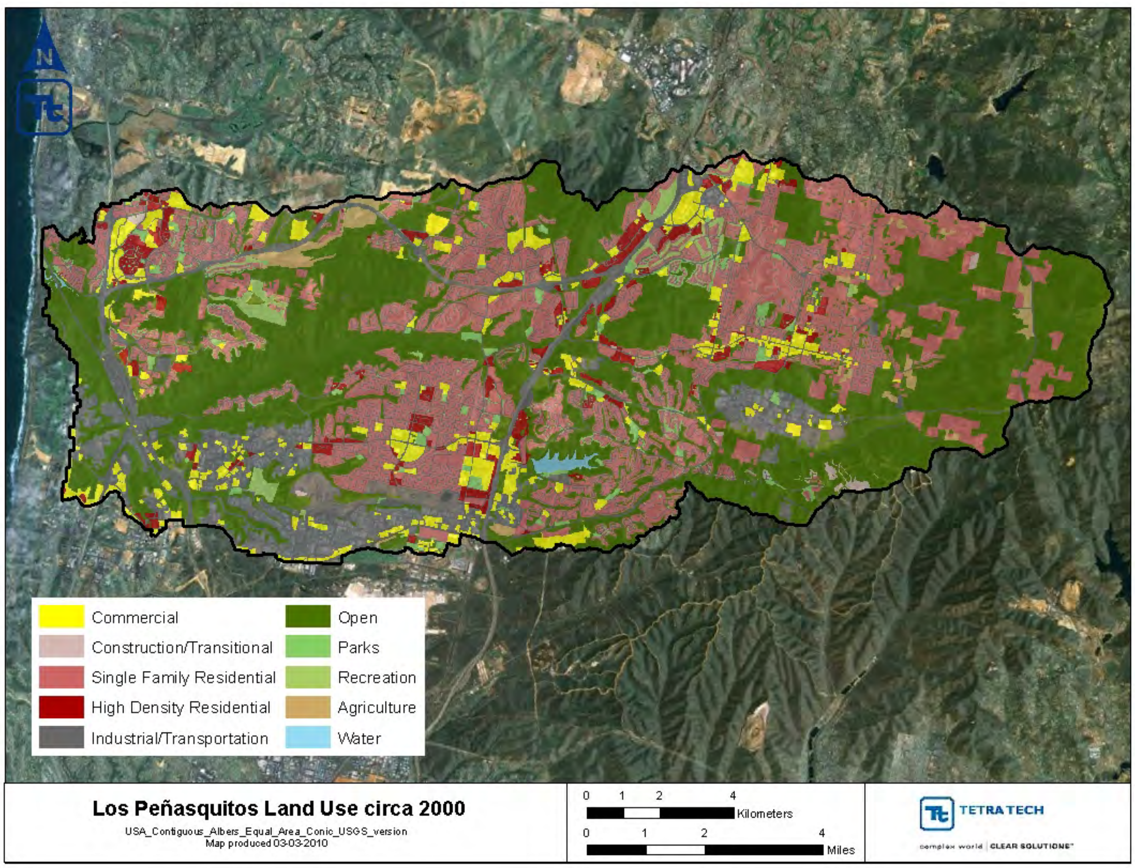

Figure 4. Year 2000 land uses in the Los Peñasquitos watershed.

Table 1. Year 2000 (SANDAG 2000) vs. historical land use comparison

Land Use	Year 2000 area (ac)	Year 2000 percent of total area	Historic, mid-1970s area (ac)	Historic, mid-1970s percent of total area	Percent change of total watershed area
Agriculture	741	1.24%	100	0.17%	1.07 %
Commercial	3,591	6.00%	1,088	1.82%	4.18%
Construction/ Transitional	169	0.28%	23	0.04%	0.24%
High Density Residential	1,840	3.07%	648	1.08%	1.99%
Industrial/ Transportation	11,654	19.46%	4,830	8.07%	11.40%
Open	25,463	42.52%	47,445	79.23%	-36.71%
Parks	1,326	2.22%	2,884	0.48%	1.73%
Recreation	670	1.12%	139	0.23%	0.89%
Single Family Residential	14,258	23.81%	5,155	8.61%	15.20%
Water	161	0.27%	160	0.27%	0.00%
Total	59,879	100.00%	59,879	100.00%	

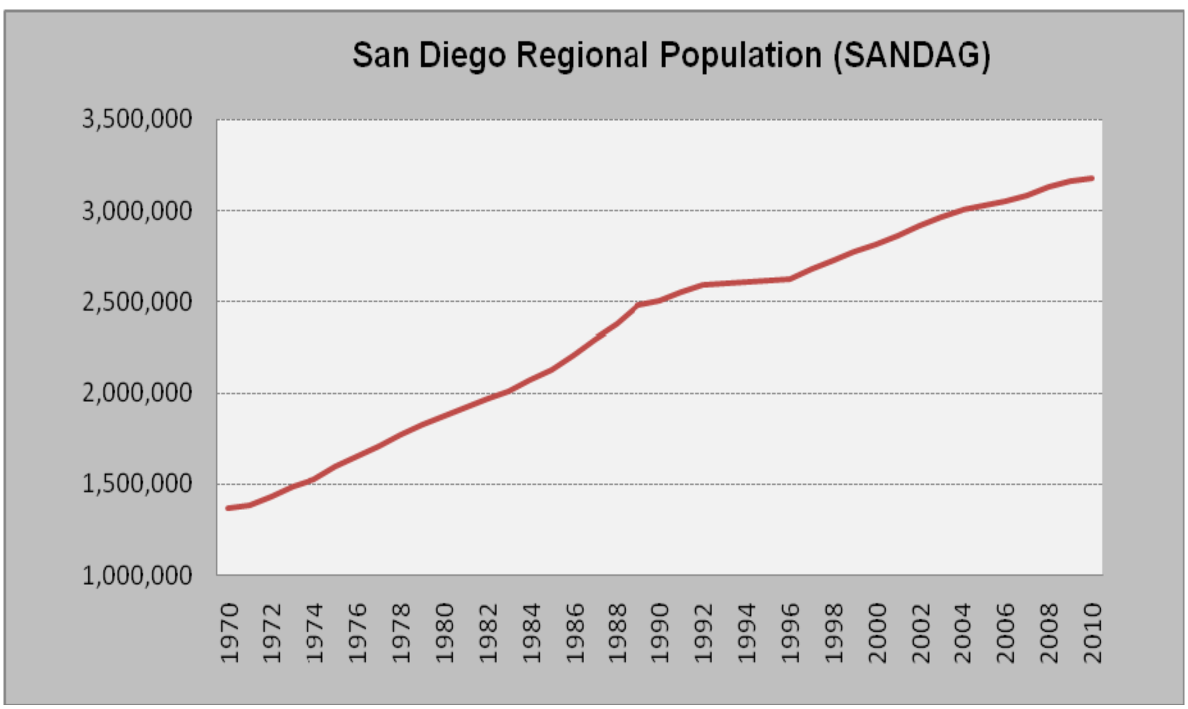

Figure 5. San Diego regional population trends (SANDAG, 2010).

3.3 Los Peñasquitos Lagoon Description

The Lagoon was formed many thousands of years ago when rising sea levels flooded the Peñasquitos Valley to form a deep marine embayment. Over the years, inflowing creeks deposited alluvial sediment, which gradually filled the embayment to form the small estuarine system seen today (Mudie et al., 1974). The Lagoon is in a dynamic state with continual influences from the tide and upstream runoff (Greer and Stowe, 2003). The Lagoon resides in Torrey Pines State Natural Reserve and is one of the few remaining native saltmarsh lagoons in southern California, thereby given the status of "Natural Preserve" by the California State Parks (Figure 6).

Figure 6. Photograph of Los Peñasquitos Lagoon. Tidal flows enter the Lagoon via a channel beneath the U.S. Highway 101 bridge and then bifurcate into the eastern and western branches.

The Lagoon is ecologically diverse, supporting a variety of plant species and providing habitat for numerous bird, fish, and small mammal populations. The saltmarsh daisy, San Diego sagewort, and coast wallflower reside in the Lagoon (LPL Foundation, 2011). The Lagoon also serves as a stopover for migratory birds and provides habitat for coastal marine and saltmarsh species. Listed bird species endemic to the Lagoon include the light-footed clapper rail (federally-listed, endangered), Belding's savannah sparrow (state-listed, endangered), California brown pelican (federally-delisted, threatened on November 17, 2009), western snowy plover (federally-listed, threatened) and California gnatcatcher (federally-listed, threatened) (Mudie, et al. 1974). The

Lagoon has also provided habitat for the federally-listed, endangered California least tern, although this species has not been observed in the Lagoon since 1980 (Cooper, 1984).

Maintaining a tidal prism and proper exchange between the ocean and the Lagoon are critical for maintaining adequate saltmarsh salinity levels. Tidal flow mainly keeps the mouth open; however, storm water flows play a role in re-establishing the thalweg in tidal channels and forcing sediment out of the inlet and back into the ocean. The role of storm water flows in performing these actions is diminished by the railway berm and by thick stands of riparian and brackish marsh habitat at the base of the Lagoon's tributaries, which impede and detain runoff flows before they can scour the inlet area.

Deposition of sediment within the Lagoon inlet is caused primarily by tides, wave run up and storm surge that push sand and cobbles from nearby beaches and offshore sources into the inlet area (LPL Foundation and State Coastal Conservancy, 1985). Grain size analysis conducted at the Lagoon inlet indicate that sediment loading from the watershed may increase the build-up rate of sand bar formation, but the primary source of sedimentation in the Lagoon's inlet area is the ocean (Elwany, 2008).

During periods when the Lagoon mouth is open, tidal flows from the Pacific Ocean enter the Los Peñasquitos Lagoon via a channel beneath the southern bridge at Torrey Pines Road, formerly referred to as Highway 101. Historical records indicate that the Lagoon was continuously connected to the ocean at least until 1888 (Mudie et al.~~,~~ 1974). Under present conditions, a permanent mouth opening to the ocean cannot be naturally maintained, except during exceptionally wet winters. This is primarily due to the loss of the inlet's ability to meander along the beach and to the reductions in velocities of storm driven outflows. The Lagoon's inlet is often mechanically dredged to alleviate the danger of flooding and to improve the health of the Lagoon.

Approximately 150 yards from the Lagoon mouth, the main Lagoon channel bifurcates (Figure 6). The eastern branch runs inland under the railroad trestle, then trends southeastward terminating in a series of small creeks that drain the few remaining salt flats and non-tidal marsh on the southeastern side of the Lagoon. The eastern branch receives flow from Carmel Creek (Figure 7). The western branch of the main channel system is generally narrower and shallower than the eastern branch. It runs in a southerly direction and terminates in a dendritic pattern of creeks that drain the marsh on the southwestern side of the Lagoon. Two of these poorly defined creeks connect with the combined Los Peñasquitos and Carroll Canyon Creeks, which flow into the Lagoon through a narrow (approximately 10 feet wide) channel on the west side of the railroad berm (Figure 8).

Figure 7. Photograph of Carmel Creek entering Los Peñasquitos Lagoon on January 3, 2011, shortly after a rain event. The creek flows along the dashed arrow, along SR 56 and beneath the I-5 freeway.

Figure 8. Photograph of the combined Los Peñasquitos and Carroll Canyon Creeks entering Los Peñasquitos Lagoon shortly after a rain event on January 3, 2011. The combined creeks flow along the dashed arrow, along the western side of the railroad berm.

3.4 Impairment Description

The Lagoon is listed as impaired on the 303(d) list for sedimentation/siltation. The 303(d) listing indicated that the entire Lagoon was not supporting beneficial uses and was impaired by sediment. Impacts due to sedimentation are not clearly differentiated from the impacts associated other stressors on the Lagoon such as freshwater inputs and physical barriers within the Lagoon.

3.4.1 Urbanization Impacts

Urbanization of the watershed has directly affected the natural drainage, pollutant loads, and hydrologic characteristics of the watershed (City of San Diego, 2005). The volume, velocity, duration, and timing of runoff events changes as the landscape changes from pervious to impervious. Recent research has shown that impervious surface is a useful metric to represent the imprint of land development on the landscape because it is directly related to runoff (Burton and Pitt, 2002; Scheuler, 1994). Land development typically results in increased runoff and erosion rates; accounting for up to 50 percent of sediment loads in urban areas (Burton and Pitt, 2002).

Impervious cover has been identified as the 'unifying theme' in stream degradation (US EPA, 1999); with stream degradation occurring with as little as ten percent imperviousness of the watershed (Scheuler, 1994). The effects of impervious surfaces on sedimentation rates in the watershed is exacerbated by the location of MS4 outfalls along or just below mesa tops that release concentrated storm flows into steep drainages with moderately to highly erosive soils (Weston 2009).

Continued sedimentation and freshwater inputs, both resulting from urbanization, have resulted in significant alterations to habitat (White and Greer, 2002; Greer and Stowe, 2003; CE, 2003; Mudie et al.~~,~~ 1974; LPL Foundation and State Coastal Conservancy, 1985). The encroachment of freshwater wetlands and reduction of saltwater marsh is evident in the National Wetland Inventory (NWI) maps from 1985 and 2009 (Figures 9 and 10). The location of different wetland types is also shown in maps that were included in the Los Peñasquitos Lagoon Enhancement Plan (1985) and in the Mudie et al. 1974 report (Figures 11 and 12). Although there are differences in the depiction of wetland areas from each study and time period, these maps show an encroachment of riparian, freshwater, and upland vegetation types in the eastern portion of the Lagoon that is likely related to sediment accumulation, year-round freshwater flows, and physical impediments to tidal flow.

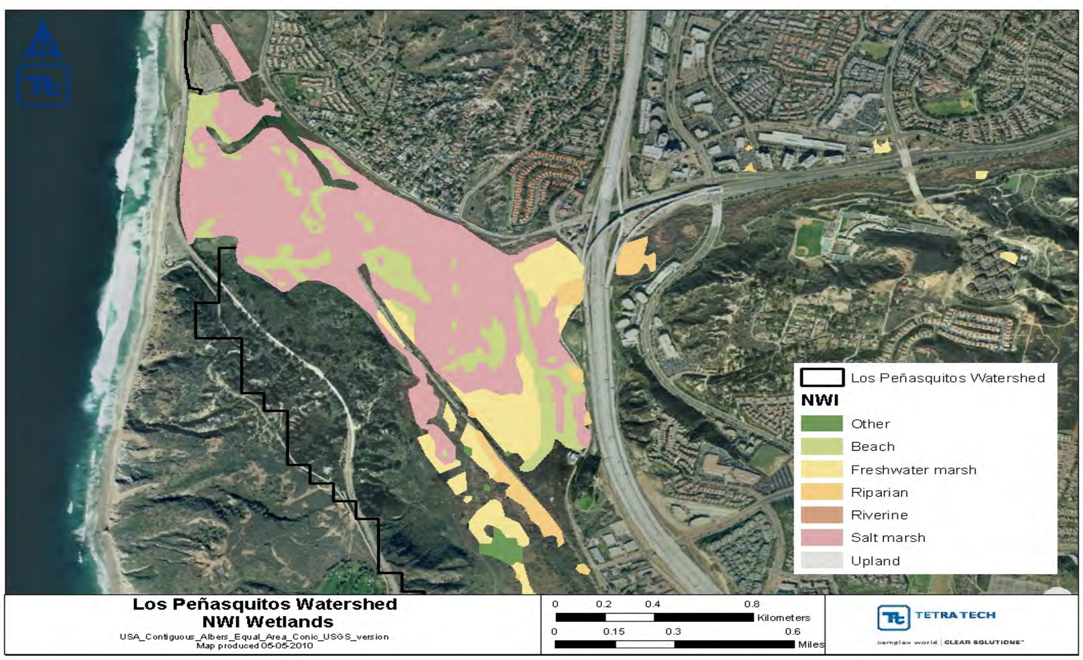

Figure 9. National Wetland Inventory (NWI) – 1985.

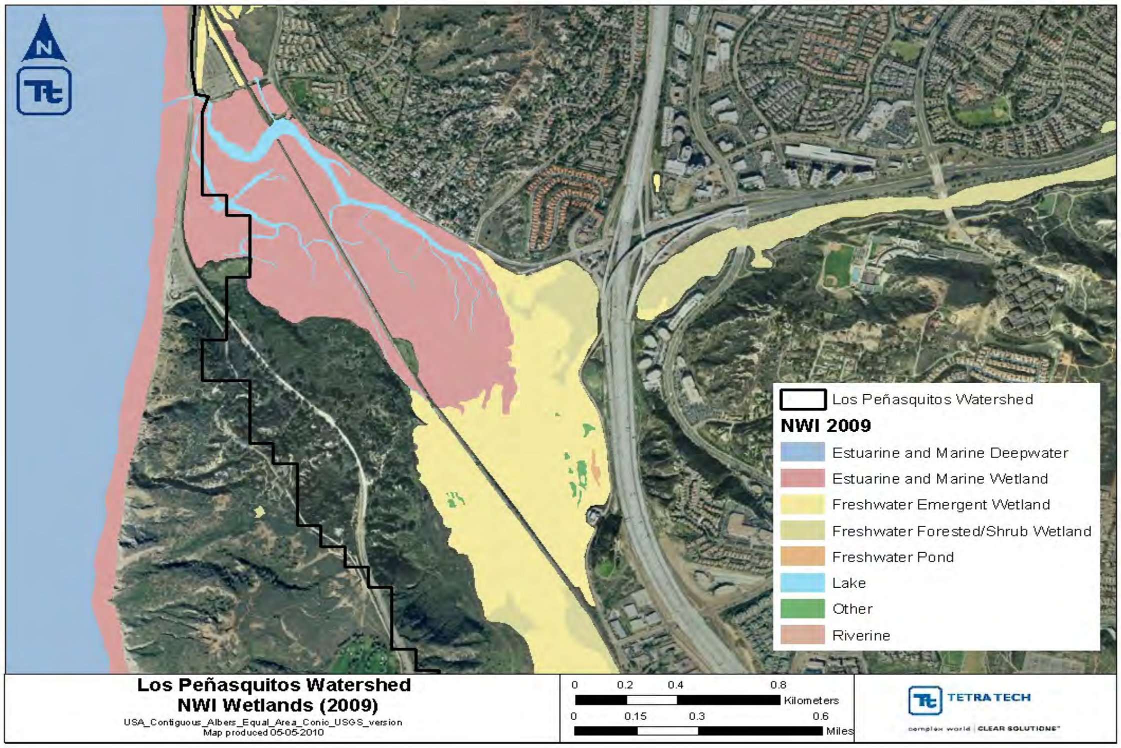

Figure 10. National Wetland Inventory (NWI) – 2009.

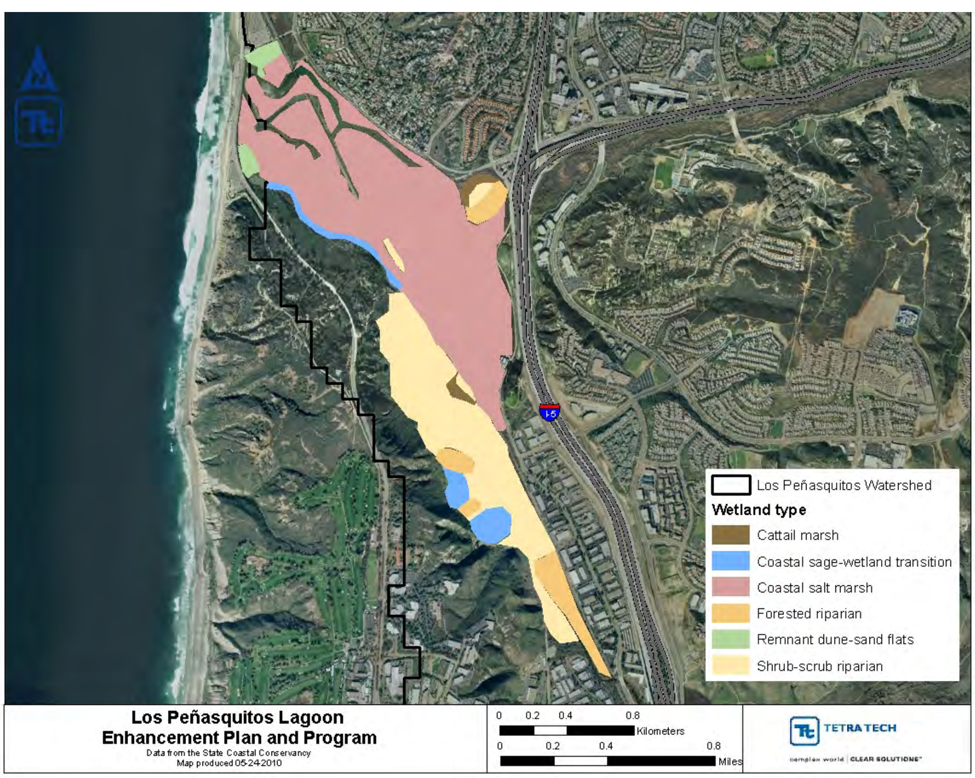

Figure 11. LPL Enhancement Plan – 1985 wetland types.

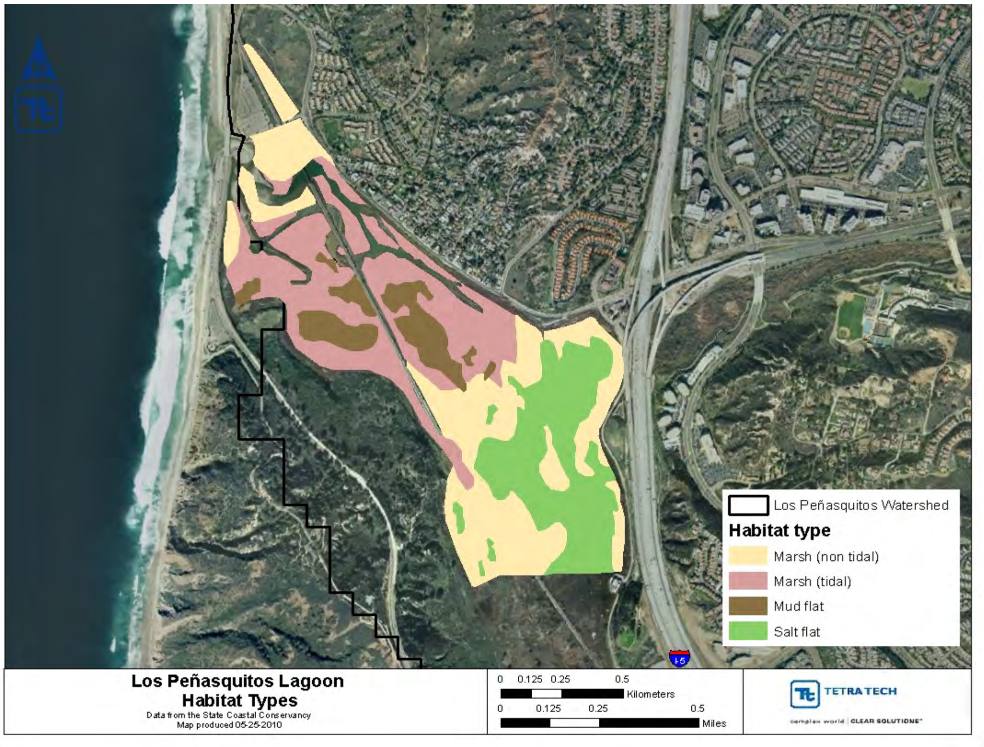

Figure 12. Historical lagoon wetland types (Mudie et al. 1974).

3.4.2 Sedimentation Impacts

Increased and rapid sedimentation results in reduced tidal mixing within Lagoon channels, degraded and net loss of saltmarsh vegetation, increased vulnerability to flooding for surrounding urban and industrial developments, increased turbidity associated with siltation in Lagoon channels, and constricted wildlife corridors. Specifically, deposition of watershed sediment contributes to elevation increases within the Lagoon, leading to an increase in height relative to mean sea level. Elevation is a critical variable that determines the productivity, diversity, and stability of saltmarshes. The long-term existence of the saltmarsh depends on the success of the dominant plants, such as *Sarcoconia pacifica* ~~(also referred to as *Salicornia virginica*)~~ and *Frankenia salina*, and their close relationship to sediment supply, sea level change, soil salinity, and tidal range (US EPA, 2005). While these species can tolerate low salinity levels, year round inundation of freshwater and/or decreases in soil salinity prevent the ability of saltmarsh plants from outcompeting transitional or brackish marsh plant species.

Several studies have documented the influx of sediment originating in the watershed to the Lagoon. In 1985, the Los Peñasquitos Lagoon Enhancement Plan estimated that sedimentation had removed 25 acres from the coastal saltmarsh inventory. Mudie and Byrne (1980) estimate that sedimentation rates have increased to 50 cm/century since European settlement of the area. This increase in sedimentation was supported by an article published in 2000 by Cole and Wahl that examined a 3,600-year sediment core take from the Lagoon (Cole, 2000). In 1978 a coastal commission report concluded that unmitigated urbanization could double the annual sediment load within 30 years (Prestegaard, 1978). The main depositional areas in the Lagoon are just downstream of the I-5 Carmel Creek culverts and at the southern end of the Lagoon near Sorrento Valley. Gradual sediment accumulation in the Lagoon results in areas of higher elevation, which tidal water no longer reaches. Between 1968 and 1985, sediment from Carmel Valley had raised the elevation of the northeast corner of the Lagoon by 6.1 feet, which has resulted in the conversion of saltmarsh vegetation into riparian and cattail marsh (LPL Foundation and State Coastal Conservancy, 1985). The formation of cattail marsh promotes sediment retention, further exacerbating sedimentation impacts.

There are many potential sources that have influenced the accumulation of sediment within the Lagoon. Sources include erosion of canyon banks and bluffs, scouring stream banks, exposed soils, and tidal influx. Some of these processes are exacerbated by anthropogenic disturbances, such as landurban development within the watershed. UrbanLand development transforms the natural landscape and results in increased runoff resulting in scouring of sediment, primarily in open space areas located below storm water outfalls that discharge into steep canyons just below the mesa top.

Sediment loads are transported downstream to the Lagoon during storm events causing deposits on the salt flats and in Lagoon channels. These sediment deposits have gradually built-up over timethe years due to increased sediment loading and inadequate flushing, which directly and indirectly affects lagoon functions and saltmarsh characteristics.

Legacy sediments from construction activities within the Lagoon (e.g. construction of the railway berms, construction and operation of the sewage treatment plant, and construction and operation of access roads) also play a role in the Lagoon's sedimentation impairment.

3.4.3 Freshwater Impacts

Freshwater runoff from adjacent and upstream urban development reduces soil salinity, allowing brackish and freshwater plant species to encroach into the saltmarsh habitat (CE, 2003). White and Greer (2002) hypothesize that hydrology and soil salinity are significant drivers to maintain the distribution and abundance of Lagoon's native saltmarsh vegetation types and, ultimately, the associated biological communities.

Most of the freshwater input into the Lagoon flows through Los Peñasquitos Canyon. Carroll Canyon Creek to the south and Carmel Creek to the north also contribute freshwater to the Lagoon. Historically, Los Peñasquitos Creek was the only tributary that flowed year-round, but only during years of above average precipitation. Carroll Canyon and Carmel Creeks only flowed during significant rainfall events and then reverted back to dry washes or creekbeds. Beginning in the 1990s, Carroll Canyon and Carmel Creeks began flowing year-round due to increased urban development within the watershed. Year-round freshwater flows attribute to habitat conversion, which results in sediment related impacts as newly established riparian and brackish marsh plant species serve as sediment traps during low to medium storm flows.

A 1974 report by the California Department of Fish and Game expressed concerns associated with a significant increase in the flow of urban runoff draining into the Lagoon's eastern channel. This report concluded that increased runoff was the result of intensive residential development of the mesas northeast of the Lagoon. During the fall of 1973, this runoff volume amounted to approximately 1,500 gallons per day (Mudie et al.,1974).

Previous studies that focused on the Lagoon and the surrounding watershed provide additional information on historical conditions and hydrologic changes associated with urbanization. For example, White and Greer (2002) classified three distinct periods of urbanization within the upper Los Peñasquitos Creek watershed: 1965-1973 was classified as low urbanization (<15 percent), 1973-1987 as moderate urbanization (15-25 percent), and 1988-2000 as high urbanization (>25 percent). Across the entire time period, the 1-2 year flood interval increased from 229 cubic feet per second (cfs) to 745 cfs to 1,272 cfs in each respective period. Flow duration curves indicate increased baseflow, such as discharges above 1.7 cfs occurred more often during the period between 1973 to 1987 than the earlier period (White and Greer, 2002). This study also estimated a four percent increase in runoff since 1972, with an increase in minimum flows throughout the study equivalent to 17 percent per year. These findings are supported by a recent review of flow data in Los Peñasquitos Creek (Figure 13), which demonstrates a steady increase in monthly mean flows since the 1970s.

The above analyses illustrate the general urbanization trends throughout the watershed that impact the Lagoon. The analyses also assist with identifying a period in time when increased sediment delivery from development was not the primary concern for the Lagoon's ecological functions.

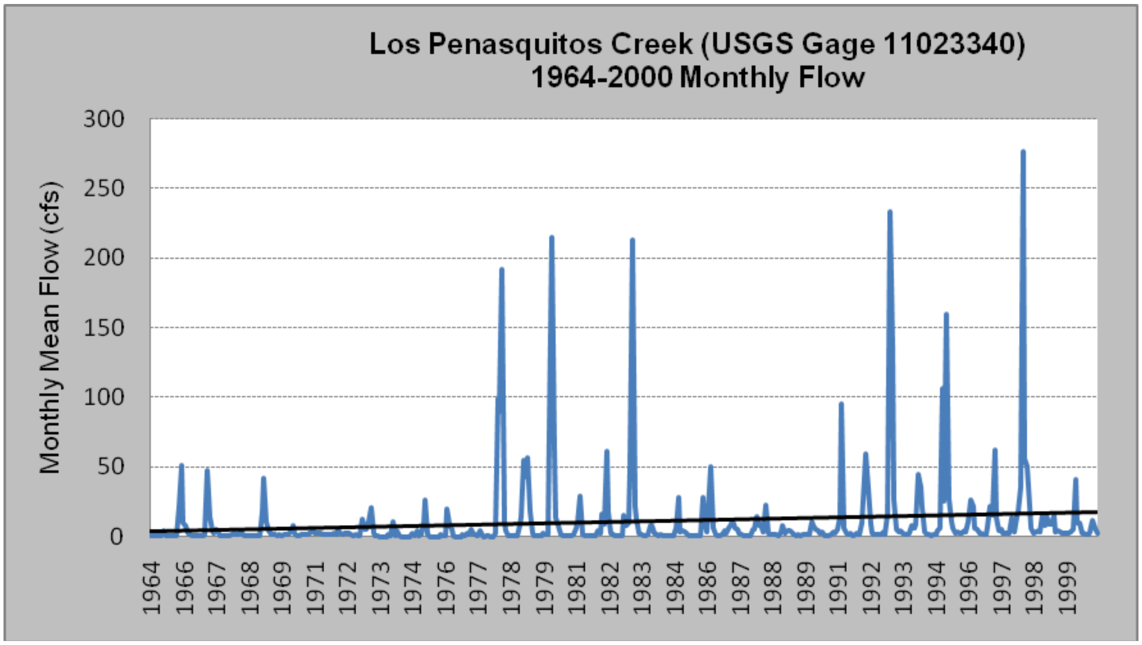

Figure 13. Hydrograph for Los Peñasquitos Creek.

3.4.4 Physical Impacts

As the region began to develop, urban infrastructure, including construction of the railroad (1880s-1925), altered the natural drainage and restricted tidal flows within the Lagoon. The original railroad was built along the eastern edge of the Lagoon (present Carmel Valley Road) and southwards across the salt flats. Construction of the Santa Fe Railroad (presently Burlington Northern Santa Fe Railroad) in 1925 moved the railway to the center of the Lagoon and cutoff several of its natural tidal channels by creating a barrier between the eastern and western portions of the Lagoon. Three railroad trestles provide the only connection between the eastern and western portions of the Lagoon. Later, the construction of Highway 101 (now referred to as Torrey Pines Road) in 1932 relocated the Lagoon's historic ocean inlet and confined the inlet to a single, narrow location under the lower bridge, which resulted in reduction of the Lagoon's tidal prism and exchange between the ocean and Lagoon (Mudie et al.~~,~~ 1974).

The North Beach Parking Lot was constructed in 1968 by State Parks in historically tidal areas that further influenced hydrologic exchanges (LPL Foundation and the State Coastal Conservancy, 1985).

3.4.5 Wastewater Treatment Plant Impacts

In response to increasing urban development within the watershed, two wastewater treatment plants operated from 1962-1972 and discharged effluent to the Lagoon and tributaries that ultimately reach the Lagoon. Although these facilities elevated minimum and median annual discharge values and assisted with maintaining the tidal prism, the effluent caused insect and odor problems (Mudie et. al.~~,~~ 1974), elevated nutrients (Bradshaw and Mudie, 1972), and depressed salinity concentrations (Torrey Pines State Natural Reserve, 2009). These problems continued until 1972 when surrounding areas were all connected to the San Diego Metropolitan sewer system. However, pump station failures have resulted in numerous sewage spills into the Lagoon. The most recent spill from Pump Station 64 occurred on September 9, 2011, during which over 1.9 million gallons of untreated sewage was discharged just upstream of the Lagoon. Impacts to water quality and aquatic species were recorded upstream and within the Lagoon's channels, as well as along local beaches outside of the lagoon inlet.

4 Numeric Targets

When calculating TMDLs, numeric targets are selected to result in attainment of the water quality standard. The numeric target is a measurable value for the pollutant of concern that, if achieved, will meet the water quality objectives (WQOs) for a waterbody and subsequently ensure the restoration and/or protection of beneficial uses. Achievement of the water quality standard for sediment in the Lagoon was interpreted using multiple lines of evidence to determine the numeric target for this TMDL.

4.1 Applicable Water Quality Standards

The narrative sediment WQO, as set forth in the Basin Plan states, “The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses” (San Diego Water Board, 1994).

The Basin Plan identifies the beneficial uses that are designated for Los Peñasquitos Lagoon (Table 2) (San Diego Water Board, 1994). Compliance with WQOs must be assessed and maintained throughout the waterbody to protect all beneficial uses. While the estuarine (EST) and preservation of biological habitats of special significance (BIOL) beneficial uses are the most sensitive to increased sedimentation, the narrative sediment WQO is applied to all beneficial uses.

Table 2. Beneficial uses designated for Los Peñasquitos Lagoon

Beneficial Use	Beneficial Use Description
REC 1	Includes uses of water for recreation activities involving body contact with water, where ingestion of water is reasonable possible. These uses include, but are not limited to, swimming, wadding, water skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.[1]
REC 2	Includes the use of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonable possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.[1]
BIOL	Includes uses of water that support designated area or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

Beneficial Use	Beneficial Use Description
EST	Includes uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
WILD	Includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
RARE	Includes uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under State or federal law as rare, threatened or endangered.
MAR	Includes uses of water that support marine ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
MIGR	Includes uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.
SPWN	Includes uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish. This use is applicable only for the protection of anadromous fish.
SHELL	Includes uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters and mussels) for human consumption, commercial, or sport purposes.

1. Access to some areas is not permitted per California State Parks.

4.2 Determining the Reference Condition

The narrative sediment WQO applies to sediment loading to the Lagoon and the accumulation of sediment in the Lagoon. One protective target would be to reduce watershed sediment loads to non-anthropogenic levels to help return and maintain the Lagoon to non-anthropogenic conditions with consideration given to background loading and other factors that also lend to impairment of beneficial uses. The numeric targets are calculated upon the historic condition when water quality standards were once met.

Available literature and past accounts of sedimentation impacts within the Lagoon were reviewed in the Technical Support Document (Attachment 1). This information provides the understanding of how watershed sedimentation results in impacts to the Lagoon's beneficial uses. Furthermore, this information was used in a weight of evidence approach to select the historic period that represents a time when water quality standards were being obtained.

The timeline of significant events and literature references (Figure 14 and Figure 15) summarizes the important changes in the Lagoon over time in relation to changes in land use (urbanization in particular) and other impacts discussed in Section 3 of this TMDL.

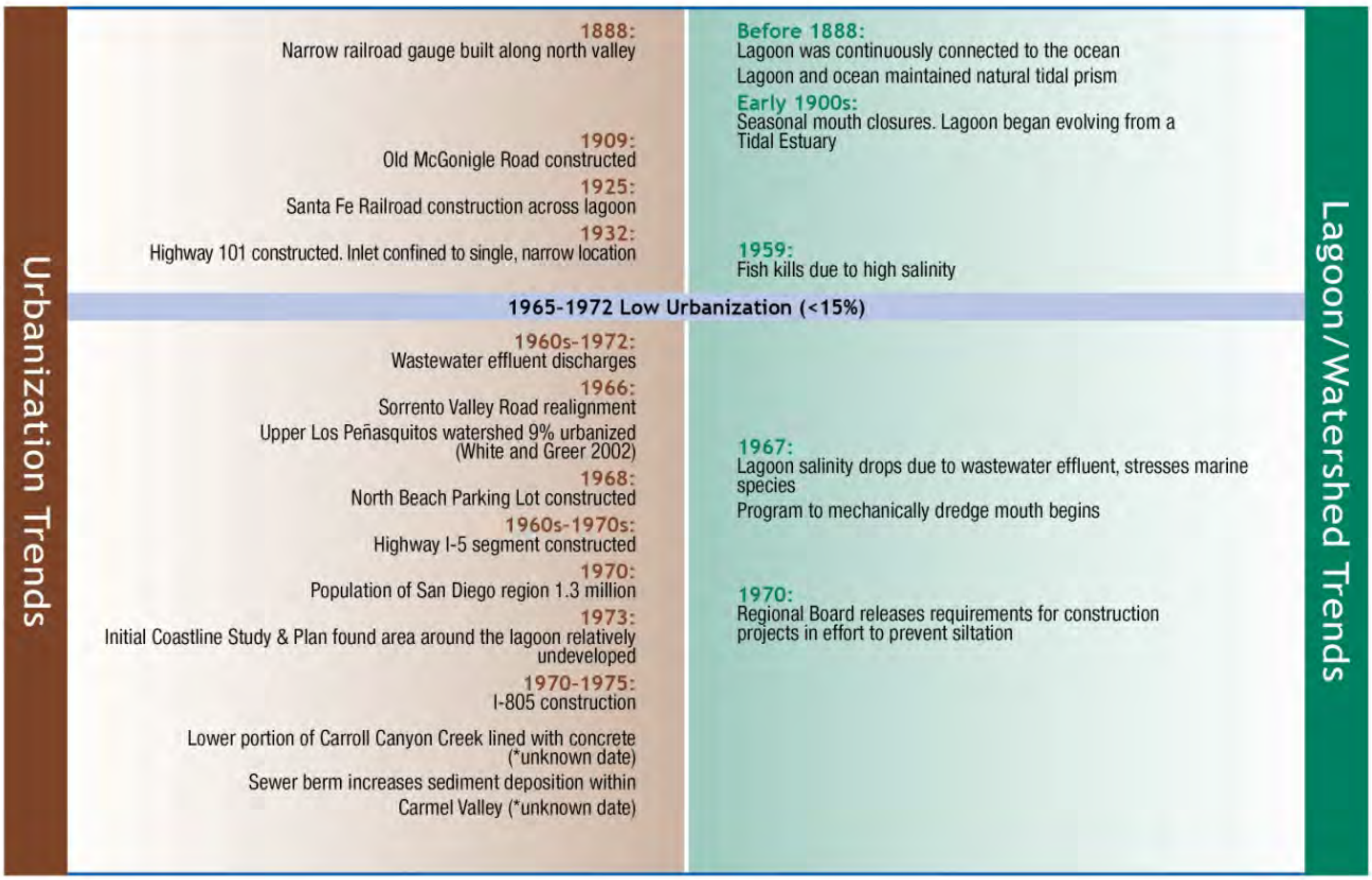

Figure 14. Timeline of urbanization and lagoon trends (1800s through early 1970s).

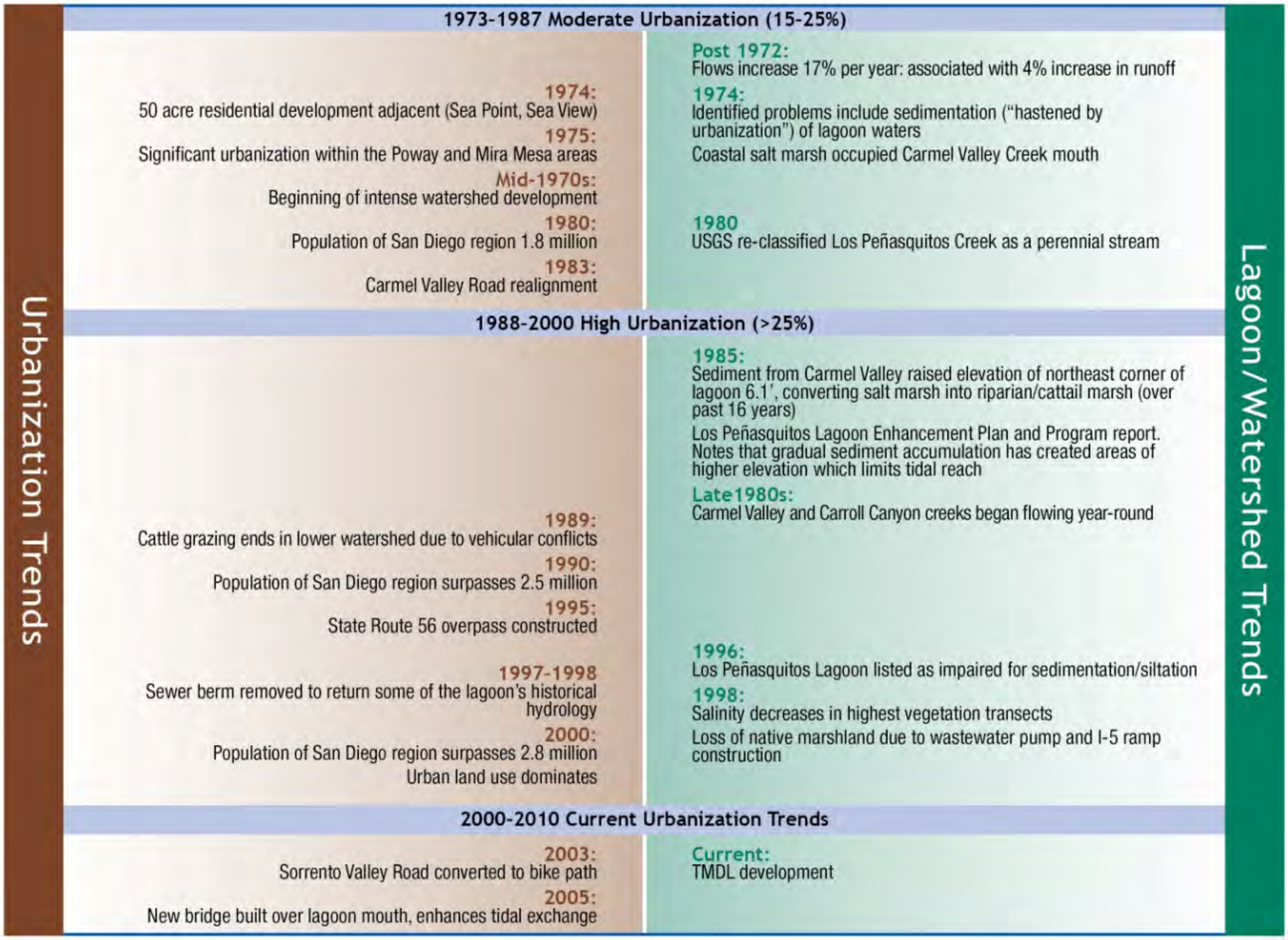

Figure 15. Timeline of urbanization and lagoon trends (mid-1970s through 2010).

Several lines of evidence were considered to determine the time period during which land-use distribution and Lagoon conditions supported water quality standards. This time period defines the reference condition upon which the numeric targets were calculated. The identified time period provides the link to the narrative sediment WQO and defines the conditions that will result in the protection of Lagoon beneficial uses from sedimentation. The lines of evidence considered include:

- **Urbanization trends**: A review of historical literature indicated that intensive development in the Los Peñasquitos watershed began in the mid-1970s. Land-use data shows a nearly 37 percent decrease in open space in the watershed beginning in the mid-1970s.
- **Population data**: Trend analysis of population data indicates that the population of the San Diego region has been steadily increasing since 1970.

- **Flow data**: Review of historical streamflow data from the US Geological Survey gage on Los Peñasquitos Creek and the conclusions drawn by White and Greer (2002) indicate that flow has increased substantially since the 1970s. White and Greer (2002) associated these flow increases with urbanization trends in the watershed.
- **Evaluation of Lagoon conditions:** As described in Section 3, Lagoon conditions have been influenced by several factors, which can be separated into watershed impacts and problems associated with the Lagoon mouth. Watershed impacts to the Lagoon include sediment delivery associated with ~~urban~~land development, which increased substantially in the mid-1970s. The wastewater treatment plants impacted water quality in the Lagoon until 1972 when the area was connected to the city sewer system, making it difficult to differentiate between the wastewater impacts and development-associated impacts during this time period (pre-1972). Available literature indicates that sediment deposition from the watershed is not adequately flushed out of the system due to problems at the Lagoon mouth caused by the railroad berm (and other physical alterations) and sediment build-up at the ocean inlet. Note that the Highway 101 bridge abutments were recently replaced and have resulted in improved tidal exchange through the area. As discussed above, reductions in the tidal prism have resulted in increased sediment build-up at the ocean inlet. Sediment deposition at the ocean inlet are primarily a function of littoral forces (Elwany, 2008) and other factors that are largely separate from the sedimentation problems that originate from the watershed. These factors are important to understand in order to effectively manage and improve conditions within the Lagoon, but they are outside the scope of the sediment TMDL analysis.

Consideration of these various lines of evidence indicates that the Lagoon was likely achieving the water quality standard for sediment before the mid-1970s.

4.3 Watershed Numeric Target

A historic coverage for the Peñasquitos watershed was developed for the mid-1970s using US Geological Survey topographic maps (primarily the La Jolla quadrangle-dated 1975). This land-use distribution was used to calculate the watershed numeric target using the LSPC watershed model (see Linkage Analysis, Section 7). This historic (mid-1970s) sediment load of 12,360 tons per critical wet period (211 days), or 58.6 tons per day, represents the sediment TMDL watershed numeric target.

4.4 Lagoon Numeric Target

An analysis of the vegetation types and acreages present in the Lagoon was developed for the mid-1970s using historic aerial photographs from which the Lagoon numeric target was calculated (see Linkage Analysis, Section 7). This analysis determined a historic condition of 420 acres of salt marsh present during the time period. The Lagoon numeric target is expressed as an increasing trend in the total area of tidal saltmarsh and non-tidal saltmarsh toward 346 acres. This target acreage represents 80 percent of the total acreage of tidal and non-tidal saltmarsh present in 1973 (see Section 7.5).

5 Source Assessment

The purpose of the source assessment is to identify and quantify the sources of sediment to the Los Peñasquitos Lagoon. Sediment can enter surface waters from both point and non-point sources. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels from, for example, municipal wastewater treatment plants or municipal separate storm sewer systems (MS4s). These discharges are regulated through waste discharge requirements (WDRs) that implement federal NPDES regulations issued by the State Water Board or the San Diego Water Board through various orders. Non-point sources are diffuse sources that have multiple routes of entry into surface waters. Some non-point sources, such as agricultural and livestock operations, are regulated under waivers of waste discharge requirements. The source assessment quantification is measured as an annual or daily load, which is then used to separate the load allocations or wasteload allocations for the TMDL. The following sections discuss the sediment sources that contribute to Los Peñasquitos Lagoon.

5.1 Sediment Processes within the Watershed

Wet weather events can cause significant erosion and transport of sediment downstream (especially from canyon areas below storm water outfalls). Dry weather loading attributes minimal sediment loading via nuisance flows from urban land-use activities such as car washing, sidewalk washing, and lawn over-irrigation, which pick up and transport the sediment into receiving waters. Due to the higher runoff potential associated with wet weather conditions, emphasis was placed on characterizing wet weather watershed loading.

Wet weather loading is dominated by episodic storm flows that wash off built up sediment on land surfaces, erode canyon areas below storm water outfalls, and scour stream banks. Erosion and scouring are exacerbated by anthropogenic disturbances, such as land~~urban~~ development within the watershed. Development can expose sediment and increase the amount of impervious surfaces on formerly undeveloped landscapes. This reduces the capacity of the remaining pervious surfaces to capture and filter rainfall. As a result, a larger percentage of rainfall becomes runoff during any given storm. Subsequently, runoff reaches stream channels much more quickly, and peak discharge rates and total runoff volume are higher than before development for the same size rainfall event (SCCWRP, 2011). This process is termed hydromodification.

In the Los Peñasquitos Watershed, the results of hydromodification are most pronounced below storm water outfalls in open space areas that discharge into steep drainages, where canyon walls are eroding into creeks. This effect is illustrated in Figure 16. Sediment is transported downstream to the Lagoon during storm events and deposited on the salt flats and in the Lagoon channels.

Figure 16. Erosion of canyon walls below storm drain outfall in the Los Peñasquitos Creek watershed (Garrity and Collison, 2011).

In 2010, a geomorphic assessment of the Peñasquitos watershed was conducted. The goals of the assessment were to identify locations within the watershed that are the main sources of sediment to the Lagoon, identify processes (natural and anthropogenic) that contribute sediment, and identify and prioritize actions to reduce and manage sediment. This study identified multiple segments of Carroll Canyon Creek that highly contribute to sediment production and have increased sediment delivery potentials due primarily to hydromodification effects on open space areas and a channelized segment of Carroll Creek (Garrity and CollisonCity of San Diego, 2011).

5.2 Sediment Processes within the Lagoon

Sediment from the watershed is discharged to the Lagoon and then redistributed to other areas of the Lagoon by both anthropogenic and natural processes. Distribution of sediment within the Lagoon is affected by physical impediments within the Lagoon including the constricted Lagoon mouth, the buildup of the floodplain adjacent to the confluence of Los Peñasquitos and Carroll Canyon Creeks, and the railroad berm. These physical impediments do not directly contribute a sediment load to the Lagoon; therefore a daily sediment load for these structures cannot be calculated.

More information on the structure of the Lagoon can be found in Background Section 3.3.

5.3 Sediment Sources

There are two broad categories of sediment sources to the Lagoon: 1) watershed sources, and 2) the Pacific Ocean. The watershed sources consist of all point and non-point sources of sediment in the watershed area draining to Los Peñasquitos Lagoon. The total sediment contribution from all watershed sources is presented as the total wasteload allocation (WLA). Sediment contributions from the Pacific Ocean are considered background sources and are presented as the Load Allocation (LA).

5.3.1 Watershed Point Sources

Direct discharges from the watershed to the Lagoon include discharges from: 1) Carmel, Peñasquitos, and Carroll Canyon Creeks; and 2) gullies adjacent to the Lagoon. These are considered point sources. This is the case because virtually the entire Los Peñasquitos watershed is drained through the Phase I MS4 collection systems. The MS4 collection system is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) (San Diego Water Board, 2007). In addition, and as stated in the San Diego County MS4 permit, historic and current development makes use of natural drainage patterns and features as conveyances for urban runoff. Urban streams used in this manner are part of the municipalities MS4 regardless of whether they are natural, man-made, or partially modified features. In these cases, the urban stream is both an MS4 and a receiving water (Finding d.3.c, San Diego Water Board 2007). For this reason the Phase I MS4s can be thought of as the primary and ultimate point sources of sediment to the Lagoon.

Storm water runoff is regulated through the following NPDES permits: the San Diego County Phase I municipal separate storm sewer system (MS4) permit, the Phase II MS4 permit for small municipal dischargers, and the statewide storm water permits issued to Caltrans, construction sites, and industrial sites. The permitting process defines these discharges as point sources because storm water is discharged from the end of a storm water conveyance system.

Phase I Municipal Separate Storm Sewer System (MS4)
As discussed above, the Phase I MS4s can be thought of as the primary and ultimate point sources of sediment to the Lagoon. The principal MS4s contributing sediment to the Lagoon are owned or operated by the municipalities located throughout the Peñasquitos watersheds including the City of San Diego, City of Poway, City of Del Mar, and County of San Diego. Note that Caltrans, Phase II MS4s, and several construction and industrial sites discharge into the Phase 1 MS4s.

Phase I MS4s contribute sediment during both dry and wet weather events; however, it is during wet weather events when runoff from storm drain outfalls causes significant erosion along canyon walls below the outfalls and along creek channels that receive these flows. In addition, sediment build-up on land surfaces from various sources is washed into the storm drain outfalls during rainfall events. The increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses. Development and urbanization increase pollutant loads in storm water runoff and the volume of storm water runoff. Impervious surfaces can neither absorb water nor remove pollutants and thus lose the purification and infiltration provided by natural vegetated soil.

The change in the natural watershed hydrologic processes and runoff characteristics (i.e., interception, infiltration, overland flow, interflow and groundwater flow) caused by urbanization or other land use changes is called “hydromodification”, and results in increased stream flows and sediment transport. In addition, alteration of stream and river channels, installation of dams and water impoundments, and excessive streambank and shoreline erosion are also considered hydromodification, due to their disruption of natural watershed hydrologic processes.
~~Runoff from urbanized areas into the Phase I MS4s can often be characterized by the term hungry water. Hungry water is used to describe discharges that have little to no sediment content to reduce flow velocities and sediment transport rates. Hungry water exacerbates the natural erosion and scouring processes in natural drainages and within~~

the receiving creek. The amount of runoff and associated concentrations are, therefore, highly dependent on the nearby land management practices.

Phase II Municipal Separate Storm Sewer System (MS4)
Phase II MS4s are storm water systems that serve public campuses, military bases, and prison and hospital complexes within or adjacent to other regulated MS4s, or which pose significant water quality threats. They are responsible for addressing water quality concerns from their small MS4s. Table 3 identifies the traditional and non-traditional small MS4s within the Los Peñasquitos watershed. Non-traditional small MS4s are federal and State operated facilities that can include universities, prisons, hospitals, military bases.

Table 3. List of traditional and non-traditional small MS4s

Agency	**Facility**	**Address**
California Community Colleges	San Diego Miramar College	10440 Black Mountain Road San Diego, CA 92126-2999
University of California	University of California, San Diego	9500 Gilman Drive La Jolla, 92093
State Park	Torrey Pines State Beach	N Torrey Pines Road San Diego, CA 92037

Storm water discharges from Phase II MS4s typically discharge into Phase I storm drain systems. As with Phase I MS4s, pollutants that build up on land surfaces within the small MS4s are washed off during rainfall events. In addition, urbanized areas within the Phase II MS4s also generate “hungry” flows that exacerbate the natural erosion and scouring processes of the creek.

Caltrans MS4s
The storm water discharges from most of the Caltrans properties and facilities within the Peñasquitos watershed discharge into a Phase I MS4 system. As with Phase I MS4s, pollutants build up on land surfaces owned by Caltrans and are washed off during rainfall events. In addition, runoff from these surfaces result in hydromodificationare “hungry” flows that exacerbate the natural erosion and scouring processes of the receiving creek.

Groundwater Extraction Discharges
Discharges from ground water extraction activities to surface waters are not a contributor of sediment to the Lagoon. These discharges are regulated under waste discharge requirements, which specify that suspended sediment concentrations in the effluent be no more than 50 milligrams per liter and that discharges shall not cause the

rate of deposition of solids and characteristics of inert solids in the sediment to be changed such that benthic communities are degraded.

Discharges of Hydrostatic Test Water and Potable Water
Discharges of Hydrostatic Test Water and Potable Water are those discharges resulting from testing of pipelines, tanks and vessels that are dedicated to drinking water purveyance and storage. These discharges are regulated under waste discharge requirements which require the implementation of Best Management Practices (BMPs) for flow and pollutants prior to entering receiving waters and/or the MS4 system.

Discharges from Utility Vault and Underground Structures
Discharges from Utility Vault and Underground Structures are not a contributor of sediment to the Lagoon. These intermittent discharges range from a few gallons to a few thousand gallons and are routed to the Lagoon directly or indirectly via the Phase I MS4 system.

Construction and Industrial Sites
During wet weather, runoff from industrial and construction sites has the potential to contribute sediment loading to the Lagoon. During dry weather, the potential contribution of pollutant loadings from industrial and construction storm water is low because non-storm water discharges are prohibited or authorized by permit only under the following circumstances: when they do not contain significant quantities of pollutants, where Best Management Practices (BMPs) are in place to minimize contact with significant materials and reduce flow, and when they are in compliance with San Diego Water Board and local agency requirements.

As of June March 20120, there were 8176 industrial facilities covering 1, 304 acres enrolled under the general industrial storm water permit in in the Los Peñasquitos watershed (Figure 17). Table 4 identifies the industrial facilities within the Peñasquitos watershed. These facilities include mining facilities, manufacturing facilities, transportation facilities, etc. Potential pollutants from an industrial site will depend on the type of facility and operations that take place at that facility. Facilities that discharge sediment have a potential to adversely impact the impaired Lagoon. For example, the two sand mining operations in Carroll Canyon have the potential to discharge sediment from theirits operation. Facilities with impervious surfaces or that alter the natural drainage of a watercourse also have the potential to adversely impact the impaired Lagoon.

Table 4. List of industrial facilities

Operator	Facility	Address
US Marine Corps Commanding Gen	US Marine Corp Air Station Mir	45249 Miramar Way, San Diego, CA 92145

Operator	Facility	Address
Sycamore Landfill Inc	Sycamore Landfill	14494 Mast Blvd, San Diego, CA 92145
Hanson Aggregates Pacific Southwest	Hanson Aggregates	9229 Harris Plant Rd, San Diego, CA 92145
New Leaf Biofuel	New Leaf Biofuel	2285 Newton Ave, San Diego, CA 92124
Fyfe Co LLC	Fyfe Co LLC	8380 Miralani Dr, San Diego, CA 92126
Vulcan Material dba Cal Mat Co	Carroll Canyon Aggregates	10051 Black Mountain Rd, San Diego, CA 92126
Hydranautics	Hydranautics	8270 Miralani Dr, San Diego, CA 92126
YRC Inc	YRC Inc	9525 Padgett St, San Diego, CA 92126
Ontrac	Ontrac	7077 Consolidated Way, San Diego, CA 92121
Penick II LLC	Olson dr	9747 Olson Dr, San Diego, CA 92121
Miramar Truck Center	Miramar Truck Center	6066 Miramar Road, San Diego, CA 92121
Penske Logistics LLC	Penske Logistics LLC	7170 Miramar Rd Ste 800 to 900, San Diego, CA 92121
Bimbo Bakeries USA	Bimbo Bakeries USA	5662 Eastgate Dr, San Diego, CA 92121
Illumina Inc	Research Place	5200 Research Pl, San Diego, CA 92121
California Precision Products Inc	California Precision Products Inc	6790 Flanders Dr, San Diego, CA 92121
Tayman Industries Inc	Tayman Industries Inc	5692 Eastgate Dr, San Diego, CA 92121
Illumina Inc	Carroll Park Dr Facility	9440 Carroll Park Dr, San Diego, CA 92121
California Commercial Asphalt	Carroll Canyon	9234 Camino Santa Fe, San Diego, CA 92121
Ametek Programmable Power	Ametek Programmable Power	9250 Brown Deer Rd, San Diego, CA 92121
Leed Recycling	Leed Recycling	8725 Miramar Pl, San Diego, CA 92121
Westside Building San	Westside Building San	7465 Carroll Rd,

Operator	Facility	Address
Diego LLC	Diego LLC	San Diego, CA 92121
West Tech Contracting Inc	West Tech Contracting	7625 Carroll Rd, San Diego, CA 92121
Integrated Microwave Corp	Integrated Microwave Corp	11353 Sorrento Valley Rd, San Diego, CA 92121
Angel P Hayes	Aquarius Marine	9384 Frost Mar Pl, San Diego, CA 92121
Stone Yard Inc	Stone Yard Inc	8980 Crestmar Point, San Diego, CA 92121
Old Dominion Freight Lines	Old Dominion Freight Lines	9850 Olson Dr, San Diego, CA 92121
Josh Degano	PCF Group	8585 Miramar Pl, San Diego, CA 92121
Expo Industries INC	Expo Industries INC	7455 Carrol Rd, San Diego, CA 92121
Deere & Company	T Systems International	7545 Carroll Rd, San Diego, CA 92121
Dale L Watkins	Shefield Platers Inc	9850 Waples St, San Diego, CA 92121
RR Donnelley	RR Donnelley	7590 Carroll Rd, San Diego, CA 92121
Pacira Pharmaceuticals, Inc.	Pacira Pharmaceuticals	10450 Science Center Dr, San Diego, CA 92121
USF Reddaway Inc Yrc Worldwide Enterprise Services Inc	USF Reddaway Inc 398 SDO	7075 B Carroll Rd, San Diego, CA 92121
Robertsons Ready Mix	Robertsons Miramar Plant	5692 Eastgate Dr, Miramar (2), CA 92121
United Parcel Service Freight	UPS Ground Freight Inc	7075 A Carroll Rd, San Diego, CA 92121
MZ3D Inc	MZ3D Inc	10739 Roselle St, San Diego, CA 92121
FedEx HD Pomona Industry	FedEx Ground Home Delivery	8515 Miramar Place, San Diego, CA 92121
ATK Space Systems	ATK Space Systems	9617 Distribution Ave, San Diego, CA 92121
Rhino Linings Inc	Rhino Linings Inc	9151 Rehco Rd, San Diego, CA 92121
San Diego City	Pump Station 64	10745 Roselle St,

Operator	Facility	Address
		San Diego, CA 92121
San Diego City	Pump Station 65	12112 Sorrento Valley Rd, San Diego, CA 92121
Illumina Inc	Illumina Inc	9885 Towne Centre Dr, San Diego, CA 92121
Quikrete	Quikrete	9265 Camino Santa Fe, San Diego, CA 92121
Allan Co	Allan Co	6733 Consolidated, San Diego, CA 92121
MJB Freight Systems	Mjb Freight Systems	6225 Marindustry Dr, San Diego, CA 92121
FedEx Freight Whittier	Fed Ex Freight West	5550 Eastgate Mall, San Diego, CA 92121
Dixieline Lumber Co	Dixieline Lumber Ne Miramar	7292 Miramar Rd, San Diego, CA 92121
Calbiochem Nova Biochem	EMD Biosciences Inc	10394 Pacific Center Ct, San Diego, CA 92121
Hanson Aggregates Pacific Southwest	Hanson Aggregates	9255 Camino Santa Fe, San Diego, CA 92121
San Diego City	San Diego City N City Water Re	4949 Eastgate Mall, San Diego, CA 92121
Pall Filtration & Separations	Pall Filtration & Separations	4116 Sorrento Valley Blvd, San Diego, CA 92121
Fed Ex	Fed Ex	10585 Heater Ct, San Diego, CA 92121
Fed Ex Ground Packaging System	Fed Ex Ground	9999 Olson Dr, San Diego, CA 92121
San Diego Gas & Electric	San Diego Gas & Electric Miram	6875 Consolidated Way, San Diego, CA 92121
Presidio Components Inc	Presidio Components Inc	7169 Construction Ct, San Diego, CA 92121
Qualcomm Inc	Qualcomm Inc	5525 Morehouse Dr, San Diego, CA 92121
Escondido Ready Mix	San Diego Ready Mix	9245 Camino Santa Fe, San Diego, CA 92121
Overnite Transportation	UPS Freight	7191 Carroll Rd, San Diego, CA 92121
RE Hazard Contracting Co	Re Hazard Contracting Co	6465 Marindustry Dr # 6485,

Operator	**Facility**	**Address**
		San Diego, CA 92121
Titan Linkabit	Titan	3033 Science Park Rd, San Diego, CA 92121
Frazee Paint	Frazee Paint	6625 Miramar Rd, San Diego, CA 92121
Van Can Co	Van Can Co	9045 Carroll Way, San Diego, CA 92121
IMS Electronics Recycling Inc	IMS Electronics Recycling Inc	12455 Kerran St 300, Poway, CA 92064
Mobile Mini Inc	Mobile Mini Inc	12345 Crosthwaite Cir, Poway, CA 92064
General Atomics Aeronautical Sys Inc Bldgs 14 & 15	General Atomics Aeronautical Sys Inc Bldgs 14 & 15	14107 Stowe Dr, Poway, CA 92064
Toray Membrane USA Inc	Toray Membrance USA Inc	13435 Danielson St, Poway, CA 92064
Joe Peterson	San Diego Crating and Packing	12678 Brookpriuter Pl, Poway, CA 92064
Sysco Food Services of San Diego	Sysco Food Services of San Diego	12180 Kirkham Rd, Poway, CA 92064
San Diego Granite Inc	San Diego Granite Inc	13026 Stowe Dr, Poway, CA 92064
FedEx Freight Inc	FedEx Freight Inc ESD	12055 Tech Center Dr, Poway, CA 92064
Atlas Transfer & Storage	Atlas Transfer & Storage	13026 Stowe Dr, Poway, CA 92064
All State Van & Storage Inc	All State Van & Storage Inc	12356 Mc Ivers Cct, Poway, CA 92064
Uke, Alan	Underwater Kinetics	13400 Danielson St, Poway, CA 92064
Poway City	Poway City Material Landing Fa	12325 Crosthwaite Cir, Poway, CA 92064
Valley Metals	Valley Metals	13125 Gregg St, Poway, CA 92064
Halllmark Circuits Inc	Hallmark Circuits Inc	13500 Danielson St, Poway, CA 92064
Vulcan Material dba Cal Mat Co	Poway	10975 Beeler Canyon Rd, Poway, CA 92064
County of San Diego	Poway Landfill	14600 Poway Rd,

Operator	Facility	Address
		San Diego, CA 92064
POWAY UNIFIED SCHOOL DISTRICT	Poway USD Transportation	13626 Twin Peaks Rd, Poway, CA 92064
Cor O Van Co	Cor O Van Co	12375 Kerran St, Poway, CA 92064
Designer Molecules Inc	Designer Molecules Inc	10080 Willow Creek Rd, San Diego, CA 92131

As of June 2010, there were 23 construction sites covering 442 acres enrolled under the general construction storm water permit in the watersheds draining to the Lagoon (Figure 17). While construction projects are intermittent and occur over relatively short durations, sediment loads from these projects can be significant.

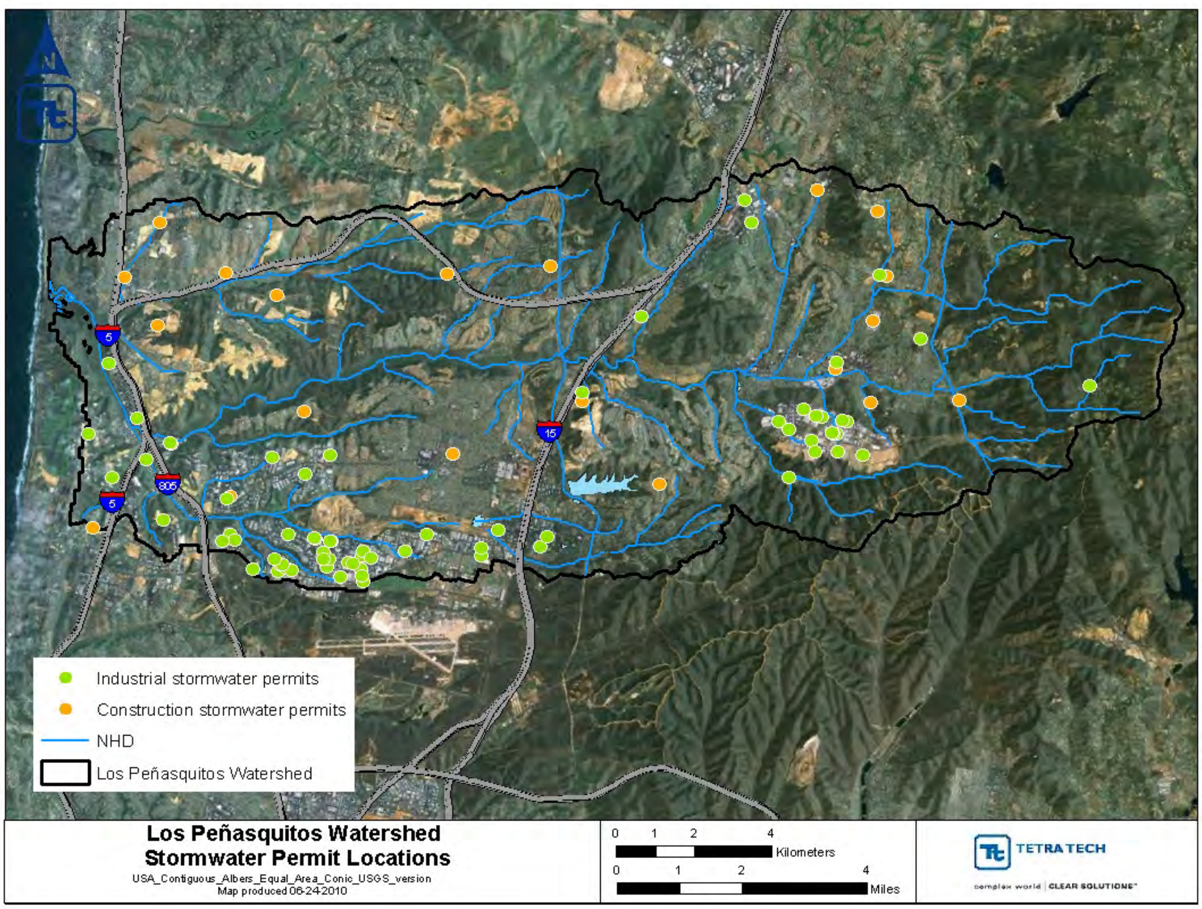

Figure 17. NPDES construction and industrial storm water permits as of June 2010.

5.3.2 Watershed Non-Point Sources

In this TMDL, the watershed sources also include all the *non-point sources located in the watershed* such as agriculture (1 percent of year 2000 land-use area) and open space (43 percent of year 2000 land-use area). This is the case because virtually the entire Los Peñasquitos watershed is drained through the Phase I MS4 collection systems. The total sediment contribution from all watershed sources is presented as the WLA.

5.3.3 Ocean Sediment Sources

~~Wave run up, storm surges and ocean tides are a source of sediment to the mouth of the Lagoon. One study found that accumulated sediment at the Lagoon's ocean inlet was similar to beach sediment and tidal sources (Elwany, 2008).~~ Ocean sediment contributions are considered a background source and accordingly an LA is assigned to ocean sediment contributions from storm surges and wave action along the ocean boundary (see Identification of Load Allocations and Reductions Section 8.8). Sediment loads from the ocean are primarily a function of littoral forces and other factors that are largely separate from the sedimentation problem originating from the watershed.

There is a natural tendency for wave-deposited sand to accumulate at the mouth of Los Peñasquitos Lagoon. This leads to the gradual formation of a broad sand bar in the vicinity of the junction of the two main branches of the lagoon drainage system. ~~The channels tend to become braided and constricted as the sand moves inland. When the height of the sand bar reaches approximately four feet above mean sea level, tidal circulation in the lagoon ceases (Mudie, 1974).~~ However, ocean sediments are dredged routinely from the Lagoon mouth to alleviate the danger of flooding and to improve the health of the Lagoon. The dredging of ocean sediments prevents the migration of sediment upstream into the lagoon system and maintains tidal exchange with the lagoon, both of which serve to maintain the tidal prism and lagoon soil salinities. ~~Because ocean sediments are dredged, ocean sediments do not traverse up Lagoon channels to directly fill in saltmarsh habitat nor do ocean sediments restrict tidal flow at the mouth, which indirectly affects the ability of the tidal prism to maintain soil salinities.~~

5.4 Quantification of Watershed Sediment Sources

Sediment sources were quantified by land-use group because sediment loading is highly correlated with land-use practices. Since several land-use types share hydrologic or pollutant loading characteristics, many were grouped into similar classifications, resulting in a subset of nine categories for modeling. Selection of these land-use categories was based on the availability of monitoring data and literature values that could be used to characterize individual land-use contributions and critical sediment-contributing practices associated with different land uses. For example, multiple urban categories were represented independently (e.g., high density residential, low density residential, and commercial/institutional), whereas other natural categories were grouped. The three major land-use sources in the watershed are open space, low density residential, and industrial/transportation. All land uses were classified as generating point source loads because, although the sediment sources within the watershed may be diffuse in origin, the pollutant loading is transported and discharged to the Lagoon waters through the storm water conveyance system.

The sediment load contributed by each land-use type was calculated using the LSPC model (note that unpermitted direct discharges of sediment to receiving waters were not explicitly quantified in the modeling analysis). Modeling parameters were varied by land use to provide the correlation between sediment loading and land-use type. More information on land uses is contained in Background Section 3.2 and the Modeling Report (Attachment 2).

6 Data Analysis and Inventory

Multiple data sources were used to characterize the watershed and Lagoon, including stream flow and water quality conditions. Much of this information was recently collected by watershed stakeholders to assist with TMDL model development. Data describing the watershed's topography, land use, soil characteristics, meteorological data, and irrigation needs along with available bathymetric survey information and data sondes analyzing pressure and salinity were used to calibrate the watershed and Lagoon models. The Technical Support Document (Attachment 1) summarizes stream flow and total suspended sediment data used for calculation of the watershed numeric target.

7 Linkage Analysis

The technical analysis of the relationship between pollutant loading from identified sources and the response of the waterbody to this loading is referred to as the linkage analysis. The purpose of the linkage analysis is to quantify the maximum pollutant loading that can be received by an impaired waterbody and still attain the WQOs of the applicable beneficial uses. This numeric value is represented by the TMDL.

The linkage analysis for this TMDL is based on biological index linkages and computer models that were developed to represent the physical processes within the impaired receiving waterbody and associated watershed. The models provided estimation of sediment loadings from the watershed based on rainfall events, land use, and simulation of the response of the receiving water to these loadings. The following sections provide more detailed discussion regarding model selection and linkage analysis.

7.1 Linkage of Targets and Sources to Beneficial Uses

As discussed in the Numeric Targets section 4, this TMDL finds that the water quality objective for sediment in the Lagoon was being attained and beneficial uses were being supported under historic conditions (mid-1970s). It follows that the Lagoon was capable of assimilating historic sediment loads under historic Lagoon conditions. The historic Lagoon condition has evolved through time with continual natural and anthropogenic sediment deposition and alterations to the Lagoon's natural systems, including: constriction of the Lagoon's floodplain by development, relocation of the Lagoon's natural ocean inlet, year round fresh water input, elevated peak discharges and volumes of storm runoff from impervious surfaces, and construction of two railway berms across the Lagoon.

Development within the Lagoon and increased sediment discharge to the Lagoon over time has contributed to sediment buildup and higher elevations that limit tidal flow and the extent of saltmarsh vegetation. This trend has resulted in adverse impacts to beneficial uses, in particular, the estuarine (EST) and preservation of biological habitats of special significance (BIOL) beneficial uses. Deposition of watershed sediment contributes to elevation increases within the Lagoon, leading to an increase in height relative to mean sea level. Elevation is a critical variable that determines the productivity, diversity, and stability of saltmarshes (e.g. see Pennings and Callaway 1992, Zedler and Callaway 2000). The long-term existence of the saltmarsh depends on the success of the dominant plants, such as *Sarcoconia pacifica* (*Salicornia virginica*) and *Frankenia salina*, and their close relationship to sediment supply, sea level change, soil salinity, and tidal range (US EPA, 2005). This subset of estuarine habitat is of particular biological significance as it is estimated that only 10 percent of the original coastal marshland in San Diego County remains in existence (Mudie et al. 1974).

Watershed and Lagoon numeric targets were identified to calculate the watershed sediment load reduction required based on historical analysis, account for impairment of saltmarsh due to historic sediment loads, and to track implementation success.

It is expected that reduced sediment loading from storm water discharges consistent with the watershed sediment reduction target will encourage the establishment of native vegetation in degraded areas through various mechanisms. Implementation actions designed to reduce sedimentation will also likely reduce nuisance freshwater flows into the Lagoon that have contributed to observed habitat and beneficial use impacts. An adaptive management approach will be used to determine the most effective course of action to achieve the numeric targets and improve beneficial uses in the Lagoon (see Implementation Plan Section 9.3). Ultimately, sediment removal in some areas may be needed to remove the excess anthropogenic sediment that has been deposited since the mid-1970s to meet the requirements of this TMDL and to re-establish elevations conducive to saltmarsh habitats progression and diversity of species, as well as improved connectivity between the watershed, Lagoon, and tidal flow.

Reducing watershed sediment loads from the year 2000 levels to historic levels (mid 1970's) is a necessary component for restoring and providing long-term protection of the Lagoon's beneficial uses. To represent the linkage between source contributions and receiving water response, a dynamic water quality model was developed to simulate source loadings and transport of sediment into the Lagoon. The models provide an important tool to evaluate year 2000 conditions, to evaluate historic conditions, and to calculate TMDL load reductions.

As mentioned before, sedimentation within coastal estuaries and lagoons is a natural process, recently augmented by human activities in the watershed over the last 200 years with the majority of sedimentation impacts occurring over the past 40 years (see Figures 14 and 15). It is believed that the Lagoon was capable of assimilating these historic sediment loads under the historic Lagoon condition. Because the Lagoon has been impacted by sediment accumulation, as demonstrated by the type changes in salt marsh habitat over the last 40 years from watershed sediment loads and hydrologic inputs, it cannot be assumed that the Lagoon, in the year 2010 condition, can assimilate the same elevated sediment loads. The historic condition represents a time period prior to major land development in the watershed, but occurs at a period following major physical modifications to the lagoon (e.g. see Figure 14). Thus, the Eevaluation of the extent of vegetation types in the Lagoon provides the necessary tool to assess how the

Lagoon responds to watershed sediment load reductions and to establish a target Lagoon condition under which the Lagoon can again assimilate the historic mid-1970's sediment loads.

7.2 Model Selection and Overview

In selecting an appropriate approach for TMDL calculation, technical and regulatory criteria were considered. Technical criteria include the source contributions, critical conditions, constituents to be addressed, and the physical domain, which is one of the most important considerations in model selection and accounts for both watershed and receiving water characteristics and processes. Regulatory criteria include water quality objectives and procedural protocol such as US EPA's *Protocol for Developing Sediment TMDLs*. In selecting a modeling framework, the models' ability to enable direct comparison of model results to the selected numeric target must be considered. For the watershed loading analysis and implementation of required reductions, it is also important that the modeling framework allow for the examination of gross land-use loading.

The selected modeling system was divided into two components representative of the processes essential for accurately modeling hydrology, hydrodynamics, and water quality. The first component of the modeling system, the Loading Simulation Program in C++ (LSPC) model, is a watershed model that predicts runoff and external pollutant loading as a result of rainfall events. The second component, the Environmental Fluids Dynamic Code (EFDC) model, is a hydrodynamic and water quality model that simulates the complex water circulation and pollutant transport patterns in the Lagoon. LSPC was specifically used to simulate watershed hydrology and transport of sediments in the streams and storm drains flowing to the impaired Lagoon. The LSPC model was linked to the EFDC model to provide all freshwater flows and loadings as the EFDC model input.

The LSPC and EFDC models were used to calculate both historic and year 2000 conditions to establish the watershed numeric target and required load reductions from year 2000 conditions.

A complete discussion, including model configuration, hydrologic and hydrodynamic calibration and validation, and water quality calibration and validation of the LSPC and EFDC models is provided in the Modeling Report (Attachment 2). In summary, these models rely on several assumptions that attempting to predict natural processes in a highly complex system. However, models can still provide a useful tool for management decisions and their accuracy can be improved with the type and amount of data used to calibrate them.

The TMDL is not limited by the models or their implementation; however, the nature of the variability of precipitation in Southern California, which leads to an extremely difficult sampling problem, coupled with the lack of bank erosion and bed load transport data creates a degree of uncertainty in the TMDL. In light of this uncertainty, this TMDL establishes a Margin of Safety (MOS; see Section 8.11) and establishes an adaptive management approach, in which an effective monitoring system is put in place to obtain detailed sediment loading data while monitoring the response of the Lagoon.

7.3 Model Application

The models were initially calibrated to hydrologic and water quality data (see Section 6) to characterize year 2000 conditions in the watershed and Lagoon. Land-use conditions present during the mid-1970s were associated with loads that met the sediment WQO to characterize historic (mid-1970s) conditions. The 1993 El Niño time period (the critical wet period, October 1, 1992-April 30, 1993) was used to calculate sediment loads under historical and year 2000 conditions. Model simulations were performed using the same meteorological data to accurately compare the watershed and Lagoon response to the same weather conditions.

The resulting historical net annual sediment load was identified as the watershed numeric target, which represents the loading (assimilative) capacity for the Lagoon (i.e. the TMDL). Historic loads define the allowable load; therefore, required load reductions represent the difference between year 2000 sediment loads and historic (allowable) loads.

7.4 Mapping Vegetation Types in the Lagoon

Through the aerial photo interpretation effort, vegetation types of the Los Peñasquitos Lagoon were estimated for the year 1973 (historical conditions) and year 2010. Aerial photography has long been used to map and assess changes to wetlands (White and Greer, 2002).

Aerial photos were acquired from the County of San Diego to characterize historical vegetation types within the Lagoon. The vegetation types were interpreted from 1:12,000 scale, 1,200 dots per square inch scans of photos by staff at California State Parks. The photography was captured on November 25, 1973 with the exception of the southernmost photo, which was captured on June 17, 1974.

Aerial photos were acquired from USA Prime Imagery map service to characterize the year 2010 vegetation types within the Lagoon. The vegetation types were interpreted from the high resolution photos by staff at California State Parks. The photography was acquired for the fall of 2010 aerial from USA Prime Imagery's I3_Imagery_Prime_World_2D map. This map presents satellite imagery for the world and high-resolution aerial imagery for the United States.

The photos representing historical vegetation types were geo-referenced to a minimum four locations within the marsh or low lying uplands to existing digital imagery. The fit appeared reasonable as transitions from one aerial to the next were not obviously misaligned and delineations fit well to modern high resolution aerial images. Individual pairs of points with high root mean square errors (RMSE) were discarded and replaced until an acceptable overall RMSE was achieved. The RMSE quantifies the distortion between a scanned aerial image and a rectified, geo-referenced base map. The average RMSE for the overall study was 7.65 pixels or 9.10 meters.

Vegetation types for historic and year 2010 conditions were heads-up digitized onscreen (at an approximate 1:2,500 scale), interpreted, and mapped into generalized classifications that could be reliably interpreted without field verification. Neither field verifications nor accuracy assessments were conducted. However, supplemental data was used to determine coarse elevations and vegetation types, including from SanGIS 2-foot topography and Google maps oblique aerials.

Vegetation types were classified as saltmarsh, non-tidal saltmarsh, ~~freshwater marsh,~~ non-tidal saltmarsh–*Lolium perrene* infested, freshwater marsh, southern willow scrub/mulefat scrub, herbaceous wetland, or upland land cover (urban, beach, dune, upland vegetation, etc.). Vegetation types are described below. Vegetation type extents under historic (mid-1970s) and year 2010 conditions are illustrated in Figures 18 and 19.

<u>Saltmarsh</u>

Description:	Exists below 6 feet (mean sea level) in elevation with an obvious tidal connection and no obvious presence of annual grasses or freshwater marsh vegetation. Also includes salt panne, mudflat, and tidal channels.
Indicators:	Deep brown and red-orange, smooth textured vegetation.

Common Species: *Sarcoconia pacifica* (*Salicornia virginica*)*, Frankenia grandiflora, Juamea carnosa*.
Confidence: Moderate-High. High confidence that vegetation is saltmarsh. Moderate confidence that this vegetation is tidal.

Non-tidal Saltmarsh
Description: Exists above 4 feet (mean sea level) in elevation with no obvious tidal connection, but presence of annual grasses or freshwater marsh vegetation.
Indicators: Deep brown and red-orange, smooth textured vegetation, but lighter in color than tidal saltmarsh due to less moisture. Includes salt panne with no obvious tidal connection.
Common species: *Sarcoconia pacifica* (*Salicornia virginica*)*, Frankenia grandiflora*. Vegetation distant from tidal connection has higher cover of *Frankenia salina* (orange color in aerials) and includes more brackish species (such as *Scirpus maritimus* and *Iva hayesiana*). This vegetation could be considered cismontane alkali marsh.
Confidence: Moderate-High. High confidence that vegetation is saltmarsh. Moderate confidence that this vegetation is non-tidal.

Non-tidal Salt Marsh – *Lolium perrene* infested
Description: Exists above 4 feet (mean sea level) in elevation with no obvious tidal connection. Dominated by annual grasses with presence of saltmarsh vegetation.
Indicators: Straw color of senescent annual grasses.
Common species: *Sarcoconia pacifica* (*Salicornia virginica*), *Frankenia grandiflora, Lolium perenne*. Could also contain *Bromus diandrus* or other non-native grass.
Confidence: Moderate.

Freshwater Marsh
Description: Freshwater marsh vegetation.
Indicators: Taller statured, more round-patterned, and pillowy-textured than saltmarsh and non-tidal saltmarsh vegetation. Lighter color than saltmarsh and non-tidal saltmarsh. Smooth texture and light color compared to Southern Willow Scrub/Mulefat Scrub.
Common species: *Typha* spp., *Scirpus californica, Scirpus americanus*
Confidence: High.

Southern Willow Scrub/Mulefat Scrub

Description: Tall-statured woody vegetation.
Indicators: Lumpy textured, bright green color. Presence of shadows.
Common species: *Salix lasiolepis, Baccharis sarothroides*.
Confidence: High.

Herbaceous Wetland (Unknown or Transitional Vegetation)
Description: A variety of vegetation types and textures mixed at close scales.
Indicators: Areas difficult to differentiate between vegetation types.
Common species: non-native grasses, freshwater marsh species, saltmarsh species, *Leymus tritichoides, Scirpus maritimus*, and others
Confidence: High.

Upland Land Cover (Urban, Beach, Dune, Upland Vegetation, etc.)
Description: Non-wetlands.
Indicators: Areas with urban infrastructure or non-wetland vegetation.
Common species: n/a
Confidence: High.

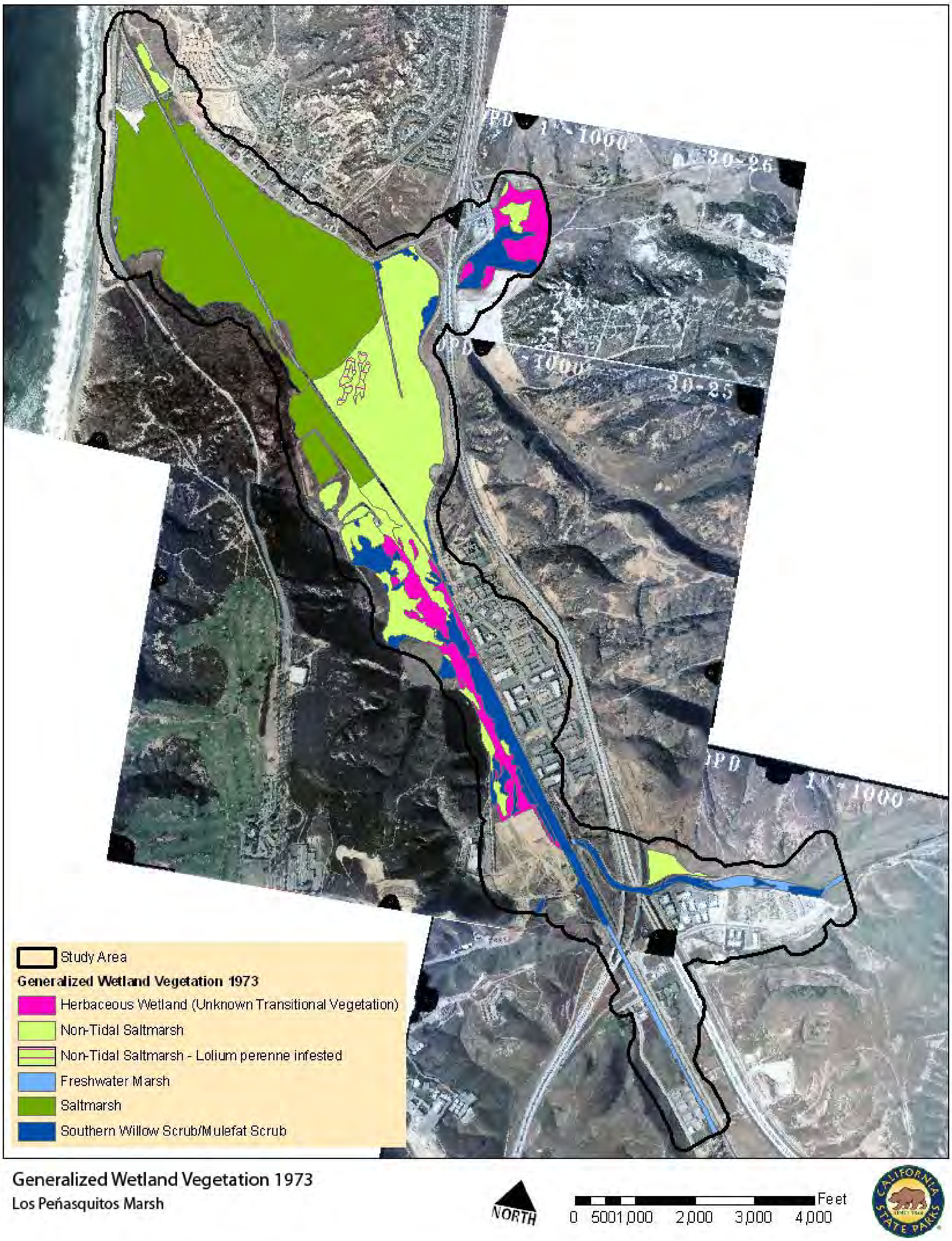

Figure 18. Historic wetland habitats within Los Peñasquitos Lagoon (California State Parks, 2011).

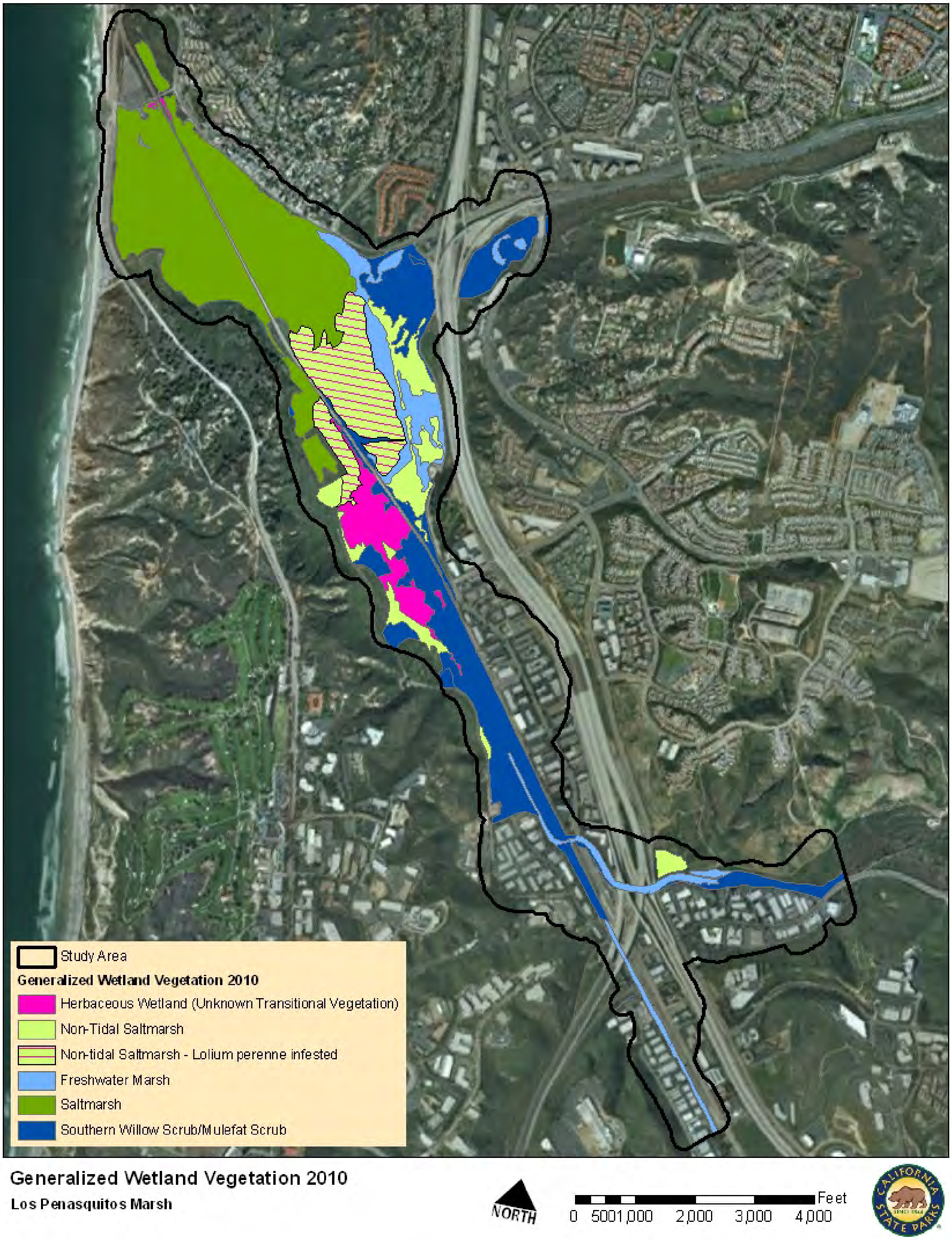

Figure 19. Year 2010 wetland habitats within Los Peñasquitos Lagoon (California State Parks, 2011).

7.5 Lagoon Mapping Application

Conditions present during the mid-1970s were associated with loads that met WQOs and did not adversely impact the Lagoon. To characterize this historical period, historic extent of vegetation types for the Lagoon were developed based on best available aerial photographs. Changes in vegetation types from 1973 to 2010 are summarized in Table 53.

Table 5. Summary of historical and year 2010 Lagoon vegetation types

Vegetation Types	**1973 acreage (ac)**	**2010 acreage (ac)**	**Change in acreage (ac)**
Saline Vegetation			
Tidal Saltmarsh	255	217	-38
Non-Tidal Saltmarsh	175	45	-130
Subtotal Saline	430	262	-168
Other Vegetation			
Non-tidal Saltmarsh - *Lolium perenne* (Perrenial Rye Grass) Infested, Non-native	4	67	63
Southern Willow Scrub/Mulefat Scrub	71	147	76
Freshwater Marsh	12	55	43
Herbaceous Wetland (Unknown or Transitional Vegetation)	49	34	-15
Subtotal Saline and Other Wetlands	566	565	-1
Upland Land Cover (Urban, Beach, Dune, Upland Vegetation, etc.)	639	640	1
Total Study Area	1205	1205	

The proposed numeric target highlights the importance of maintaining the critical saltmarsh and non-tidal saltmarsh habitats for protection of beneficial uses. Because the total study area of the Lagoon is constant, any increase in saltmarsh and non-tidal saltmarsh areas must be realized by reducing other areas. Of greatest priority and preference is the increase in areas of high biological importance (tidal saltmarsh and non-tidal saltmarsh) and reduction of areas with less biological importance, most notably the area identified as non-tidal saltmarsh-*Lolium perenne* infested. The Lagoon's 565 acres of non-upland land cover include 262 acres of tidal saltmarsh (including salt panne, tidal channels, and mudflats) and non-tidal saltmarsh and 132 acres of freshwater marsh, herbaceous wetland, and woody riparian (for example southern willow scrub and mulefat scrub) habitats. The remaining 171 acres of vegetation (not considering upland) is impaired and converted from coastal saltmarsh to *Lolium perenne* infested non-tidal saltmarsh, freshwater marsh, and woody riparian habitats (California State Parks, 2011).

The Lagoon numeric target is expressed as an increasing trend in the total area of tidal saltmarsh and non-tidal saltmarsh toward 346 acres. This target acreage represents 80 percent of the total acreage of tidal and non-tidal saltmarsh present in 1973.

Historic saltmarsh and non-tidal saltmarsh acreage is equivalent to 430 acres with 168 acres lost due to sedimentation, freshwater, and other physical factors discussed in the Background section of this Staff Report. Without available studies to determine what proportion of this loss is due to sedimentation over other factors, best professional judgment is used to determine the amount of habitat loss due to historic sediment discharges.

The target tidal and non-tidal saltmarsh acreage was calculated based upon the total acreage of tidal and non-tidal saltmarsh lost multiplied by a factor of 0.5. A factor of 0.5 indicates that half the acreage of tidal and non-tidal saltmarsh lost is due to sedimentation or 84 acres. Subtracting this lost acreage due to sedimentation from the historic extent of tidal and non-tidal saltmarsh results in the target acreage of 346 acres of tidal and non-tidal saltmarsh. This target acreage represents 80 percent of the total acreage of tidal and non-tidal saltmarsh present in 1973 and provides a reasonable consideration of factors beyond sedimentation that have led to the loss of saltmarsh and non-tidal saltmarsh.

If insufficient acreage is available for remediation based on the results of future monitoring efforts and field investigations, the Lagoon numeric target may be adjusted according to the amount of areas that are present and feasible for restoration. Any revision to the Lagoon numeric target will require a Basin Plan amendment (see Reconsiderations section 9.7).

8 Identification of Load Allocations and Reductions

The calibrated models and Lagoon mapping were used to simulate historical and year 2000 sediment loads to the Los Peñasquitos Lagoon from which numeric targets and load reductions were established. This section discusses the methodology used for TMDL development and the resulting loading capacities and required load reductions for Los Peñasquitos Lagoon. Other TMDL components are also discussed including the margin of safety (MOS), seasonality and critical conditions, and a daily load expression.

8.1 Loading Analysis

Year 2000 sediment loads to the Lagoon were estimated using the calibrated LSPC model, and receiving water conditions were simulated using the EFDC model (see Linkage Analysis, Section 7). Using the EFDC model, the assimilative capacity of the Lagoon was assessed and compared to the historical numeric target for evaluation of sediment loading.

8.2 Application of Numeric Targets

As discussed in Section 4, the narrative WQO for sediment was interpreted using a weight of evidence approach to determine a reference condition to define the TMDL numeric target (i.e., a historical period when the Lagoon was not impaired for sedimentation). Several lines of evidence were used to establish the mid-1970s as the historic time period including urbanization trends, population data, flow data, and evaluation of Lagoon conditions over time. The watershed and Lagoon numeric targets were determined using modeling and Lagoon mapping under historical (mid-19070s) conditions.

8.3 Load Estimation

Estimation of year 2000 watershed loading to the impaired Lagoon required use of the LSPC model to predict flows and sediment loads. The dynamic model-simulated watershed processes, based on observed rainfall data as model input, provided temporally variable load estimates for the critical period. These load estimates were simulated using calibrated and validated land-use specific processes associated with hydrology and sediment transport (see Attachment 2).

8.4 Identification of Critical Conditions

Due to the higher transport potential of sediment during wet weather, the 1993 El Niño time period was selected as the critical period for assessment. The 1993 El Niño time period (October 1, 1992-April 10, 1993) is one of the wettest periods on record over the past several decades. Statistically, 1993 corresponds with the 93rd percentile of annual rainfall for the past 15 years measured at the San Diego Airport (Lindbergh Field). Selection of this year was also consistent with studies performed by the Southern California Coastal Water Research Project (SCCWRP). An analysis of rainfall data for the Los Angeles Airport from 1947 to 2000 shows that 1993 was the 90th percentile year; meaning 90 percent of the years between 1947 and 2000 had less annual rainfall than 1993 (Los Angeles Water Board, 2002).

The watershed numeric target and load reductions were calculated based on modeling of historical (mid-1970s) land-use conditions and the same meteorological data in order to accurately compare the watershed and Lagoon response to the same weather conditions

8.5 Critical Locations for TMDL Calculation

Due to the variability and dynamic nature of conditions within the Lagoon (e.g., mouth closures, tidal fluctuations, sediment fate and transport, etc.), the entire modeled Lagoon area was assessed as the critical location. Load reductions for sediment were based on achieving the numeric TMDL target across the Lagoon.

8.6 Calculation of TMDL and Allocation of Loads

Conceptually, a TMDL is represented by the equation:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

The wasteload allocation (WLA) portion of this equation is the total loading assigned to point sources. The load allocation (LA) portion is the loading assigned to non-point sources. The margin of safety (MOS) is the portion of loading reserved to account for any uncertainty in the data and computational methodology. An explicit implicit MOS was incorporated for this TMDL.

Load calculations for sediment were developed based on watershed modeling results and meteorological conditions using land-use based generation rates and meteorological conditions from the critical wet period (October 1, 1992-April 10, 1993).

8.7 Wasteload Allocations

The point sources identified in the Los Peñasquitos watershed are Phase I MS4 co-permittees (San Diego County and the cities of San Diego, Poway, and Del Mar), Phase II MS4s, Caltrans, and construction and industrial storm water permit holders. The year 2000 estimated loads were solely the result of watershed runoff (land-use based) and streambank erosion and not other types of point sources. The total sediment contribution from all responsible parties in the watershed is presented as the WLA.

8.8 Load Allocations

According to federal regulations (40 CFR 130.2(g)), load allocations (LA) are best estimates of the non-point source or background loading. For the Los Peñasquitos watershed, land-usenon-point source contributions to MS4 systems are included in the WLAs described above, including contributions due to hydromodification and accelerated erosion. An LA was assigned to sediment contributions from storm surges and wave action along the ocean boundary (ocean sediment contributions). The ocean is a background source of sediment to the Lagoon. The LA calculated using the models represents the amount of ocean sediments coming from the ocean and depositing at the Lagoon mouth.

8.9 Summary of TMDL Results

The overall TMDL and its component loads are presented in Table 46. Daily loads are established by dividing the modeled loads by the number of days (211 days) within the critical wet period (October 1, 1992–April 30, 1993). Year 2000 loads, historical loads, and required reductions are presented in Table 57. Year 2000 loads were estimated based on modeling of year 2000 land-use conditions (from the SANDAG 2000 land-use coverage) and meteorological conditions from the critical wet period (October 1, 1992–April 30, 1993). As described in Section 4, the numeric targets were calculated based on modeling of historical (mid-1970s) land-use conditions and the same critical wet period meteorological data in order to accurately compare the watershed and Lagoon response to the same weather conditions. Historic loads define the allowable load; therefore, required load reductions represent the difference between year 2000 sediment loads and historic (allowable) loads.

Sediment dynamics within the Lagoon are dependent on a number of factors, including runoff volumes and the amount of sediment that is transported to the Lagoon from the watershed. These factors are important components in determining the timing and magnitude of erosion and depositional processes within the Lagoon. Modeling The Lagoon sediment dynamics model shows that a reductiingon in watershed sediment loadsing affects increases the amount of ocean sediments that can deposit throughout the Lagoon. from oceanic inputs (considering the input of sediment from the ocean boundary under year 2000 and historical conditions is constant). The model analysis for

~~historical conditions indicates that a greater proportion of sediment that deposits in the Lagoon originates from tidal inputs during lower watershed loading periods; therefore,~~ Therefore, the TMDL results show reduced sediment deposition from tidal/oceanic input during the critical wet period under historical conditions because of complex lagoon deposition/erosion dynamics~~that a net decrease in oceanic loads occurs during the critical wet period under historical land-use conditions~~. This is likely explained by the hydrodynamic conditions within the watershed and Lagoon. The higher storm water flows (due to hydromodification) from the watershed under current conditions flushes ocean sediments from the mouth, whereas the lower storm water flows under historic conditions allows more ocean sediments to accumulate in the mouth.

To meet the TMDL, the total load reduction required from the watershed is approximately 67~~75~~ percent. Tidal input from the ocean boundary represents natural background loads; therefore, no reduction is required for this source category.

Table 6. TMDL summary

Source	Critical Wet Period Load (tons)	Daily Load (tons)
Watershed contribution (WLA)	2,580~~1,962~~	12.2~~9.3~~
Ocean boundary (LA)	9,780	46.4
Margin of Safety (MOS)	implicit~~618~~	implicit~~2.9~~
TMDL	12,360	58.6

Table 7. Year 2000 vs. historical loads and percent reduction

Source	Year 2000 Load (tons)	Historical (mid-1970s) Load (tons)	Load Reduction (tons)	Percent Reduction Required
Watershed contribution (WLA)	7,719	2,580~~1,962~~	5,139~~757~~	67~~5~~%
Ocean boundary (LA)	5,944	9,780	+3,836 (increase)	+39% (increase)
Total	13,663	12,360	1,303	10%

8.10 Daily Load Expression

Load allocations are expressed in terms of net sediment load for the critical period (tons) because sediment delivery to streams is highly variable on a daily and annual basis. Loads were also divided by the number of days in the critical period (211 days) to derive daily loading rates (tons/mi^2/day). Because of the natural variability in sediment delivery rates, compliance with load allocations must be evaluated using a long-term, weighted rolling average.

8.11 Margin of Safety

A margin of safety (MOS) is incorporated into a TMDL to account for uncertainty in developing the relationship between pollutant discharges and water quality impacts (US EPA, 1991). For this TMDL, an explicit implicit MOS was included through application of conservative assumptions during selection of numeric targets and development of the implementation plan.

Conservative assumptions were applied when selecting the watershed numeric target. The following list describes several key assumptions that were used.

- **Critical condition** - The wet season that includes the 1993 El Nino storm events (10/1/92 – 4/30/93) was selected as the critical condition time period for TMDL development. This is one of the wettest periods on record over the past several decades. Because of the large amount of rainfall, sediment loads were significantly higher during this period than in other years with less rainfall.

- **Soil composition** - Soils that are more easily transported typically have higher proportions of smaller particles sizes (silt and clay fractions), as compared to local parent soils, because of differences in settling rates and other sediment transport characteristics. To account for these differences in the model, soils transported by surface runoff were assumed to be composed of 5 percent sand, twice as much clay as the percentage of clay within each hydrologic soil group, and the remainder assigned to the silt fraction.

- **Numeric target** - The historical analysis involved an extensive literature search and technical analysis in order to identify an appropriate time period for development of the numeric sediment target. This comprehensive 'weight of evidence' analysis considered all available information regarding urbanization and lagoon impacts over time in order to identify a conservative reference condition.

Conservative assumptions were applied when selecting the Lagoon numeric target. By selecting a Lagoon numeric target in addition to the watershed numeric target, assurance is provided that sediment discharged between the mid-1970s and the year 2000 will be accounted for. Furthermore, the Lagoon numeric target provides a direct assessment of Lagoon conditions relative to beneficial uses relative to the watershed loading target. An explicit MOS of 5 percent was applied to account for the difficulty in collecting water samples that accurately compute sediment transport and the lack of available bank erosion and bedload transport data.

Lastly, conservative assumptions were employed in the implementation plan through outlining the adaptive management approach to be used in determine the acceptable balance of sediment loading relative to progress in achieving and maintaining beneficial uses in the Lagoon and other factors.

8.12 Seasonality

The federal regulations at 40 CFR 130.7 require that TMDLs include seasonal variations. Sources of sediment are similar for both dry and wet weather seasons (the two general seasons in the San Diego region). Despite the similarity of wet/dry sources, transport mechanisms can vary between the two seasons. Throughout the TMDL monitoring period, the greatest transport of sediment occurred during rainfall events. Dry weather will contribute a deminimus discharge of sediment; however, model calibration and TMDL development focused on wet weather conditions because sediment transport is dramatically higher during wet weather. Model simulation was completed for the October 1, 1992–April 30, 1993 wet period to account for the much greater sediment loading and associated impacts to the Lagoon during this time period.

9 Implementation Plan

Los Peñasquitos Lagoon (Lagoon) is impaired for sedimentation/siltation, requiring the development of a TMDL and an implementation plan. The goal of the implementation plan is to ensure water quality objectives (WQOs) for sediment are met in the Lagoon. Consistent with California Water Code section 13242, this implementation plan describes the required actions by responsible parties, establishes a timeline, identifies interim milestones, and outlines monitoring objectives that will be used to assess the success of TMDL implementation.

As discussed in the source assessment and allocation sections of this TMDL, increased sediment discharge to the lagoon over time has contributed to sediment buildup and higher elevations that limit tidal flow and the extent of saltmarsh vegetation. This trend has resulted in impacts to beneficial uses, in particular, the estuarine and preservation of biological habitats of special significance beneficial uses. Watershed and lagoon numeric targets were identified to calculate the watershed sediment load reduction required based on historical analysis and to track implementation success. Reduced loading from storm water discharges and sediment removal in some areas may be needed to meet the requirements of this TMDL and to re-establish a more natural connection between the watershed, lagoon, and tidal flow.

Compliance with this sediment TMDL shall be based on achieving the Lagoon numeric target within the compliance timeframe. The responsible parties can implement a variety of implementation strategies, including preservation and restoration; education and outreach; retrofitting, new development, and site management; storm water BMP project construction and maintenance; and monitoring. Responsible parties are encouraged to work collaboratively to achieve the numeric targets and allocations specified in this TMDL.

This implementation section includes discussion of implementation actions needed to address this TMDL and describes an adaptive management framework that accounts for environmental and political complexities, as well as the time and financial resources needed to restore a coastal lagoon. This framework includes the following implementation processes:

1) Implement and evaluate the effectiveness of BMPs and source control strategies in conjunction with remediation actions to remove sediment as necessary;

2) Evaluate the effectiveness of controlling sediment loading from Carroll Canyon, Los Peñasquitos, and Carmel Creeks.

3) Conduct monitoring to inform decision making and to evaluate compliance during and after implementation actions are completed.

4) Re-evaluate the WLAs and LAs, if necessary.

5) Evaluate compliance with interim and final milestones.

9.1 Regulation by the San Diego Water Board

The Porter-Cologne Water Quality Control Act provides that "All discharges of waste into the waters of the State are privileges, not rights." Furthermore, all discharges are subject to regulation under the Porter-Cologne Act including both point and nonpoint source discharges.[1] In obligating the State Water Board and Regional Water Boards to address all discharges of waste that can affect water quality, the legislature provides the State Water Board and Regional Water Boards with authority in the form of administrative tools (waste discharge requirements [WDRs], waivers of WDRs, and Basin Plan waste discharge prohibitions) to address ongoing and proposed waste discharges. Hence, all current and proposed discharges must be regulated under WDRs, waivers of WDRs, a prohibition, or some combination of these or other administrative tools (e.g. Statewide Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program). Since the US EPA delegated responsibility to the State for implementation of the National Pollutant Discharge Elimination System (NPDES) program, WDRs for discharges to surface waters also serve as NPDES permits.

The regulatory mechanisms to implement the TMDL include, but are not limited to, general NPDES permits, individual NPDES permits, MS4 permits covering jurisdictions

[1] See Water Code sections 13260 and 13376.

and flood control districts within these waters, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, the Statewide Storm water Permit for Caltrans Activities, and the authority contained in Sections 13263, 13267 and 13383 of the Water Code. For each discharger assigned a WLA, the appropriate Order shall be reopened or amended when the order is reissued, in accordance with applicable laws, to incorporate the applicable WLA(s) as a permit requirement consistent with federal regulation and related guidance.[2]

9.2 Responsible Party Identification

Under this TMDL, the responsible parties are collectively assigned a single WLA, which they are responsible for meeting. An aggregate WLA allows for flexibility in achieving the load reduction required to meet the TMDL and improve Lagoon conditions. Responsible parties include: Phase I MS4 copermittees (the County of San Diego, City of San Diego, City of Del Mar, and the City of Poway), Phase II MS4 permittees, Caltrans, and the General Construction and General Industrial Storm Water NPDES permittees.

The San Diego Water Board encourages cooperation among all the responsible parties. While all the responsible parties in the Los Peñasquitos watershed must reduce their collective sediment load, the Phase I MS4 systems collect and drain virtually the entire watershed. As such, the Phase I MS4 copermittees represent the ultimate point source conveyor of sediment to the Lagoon. Therefore, it is the responsibility of the Phase I MS4 copermittees to assume the lead role in coordinating and carrying out the necessary actions, compliance monitoring requirements, and successful implementation of the adaptive management framework required as part of this TMDL.

Individual industrial facilities and construction sites are subject to regulation on two levels: (1) The San Diego Water Board is responsible for enforcing the statewide general industrial and construction storm water NPDES permits for sites within its jurisdiction.; and (2) each local municipality is responsible, under the MS4 storm water permit, for enforcing its own ordinances and permits (for violations of its ordinances/permits by an individual industrial facility or construction site within its jurisdiction). The San Diego Water Board is responsible for ensuring that the MS4 copermittees comply with specific MS4 permit requirements regarding the MS4 copermittees implementation of BMPs, such as inspections and ordinance enforcement, for construction and industrial sites within their jurisdiction.

[2] 40 CFR 144.22(d)(1)(vii)(B); US EPA Memorandum “Revisions to the November 22, 2002 Memorandum ‘Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs’” (November 12, 2010).

The San Diego Water Board relies upon the municipality to enforce its ordinances/permits and then works with the municipality to coordinate information and actions to compel compliance at the local and state level.

9.3 Phased Implementation via the Adaptive Management Approach

A common problem in natural resource management involves a temporal sequence of decisions (or implementation actions), in which the best action at each decision point depends on the state of the managed system. Adaptive management is a structured iterative implementation process that offers flexibility for responsible parties to monitor implementation actions, determine the success of such actions and ultimately, base future management decisions upon the measured results of completed implementation actions and the current state of the system. This process enhances the understanding and estimation of predicted outcomes and ensures refinement of necessary activities to better guarantee desirable results. In this way, understanding of the resource can be enhanced over time, and management can be improved.

Adaptive management entails applying the scientific method to the TMDL. A National Research Council review of US EPA's TMDL program strongly suggests that the key to improving the application of science in the TMDL program is to apply the scientific method to TMDL implementation (NRC 2001). For a TMDL, applying the scientific method involves 1) taking immediate actions commensurate with available information, 2) defining and implementing a program for refining the information on which the immediate actions are based, and 3) modifying actions as necessary based on new information. This approach allows the Lagoon to make progress toward attaining water quality standards while regulators and stakeholders improve the understanding of the system through research and observation of how it responds to the immediate actions.

Implementation actions to achieve the numeric targets will be implemented via an iterative process, whereby the information collected at each step will be used to inform the implementation of the next phase. The project will be adjusted, as necessary, based on the latest information collected to optimize the efficiency of implementation efforts. Ultimately, the path moving forward is to create the physical conditions related to remediating sediment impacts associated with this TMDL.

The implementation effort can be divided into three primary phases for this TMDL, as described below:

- Phase I Implementation includes elements to reduce the amount of sediment that is transported from the watershed to the Lagoon. An important component of Phase I will be to secure the relationships and agreements between cooperating parties and to develop a detailed scope of work with priorities.

  Phase I includes the following elements:
  - Incorporate interim limits into WDRs and NPDES permits;
  - Implement structural and nonstructural BMPs throughout the watershed; and
  - Develop and initiate a comprehensive monitoring program, which includes compliance monitoring and targeted special studies.

  If appropriate, the TMDL will be reconsidered by the San Diego Water Board at the end of Phase I to consider completed special studies or policy changes (see section 9.7).

- Phase II includes the implementation of additional watershed actions that are targeted to reduceeing sediment loads from high priority areas, as well as lagoon-specific actions that may be needed to facilitate recovery of beneficial uses that have been affected by various complex processes, including sedimentation, nuisance flows, reduced tidal circulation, and other factors. These actions may include Lagoon sediment remediation efforts, re-connecting the Lagoon's historic tidal channels, and maintenance of the Lagoon inlet in collaboration with State Parks, the San Diego Water Board, the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor Agency, US EPA, and the watershed responsible parties. Phase II may also include additional upstream protections and BMP implementation to further reduce watershed sediment contributions. Responsible parties will develop, prioritize, and implement Phase II elements based on data from compliance monitoring and special studies.

- Phase III includes implementation of secondary and additional remediation actions, as necessary, to be in compliance with this TMDL.

9.4 Develop and Submit a Load Reduction Plan

Responsible parties are required to prepare and submit for San Diego Water Board review, comment, and revision, a Load Reduction Plan that demonstrates how they will comply with this TMDL. The San Diego Water Board expects that Load Reduction Plans will be developed collaboratively by the responsible parties within the watershed. The Load Reduction Plan shall be submitted to the San Diego Water Board within 182 months of the TMDL effective date, and reviewed by the San Diego Water Board Executive Officer within six months of submittal (this period will likely include a round of revisions by the responsible parties based on San Diego Water Board staff comments).

The Load Reduction Plan shall establish a watershed-wide, programmatic, adaptive management approach for implementation and include a detailed description of implementation actions, identified and planned by the responsible parties, to meet the requirements of this TMDL. Implementation actions identified by the Load Reduction Plan may include source control techniques, structural and/or non-structural storm water BMPs, and/or special studies that refine the understanding of sediment and pollutant sources within the watershed. The Load Reduction Plan shall include a description and objective of each implementation action, potential BMP locations, a timeline for project or BMP completion, and a monitoring plan to measure the effectiveness of implementation actions.

Storm Water Pollution Prevention Plans (SWPPPs) prepared by Phase II MS4s, Industrial Permittees, and Construction Permittees pursuant to their respective statewide general NPDES permits fulfill these entities responsibility to prepare a Load Reduction Plan. Permittees within the Los Peñasquitos watershed shall update their SWPPPs within 12 months of the TMDL effective date with any additional BMPs, monitoring, etc. to account for their site’s potential to impact the receiving waterbody with respect to sediment. Sites identified through monitoring data or site inspections as posing an increased risk to the receiving water body may be directed to perform additional monitoring by the San Diego Water Board Executive Officer to quantify sediment load contributions to the receiving waterbody.

9.4.1 Comprehensive Approach

The comprehensive approach to the Load Reduction Plan requires that implementation efforts address all current TMDLs, current 303(d) listed waterbody/pollutant combinations, and other targeted impairments within the Los Peñasquitos watershed. A comprehensive approach to the Load Reduction Plan is consistent with implementation planning currently underway to address all of the impaired segments that were included in the approved bacteria TMDLs for San Diego Region Beaches and Creeks (San Diego Water Board, 2010).

The comprehensive approach to the Load Reduction Plan allows the responsible parties to proactively address other listed impairments within the watershed, which requires special studies to investigate sources and the water quality improvements needed to address these pollutants. Such special studies (discussed in more detail below) may significantly alter current understanding and refine the TMDL loading and/or allocations. This can impact the selection of subsequent implementation actions and how they are prioritized by responsible parties. A comprehensive approach to development of the Load Reduction Plan will provide a more cost effective and efficient approach for TMDL implementation and will have fewer potential environmental impacts associated with construction of structural BMPs (San Diego Water Board, 2010).

9.4.2 Load Reduction Plan Framework

With increased urban land development and inadequate management of runoff from impervious areas, increasing amounts of sediment are deposited into the Lagoon annually. To minimize the effects of runoff, proper sediment control can be achieved through the execution of implementation actions such as BMPs. Sediment implementation actions can be grouped into four categories: preservation and restoration, education and outreach, retrofitting, new development, and site management, and monitoring. Proposed activities presented in the Load Reduction Plan may be grouped into these categories, each is summarized below.

1) **Preservation and Restoration:** Significant areas of land have been set aside for open space. Such land acquisition and preservation prevents natural areas from being developed and disturbed. Additionally, the restoration of riparian buffers and wetlands can include the stabilization of steep slopes with native riparian vegetation. This not only helps restore the habitat but also the natural function of the stream.

2) **Education & Outreach:** As a source control technique, education and outreach can function as pollution prevention to reduce or eliminate the amount of sediment generated at its source. Education and outreach can be targeted at specific land user groups and/or staff involved with site maintenance. As an example, implementation actions such as municipal incentives can be used to encourage proper irrigation and landscaping and can significantly reduce volumes of runoff.

3) **Retrofitting, New Development, & Site Management:** ~~Urban~~ Land development (MS4 contribution) is the primary source of anthropogenic sediment contribution above historical conditions. Development can expose sediment and contribute excessive amounts of sediment to the Lagoon. Additionally, increased imperviousness associated with development can lead to increased storm water runoff and soil erosion or gullying within the MS4 and receiving waters. Appropriate site management can partially or fully mitigate the effects of development. The Load Reduction Plan must identify and prioritize BMPs based on an analysis of opportunities and cost/benefit considerations. Furthermore, the Load Reduction Plan must detail BMP projects and locations. Storm water BMPs can be implemented to reduce the effects of pollutant loading and increased storm water flows from ~~urban~~ development. Structural BMPs include incorporation of low impact development (LID) and storm flow hydrograph matching into new projects. The same structural BMPs can be utilized to retrofit existing sites or be applied as regional MS4 BMPs to treat pollutants and/or flows prior to discharge into receiving waters.

4) **Monitoring:** A coordinated monitoring plan is needed to establish existing watershed conditions (baseline conditions) from which future changes and anticipated improvement in water quality can be measured. Additional monitoring could focus on sensitive species, areas of saltmarsh coverage, extent of invasive plant species, BMP effectiveness, in-stream hydromodification, and/or reduction in impervious coverage. Additionally, monitoring is crucial in the assessment of implementation actions to gain an understanding of performance for future adaptive management actions.

9.5 Load Reduction Plan Implementation

The Load Reduction Plan must be implemented within ~~30~~ 90 days upon receipt of San Diego Water Board comments and recommendation, but in any event, no later than ~~60 days~~6 months after submittal.

9.6 Monitoring

Monitoring is required to measure the progress of pollutant load reductions and improvements in water and saltmarsh habitat acreage. The information presented in this section is intended to be a brief overview of the goals of the monitoring. Special studies may be planned to improve understanding of key aspects related to achievement of WLAs, LAs, and numeric targets, restore the beneficial uses, and to assist in the modification of structural and non-structural BMPs if necessary.

The goals of monitoring include:

1) To determine compliance with the assigned wasteload and load allocations.

2) To monitor the effect of implementation actions proposed by responsible parties to improve water and saltmarsh habitat quality including proposed structural and non-structural BMPs to reduce storm water run-off and sediment loading, and remediation actions to remove sediment from the Lagoon.

3) To monitor the extent of vegetation habitat acreages in the Lagoon and determine if additional implementation action should be required.

4) To implement the monitoring in a manner consistent with other TMDL implementation plans and regulatory actions within the Los Peñasquitos watershed.

The proposed monitoring program shall be included in the Load Reduction Plan submitted to the San Diego Water Board Executive Officer for review.

Monitoring shall be conducted under technically appropriate Monitoring and Reporting Plans (MRPs) and Quality Assurance Project Plans (QAPPs). The MRPs shall include a requirement that the responsible parties report compliance and non-compliance with interim milestones as part of annual reports submitted to the San Diego Water Board. The QAPPs shall include protocols for sample collection, standard analytical procedures, and laboratory certification. All samples shall be collected in accordance with SWAMP protocols. The monitoring program must establish the following elements:

1) Specification of the constituents, sample locations and frequency of monitoring.

2) The types of monitoring techniques to be used.

3) The standard operating procedures and appropriate quality assurance protocols.

4) Analytical techniques and objectives for the interpretation and analysis of information gathered.

5) A process for refining and modifying the monitoring design in response to changing objectives and improved information.

6) A designated laboratory with sufficient capacity and appropriate levels of certification.

The San Diego Water Board Executive Officer may reduce, increase, or modify monitoring and reporting requirements, as necessary, based on the results of the TMDL monitoring program.

9.6.1 Watershed Monitoring

Responsible parties must conduct suspended sediment, bedload, and flow monitoring to calculate total sediment loading to the Lagoon for each wet period (October 1 thru April 30) throughout the 20-year compliance period. The responsible parties must monitor enough storm events throughout to quantify total annual sediment loading over each wet period. The compliance point for the WLA shall be the Lagoon as measured through the cumulative sediment loading from Los Peñasquitos, Carroll Canyon, and Carmel Creeks prior to entering the Lagoon. The responsible parties must monitor as many stations as necessary to quantify sediment loading to the Lagoon. Because of the natural variability in sediment delivery rates, sediment loading shall be evaluated using a 3-year, weighted rolling average. The first average must be calculated following the third critical wet period after the TMDL effective date.

Responsible parties are encouraged to collaborate or coordinate their efforts with other regional and local monitoring programs to avoid duplication and reduce associated costs.

In addition to the TMDL constituents identified above, the responsible parties should consider conducting general water chemistry (temperature, dissolved oxygen, pH, and electrical conductivity) at each sampling event. General chemistry measurements may be taken in the laboratory immediately following sample collection if auto samplers are used for sample collection or if weather conditions are unsuitable for field measurements.

9.6.2 Lagoon Monitoring

The responsible parties shall monitor the Lagoon ~~monitored~~ annually in the fall for changes in extent of the vegetation types via aerial photography and/or land-based survey methods. Aerial photography must be conducted in accordance with compliance dates in Table 8 (below), specifically Items 1,8,9,10,11 and 12. Lagoon monitoring shall be consistent with the methodology used to calculate the numeric target described in Section 7.4. Aerial photos of the Lagoon must be acquired, digitized onscreen (at an approximate 1:2,500 scale), interpreted, and mapped into generalized classifications. Vegetation types must be classified as saltmarsh, non-tidal saltmarsh, freshwater marsh, non-tidal saltmarsh – *Lolium perrene* infested, freshwater marsh, southern willow scrub/mulefat scrub, herbaceous wetland, or upland land cover (urban, beach, dune, upland vegetation, etc.). Vegetation type classifications are described in Section

7.4. Ground truthing may be performed after aerial photo interpretation to distinguish between vegetation types.

9.7 Reconsiderations

Special studies may be used to refine source assessments, assign appropriate allocation based on updated information from the results of implementation actions and the monitoring program, and help focus implementation efforts. San Diego Water Board staff also recognize that the TMDL targets, allocations, and proposed implementation actions to reach those targets and allocations may change. The results of special studies submitted to the San Diego Water Board's Executive Officer will be considered during subsequent TMDL reopeners. In addition, it may be necessary to make adjustments to the TMDL to be responsive to new State policies and other regulations.

If appropriate, the TMDL will be reconsidered by the San Diego Water Board at the end of Phase I to consider completed special studies or policy changes.

The responsible parties always have the option to propose new numeric targets or a revised compliance schedule, with adequate support, to reopen the TMDL.

As the implementation of this TMDL progresses, the San Diego Water Board recognizes that revisions to the TMDL, WLA, LA, numeric targets, implementation plan, and potentially to beneficial uses and water quality objectives may be necessary in the future. Any future revisions to the Basin Plan necessary to implement this TMDL will require a Basin Plan amendment.

Revisions to the Basin Plan typically require substantial evidence and supporting documentation to initiate the Basin Plan amendment process. Given the severely limited resources available to the San Diego Water Board for developing Basin Plan amendment projects, developing the evidence and documentation to initiate a Basin Plan amendment will be the responsibility of the dischargers and/or other parties interested in amending the requirements or provisions implementing this TMDL.

The San Diego Water Board will initiate a Basin Plan amendment project to revise the requirements and/or provisions for implementing this TMDL (including, but not limited to, the TMDL, WLA, LA, numeric targets, implementation plan) if all the following conditions are met:

- Sufficient data are collected to provide the basis for the Basin Plan amendment.
- A report is submitted to the San Diego Water Board documenting the findings from the collected data.

- o A request is submitted to the San Diego Water Board with specific revisions proposed to the Basin Plan, and the documentation supporting such revisions.

- o TMDL revision is consistent with Basin Plan review priorities.

The San Diego Water Board will work with the project proponents to ensure that the data and documentation will be adequate for the initiation of the Basin Plan amendment. The San Diego Water Board will be responsible for taking the Basin Plan amendment project through the administrative and regulatory processes for adoption by the San Diego Water Board, and approval by the State Water Board, Office of Administrative Law, and US EPA.

9.8 Compliance Schedule and Determination

9.8.1 Compliance Schedule

As discussed above, the implementation schedule for this TMDL follows the form of an adaptive management strategy, tracks implementation progress with established milestones or interim goals, and sets forth a final compliance date. It is impractical for land managers to actually measure sediment loading on a daily basis; thus, compliance with the TMDL is most appropriately expressed as an average annual load and should be evaluated as a long-term running average to account for natural fluctuations and inaccuracies in estimating sediment loads.

The expected timeframe to achieve the required reduction in sediment loading is 20 years following TMDL approval. This timeline takes into consideration the planning needs of the responsible parties and other stakeholders to establish a Load Reduction Plan, time needed to address multiple impairments, and provides adequate time to measure temporal disparities between reductions in upland loading and the corresponding Lagoon water quality response.

Current studies and other implementation actions or projects are already underway to reduce sediment loading to the Lagoon and to gain a better understanding of source contributions. A variety of such projects will continue throughout the development of the Load Reduction Plan, ensuring there are no gaps in implementation efforts throughout the process.

At the end of the TMDL compliance schedule, as outlined in Table 86, waters must meet the Lagoon's sediment water quality standard and therefore, the Lagoon numeric target. If at any point during the implementation plan, monitoring data or special studies indicate that WLA will be attained but the Lagoon numeric target may not be achieved, the San Diego Water Board shall reconsider the TMDL to modify WLA to ensure that the Lagoon numeric target is attained.

Table 8. Implementation compliance schedule.

Item	Implementation Action	Responsible Party	Date
1	Obtain approval by OAL of Los Peñasquitos Lagoon Sediment TMDL = Establishes effective date of TMDL	San Diego Water Board, San Diego County, City of San Diego, City of Poway, City of Del Mar, Caltrans, General Storm Industrial and Construction permittees	Estimated June 2013
2a	Issue, reissue, or revise general WDRs and NPDES requirements for Phase I MS4s, including Caltrans, to incorporate requirements for complying with TMDL and WLAs	San Diego Water Board and State Water Board	Completed during permit renewal - within 5 years of applicable permit date, and every 5 years thereafter.
2b	Issue, reissue, or revise general WDRs and NPDES requirements for Construction and Industrial NPDES to incorporate requirements for complying with TMDL and WLAs	San Diego Water Board and State Water Board	Completed during permit renewal - within 5 years of applicable permit date, and every 5 years thereafter.
2c	Issue, reissue, or revise general WDRs and NPDES requirements for Phase II NPDES permittees to incorporate requirements for complying with TMDL and WLAs	San Diego Water Board and State Water Board	Completed during permit renewal - within 5 years of applicable permit date, and every 5 years thereafter.
3a	Completion of Load Reduction Plans	Phase 1 MS4s and Caltrans	Within 182 months of OAL effective date for sediment TMDL
3b	Approval of Load Reduction Plan	San Diego Water Board Executive Officer	Within 6 months of submittal

Item	Implementation Action	Responsible Party	Date
3c	Phased, adaptive implementation of Load Reduction Plan	Phase 1 MS4s and Caltrans	In accordance with Load Reduction Strategy – ongoing throughout the implementation
3d	Revision of SWPPPs	Construction, I~~i~~ndustrial, and Phase II Permittees	Within 12 months of OAL effective date for sediment TMDL
4a	Submit annual Progress Report to the San Diego Water Board due January 31 each year	Phase 1 MS4s	Annually after reissuance of NPDES WDR
4b	Submit annual Progress Report to the San Diego Water Board due April 1 each year	Caltrans	Annually after reissuance of NPDES WDR
5	Enforcement Actions	San Diego Water Board	As needed
6	Refine Load Reduction Plan	Phase 1 MS4s and Caltrans	As warranted by completion of special studies, additional monitoring and data compilation.
7	Reopen and reconsider TMDL	San Diego Water Board	As defensible through the collection of additional data and significant findings by the watershed stakeholders.
8	Meet Interim Milestone #1: Attain 20 percent required reduction in sediment loading (equivalent to 6691~~6567~~ tons of sediment per year) and/or show progress in improving Lagoon conditions consistent with the specified targets	MS4s and NPDES permittees	Within 5 years of approved TMDL

Item	Implementation Action	Responsible Party	Date
9	Meet Interim Milestone #2: Attain 40 percent required reduction in sediment loading (equivalent to 5663~~5416~~ tons of sediment per year) and/or show progress in improving Lagoon conditions consistent with the specified targets	MS4s and NPDES permittees	Within 9 years of approved TMDL
10	Meet Interim Milestone #3: Attain 60 percent required reduction in sediment loading (equivalent to 4636~~4265~~ tons of sediment per year) and/or show progress in improving Lagoon conditions consistent with the specified targets	MS4s and NPDES permittees	Within 13 years of approved TMDL
11	Meet Interim Milestone #4: Attain 80 percent required reduction in sediment loading (equivalent to 3608~~3113~~ tons of sediment per year) and/or show progress in improving Lagoon conditions consistent with the specified targets	MS4s and NPDES permittees	Within 15 years of approved TMDL
12	Meet Final Milestone: Achieve Lagoon numeric target: the successful restoration of tidal and non-tidal salt marsh to achieve a lgoon total of 346 acres.[3]	MS4s and NPDES permittees	Within 20 years of approved TMDL

**Note: TMDL implementation schedule may be altered due to TMDL reconsideration; additionally, enforcement actions by the San Diego Water Board will be taken as necessary.*

[3] This can either mean:
1. Successful restoration of 80 percent of the 1973 acreage of lagoon salt marsh habitat (346 acres); or
2. Demonstrate, with reasonable assurance for success, the implementation of activities that will lead to sustainable restoration of 80 percent of the 1973 acreage of lagoon salt marsh habitat (346 acres).

If the later, then continued monitoring will be required to demonstrate successful achievement of the 80 percent target, and a funding source must be identified for necessary remedial measures.

9.8.2 Compliance for Phase I MS4s and Caltrans

~~The goal of the TMDL is to achieve the Lagoon's sediment water quality standard through restoration of all of the Lagoon's beneficial uses and attainment of the sediment water quality objective.~~ The TMDL is achieved and thus tThe sediment water quality standard is attained when the Lagoon numeric target is met. If the Lagoon numeric target is not met, the responsible parties must demonstrate they have 1) complied with the WLA and 2) addressed historical sediment discharged to the Lagoon since the 1970s that the responsible parties caused or contributed to. Responsible parties can address the discharges of historical sediment in numerous ways including, but not limited to, Lagoon restoration activities and monitored natural reduction of sediment in the Lagoon. Monitored natural reduction of sediment refers to the reliance on natural processes to achieve site-specific restoration objectives within a time frame that is reasonable compared to that offered by other more active methods. Compliance is assessed through special studies and monitoring of the Lagoon and its contributing watershed.

Compliance with interim milestones shall be assessed based on each party's ability to demonstrate that it has complied with the interim milestones. Since sediment transport can vary immensely between wet and dry years, compliance with interim targets shall be achieved if the responsible parties can demonstrate that they have 1) shown progress in improving Lagoon conditions consistent with the Lagoon numeric target and/or 2) achieved the sediment load reductions outlined in Table 86. Progress can be demonstrated through monitoring and reporting on implementation actions achieved as outlined in the Load Reduction Plan, implementation action successes, and/or improvements in saltmarsh and non-tidal saltmarsh habitat. For other measures to be considered, they must be described in the Load Reduction Plan and be accompanied by a monitoring plan to measure progress.

9.8.3 Compliance for Phase II MS4s, Construction Permittees, and Industrial Permittees

Phase II MS4s, Construction, and Industrial NPDES Permittees are assumed to be in compliance with the TMDL and their contribution to the total WLA if they are enrolled and in compliance with their respective general statewide permit, and are found to not contribute to the sediment impairment in the Lagoon through monitoring data and/or inspections. The San Diego Water Board may direct individual Permittees under the Phase II MS4, Construction, and Industrial general storm water NPDES permits to obtain an Individual NPDES permit for their storm water discharges. Direction by the San Diego Water Board to obtain an individual NPDES permit may occur based upon program audits, state or local compliance inspections, and/or Permittee monitoring.

As discussed in Section 9.2 above, it is the responsibility of the Phase I MS4 copermittees to assume the lead role in coordinating and carrying out the necessary actions, monitoring requirements, and successful implementation of the adaptive management framework required as part of this TMDL. The San Diego Water Board relies upon the Phase I MS4s to enforce its ordinances/permits and then work with the San Diego Water Board to coordinate information and actions to compel compliance. The San Diego Water Board shall consider enforcement actions, as necessary, to control the discharge of sediment to any receiving waterbody that ultimately impairs the Lagoon to attain compliance with the sediment WLA specified in this TMDL.

10 Necessity of Regulatory Provisions

The Office of Administrative Law (OAL) is responsible for reviewing administrative regulations proposed by State agencies for compliance with standards set forth in California's Administrative Procedure Act, Government Code section 11340 *et seq*., for transmitting these regulations to the Secretary of State and for publishing regulations in the California Code of Regulations. Following State Water Board approval of this Basin Plan amendment establishing a TMDL, any regulatory portions of the amendment must be approved by the OAL per Government Code section 11352. The State Water Board must include in its submittal to the OAL a summary of the necessity for the regulatory provision. "Necessity" means the record of the rulemaking proceeding demonstrates by substantial evidence the need for a regulation to effectuate the purpose of the statute, court decision, provision of law that the regulation implements, interprets, or makes, taking into account the totality of the record. For purposes of this standard, evidence includes, but is not limited to, facts, studies, and expert opinion [Government Code section 11349(a)].

This Basin Plan amendment for sediment impairment of the Los Peñasquitos Lagoon meets the "necessity standard" of Government Code section 11353(b). Amendment of the Basin Plan to establish and implement the sediment TMDL for the Los Peñasquitos Lagoon is necessary because the existing water quality does not meet the applicable narrative sediment WQOs. Applicable State and federal laws require the adoption of this Basin Plan amendment and regulations as provided below.

The State Water Board and Regional Water Boards are delegated the responsibility for implementing the California Water Code and the federal CWA. Pursuant to relevant provisions of both, the State Water Board and Regional Water Boards establish water quality standards, including designated (beneficial) uses and criteria or objectives to protect those uses.

Section 303(d) of the CWA [33 USC section 1313(d)] requires the states to identify certain waters within its borders that are not attaining water quality standards and to establish TMDLs for the pollutants impairing those waters. US EPA regulations [40 CFR 130.2] provide that a TMDL is a numerical calculation of the amount of a pollutant that a water body can assimilate and still meet standards. A TMDL includes one or more numeric targets that represent attainment of the applicable standard, considering seasonal variations, a margin of safety, and load allocations. TMDLs established for impaired waters must be submitted to the US EPA for approval.

CWA section 303(e) requires that TMDLs, upon US EPA approval, be incorporated into the state's Water Quality Management Plans, along with adequate measures to implement all aspects of the TMDL. In California, these are the basin plans for the nine regions. Water Code sections 13050(j) and 13242 require that basin plans have a program of implementation to achieve WQOs. The implementation program must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the objectives. California law requires that a TMDL project include an implementation plan because TMDLs normally are, in essence, interpretations or refinements of existing WQOs. The TMDL has to be incorporated into the region's basin plan [CWA section 303(e)] because the TMDL supplements, interprets, or refines an existing objective.

11 Public Participation

Public participation is an important component of TMDL development. Federal regulations [40 CFR 130.7] require that TMDL projects be subject to public review. All public hearings and public meetings have been conducted as stipulated in the regulations [40 CFR 25.5 and 25.6] for all programs under the CWA. Public participation was provided through one public workshop and through the formation and participation of the third party ~~S~~stakeholder ~~Advisory G~~group, which met at least monthly between April 2009 and June 2011, and additionally thereafter as needed to discuss technical issues and review draft documents. In addition, staff contact information was provided on the San Diego Water Board's website, along with periodically updated drafts of the TMDL project documents. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included a hearing and two formal public comment periods. Public comments from the first formal public comment period are available in Attachment 5. A chronology of public participation and major milestones is provided in Table 9 ~~Table 7~~.

Table 9. Public participation milestones

Date	Event
February 15, 2011	Public Workshop and CEQA Scoping Meeting
April 22, 2011	Draft Documents released for public review
February 15, 2012	Revised Draft Documents released for public review
June 13~~May 9~~, 2012	Public Hearing and Adoption

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Attachment 1
Technical Support Document

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Los Peñasquitos Lagoon Sediment/Siltation TMDL

Also known as Attachment 1, Technical Support Document to the Staff Report for the Sediment TMDL for Los Peñasquitos Lagoon

Prepared for:

City of San Diego, Storm Water Department

and

U.S. Environmental Protection Agency Region IX

Prepared by:

TETRA TECH

Final - October 20, 2010

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Abbreviations:

BAT:	Best Available Technology
BMP:	Best Management Practice
CWA:	Clean Water Act
CFR:	Code of Federal Regulations
EFDC:	Environmental Fluids Dynamic Code
EMC:	Event Mean Concentration
USEPA:	United States Environmental Protection Agency
LA:	Load Allocation
LSPC:	Loading Simulation Program in C++
MLS:	Mass Loading Station
MOS:	Margin of Safety
MS4:	Municipal Separate Storm Sewer System
NPS:	Nonpoint Source Pollution
NPDES:	National Pollutant Discharge Elimination System
SANDAG:	San Diego Association of Governments
TBELs:	Technology Based Effluent Limitations
TMDL:	Total Maximum Daily Load
TSS:	Total Suspended Solids
TWAS:	Temporary Watershed Assessment Stations
USGS:	Unites States Geological Survey
WQOs:	Water Quality Objectives
WLA:	Wasteload Allocation
WDRs:	Waste Discharge Requirements
WQBELs:	Water Quality Based Effluent Limitations (WQBELs)

Executive Summary

The purpose of this technical report is to present the development of a Total Maximum Daily Load (TMDL) for sedimentation/siltation in Los Peñasquitos Lagoon (Lagoon). Sedimentation within the Lagoon has restricted the tidal prism, or exchange between the ocean and the Lagoon, and degraded salt marsh habitats through various processes. As required by Section 303(d) of the Clean Water Act (CWA), a TMDL was developed to address sedimentation within the Lagoon, which was originally identified as impaired for sediment on the 1996 CWA Section 303(d) List of Water Quality Limited Segments.

The purpose of a TMDL is to attain water quality objectives (WQOs) that support beneficial uses in the waterbody. A TMDL is defined as the sum of the waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background [40 CFR 130.2] such that the capacity of the waterbody to assimilate pollutant loading (i.e., the loading capacity) is not exceeded. Therefore, a TMDL represents the maximum amount of the pollutant of concern that the waterbody can receive and still attain water quality standards. Additionally, a TMDL represents a strategy for meeting WQOs by allocating quantitative limits for point and nonpoint pollution sources. Once this maximum pollutant amount has been calculated, it is then divided up and allocated among all of the contributing sources in the watershed.

Based on historical and current accounts of sediment-associated impacts to the Lagoon, the San Diego Regional Water Quality Control Board (Regional Board) placed the Lagoon on the CWA Section 303(d) List of Water Quality Limited Segments as being impaired (i.e., does not meet applicable water quality standards). Sediment water quality standards are narrative in nature and ensure that sediment accumulation or alteration does not cause a nuisance or adversely affect beneficial uses. Excessive sedimentation within the Lagoon threatens critical habitat areas and beneficial uses such as, Estuarine (EST), Marine Life Habitat (MAR), and Preservation of Biological Habitats of Special Significance (BIOL). Additional information on beneficial uses impacted by the impairment is discussed in Section 3.3.

In order to calculate a TMDL for sediment, a numeric target must be identified. A numeric target was selected based on historical conditions that met WQOs and supported the designated beneficial uses of the Lagoon. A historical analysis of available literature that describes the pattern of urbanization within the watershed and impacts to the Lagoon over time was used to identify the time period when the Lagoon met WQOs. Existing and historical land use conditions were then modeled to determine

the acceptable net annual sediment load that the Lagoon could assimilate and still meet WQOs.

Available data were used to configure, calibrate, and validate a customized modeling framework developed to support sediment TMDL development. The modeling framework consists of a watershed model (based on the Loading Simulation Program in C++, LSPC) and a receiving water model (based on the Environmental Fluids Dynamic Code, EFDC). The watershed model was used to calculate existing and historical sediment loading to the Lagoon from the Los Peñasquitos watershed, while the Lagoon receiving water model was used to simulate hydrodynamics and sediment transport characteristics for this tidally-influenced waterbody.

A source analysis was performed to identify and quantify the sources of sediment to the Lagoon. The most significant source identified was urban development and urban runoff delivered by the storm drain system to the Lagoon from the surrounding watershed. In particular, from open space areas located below storm water outfalls and from stream bank erosion/bed scouring. Additional sources include wave action, tidal exchange, and loads contributed by transportation infrastructure.

The TMDL also includes a margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and predicted water quality of the receiving water. An implicit MOS was included through the application of a number of conservative assumptions, including establishing the TMDL based on the 1993 critical wet period, and consideration of the overall predictive capability of the modeling framework that was developed for this study.

The TMDL is divided among the waste load allocation (WLA) for point sources, load allocation (LA) for nonpoint sources, and the MOS. Load reduction requirements are assigned to point sources and nonpoint sources. Identified point sources include the municipalities that are included in the San Diego County Phase I municipal separate storm sewer system (MS4s) permit, MS4 Phase II permittees, and the California Department of Transportation (Caltrans) storm water permit. Sediment loading to the Lagoon was estimated based on modeling of watershed runoff, streambank erosion, and sediment transport. A total WLA was assigned to the respective municipalities regulated under the Phase I MS4 permit (San Diego County, the City of San Diego, the City of Del Mar and the City of Poway), Phase II MS4 permittees, and Caltrans.

There is legal authority and a regulatory framework that empowers the Regional Board to require dischargers to implement and monitor compliance with the requirements set forth in this TMDL. As previously noted, sediment is transported to the impaired Lagoon through runoff generated from urbanization, scouring of canyons below storm outfalls, stream bank erosion/bed scouring, land use practices, and other processes. A significant amount of the sediment load results from controllable water quality factors which are defined as those actions, conditions, or circumstances resulting from anthropogenic activities that may influence the quality of the waters of the State and that may be reasonably controlled. This TMDL establishes a WLA for point sources and a LA for nonpoint sources of sediment to the Lagoon.

The regulatory framework for point sources differs from the regulatory framework for nonpoint sources. CWA section 402 establishes the National Pollutant Discharge Elimination System (NPDES) program to regulate the ‘‘discharge of a pollutant,’’ other than dredged or fill materials, from a ‘‘point source’’ into ‘‘waters of the U.S.” Under section 402, discharges of pollutants to waters of the U.S. are authorized by obtaining and complying with NPDES permits. These permits commonly contain effluent limitations consisting of either Technology Based Effluent Limitations (TBELs) or Water Quality Based Effluent Limitations (WQBELs).

In California, State Waste Discharge Requirements (WDRs) for discharges of pollutants from point sources to navigable waters of the United States that implement federal NPDES requirements and CWA requirements (NPDES requirements) serve in lieu of federal NPDES permits. These are referred to as NPDES requirements. Such requirements are issued by the State pursuant to the authority that is described in California’s Porter Cologne Water Quality Control Act. Point source discharges of sediment to the Lagoon include municipal MS4 Phase I and II dischargers, Caltrans, and NPDES construction and industrial permits within the watershed.

For each TMDL where nonpoint sources are determined to be significant, a LA is calculated, which is the maximum amount of a pollutant that may be contributed to a waterbody by “nonpoint source” discharges in order to attain WQOs. The Porter-Cologne Water Quality Control Act applies to both point and nonpoint sources of pollution and serves as the principle legal authority in California for the application and enforcement of TMDL LAs for nonpoint sources. The State plan and policy for control and regulation of nonpoint source pollution is contained in the Plan for California’s Nonpoint Source Pollution Control Program (NPS Program Plan) and the Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Implementation and Enforcement Policy). Nonpoint sources that warrant regulation include, for example, runoff from farms and urban development. This policy applies to discharges from agricultural irrigation return flow, nursery irrigation return flow, orchard irrigation return flow, animal feeding operations, manure composting, soil amendment operations, and septic systems. Individual landowners and other persons engaged in these land use activities can be held accountable for attaining sediment load reductions in affected watersheds through enforcement of WDRs and the Waiver Policy.

Nonpoint source discharges from natural sources are considered largely uncontrollable, and therefore should not be regulated. Sediment discharged via tidal exchange is an example of an uncontrollable nonpoint sediment source that is not governed by a MS4 permit. Hydromodification and accelerated erosion via storm water runoff are controllable sources of sedimentation.

In order to meet the TMDL, a Sediment Load Reduction Plan (SLRP) will be developed that will describe the regulatory and/or enforcement actions that the Regional Board and dischargers may take to reduce pollutant loading and monitor effluent and/or receiving waters. The SLRP will describe the pollutant reduction actions that are recommended by the various dischargers to meet the allocation. The SLRP will include provisions to perform studies by the dischargers to fill data gaps, refine the TMDL and required load reductions, and/or modify compliance requirements. The dischargers will conduct monitoring to assess the effectiveness of the implementation measures at meeting the wasteload reduction.

The TMDL results are summarized in the tables below. The overall WLA is represented by the watershed contribution in Tables ES-1 and ES-2. The ocean boundary (LA) includes sediment loads from storm surge, wave action, and tidal exchange. The historical load represents the estimated load contribution from the mid-1970s time period (reference condition).

Table ES-1. TMDL summary

Source	Critical Wet Period Load (tons)	Daily Load (tons)
TMDL	12,360	59
Watershed contribution (WLA)	2,580	12
Ocean boundary (LA)	9,780	46
MOS	Implicit	Implicit

Table ES-2. Current vs. historical loads and percent reduction

Source	Current Load (tons)	Historical Load (tons)	Load Reduction (tons)	Percent Reduction Required
TMDL	13,663	12,360	1,303	10%
Watershed contribution (WLA)	7,719	2,580	5,139	**67%**
Ocean boundary (LA)	5,944	9,780	+3,836 (increase)	+39% (increase)

1 Introduction

The purpose of this technical report is to present the Total Maximum Daily Load (TMDL) that was developed for sediment/siltation for Los Peñasquitos Lagoon (Lagoon). The Lagoon is listed as impaired for sediment/siltation on the Clean Water Act (CWA) Section 303(d) List of Water Quality Limited Segments. Sedimentation within the Lagoon restricts the tidal prism, or exchange between the ocean and the Lagoon, and degrades critical salt marsh habitats through various processes. A TMDL is needed to help restore the beneficial uses of the Lagoon and achieve water quality standards.

Section 303(d) of the CWA requires that each state identify waterbodies within its boundaries for which the effluent limitations are not stringent enough to meet applicable water quality standards, which consist of beneficial uses, water quality objectives (WQOs), and an antidegradation policy. The CWA also requires states to establish a priority ranking for these impaired waters, known as the CWA Section 303(d) List of Water Quality Limited Segments, and to establish TMDLs for the identified waterbodies.

The purpose of a TMDL is to attain WQOs that support beneficial uses in the waterbody. A TMDL is defined as the sum of the individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for nonpoint sources and natural background, such that the capacity of the waterbody to assimilate pollutant loading (i.e., the loading capacity) is not exceeded[1]. A TMDL, therefore, represents the maximum amount of the pollutant of concern that the waterbody can receive and still attain water quality standards. Additionally, a TMDL represents a strategy for meeting WQOs by allocating quantitative limits for point and nonpoint pollution sources. Once the total maximum pollutant load has been calculated, it is divided up and allocated among all of the contributing sources in the watershed.

The TMDL process begins with the development of a technical analysis which includes the following seven components:

1) **Problem Statement** – generally describes impairment (Section 2)
2) **Numeric Targets** – identifies the historic numeric target which will result in attainment of the WQOs and protection of beneficial uses (Section 4)
3) **Source Assessment** – identifies all of the known point sources and nonpoint sources of the impairing pollutant in the watershed (Section 6)
4) **Linkage Analysis** – establishes the relationship between pollutant sources and receiving water conditions and calculates the Loading Capacity of the waterbody,

[1] 40 CFR 130.2

which is the maximum load of the pollutant that may be discharged to the waterbody without causing exceedances of WQOs and impairment of beneficial uses (Section 7)

5) **Margin of Safety (MOS)** – accounts for uncertainties in the analysis (Section 8)
6) **Seasonal Variation and Critical Conditions** – describes how these factors are accounted for in the TMDL determination (Section 8)
7) **Allocation of the TMDL** – division of the TMDL among each of the contributing sources in the watershed; wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint and background sources (Section 9)

The write-up for the above components is generally referred to as the technical TMDL analysis. This technical report also includes background information on the Lagoon, including a description of the Lagoon and its watershed, discussion of the applicable WQOs and beneficial uses (Section 3), and a discussion summary of the data that were used to characterize the impairment and associated pollution sources (Section 5). The TMDL Implementation Section will be included later, as this information is currently being developed. This section focuses on the Regional Board's regulatory authority. This information will be updated in the future through development of a detailed Sediment Load Reduction Plan (SLRP) that will be submitted for approval after adoption of the TMDL.

This TMDL was developed through close collaboration between the municipalities within the Los Peñasquitos watershed (City of San Diego, San Diego County, City of Del Mar, and City of Poway), the California Department of Transportation (Caltrans), San Diego Coastkeeper, California State Parks, the Los Peñasquitos Lagoon Foundation, and representatives from the Regional Board. This third party TMDL effort was led by the City of San Diego and included detailed modeling of the Lagoon and its contributing watershed.

2 Problem Statement

Under Section 303(d) of the Clean Water Act (CWA), states are required to identify waters whose beneficial uses have been impaired due to specific constituents. Los Peñasquitos Lagoon was placed on Section 303 (d) list of Water Quality Limited Segments in 1996 for sedimentation and siltation with an estimated area affected of 469 acres. The Lagoon is subject to the development of a total maximum daily load (TMDL) (USEPA, 2009).

The Lagoon is an estuarine system that is part of the Torrey Pines State Natural Reserve. In addition to its marine influence, the Lagoon receives freshwater inputs from an approximately 60,000-acre watershed comprised of three major canyons (Carroll Canyon, Los Peñasquitos Canyon, and Carmel Canyon). Given the status of "Natural Preserve" by the California State Parks, the Lagoon is one of the few remaining native salt marsh lagoons in southern California, providing a home to several endangered species (California State Parks, 2009). The Lagoon is ecologically diverse, supporting a variety of plant species, and providing habitat for numerous bird, fish, and small mammal populations. The Lagoon also serves as a stopover for the Pacific Flyway, offering migratory birds a safe place to rest and feed, as well as providing refuge for coastal marine species that use the Lagoon to feed and hide from predators.

The San Diego Basin Plan states, "The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses". Beneficial uses listed in the basin plan for the lagoon include contact water recreation, non-contact water recreation (although access is not permitted in some areas per California State Parks), preservation of biological habitats of special significance, estuarine habitat, wildlife habitat, rare, threatened or endangered species, marine habitat, migration of aquatic organisms, and spawning, reproduction and/or early development. The beneficial use that is most sensitive to increased sedimentation is estuarine habitat. Estuarine uses may include preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (such as marine mammals or shorebirds).

Impacts associated with increased and rapid sedimentation include: reduced tidal mixing within Lagoon channels, degradation and (in some cases) net loss of riparian and salt marsh vegetation, increased vulnerability to flooding for surrounding urban and industrial developments, turbidity associated with siltation in Lagoon channels, and constriction of a main wildlife corridor. The Los Peñasquitos Lagoon Enhancement Plan and Program (1985), San Diego Basin Plan (1994), and Clean Water Act Section 303(d) highlight sedimentation as a significant impact associated with urban development and a leading cause in the rapid loss of salt marsh habitt in the Lagoon, making sediment reduction a management priority.

According to California State Parks, the Lagoon consists of approximately 510 acres of wetland habitats including coastal salt marsh (this includes salt panne, tidal channels, and mudflats), brackish marsh, riparian woodland and scrub, and freshwater marsh. The Lagoon's 510 acres includes approximately 210 acres of tidal salt marsh and 120 acres of freshwater wetlands are considered unimpaired (data from California State Parks 2010; see Figure 7). The remaining 180 acres of salt marsh and brackish marsh vegetation has been impaired by sedimentation, converting coastal salt marsh to freshwater or upland habitats. The environmental processes that support wetland habitats in the Lagoon have been altered by urban development in three ways:

1) Increase in the volume and frequency of freshwater input
2) Increase in sediment deposition
3) Decrease in the tidal prism

These factors have led to decreases in saltwater and brackish marsh habitats and increases in freshwater habitats as well as increases in the abundance of non-native species.

Developing a sediment TMDL for the Lagoon is necessary for the restoration of the beneficial uses of the Lagoon, including the estuarine beneficial use most impacted by sediment accumulation.

3 Background Information

This section describes the Los Peñasquitos watershed and Lagoon, applicable water quality standards (including beneficial uses and WQOs), and provides background information on the impairment.

3.1 Los Peñasquitos Watershed Description

The Los Peñasquitos watershed is located in central San Diego County (Figure 1). Both the watershed and Lagoon are included in the Los Peñasquitos Hydrologic Unit (906), which also includes Mission Bay and several coastal tributaries. This 93 mi^2 (approximately 60,000 acres) coastal watershed includes portions of the cities of San Diego, Poway, and Del Mar (Figure 2). In addition, a small portion of San Diego County is located in the eastern headwaters area. There are also several major road corridors that are maintained by Caltrans within the watershed.

Figure 1. Location of the Los Peñasquitos watershed

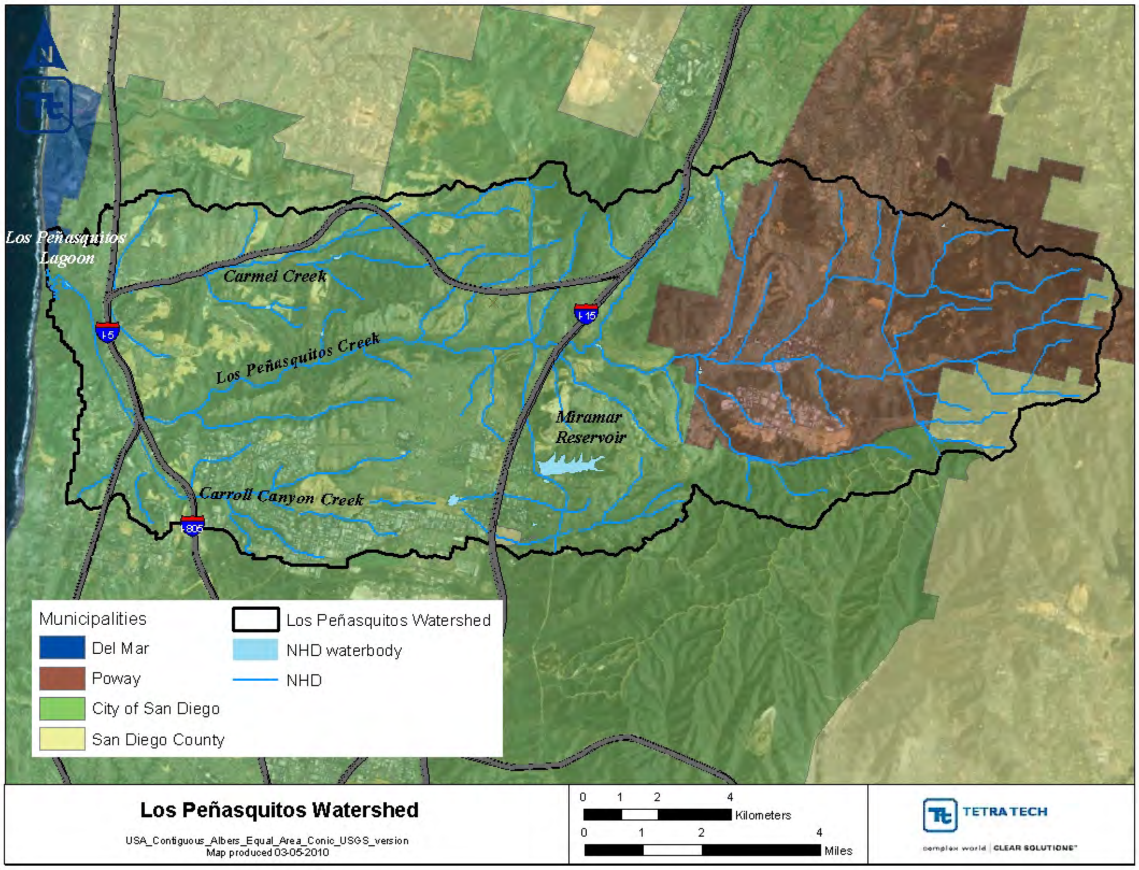

Figure 2. Municipalities within the Los Peñasquitos watershed

The climate in the Region is generally mild with annual temperatures averaging around 65°F near the coastal areas. Average annual rainfall ranges from nine to 11 inches along the coast. There are three distinct types of weather in the Region. The summer dry weather occurs from May 1 to September 30. The winter season occurs from October 1 to April 30 and has two types of weather; 1) winter dry weather when rain has not fallen for the preceding 72 hours, and 2) wet weather consisting of storms of 0.1 inches of rainfall (or greater) and the 72 hour period after the storm. 85 to 90 percent of the annual rainfall occurs during the winter season.

Three major streams drain the watershed and flow into the tidal Lagoon (Figure 2). Los Peñasquitos Creek is the largest catchment in the watershed draining 59 mi^2 (approximately 37,760 acres) through its central portion. Carroll Canyon Creek is the second largest catchment (approximately 18 mi^2 or 11,520 acres) and drains the southern portion of the watershed. Carmel Creek is located along the northern, coastal area and drains the remaining 16 mi^2 (approximately 10,240 acres). Los Peñasquitos Creek and Carroll Canyon Creek confluence together prior to entering the Lagoon.

There is one major dam in the Carroll Canyon Creek watershed, which drains approximately 1 mi^2 (approximately 640 acres) and forms Miramar Reservoir (retains imported drinking water; does not discharge downstream). Watershed elevation rises from sea level to 2,600 ft in the headwaters (Figure 3).

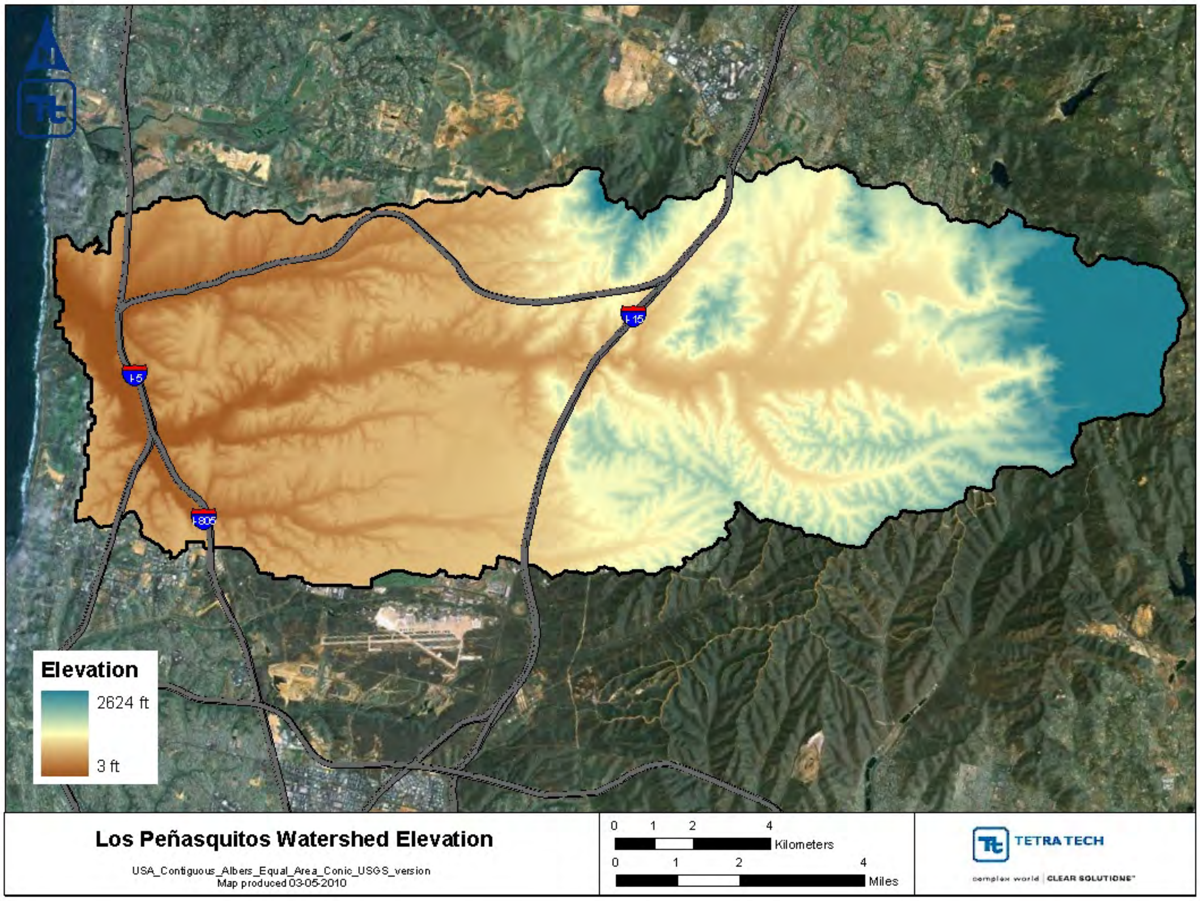

Figure 3. Los Peñasquitos watershed elevation

The 27-acre El Cuervo Norte wetlands restoration project is located in the Peñasquitos Canyon Preserve and will provide over 24 acres of southern willow scrub, oak-sycamore woodland and freshwater marsh habitat. The project consists of approximately 9 acres of wetland creation, 14.3 acres of wetlands enhancement, 2 acres of upland native buffer, and 1.3 acres of park access road and a San Diego Gas & Electric power pole maintenance area.

Data detailing land use in the Los Peñasquitos watershed is available through the San Diego Association of Governments 2000 land use coverage[2] and presented in (Figure 4). Approximately 54 percent of the watershed has been developed, with 46 percent of

[2] http://www.sandag.org/resources/maps_and_gis/gis_downloads/downloads/zip/Land/CurrentLand/lu.zip

that area classified as impervious. The largest single land use type in the Los Peñasquitos watershed is open space (approximately 25,500 acres), followed by low density residential development (approximately 14,250 acres), and industrial/transportation (approximately 11,660 acres). The percent distribution of all land uses in the watershed is presented in Figure 5. Additional key watershed characteristics that are important for model configuration are described in later sections and within the modeling report (Appendix A).

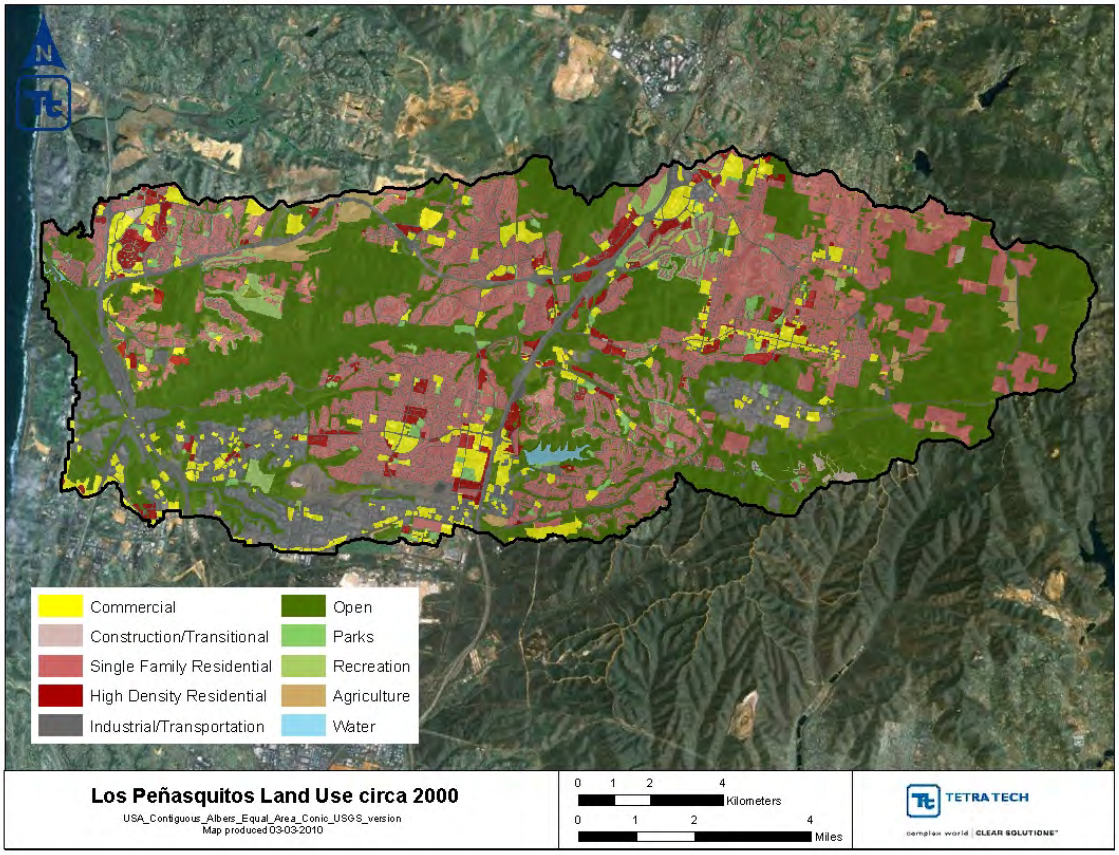

Figure 4. Land uses in the Los Peñasquitos watershed

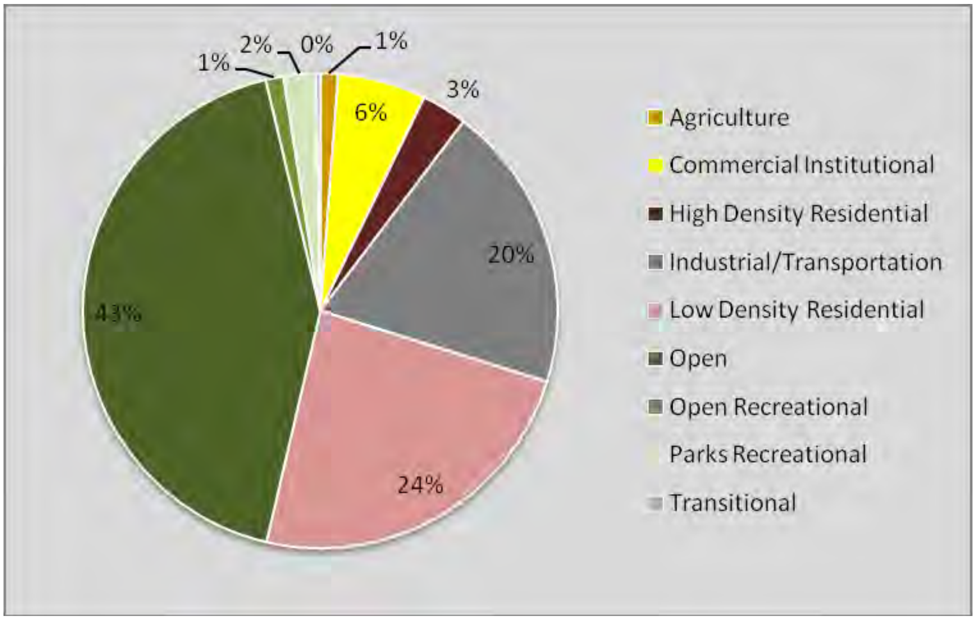

Figure 5. Land use distribution in the Los Peñasquitos watershed

3.2 Los Peñasquitos Lagoon Description

The Los Peñasquitos Lagoon is a relatively small estuarine system (approximately 0.6 mi^2 or 384 acres) that is part of the Torrey Pines State Natural Reserve (Figure 6). Given the status of "Natural Preserve" by the California State Parks, the Lagoon is one of the few remaining native salt marsh lagoons in southern California. The Lagoon is ecologically diverse, supporting a variety of plant species, and providing habitat for numerous bird, fish, and small mammal populations. The Lagoon also serves as a stopover for migratory birds and provides habitat for coastal marine and salt marsh species.

Figure 6. Photograph of Los Peñasquitos Lagoon

Tidal flows enter the Lagoon during periods when the Lagoon mouth is open to the ocean. Currently, the Lagoon mouth is open throughout most of the year. Mouth closures are typically caused by coastal processes (deposition of sand and cobble storms surges and wave action) and structures, such as the U.S. Highway 101 abutments. Mechanical dredging is used when needed to eliminate blockages and allow for tidal flow into the Lagoon in order to improve water quality conditions and support salt marsh species.

Most of the freshwater input flows through Los Peñasquitos Canyon into the Lagoon. Carroll Canyon Creek to the south and Carmel Creek to the north also contribute freshwater to the Lagoon. Historically, Los Peñasquitos Creek was the only tributary that flowed year-round, while Carroll Canyon and Carmel Creeks only flowed during significant rainfall events. Beginning in the 1990s, these drainages also began flowing year-round due to increasing urban development within the watershed. Carroll Canyon Creek confluences with Los Peñasquitos Creek upstream and the combined stream channel extends into the Lagoon along the western side of the railroad track berm. This berm acts as a barrier between the eastern and western portions of the Lagoon for much of its length. The railroad trestle along the northern side provides the main connection between eastern and western portions of the lagoon. The Lagoon channel that receives flow from Carmel Creek crosses through this area. In addition, there are two smaller bridges located in the southern portion of the Lagoon which allow flow from Carroll Canyon Creek to pass through to the eastern side of the Lagoon during high flow events.

3.3 Applicable Water Quality Standards

Water quality standards consist of WQOs, beneficial uses, and an anti-degradation policy. WQOs are defined under Water Code section 13050(h) as "limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water." Under section 304(a)(1) of the CWA, the USEPA is required to publish water quality criteria that incorporate ecological and human health assessments based on current scientific information. WQOs must be based on scientifically sound water quality criteria, and be at least as stringent as those criteria.

The sediment WQO, as set forth in the Water Quality Control Plan for the San Diego Basin (Basin Plan), is narrative in nature and states "*The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses*" (Regional Board, 1994). To interpret the narrative nature of the sediment WQO, a numeric target was developed to establish the allowable sediment loading to the Lagoon. Section 4 presents the detailed information that was used to develop a numeric target for sediment.

The Basin Plan identifies the beneficial uses that are designated for Los Peñasquitos Lagoon (Regional Board, 1994) (Table 1). The narrative standard for sediment is applied to all beneficial uses. Compliance with WQOs must be assessed and maintained throughout the waterbody to protect all beneficial uses.

Table 1. Beneficial uses designated for Los Peñasquitos Lagoon

Beneficial Use	Beneficial Use Description
REC 1	Includes uses of water for recreation activities involving body contact with water, where ingestion of water is reasonable possible. These uses include, but are not limited to, swimming, wadding, water skiing, ski and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs. *Note that access to some areas is not permitted per California State Parks
REC 2	Includes the use of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonable possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities. *Note that access to some areas is not permitted per California State Parks
BIOL	Includes uses of water that support designated area or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS),

Beneficial Use	Beneficial Use Description
	where the preservation or enhancement of natural resources requires special protection.
EST	Includes uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds)
WILD	Includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
RARE	Includes uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.
MAR	Includes uses of water that support marine ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
MIGR	Includes uses of water that support habitats necessary for migration, acclimatization, between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.
SPWN	Includes uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish. This use is applicable only for the protection of anadromous fish.
SHELL	Includes uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters and mussels) for human consumption, commercial, or sport purposes.

3.4 Impairment Description

The Lagoon is listed as impaired on the CWA Section 303(d) list due to sediment/siltation impacts that originate from watershed sediment contributions. This impairment impacts several beneficial uses; however, the estuarine habitat use is the most sensitive to increased sedimentation. The Lagoon's wetland habitats consist of estuarine and riparian habitats, including coastal salt marsh habitat and wetland/upland buffer areas. The 303(d) listing indicates that an estimated area of 469 acres is impaired. Recent surveys by California State Parks indicate that greater than 180 acres of the 510 acres of coastal salt marsh has been impaired by sedimentation, converting coastal salt marsh to riparian habitat (California State Parks, 2009; California State Parks, 2010). .

As discussed in the problem statement, impacts associated with sedimentation include: reduced tidal mixing within Lagoon channels, degradation and (in some cases) net loss of wetland vegetation, conversion from saline to freshwater habitats, and turbidity associated with siltation in Lagoon channels. There are many potential sources that have influenced the accumulation of sediment within the Lagoon. Sources include erosion of canyon banks, bluffs, scouring stream banks, and tidal influx. Some of these processes are exacerbated by anthropogenic disturbances, such as urban development within the watershed. Urban development transforms the natural landscape and results in increased runoff due to hydromodifcation resulting in scouring of sediment, primarily below storm water outfalls that discharge into canyon areas. Sediment loads are transported downstream to the Lagoon during storm events causing deposits on the salt flats, and in Lagoon channels. These sediment deposits have gradually built-up over the years due to increased sediment loading and inadequate flushing, which directly and indirectly affects lagoon functions and salt marsh characteristics.

To address the impairment, and interpret the narrative WQOs, a historical watershed-based approach was used to calculate the acceptable sediment load to the Lagoon. The historical analysis focused on identifying an earlier time period that corresponds with natural sediment loading from the watershed which did not exceed the Lagoon's assimilative capacity, as described in the following section (Section 4).

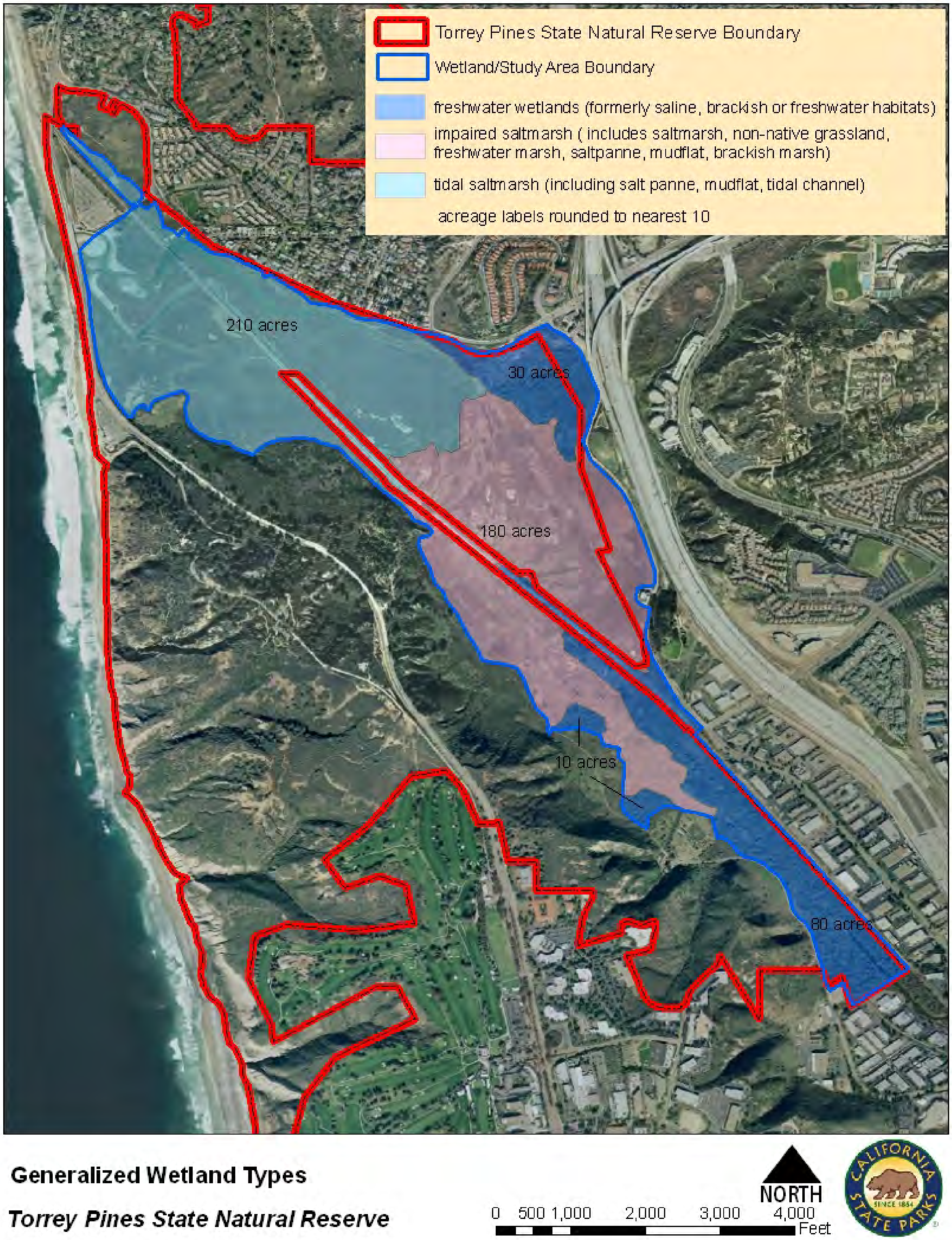

Figure 7. Wetland habitats within Los Peñasquitos Lagoon (California State Parks, 2010)

4 Numeric Targets

When calculating TMDLs, numeric targets are selected to meet the WQOs for a waterbody and subsequently establish measureable targets for the restoration and/or protection of beneficial uses. The sediment WQO, as set forth in the Basin Plan, is narrative and states:

> *The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses* (Regional Board, 1994).

Due to the narrative nature of the sediment/siltation WQO, this WQO must be interpreted through the development of a numeric target for TMDL and implementation planning purposes. A numeric target is needed to define the conditions that will result in the attainment of water quality conditions. For the sediment/siltation impairment of the Lagoon, a numeric target was derived using a ‘reference watershed approach’. The ‘reference watershed approach’ typically refers to the process of comparing the impaired waterbody to a similar-unimpaired waterbody to establish an acceptable loading capacity which would result in the attainment of water quality standards. Due to the unique characteristics of the Lagoon, it was determined that a historical analysis of the Lagoon and its watershed would provide the best information available for determining the conditions that support water quality standards. Available literature and past accounts of sedimentation impacts within the Lagoon were reviewed to understand the relationship between urbanization in the watershed and associated changes in Lagoon water quality conditions. A timeline of significant events and literature references was developed to document important changes in lagoon condition over time in relation to changes in land use (urbanization in particular) and other impacts (Figures 8 and 9). The linkage between these factors was evaluated using a weight of evidence approach (Sections 4.1 through 4.3) in order to identify an appropriate reference time period that could be used calculate the numeric target for sediment TMDL development (Section 4.4). Note that much of the background information presented below is also referenced in the historical timeline.

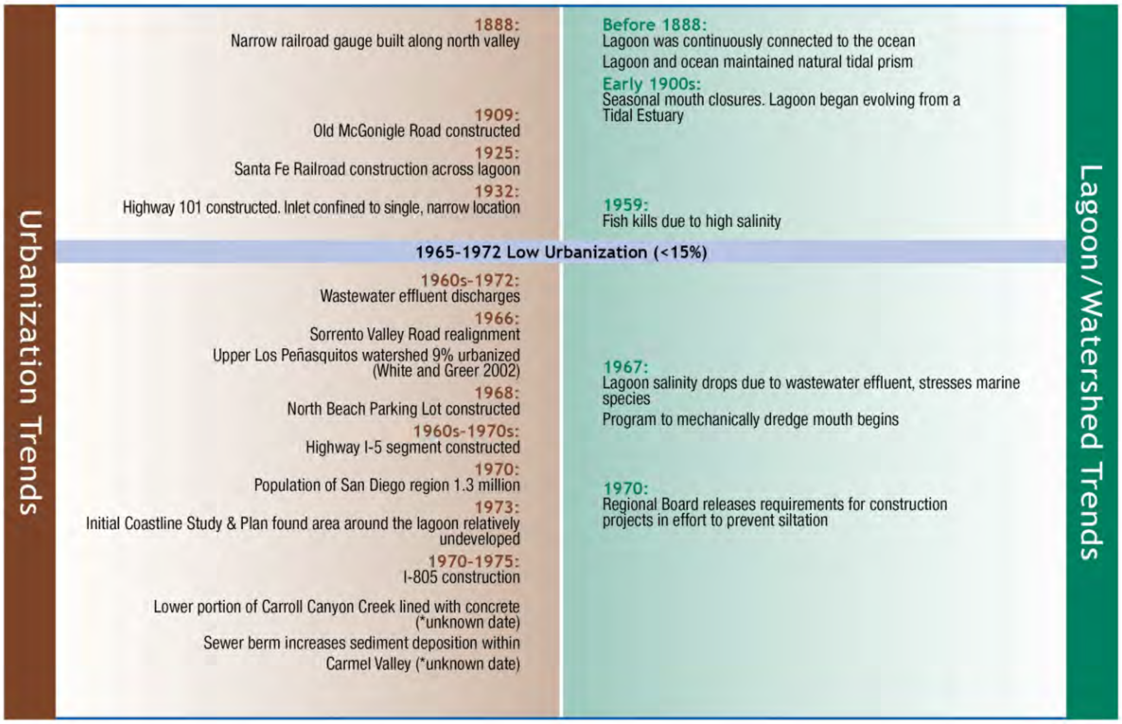

Figure 8. Timeline of urbanization and lagoon trends (1800s through early 1970s)

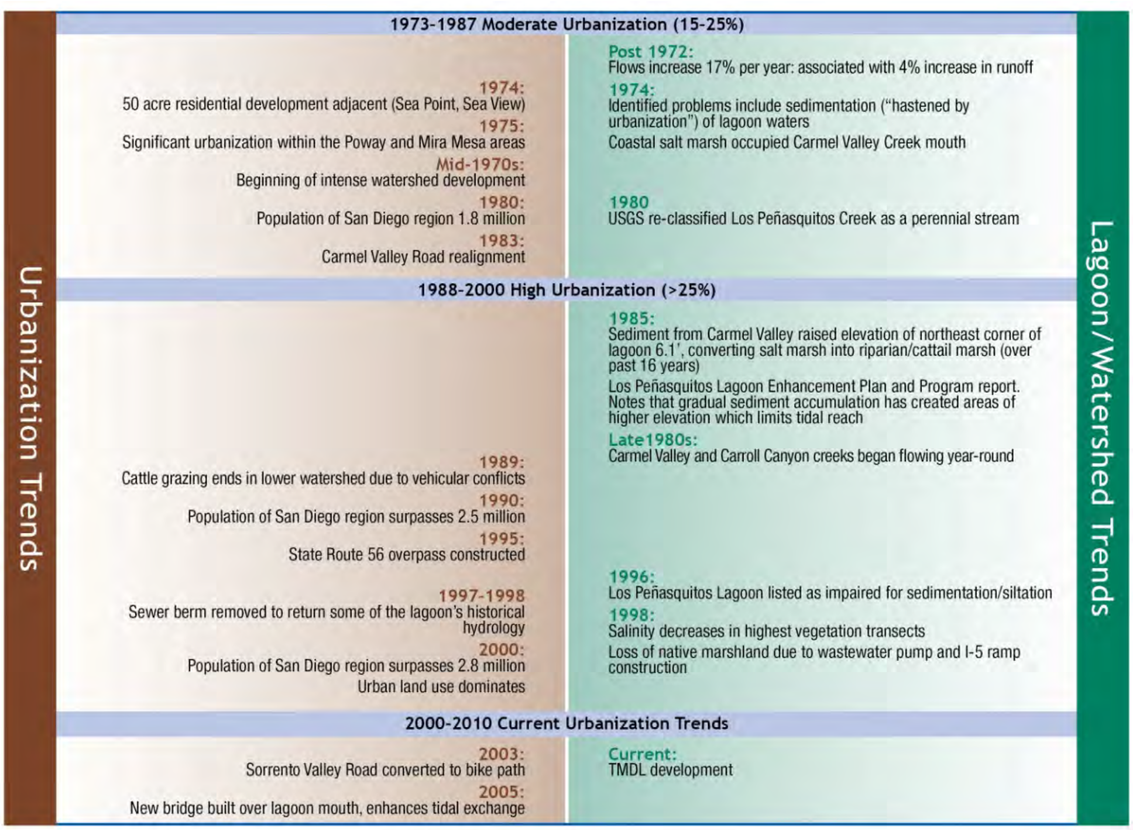

Figure 9. Timeline of urbanization and lagoon trends (mid 1970s through current)

4.1 Land Use Changes in the Los Peñasquitos Watershed

As the first Mexican land grant in California, land in the Los Peñasquitos watershed was historically maintained as a family homestead and livestock ranch throughout the 1800s and early 1900s. By the early 1900s, the City of San Diego and San Diego County began acquiring parcels of land surrounding the Lagoon. As the region began to develop, urban infrastructure, including construction of the railroad (1880s-1925), altered the natural drainage and restricted the mouth of the Lagoon. Later, the construction of U.S. Highway 101 in 1932 permanently confined the inlet to a single, narrow location and restricted the tidal prism and exchange between the ocean and Lagoon (Mudie et al., 1974). The North Beach Parking Lot was constructed in 1968 by California State Parks in historically tidal areas which further influenced hydrologic exchanges (LPL Foundation and the State Coastal Conservancy, 1985). Although there were significant alterations to the Lagoon’s hydrology, the Initial Coastline Study and Plan released in 1973 found that the area surrounding the Lagoon remained relatively undeveloped (Duncan and Jones, 1973), but was at the threshold of rapid growth (Jet Propulsion, 1971).

In 1966 the Upper Los Peñasquitos subwatershed was 9% urbanized (White and Greer, 2002); however, by 1975, the watershed experienced significant urbanization with agricultural areas being converted to urban uses, specifically in the Poway and Mira Mesa areas (City of San Diego, 2005). In 1974, a California Fish and Game report expressed concerns associated with the anticipated completion of a 50 acre development along the shores of the Lagoon. The report also stated that within the following five years (1974 to 1979), the population surrounding the immediate lagoon environs was expected to increase by a factor of four to six over the 1972 level of approximately 1,000 people (Mudie et al., 1974). Urban runoff associated with the increased development had already been identified as the primary threat to water quality in the Lagoon (Jet Propulsion Lab, 1971); however, other factors existed including agriculture and grazing. In 1989, cattle grazing in the Los Peñasquitos Creek watershed ceased (White and Greer, 2002) primarily due to vehicular conflicts.

While development occurred sporadically before the 1970s, the mid-1970s appears to be the beginning of intense watershed development. Land use associated with this time period is illustrated in Figure 10. Land use/land cover data for the Los Peñasquitos watershed were not available for this period, therefore, a historical coverage was developed based on the location and type of structures that are shown in USGS topographic maps from the 1970s (primarily the La Jolla quadrangle – dated 1975). The most recent land use coverage (from SANDAG 2000 – refer to Section 3.1) was modified based on this information in order to create a uniform historical land use map for the watershed for comparison. Land use differences between the current and historical time periods are shown in Table 2.

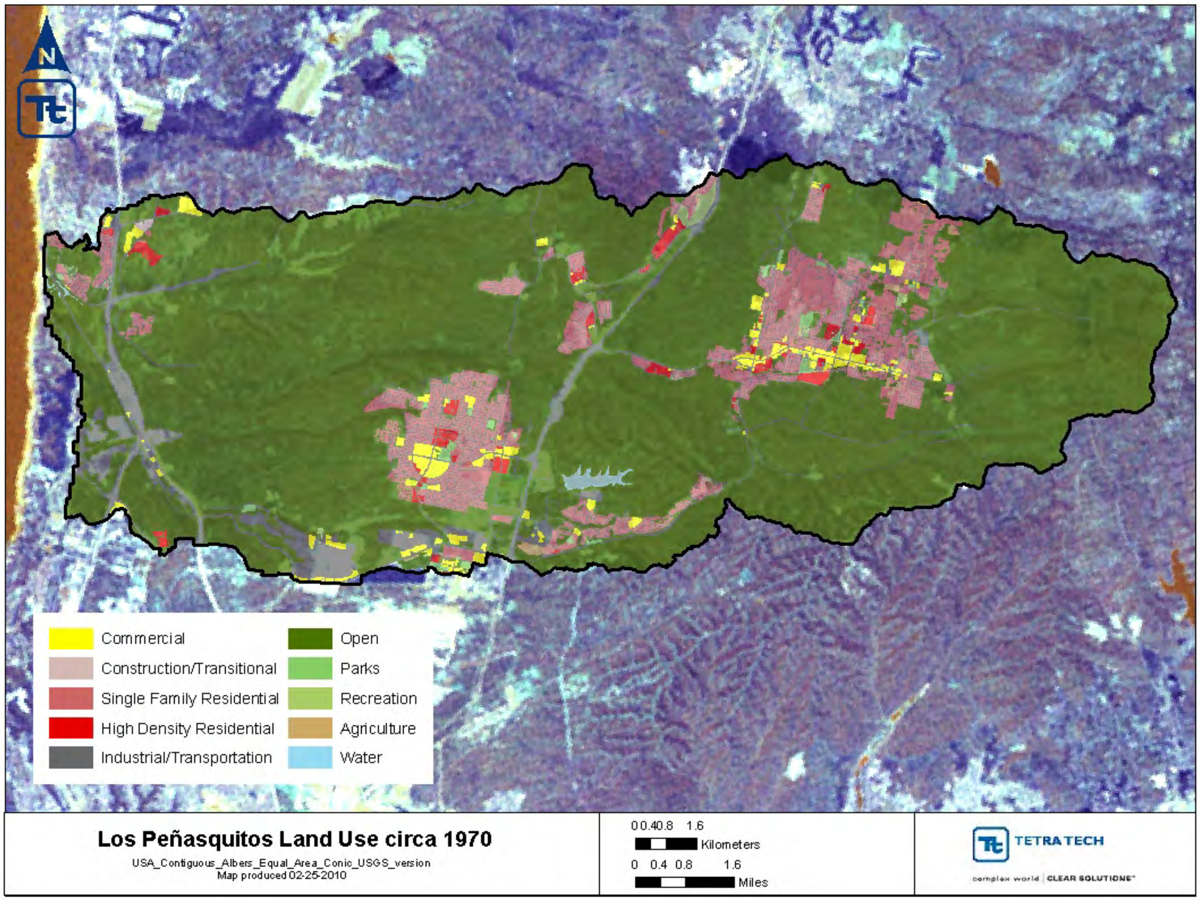

Figure 10. Historic land use in the Los Peñasquitos watershed (1970's)

Table 2. Current (SANDAG 2000) vs. historical land use comparison

Land Use	Current area (ac)	Current area (%)	Historic area (ac)	Historic area (%)	Relative Change (%)
Agriculture	741	1.24%	100	0.17%	1.07%
Commercial	3,591	6.00%	1,088	1.82%	4.18%
Construction/Transitional	169	0.28%	23	0.04%	0.24%
High Density Residential	1,840	3.07%	648	1.08%	1.99%
Industrial/Transportation	11,654	19.46%	4,830	8.07%	11.40%
Open	25,463	42.52%	47,445	79.23%	-36.71%
Parks	1,326	2.22%	2,884	0.48%	1.73%
Recreation	670	1.12%	139	0.23%	0.89%
Single Family Residential	14,258	23.81%	5,155	8.61%	15.20%
Water	161	0.27%	160	0.27%	0.00%
Total	59,879	100.00%	59,879	100.00%	

From 1966 to 1999, the acreage of urbanized land within the upper Los Peñasquitos Creek watershed increased by 290 percent (White and Greer, 2002) and by 2000, the Los Peñasquitos watershed was dominated by urban uses (City of San Diego, 2005). Additional highway infrastructure was built in and around the Los Peñasquitos watershed to accommodate increasing population growth. Realignment of Sorrento Valley Road (~1966) and Carmel Valley Road (1983) both impacted the surrounding watershed (Greer and Stow, 2003) as well as segments of the I-5 freeway (1994) and the State Route 56 overpass (1995). To decrease impacts from road infrastructure, Sorrento Valley Road was converted to a bike path in 2003 and a new U.S. Highway 101 bridge was constructed over the Lagoon mouth in August 2005, enhancing tidal exchange. Figure 11 shows the major roads within the watershed. Runoff from surrounding roads and highways ultimately reaches the Lagoon.

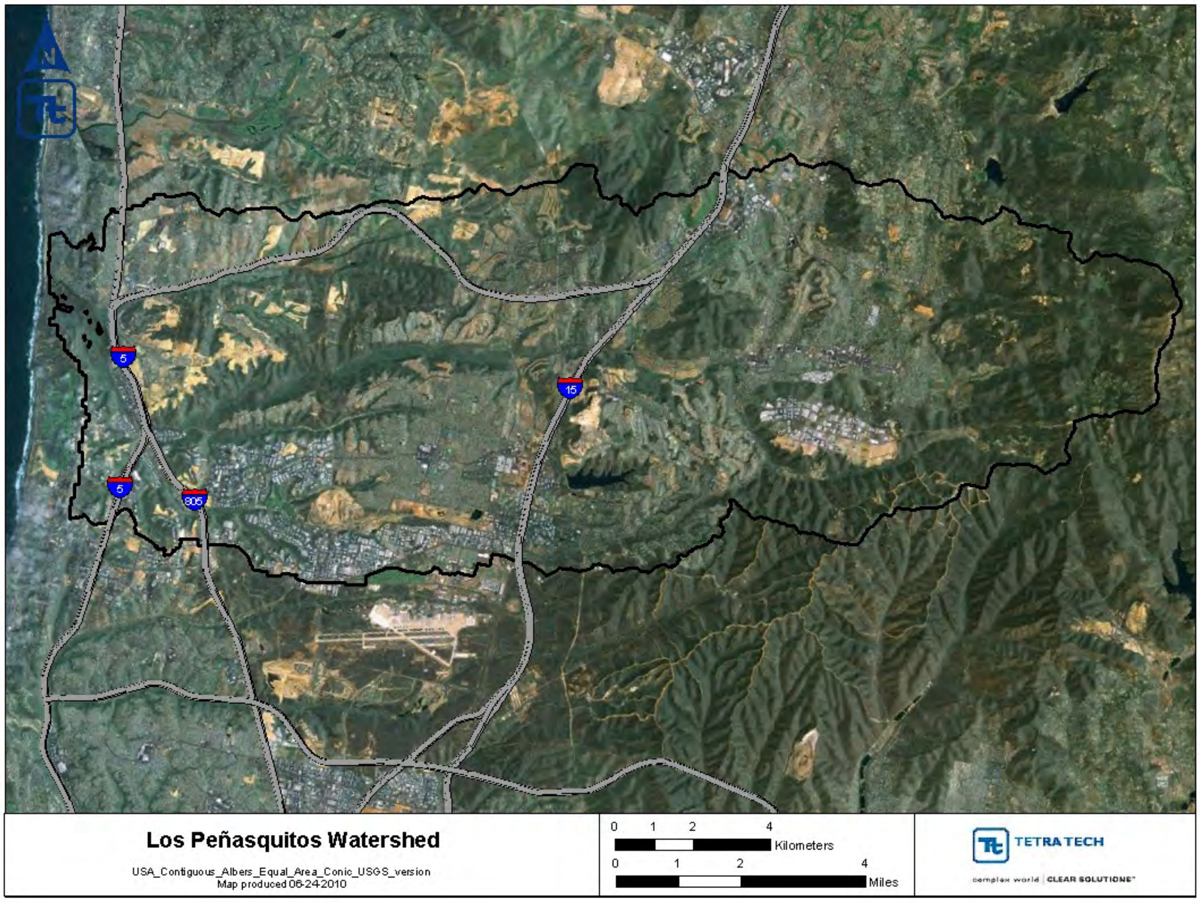

Figure 11. Major roads within the Los Peñasquitos watershed

To further characterize the land use changes, population trends in the San Diego region were evaluated. Population steadily increased from 1970 to 2010 in the San Diego region[3] as shown in Figure 12. This regional population analysis was used to evaluate general trends and includes surrounding areas. General trends show expansive population growth, resulting in intense development throughout the region.

[3] www.sandag.org

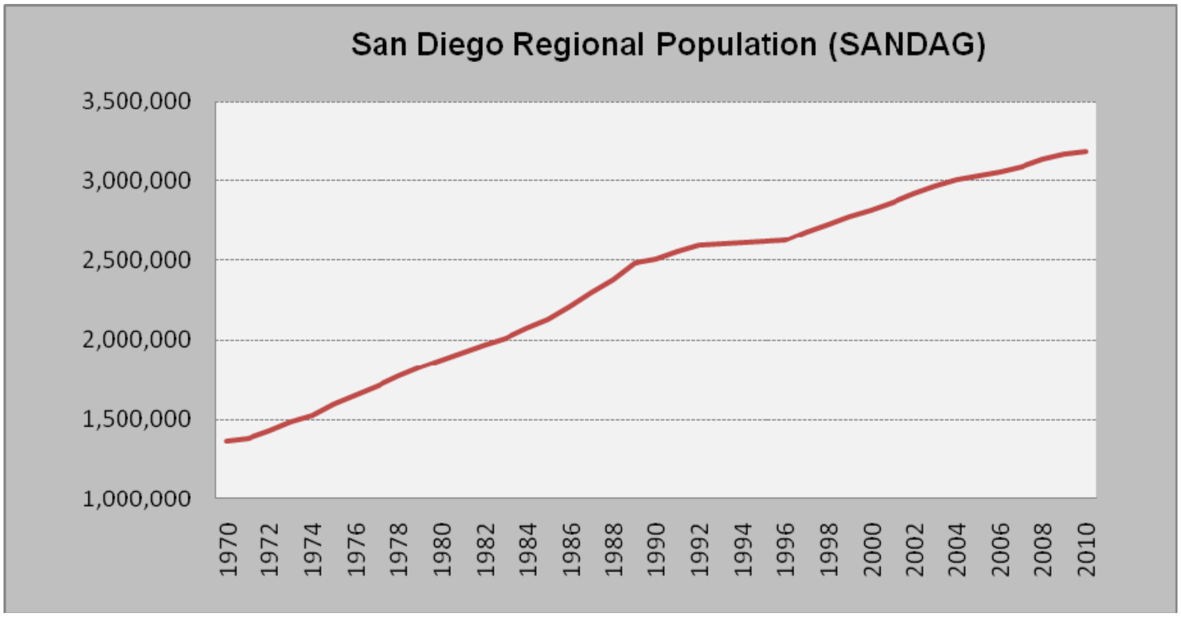

Figure 12. San Diego regional population trends (SANDAG, 2010)

4.1.1 Los Peñasquitos Lagoon Historical Water Quality Conditions

In the past 60 years, the Lagoon has evolved from a tidal estuary with an active connection to the ocean, to one that is closed to tidal action for long periods of time and requires mechanical excavation to reopen. The major factors that were responsible for degradation of the lagoon before the 1990s are: (1) the railroad embankment that cuts off lagoon channels; (2) construction of North Torrey Pines Road (part of U.S. Highway 101) along the barrier beach that restricted the location of the lagoon mouth; (3) construction of the North Beach Parking Lot in historic tidal areas; (4) increased sediment from changing land uses upstream; and, (5) decreased water quality from urban runoff and sewage effluent (LPL Foundation and State Coastal Conservancy, 1985). Hydromodification linked to urban development within the watershed and lagoon in the 1980s and 1990s played (and still plays) a major role in the degradation of the Lagoon. Water quality impacts to the Lagoon are primarily associated with a restricted tidal prism, historical discharge of wastewater effluent from 1962-1972; and more recently, hydromodification that has resulted in increased sedimentation and year-round freshwater inputs. Information that relates to each of these impacts is discussed below.

4.1.2 Tidal Prism Restriction

Maintaining a tidal prism, and proper exchange between the ocean and the Lagoon, is critical for maintaining adequate salt marsh salinity levels, and other water quality parameters. The Los Peñasquitos Enhancement Plan identifies mouth closures as one of the most important problems occurring in the Lagoon (Elwany, 2008). Tidal inflows and outflows of impounded water from large storm events help to keep the mouth open, whereas, wave-induced currents are responsible for the depositional processes which tend to close the lagoon entrance (LPL Foundation and State Coastal Conservancy, 1985). Sedimentation of lagoon environments is a natural process; research of the Lagoon determined that the volume of sand trapped in the inlet is a function of wave and flooding dynamics (Elwany, 2008). Although increased sediment loading from the watershed may increase the build-up rate of sand bar formation, this study also determined that the grain size distribution of accumulated sand at the inlet was comparable to the distribution of grain size on the beach, thus identifying significant marine sources (Elwany, 2008) rather than watershed sources affecting the western portion of the Lagoon.

Despite the natural process, historical evidence indicates that the lagoon was continuously connected to the ocean until at least 1888 and after this time period, the natural process within the Los Peñasquitos watershed was accelerated by disturbances (Mudie et al., 1974). For example, construction of the railroad and U.S. Highway 101 across the lagoon reduced the volume of water flowing in and out of the lagoon; this allows sand to build up at the entrance and can prevent tidal flow altogether (Duncan and Jones, 1973). In 1966, a program was initiated to restore the tidal prism by mechanically dredging and removing the accumulated sediment at the mouth of the Lagoon (LPL Foundation and State Coastal Conservancy, 1985). This effort was later refined in the mid 1980s and early 1990s to improve tidal mixing and reduce the frequency of mouth closures. Because of continued, sporadic mouth closures, a dredging program continues to date (Elwany, 2008). The program seeks to enhance tidal flushing, water quality, and marine habitats.

4.1.3 Wastewater Effluent Discharge

To accommodate increasing urban development within the watershed, two wastewater treatment plants operated from 1962-1972 and discharged effluent to the Lagoon or tributaries that ultimately reach the Lagoon. Although these facilities elevated minimum and median annual discharge values and assisted with maintaining the tidal prism, the effluent caused insect and odor problems (Mudie et. al., 1974), as well as elevated nutrients (Bradshaw and Mudie, 1972), and depressed salinity[4] concentrations. These problems continued until 1972 when surrounding areas were all connected to the San Diego Metropolitan sewer system.

4.1.4 Watershed Sedimentation

Several studies have documented the influx of sediment originating in the watershed to the Lagoon. Mudie and Byrne (1980) estimate that sedimentation rates have increased to 50 cm/100 years since European settlement of the area. Between 1968 and 1985,

[4] (http://www.torreypine.org/parks/Peñasquitos-lagoon.html).

sediment from Carmel Valley has raised the elevation of the northeast corner of the lagoon by 6.1 feet, converting salt marsh vegetation into riparian and cattail marsh which helps retain sediment (LPL Foundation and State Coastal Conservancy, 1985). The main depositional areas in the lagoon are just downstream of the I-5 Carmel Valley Creek culverts and at the southern end of the Lagoon near Sorrento Valley. Deposition at the I-5 culvert, which is the outlet of Carmel Valley, was caused by a sewer berm located about 1000' west of I-5 (removed in the late 1980s). Storm flows from Carmel Valley pond behind the berm and allow coarse sediment to be deposited (LPL Foundation and State Coastal Conservancy, 1985). Gradual sediment accumulation in the lagoon has created areas of higher elevation which tidal water no longer reaches. The mouth of Carmel Valley Creek is the primary example of this process. In 1974, coastal salt marsh occupied the Carmel Valley Creek mouth; however, the ground elevation at the lower end of the Carmel Valley culverts rose 6.1 feet in the past 16 years, due to sedimentation from upstream (LPL Foundation and State Coastal Conservancy, 1985).

In an attempt to control the increasing sedimentation rate from development in the watershed, the Regional Board first approved a resolution (70-R26). This resolution established requirements for control of siltation from construction projects in areas that drain to the Lagoon in 1970 (Mudie et al., 1974). Despite these actions, a 1974 report by the California Department of Fish and Game expressed concerns associated with a significant increase in flow of urban runoff draining into the eastern channel. It was determined that the runoff was the result of intensive residential development of the mesas northeast of the lagoon. During the fall of 1973, this runoff volume amounted to approximately 1,500 gal/day (Mudie et al.,1974). Prestegaard (1978) concluded that unmitigated urbanization could double the annual sediment load within 30 years. More recently, the City of San Diego identified increasing urban development, resulting in alterations in hydrology and modified geomorphic conditions within the three main tributaries of the Lagoon's watershed, as a source of sedimentation (City of San Diego, 2005).

The regional climate is characterized by higher precipitation during winter months and lower precipitation, and corresponding high lagoon salinity, during the dry summer months (Williams, 1997). Storm events transport sediment into the lagoon which deposits on the salt flats and within lagoon channels. These sediment deposits have gradually built-up over the years due to increased sediment loading and inadequate flushing, which directly and indirectly affects lagoon functions and salt marsh characteristics.

4.1.5 Habitat alterations

Continued sedimentation and freshwater inputs, both resulting from urbanization, have resulted in significant alterations to habitat (White and Greer, 2002; Greer and Stowe, 2003; CE, 2003; Mudie et al, 1974; LPL Foundation and State Coastal Conservancy, 1985). In 1985, the Los Peñasquitos Lagoon Enhancement Plan estimated that sedimentation had removed 25 acres from the coastal salt marsh inventory. The encroachment of freshwater wetlands and reduction of saltwater marsh is evident in the National Wetland Inventory (NWI) maps from 1985 and 2009 (Figures 13 and 14). The location of different wetland types is also shown in maps that were included in the Los Peñasquitos Lagoon Enhancement Plan (1985) and in the Mudie et al. 1974 report (Figures 15 and 16). Although there are differences in the depiction of wetland areas from each study and time period, these maps show an encroachment of riparian, freshwater, and upland vegetation types in the eastern portion of the lagoon that is likely related to sediment accumulation and impediments to tidal flow. As discussed in Section 3.4, California State Parks estimated that 180 acres of the 390 to 570 acres of coastal salt marsh has been impaired by sedimentation, converting coastal salt marsh to more riparian habitat.

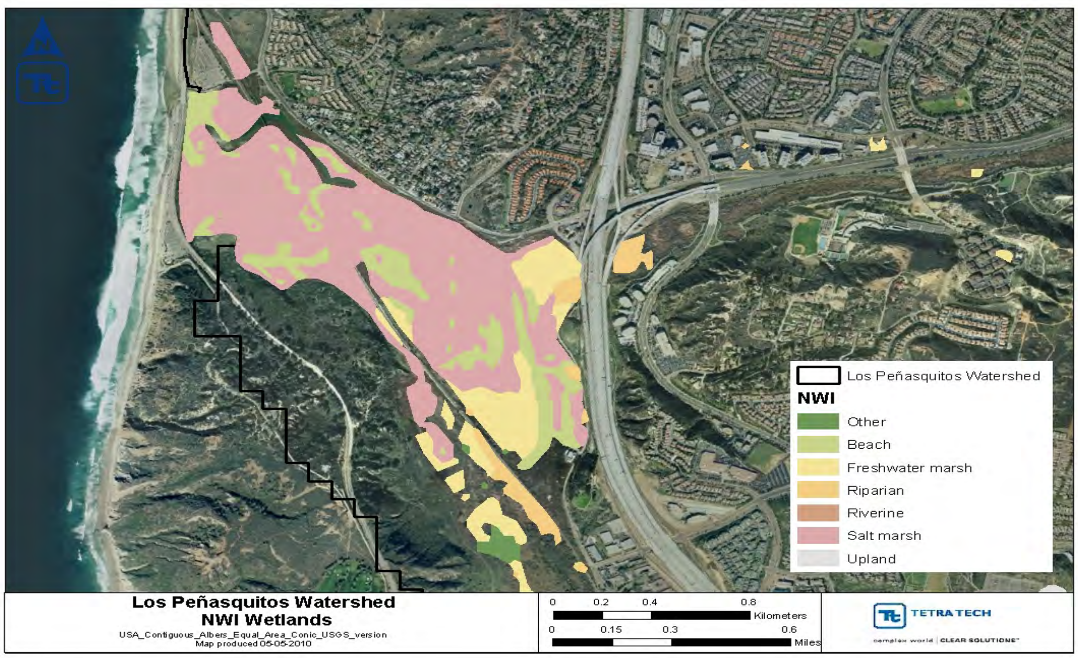

Figure 13. National Wetland Inventory (NWI) - 1985

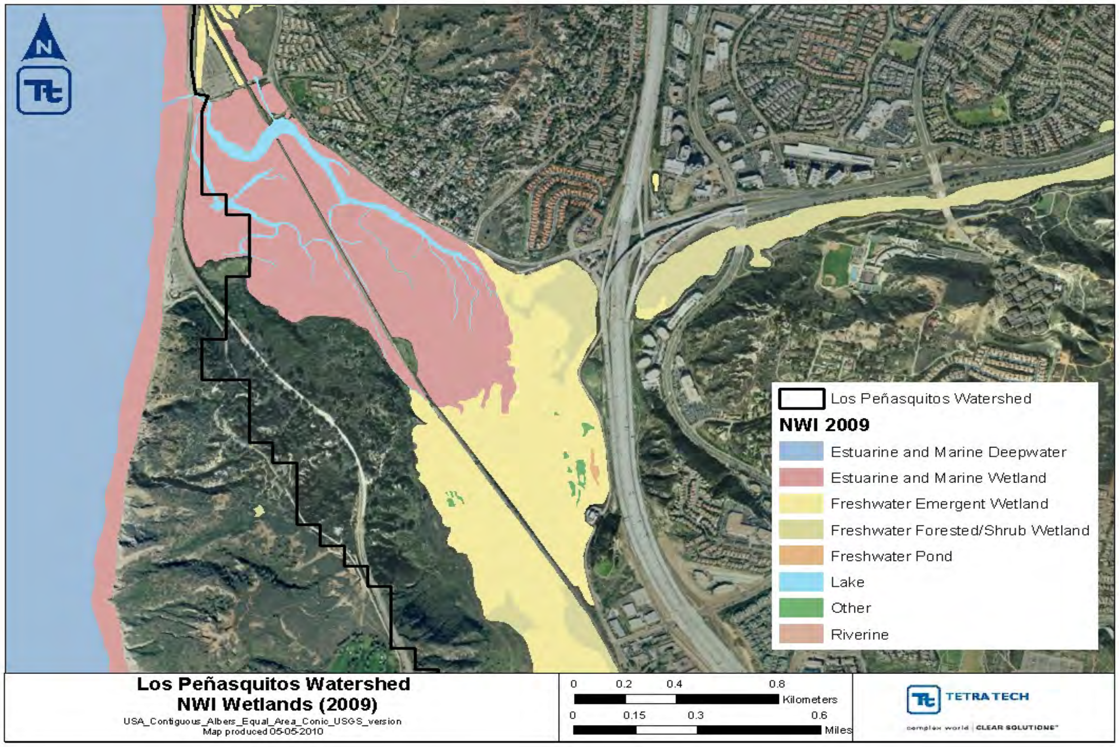

Figure 14. National Wetland Inventory (NWI) - 2009

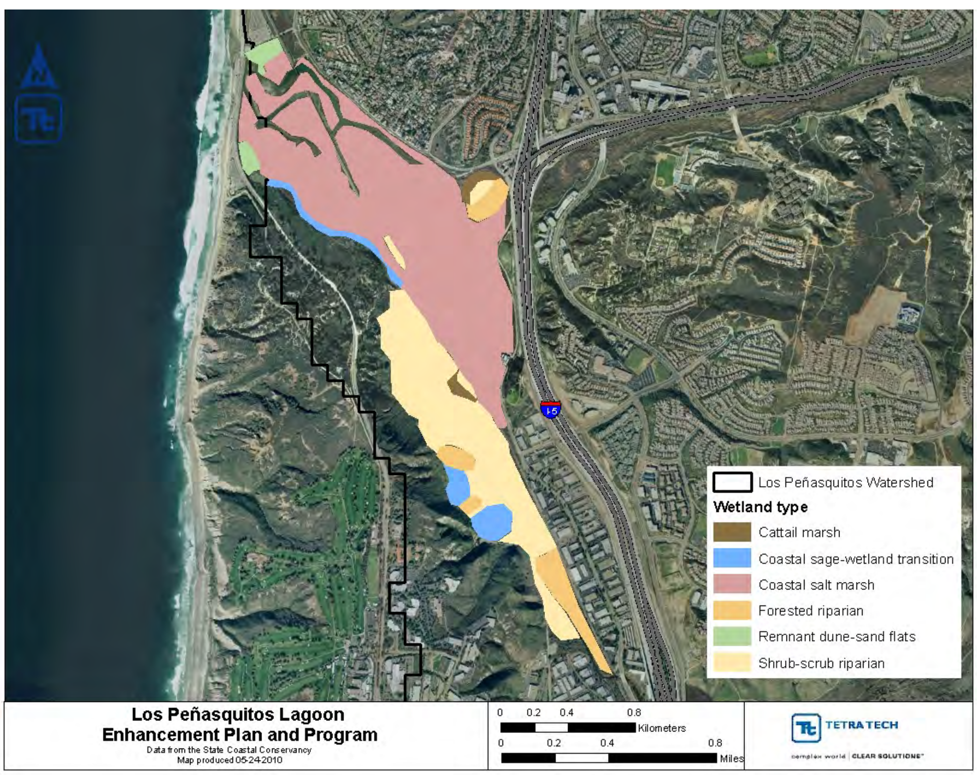

Figure 15. LPL Enhancement Plan – 1985 wetland types

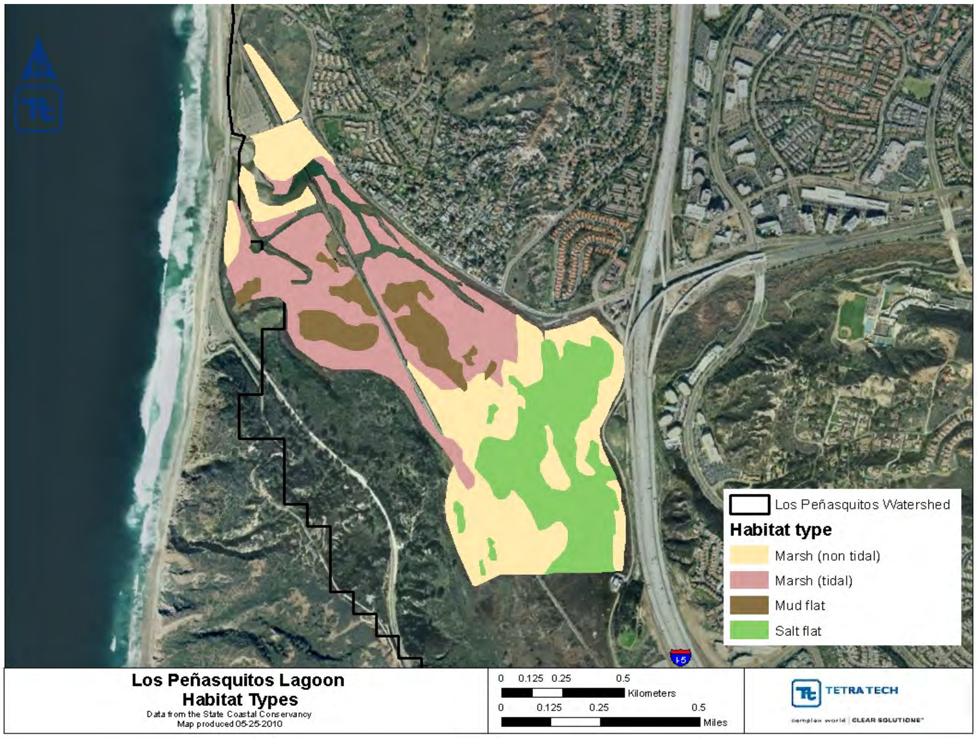

Figure 16. Historical lagoon wetland types (Mudie et al. 1974)

4.2 Impacts of Urbanization on Water Quality

Rapid urbanization of the watershed directly affects the natural drainage, pollutant loads and hydrologic characteristics such as peak flow rates, flow volumes, flow durations, and flow velocities (City of San Diego, 2005). Increased development has resulted in year-round flow in the main tributaries to the Lagoon (White and Greer, 2002; Greer and Stow, 2003). In addition to pollutant loading associated with specific land use practices, urbanization changes the landscape from pervious to impervious. Recent research has shown that impervious surfaces represent the imprint of land development on the landscape and is directly related to runoff (Burton and Pitt, 2002; Scheuler, 1994). Furthermore, impervious cover has been identified as the 'unifying theme' in stream degradation (USEPA, 1999); with stream degradation occurring with as little as ten percent imperviousness of the watershed (Scheuler, 1994).

The concerns associated with urban development are multifaceted. Land development typically results in increased erosion and runoff rates; accounting for up to 50 percent of sediment loads in urban areas (Burton and Pitt, 2002). In addition, urbanization increases imperviousness, resulting in alteration of the volume, velocity, duration, and timing of runoff events. Lowered infiltration rates speed surface runoff which leads to increased surface erosion and gullying. Ultimately, increased erosion destabilizes streambanks and washes sediment into surface waters. Freshwater runoff from adjacent and upstream urban development also reduces salinity, and brackish and freshwater plant species have encroached upon the area, reducing the salt marsh acreage (CE, 2003).

Previous studies which focused on the Lagoon and the surrounding watershed provide additional information on historical conditions and hydrologic changes associated with urbanization. For example, White and Greer (2002) classified three distinct periods of urbanization within the upper Los Peñasquitos Creek watershed: 1965-1973 was classified as low urbanization (<15 percent), 1973-1987 as moderate urbanization (15-25 percent), and 1988-2000 as high urbanization (>25%). Across the entire time period, the 1-2 year flood interval increased from 229 cubic feet per second (cfs), to 745 cfs, to 1,272 cubic feet per second in each respective period. Flow duration curves indicate increased baseflow, such that discharges above 1.7 cfs occurred more often during the period between 1973 to1987 than the earlier period (White and Greer, 2002). This study also estimated a four percent increase in runoff, per year, since 1972, with an increase in minimum flows throughout the study equivalent to 17 percent per year (2002). These findings are supported by a recent review of flow data in Los Peñasquitos Creek (Figure 17), which demonstrates a steady increase in monthly mean flows since the 1970s. These analyses illustrate the general urbanization trends throughout the watershed that impact the Lagoon and assist with identifying a period in time when development, and increased sediment delivery from the watershed, was not the primary concern.

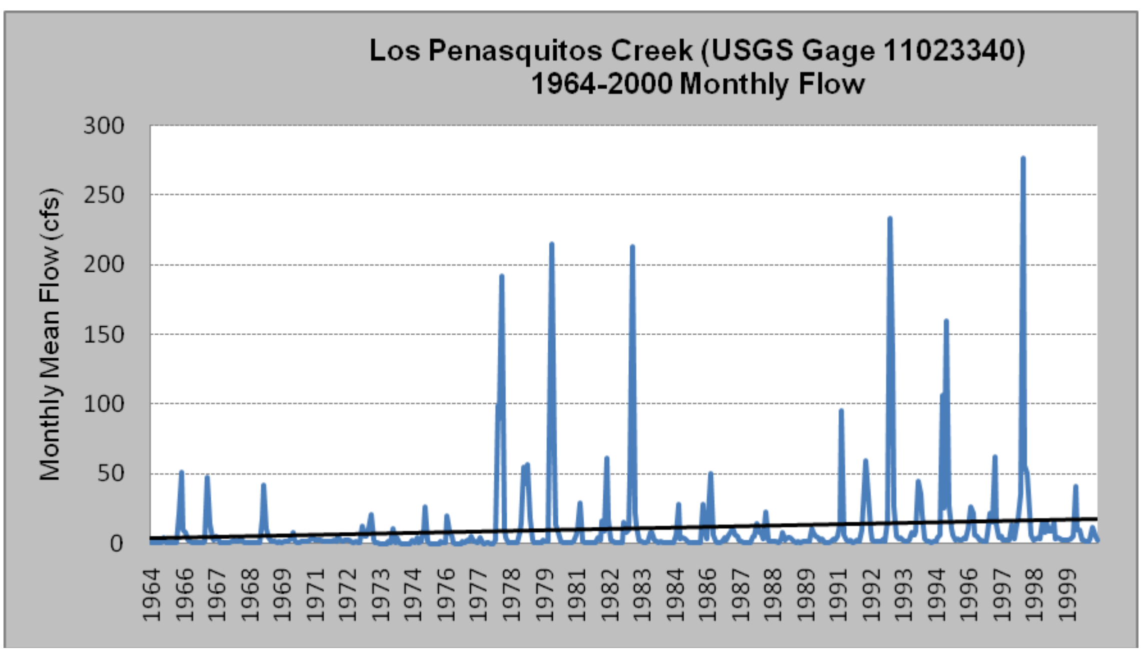

Figure 17. Hydrograph for Los Peñasquitos Creek

4.3 Selection of TMDL Numeric Target

A numeric sediment TMDL target was established through the historical analysis of land use and lagoon conditions using a 'weight of evidence' approach. The numeric target provides the link to the narrative WQO for sediment and defines the conditions that will result in the attainment of WQS for the Lagoon. Available data and literature studies of the Lagoon and watershed were evaluated to help identify the general time period when sedimentation impacts were likely minimal. This time period defines the reference condition upon which the numeric sediment target load was calculated. This approach was needed because numeric criteria are not specified in California's water quality standards and available data for the Lagoon does not specifically define a sediment loading rate or other measure of natural background sediment loading that can be used for TMDL development.

Several lines of evidence were considered when evaluating the watershed and Lagoon conditions in order to determine an appropriate reference time period for TMDL development. These lines of evidence include:

- **Urbanization trends**: A review of historical literature that describes urbanization in the watershed (Section 4.1) indicates that intensive development began in the in the mid-1970s. Land use data shows a nearly 37% decrease in open space in the watershed beginning in the mid 1970s.
- **Population data**: Trend analysis of population data (Section 4.1) indicates that the population of the San Diego region has been steadily increasing since 1970.
- **Flow data**: Review of historical streamflow data from the USGS gage on Los Peñasquitos Creek and the conclusions drawn by White and Greer (2002) indicate that flow has increased substantially since the 1970s. White and Greer (2002) associated these flow increases with urbanization trends in the watershed.
- **Evaluation of Lagoon conditions** (Section 4.1.1). As described above, Lagoon conditions have been influenced by several factors, which can be separated into watershed impacts and problems associated with the lagoon mouth. Salt marsh habitat loss is primarily associated with long-term sedimentation impacts, reduced tidal flushing, and year-round freshwater input. Watershed impacts to the Lagoon include sediment delivery associated with urban development, which increased substantially in the mid-1970s. The wastewater treatment plants impacted water quality in the Lagoon until 1972 when the area was connected to the city sewer system, making it difficult to differentiate between the wastewater impacts and development-associated impacts during this time period (pre-1972). Available literature indicates that sediment deposition from the watershed is not adequately flushed out of the system due to problems at the lagoon mouth caused by the railroad berm (and other physical alterations) and sediment build-

up at the ocean inlet. Note that the Highway 101 bridge abutments were recently replaced and have resulted in improved tidal exchange through the area. As discussed above, reductions in the tidal prism have resulted in increased sediment build-up at the ocean inlet. Sediment impacts at the ocean inlet are primarily a function of littoral forces (Elwany, 2008) and other factors that are largely separate from the sedimentation problems that originate from the watershed. These factors are important to understand in order to effectively manage and improve conditions within the Lagoon, but are outside the scope of the sediment TMDL analysis.

Consideration of these various lines of evidence indicates that the Lagoon was likely achieving WQS for sediment before the mid-1970s; therefore the numeric target was calculated based on the historic mid-1970s land use distribution for the watershed (Figure 10). Existing and historic land use areas and the calculated percent change by land use category are shown in Table 2. This table indicates that open space decreased by nearly 37% between the mid-1970s and existing conditions (based on SANDAG 2000 land use data). The percent impervious associated with the historic land use cover was also determined. Overall, in the mid-1970s the Los Peñasquitos Lagoon watershed was approximately 9.4% percent impervious, which is just below the threshold of stream degradation that occurs at 10 to 15 percent of watershed imperviousness (Scheuler, 1994), thereby further justifying use of this historic time period.

The historic land use coverage was used to calculate the sediment load to the Lagoon using the LSPC watershed model (see Appendix A). This historic sediment load represents the sediment TMDL numeric target.

5 Data Inventory and Analysis

Multiple data sources were used to characterize the watershed and Lagoon, in particular stream flow and water quality conditions. Much of this information was recently collected by watershed stakeholders to assist with TMDL model development. Data describing the watershed's topography, land use, soil characteristics, meteorological data, and irrigation needs along with available bathymetric survey information and data sondes analyzing pressure and salinity were used to calibrate the watershed and Lagoon models. This section summarizes stream flow and total suspended sediment data; refer to the Modeling Report (Appendix A) for additional details.

5.1 Streamflow Data Summary

Available streamflow data collected within the watershed were compiled for model calibration and validation. The United States Geological Survey (USGS) maintains a long term flow gage (11023340) in the upper Los Peñasquitos watershed (Figure 18). Daily data from 1990 through 2008 were downloaded for calibration of model hydrologic parameters. Total suspended solids (TSS) data were also collected at this location and a downstream USGS sediment monitoring station (325423117124501) (see Section 5.2). Additional streamflow data were collected at the base of Los Peñasquitos, Carroll Canyon, and Carmel Creeks as part of the Los Peñasquitos TMDL monitoring study (City of San Diego, 2009) as described in the Modeling Report (Appendix A) (Figure 18).

Los Peñasquitos Creek drains the largest area within the watershed and, accordingly, recorded the highest measured flows and runoff volume (Figure 19). Review of recent data (2007-2008) shows that median flows in Los Peñasquitos Creek were roughly twice those in Carmel Creek and two orders of magnitude greater than in Carroll Canyon Creek. A continual increase in cumulative volume for Los Peñasquitos Creek and Carmel Creek indicated consistent baseflows. By contrast, streamflow data collected on Carroll Canyon Creek included periods with little change in cumulative volume, flashy response time, and low baseflow. Low flows at this station were within the tenth percentile. Additional stream flow data, including a discussion of data from the mass loading station (MLS) and location-specific challenges to flow monitoring are presented in Appendix A.

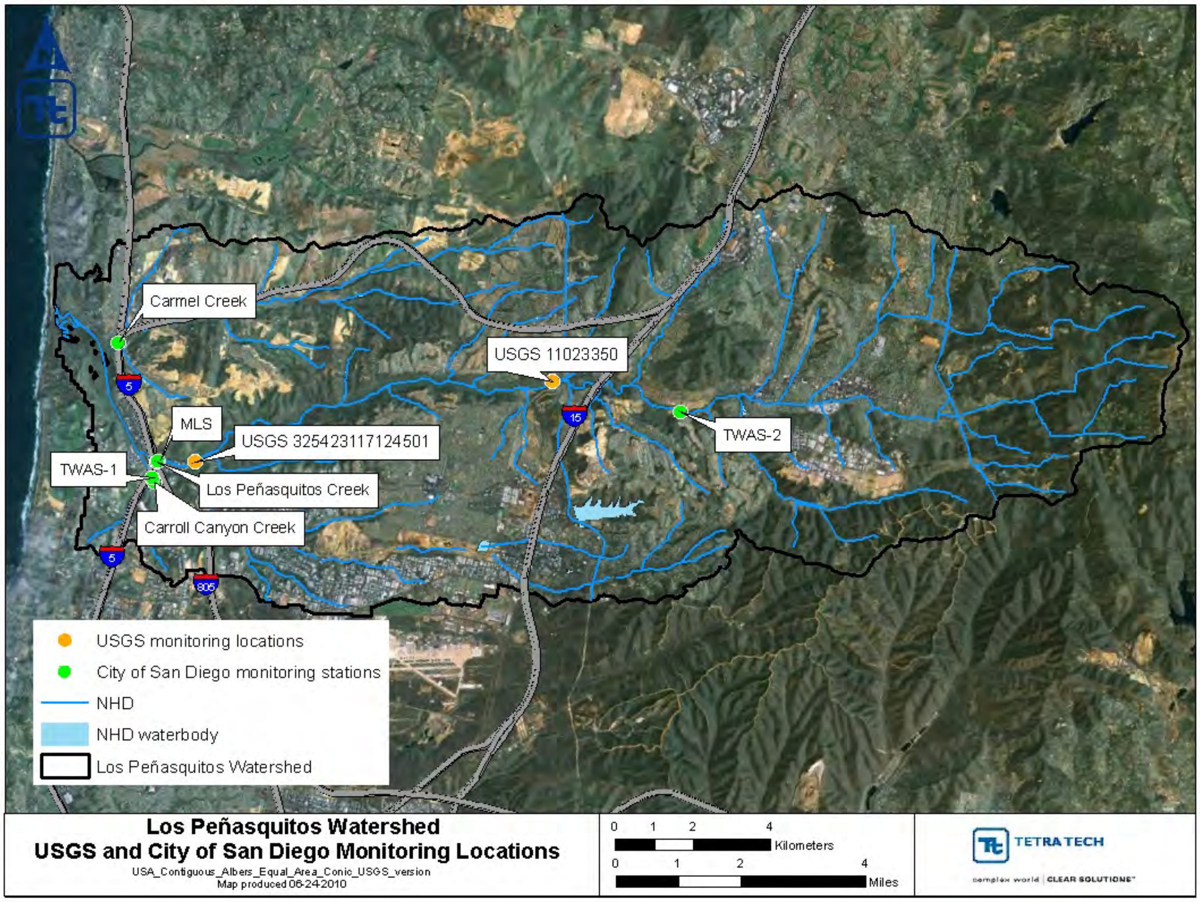

Figure 18. Monitoring locations in the Los Peñasquitos watershed

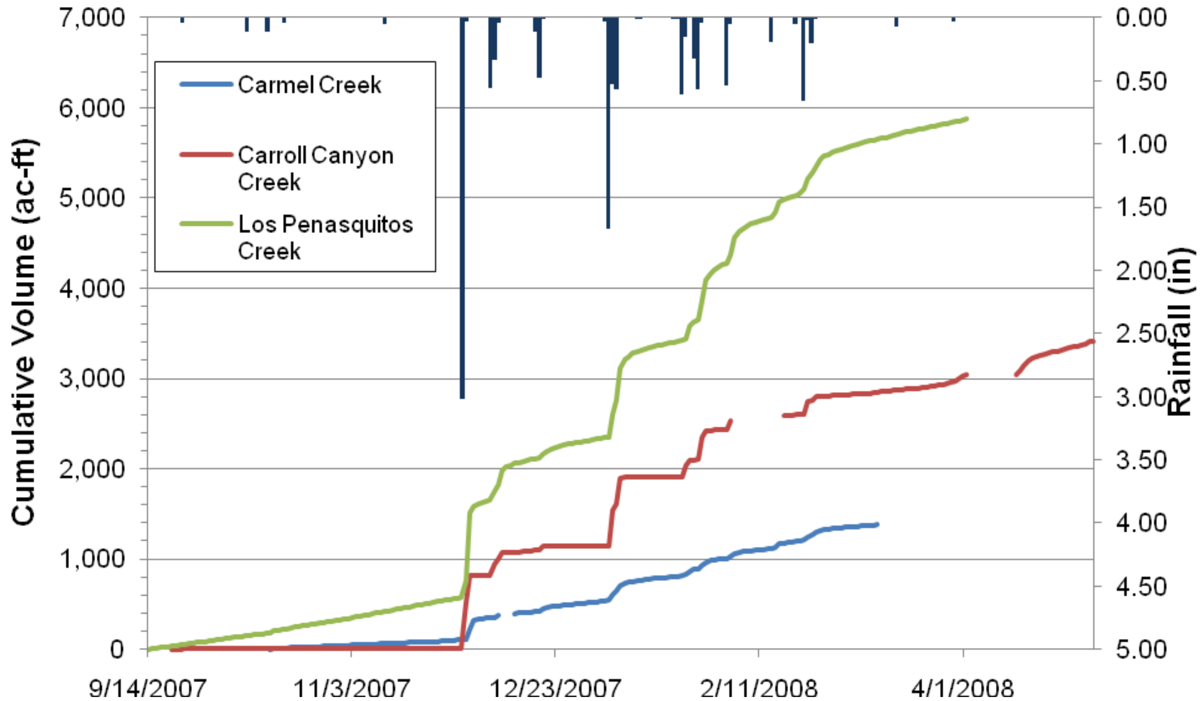

Figure 19. Cumulative flow volumes at TMDL monitoring locations

5.2 Suspended Sediment Data Summary

Total suspended solids and particle size data were collected by the City of San Diego (in accordance with Regional Board requirements) at several locations within the Los Peñasquitos watershed and used to develop and calibrate the watershed model (Figure 18). The USGS collected samples at gage 11023340 as well as at gage 325423117124501 (USGS, 2009). Event mean concentrations (EMCs) from storm water and dry weather runoff were collected at the MLS on Los Peñasquitos Creek immediately upstream of the confluence with Carroll Canyon Creek. Storm water and dry weather runoff events were also monitored at this station since 2001, in accordance with NPDES permit requirements. In addition, two Temporary Watershed Assessment Stations (TWAS) are located within the watershed on Los Peñasquitos Creek upstream (TWAS-2) and on Carroll Canyon Creek (TWAS-1). Collectively, these data were used to better understand the relationship between flow and sediment loading for model development purposes.

Pollutograph samples characterizing suspended sediment concentration changes throughout a storm were collected during three storms in the 2007-2008 storm season as part of the TMDL monitoring study. Samples were collected from the three major streams flowing into the lagoon: Los Peñasquitos, Carroll Canyon, and Carmel Creeks.

Longer-term datasets were also available for comparison (MLS and USGS stations). TSS concentrations recorded at the MLS on Los Peñasquitos Creek since 2001 were more than five times lower than the data collected by the USGS at both stations, possibly due to the presence of cattails upstream of the Los Peñasquitos MLS and the presence of the El Cuervo Norte wetland diverting flows from Los Peñasquitos Creek (Figure 20). When comparing just the pollutographs for the three major streams, TSS EMCs at Carroll Canyon Creek were consistently higher than those at Los Peñasquitos and Carmel Creeks (Figure 20). Additional details on sediment data, including particle size distribution, further comparison of the pollutographs and EMCs, and correlations with rainfall are presented in Appendix A.

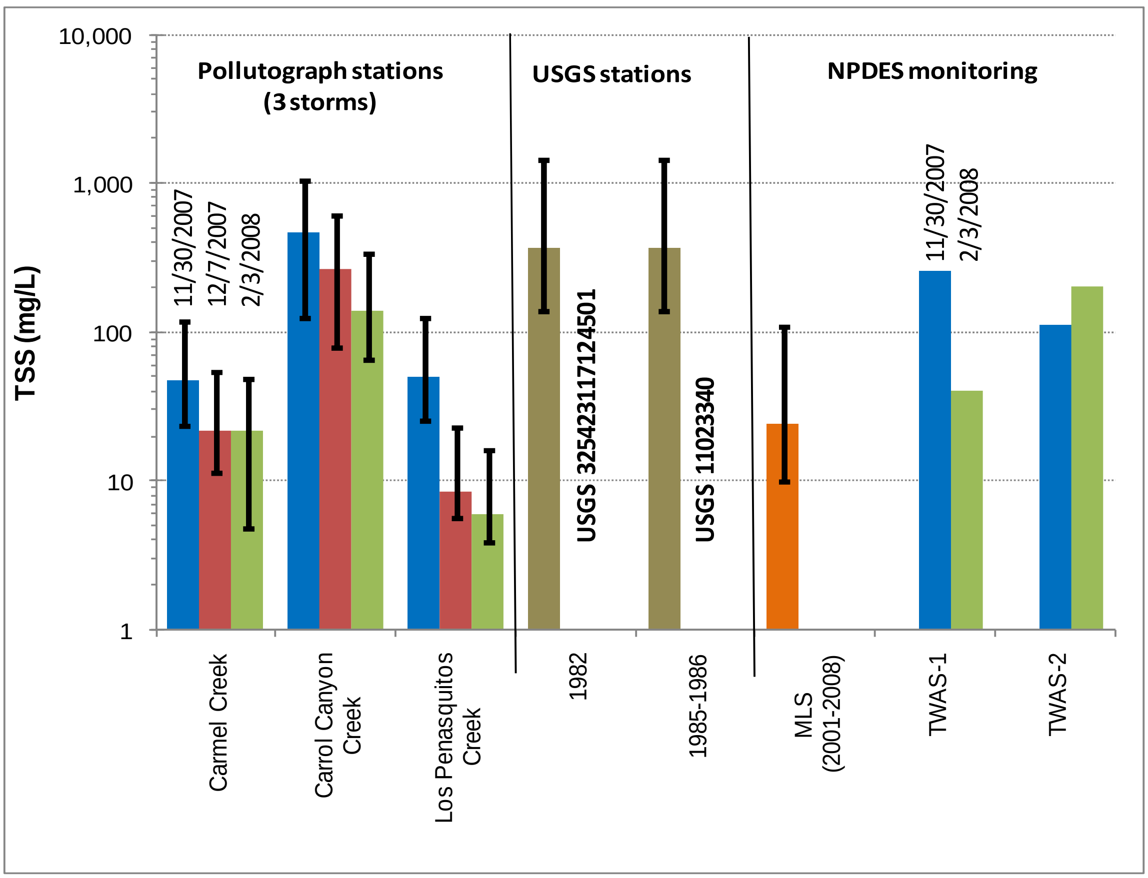

Figure 20. EMC/Median TSS and 95th percentile confidence intervals for all sampling events

6 Source Assessment

The purpose of the source assessment is to identify and quantify the sources of sediment to the Los Peñasquitos Lagoon. Sediment can enter surface waters from both point and nonpoint sources. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels from, for example, municipal wastewater treatment plants or municipal separate storm sewer systems (MS4s). These discharges are regulated through waste discharge requirements (WDRs) that implement federal NPDES regulations issued by the State Water Board or the Regional Board through various orders. Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters. Some nonpoint sources, such as agricultural and livestock operations are regulated under the Basin Plan's waste discharge requirement waiver policy (Waiver Policy). The source assessment quantification is measured as an annual or daily load, which is then used to separate the load allocations or wasteload allocations for the TMDL. The following sections discuss the sediment sources that contribute to Los Peñasquitos Lagoon.

6.1 Land Use / Sediment Source Correlation

Sources of sediment are generally the same under both wet weather and dry weather conditions; however, storm events can cause significant erosion and transport of sediment downstream (especially from canyon areas below storm water outfalls). Dry weather loading is dominated by nuisance flows from urban land use activities such as car washing, sidewalk washing, and lawn over-irrigation, which pick up and transport sediment into receiving waters. Wet weather loading is dominated by episodic storm flows that wash off sediment that has built up on land surfaces during dry periods and from canyon areas below storm water outfalls. Due to the higher runoff potential associated with wet weather conditions, emphasis was placed on characterizing wet weather watershed loading.

Sediment sources were quantified by land use group since sediment loading can be highly correlated with land use practices. For example, land disturbance may occur from construction or agricultural practices, disturbing native vegetative cover and leaving the soil susceptible to erosion. With the native cover disturbed, a rainfall event can cause soil detachment and further erosion of the land due to overland flow. For impervious areas, a different process occurs where sediment builds up over time to a maximum amount for each impervious land use type. For both pervious and impervious land uses, the amount of sediment that can be transported is a function of runoff. Scouring of stream banks can also occur in un-protected areas.

Since several land use types share hydrologic or pollutant loading characteristics, many were grouped into similar classifications, resulting in a subset of nine categories for modeling. Selection of these land use categories was based on the availability of monitoring data and literature values that could be used to characterize individual land use contributions and critical sediment-contributing practices associated with different land uses. For example, multiple urban categories were represented independently (e.g., high density residential, low density residential, and commercial/institutional), whereas other natural categories were grouped. The three major land use sources in the watershed are open space, low density residential, and industrial/transportation.

The sediment load contributed by each land use type was calculated using the LSPC model. Modeling parameters varied by land use to provide the correlation between sediment loading and land use type. The amount of runoff and associated sediment concentrations are highly dependent on land use.

6.2 Point Sources

Storm water runoff is regulated through the following NPDES permits: the San Diego County Phase I municipal separate storm sewer system (MS4) permit, the Phase II MS4 permit for small municipal dischargers, and the statewide storm water permit issued to Caltrans. The permitting process defines these discharges as point sources because storm water is discharged from the end of a storm water conveyance system, as described below. NPDES permits are also issued for construction and industrial sites that are enrolled in the statewide General Storm Water permit program. These sites are located within areas controlled by the San Diego County Phase I MS4 permit and are, therefore, not specifically included in the TMDL analysis.

6.2.1 Phase I Municipal Separate Storm Sewer System (MS4)

In 1990, the USEPA developed rules establishing Phase I of the NPDES storm water program, designed to prevent harmful pollutants from being washed by urban runoff into MS4s or from being discharged directly into MS4s, and then local receiving waters. Phase I of the program required operators of medium and large MS4s (those generally serving populations of 100,000 or more) to implement an urban runoff management program as a means to control polluted discharges from MS4s.

Approved urban runoff management programs for medium and large MS4s are required to address a variety of water quality-related issues, including roadway runoff management, municipally owned operations and hazardous waste treatment. More specifically, large and medium operators are required to develop and implement Urban Runoff Management Plans that address, at a minimum, the following elements:

- Structural control maintenance;
- Areas of significant development or redevelopment;
- Roadway runoff management;
- Flood control related to water quality issues;
- Municipally owned operations such as landfills, wastewater treatment plants, etc.;
- Hazardous waste treatment, storage, or disposal sites, etc.;
- Application of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination;
- Regulation of sites classified as associated with industrial activity;
- Construction site and post-construction site runoff control; and
- Public education and outreach.

Twenty one entities are identified in Regional Board Order R9-2007-0001 (NPDES No. CAS0108758) and are responsible for addressing water quality concerns for the MS4 (Regional Board, 2007). Responsible Municipal Dischargers within the Los Peñasquitos watershed are San Diego County, the City of San Diego, the City of Del Mar, and the City of Poway.

During wet weather events, significant erosion can occur along canyon walls below storm water outfalls. Sediment also builds up on the land surface from various sources and associated management practices and is then washed off the surface during rainfall events. The amount of runoff and associated concentrations are, therefore, highly dependent on the nearby land management practices. Note that the redistribution of sediment to other areas of the Lagoon can be caused by both anthropogenic and natural processes; however, most of the sediment is contributed by point sources in the watershed so this resuspension is associated with and quantified in the MS4 load calculations.

All land uses were classified as generating point source loads because, although the sediment sources on these land use types may be diffuse in origin, the pollutant loading is transported and discharged to receiving waters through the MS4. Sediment loads that are attributed to point sources are discharged via the MS4 from all land uses. Note that several construction and industrial sites regulated under the General Statewide Storm Water Permit program are located within the Phase 1 MS4 permitted area. Additional information would be needed to estimate the sediment load contribution from these sites.

6.2.2 Phase II Municipal Separate Storm Sewer System (MS4)

In 1999, the USEPA developed rules establishing Phase II of the NPDES storm water program, extending the regulations to storm water discharges from small MS4s located in “urbanized areas” and construction activities that disturb 1 to 5 acres of land. Small MS4 systems are not permitted under the municipal Phase I regulations, and are owned or operated by the United States, a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity.

The General Permit for the Discharge of Storm Water from Small MS4s, Water Quality Order No. 2003-0005-DWQ (Small MS4 General Permit) regulates discharges of storm water from “regulated Small MS4s.” A “regulated Small MS4” is defined as a Small MS4 that discharges to a water of the United States or to another MS4 regulated by an NPDES permit. The General Permit requires that Small MS4 Dischargers develop and implement a Storm Water Management Program (SWMP) that reduces the discharge of pollutants through their MS4s to the Maximum Extent Practicable (MEP). The SWMP must describe the best management practices (BMPs), measurable goals, include time schedules of implementation, and assign responsibility of each task.

Non-traditional Small MS4s may also require coverage by the permit. The non-traditional Small MS4s include those located within or discharge to a permitted MS4, and that pose significant water quality threats. In general, these are storm water systems serving public campuses (including universities, community colleges, primary schools, and other publicly owned learning institutions with campuses), military bases, and prison and hospital complexes within or adjacent to other regulated MS4s, or which pose significant water quality threats. The State Water Board considered designating non-traditional small MS4s when adopting this General Permit.

Entities that enroll in Order No. 2003-0005-DWQ are responsible for addressing water quality concerns from their small MS4s. In the San Diego Region, the non-traditional small MS4s that are subject to the Order include the San Diego Unified School District (SDUSD) and others, as applicable, in the watershed.

As with Phase I MS4s, pollutants build up on land surfaces and then are washed off during rainfall events. The amount of runoff and associated concentrations are highly dependent on the nearby land uses and management practices.

6.2.3 Caltrans MS4s

Caltrans is regulated by a statewide storm water discharge permit that covers all municipal storm water activities and construction activities (State Board Order No. 99-06-DWQ; CAS000003). The Caltrans storm water permit authorizes storm water discharges from Caltrans properties such as the state highway system, park and ride facilities, and maintenance yards. The storm water discharges from most of these Caltrans properties and facilities eventually ends up in either a city or county storm drain system.

6.3 Nonpoint Sources

A nonpoint source is a source that discharges via sheet flow or natural discharges. Additionally, storm surges and ocean tides can be a source of sediment to the mouth of the Lagoon; however, a recent study found that accumulated sediment at the Lagoon's ocean inlet was similar to beach sediment and tidal sources (Elwany, 2008). For this reason, watershed loading was assumed to have a less significant contribution to sediment build-up at the inlet. Beach erosion processes cannot be modeled with the existing model configuration which lacks wave, wave-breaking, and wave-current interaction components; therefore, sediment modeling used a reduced grid which sets the open ocean boundary immediately outside of the ocean inlet (see Appendix A for a more detailed discussion).

7 Linkage Analysis

The technical analysis of the relationship between pollutant loading from identified sources and the response of the waterbody to this loading is referred to as the linkage analysis. The purpose of the linkage analysis is to quantify the maximum allowable sediment loading that can be received by an impaired waterbody and still attain the WQOs of the applicable beneficial uses. This numeric value is represented by the TMDL.

The linkage analysis for this TMDL is based on computer models that were developed to represent the physical processes within the impaired receiving waterbody and the associated watershed. The models provide estimation of sediment loadings from the watersheds based on rainfall events, and simulation of the response of the receiving water to these loadings. The following sections provide more detailed discussion regarding model selection and linkage analyses.

7.1 Model Selection Criteria

In selecting an appropriate approach for TMDL calculation, technical and regulatory criteria were considered. Technical criteria include the physical system, including watershed or receiving water characteristics and processes and the constituents of interest. Regulatory criteria include water quality objectives or procedural protocol. The following discussion details the considerations in each of these categories. Based on these considerations, appropriate models were chosen to simulate watershed and receiving water conditions.

7.2 Technical Criteria

Technical criteria were divided into four main topics. Consideration of each topic was critical in selecting the most appropriate modeling system to address the types of sources and the numeric target associated with the impaired waterbody.

Physical Domain

Representation of the physical domain is perhaps the most important consideration in model selection. The physical domain is the focus of the modeling effort—typically, either the receiving water itself or a combination of the contributing watershed and the receiving water. Selection of the appropriate modeling domain depends on the constituents and the conditions under which the waterbody exhibits impairment. For a waterbody dominated by point source inputs that exhibits impairments under only low-flow conditions, a steady-state approach is typically used. If the system includes tidal influences, quasi-steady-state simulation is typically performed that assumes steady-state inputs, but includes diurnal variability in hydrodynamics associated with tidal effects. The steady-state and quasi-steady-state modeling approaches primarily focus on receiving water processes during a user-specified condition.

For waterbodies affected additionally or solely by nonpoint sources or primarily rainfall-driven flow and pollutant contributions, a dynamic approach is recommended. Dynamic models consider time-variable nonpoint source contributions from a watershed surface or subsurface, as well as a hydrodynamic response of the receiving water. Some models consider monthly or seasonal variability, while others enable assessment of conditions immediately before, during, and after individual rainfall events. Dynamic models require a substantial amount of information regarding input parameters and data for calibration purposes.

Source Contributions

Primary pollutant sources must be considered in the model selection process. Accurately representing contributions from nonpoint sources and point sources is critical in properly representing the system and ultimately evaluating potential load reduction scenarios.

Water quality monitoring data were not sufficient to fully characterize all sources of sediment to the Lagoon, however, available data indicate that the main controllable sources are watershed runoff and streambank erosion. As a result, the models selected to develop a sediment TMDL for the Los Peñasquitos Lagoon need to address the major source categories during conditions considered controllable for TMDL implementation purposes.

Critical Conditions

The goal of the TMDL analysis is to determine the assimilative capacity of the waterbody and to identify potential allocation scenarios that will enable that waterbody to achieve WQOs. The critical condition is the set of environmental conditions for which controls designed to protect water quality will ensure attainment of objectives for all other conditions. This is typically the period of time in which the waterbody exhibits the most vulnerability. For the Lagoon and its watershed there is a high degree of variability in when sediments are deposited at the mouths of each creek. This variability is due to the nature of wet weather events that represent the critical condition for sediment deposition.

Constituents

Another important consideration in model selection and application is the constituent(s) to be assessed. Choice of state variables is a critical part of model implementation. The more state variables included, the more difficult the model will be to apply and calibrate.

However, if key state variables are omitted from the simulation, the model might not simulate all necessary aspects of the system and might produce unrealistic results. A delicate balance must be met between minimal constituent simulation and maximum applicability.

7.3 Regulatory Criteria

A properly designed and applied model provides the source-response linkage component of the TMDL and enables accurate assessment of assimilative capacity and allocation distribution. The receiving water's assimilative capacity is determined by assuming adherence to WQOs. For all waters in the San Diego Region, the Basin Plan establishes the beneficial uses for each waterbody to be protected and the WQOs that protect those uses. In the case of narrative objectives, interpretation is required to develop a numeric target for TMDL development (refer to Section 4). The modeling framework must enable direct comparison of model results to the selected numeric target and allow for the analysis of the duration of those conditions. For the watershed loading analysis and implementation of required reductions, it is also important that the modeling framework allow for the examination of gross land use loading.

7.4 Model Selection and Overview

Establishing the relationship between the receiving water quality target and source loading is a critical component of TMDL development. This allows for the evaluation of management options that will help achieve the desired source load reductions. This can be established through a number of techniques, ranging from qualitative assumptions based on sound scientific principles to sophisticated modeling techniques. Ideally, the linkage will be supported by monitoring data that allow the TMDL developer to associate certain waterbody responses to flow and loading conditions. The objective of this section is to present the approach taken to develop the linkage between sources and receiving water responses for TMDL development in the Lagoon.

In addition, to assist in TMDL development and to provide decision support for watershed management, the models can be used to simulate various scenarios and may require future modifications to address specific management and environmental factors. Such scenarios may result from the augmentation of input data to be collected in ensuing monitoring efforts, future implementation of various management strategies or best management practices (BMPs), or adaptation and linkage to additional models developed in subsequent projects. Therefore, model flexibility is a key attribute for model selection.

The modeling system was divided into two components representative of the processes essential for accurately modeling hydrology, hydrodynamics, and water quality. The first component of the modeling system is a watershed model that predicts runoff and external pollutant loading as a result of rainfall events. The second component is a hydrodynamic and water quality model that simulates the complex water circulation and pollutant transport patterns in the Lagoon.

The models selected for the Lagoon sediment TMDL are components of USEPA's TMDL Modeling Toolbox (Toolbox), which was developed through a joint effort between USEPA and Tetra Tech, Inc. (USEPA, 2003). The Toolbox is a collection of models, modeling tools, and databases that have been utilized over the past decade to assist with TMDL development and other environmental studies. The Loading Simulation Program in C++ (LSPC) is the primary watershed hydrology and pollutant loading model and the Environmental Fluids Dynamic Code (EFDC) is the receiving water hydrodynamic and water quality model in the Toolbox modeling package. Both the LSPC and EFDC models are summarized below and described in detail in the Modeling Report (Appendix A).

7.4.1 Watershed Model: Loading Simulation Program in C++ (LSPC)

LSPC was selected for simulation of land-use based sources of sediment and the hydrologic and hydraulic processes that affect delivery (Shen et al., 2004; Tetra Tech and USEPA, 2002; USEPA, 2003). LSPC was specifically used to simulate watershed hydrology and transport of sediments in the streams and storm drains flowing to the impaired Lagoon. LSPC is a watershed modeling system that includes streamlined Hydrologic Simulation Program Fortran (HSPF) (Bicknell et al., 1997) algorithms for simulating hydrology, sediment, and general water quality on land, as well as a simplified stream fate and transport model. Since its original public release, the LSPC model has been expanded to include additional GQUAL components for sorption/desorption of selected water quality constituents with sediment, enhanced temperature simulation, and the HSPF RQUAL module for simulating dissolved oxygen, nutrients, and algae.

The hydrologic (water budget) process is complex and interconnected within LSPC. Rain falls and lands on various constructed landscapes, vegetation, and bare soil areas within a watershed. Varying soil types allow the water to infiltrate at different rates while evaporation and plant matter exert a demand on this rainfall. Water flows overland and through the soil matrix. There may also be point source discharge and water withdrawals/intakes. The land representation in the LSPC model environment considers three flowpaths; surface, interflow, and groundwater outflow. The sediment routine in LSPC represents the general detachment of sediment due to rainfall, overland and instream transport, attachment when there is no rainfall, and scour.

The model can simulate sediment loadings from specific source areas (i.e., subwatershed or land use areas). This is important in terms of TMDL development and allocation analysis. For this TMDL, the LSPC model was used to calculate both historic and existing conditions within the watershed to establish the TMDL numeric target and required load reductions from existing conditions. The LSPC model output was incorporated as an input to the receiving water model for the Lagoon, as described below.

7.4.2 Lagoon Model: Environmental Fluid Dynamics Code (EFDC)

The Los Peñasquitos Lagoon was simulated using the EFDC model. The LSPC watershed model was linked to EFDC and provided all freshwater flows and loadings as model input. EFDC is a public domain, general purpose modeling package for simulating one-dimensional (1-D), two-dimensional (2-D), and three-dimensional (3-D) flow, sediment transport, and biogeochemical processes in surface water systems including rivers, lakes, estuaries, reservoirs, wetlands, and coastal regions. The EFDC model was originally developed at the Virginia Institute of Marine Science for estuarine and coastal applications (Hamrick, 1992). This model is now being supported by the USEPA and has been used extensively to support TMDL development throughout the country. In addition to hydrodynamic, salinity, and temperature transport simulation capabilities, EFDC is capable of simulating cohesive and noncohesive sediment transport, near-field and far-field discharge dilution from multiple sources, eutrophication processes, the transport and fate of toxic contaminants in the water and sediment phases, and the transport and fate of various life stages of finfish and shellfish. The EFDC model has been extensively tested, documented, and applied to environmental studies worldwide by universities, governmental agencies, and other entities.

The EFDC model includes four primary modules: (1) a hydrodynamic model, (2) a water quality model, (3) a sediment transport model, and (4) a toxics model. The hydrodynamic model predicts water depth, velocities, and water temperature. The water quality portion of the model uses the results from the hydrodynamic model to compute the transport of the water quality variables. The water quality model then computes the fate of up to 22 water quality parameters including dissolved oxygen, phytoplankton (three groups), benthic algae, various components of carbon, nitrogen, phosphorus and silica cycles, and fecal coliform bacteria (Cerco and Cole 1994). The sediment transport and toxics modules use the hydrodynamic model results to calculate the settling of suspended sediment and toxics, resuspension of bottom sediments and toxics, and bed load movement of noncohesive sediments and associated toxics. For this project, the hydrodynamics and sediment transport models were used. The hydrodynamics model simulated the circulation, water temperature, and salinity in the lagoon driven by ocean tides and watershed inflows. The sediment transport model simulated the transport of sand, silt as non-cohesive sediments, and clay as cohesive sediment. Details of the EFDC model's hydrodynamic and eutrophication components are provided in Hamrick (1992) and Tetra Tech (2002, 2006a, 2006b, 2006c, 2006d).

The EFDC model was configured to simulate hydrodynamics and sediment transport in the Los Peñasquitos Lagoon for both existing and historic conditions. Specifically, water temperature and salinity were both modeled for hydrodynamics. Sediment fractions considered in the model include sand, silt, and clay. Sand and silt were modeled using the non-cohesive sediment module and clay was modeled using the cohesive sediment module in EFDC.

7.5 Model Application

A complete discussion, including model configuration, hydrologic and hydrodynamic calibration and validation, and water quality calibration and validation, of the LSPC and EFDC models is provided in the Modeling Report (Appendix A). These models provide the technical analysis framework that will be used to make regulatory and management decisions for the Lagoon and its watershed.

The models were initially calibrated to observed hydrologic and water quality data to characterize existing conditions in the watershed and Lagoon (required load reductions are based on these existing loads). In addition, the models were used to establish a TMDL numeric target for sediment. As described in Section 4, a historical review of available literature regarding urbanization trends and Lagoon impacts was used to identify an appropriate time period (mid 1970s) for calculating the numeric target that represents the sediment WQO. Conditions present at this time were associated with loads that met WQOs and did not adversely impact the Lagoon. To characterize this historical period, a historic land use coverage for the watershed was developed and model simulations were performed. The resulting historical net annual sediment load was identified as the TMDL numeric target and represents the loading (assimilative) capacity for the lagoon (i.e. the TMDL). Percent reductions were calculated based on the difference between the TMDL load and the sediment load that corresponds with existing conditions.

8 Identification of Load Allocations and Reductions

The calibrated models were used to simulate historical and existing sediment loads to the Los Peñasquitos Lagoon from which numeric targets and load reductions were established. Point sources were then assigned a wasteload allocation (WLA) while nonpoint sources were assigned a load allocation (LA). This section discusses the methodology used for TMDL development and the results in terms of loading capacities and required load reductions for the Los Peñasquitos Lagoon. Other TMDL components are also discussed including the margin of safety (MOS), seasonality and critical conditions, and a daily load expression.

8.1 Loading Analysis

The calibrated LSPC model was used to estimate existing sediment loads to the Lagoon, with the receiving water simulated based on the EFDC model (see Appendix A). Using the EFDC model, the assimilative capacity of the Lagoon was assessed and compared to the historical numeric target for evaluation of sediment quality.

8.2 Application of Numeric Targets

As discussed in Section 4, the narrative WQO for sediment was interpreted using a weight of evidence approach to determine a reference condition to define the TMDL numeric target (i.e., a historical period when the Lagoon was not impaired for sedimentation). Several lines of evidence used to establish a numeric sediment target include: urbanization trends, population data, flow data, and evaluation of Lagoon conditions over time.

8.3 Load Estimation

Estimation of current watershed loading to the impaired Lagoon required use of the LSPC model to predict flows and pollutant concentrations. The dynamic model-simulated watershed processes, based on observed rainfall data as model input, provided temporally variable load estimates for the critical period. These load estimates were simulated using calibrated, land use-specific processes associated with hydrology and sediment transport (see Appendix A).

8.4 Identification of Critical Conditions

Due to the higher transport potential of sediment during wet weather, the 1993 El Nino time period was selected as the critical period for assessment. The wet season that includes the 1993 El Nino storm events (10/1/92 – 4/30/93) is one of the wettest periods on record over the past several decades. Statistically, 1993 corresponds with the 93rd percentile of annual rainfall for the past 15 years measured at the San Diego Airport (Lindbergh Field). Selection of this year was also consistent with studies performed by the Southern California Coastal Water Research Project (SCCWRP). An analysis of rainfall data for the Los Angeles Airport from 1947 to 2000 shows that 1993 was the 90^{th} percentile year; meaning 90 percent of the years between 1947 and 2000 had less annual rainfall than 1993 (Los Angeles Water Board, 2002).

8.5 Critical Locations for TMDL Calculation

For TMDL calculation, a critical location within the impaired waterbody is selected for comparison to the numeric target in order to determine the required pollutant load reductions needed to meet the WQOs. The selection of a critical location (or locations) represents a conservative assessment of water quality conditions, as these areas typically display the worst water quality conditions and are the most vulnerable to pollution impacts. Although, a critical location is used for water quality assessment in the TMDL analysis, compliance with WQOs must be assessed and maintained throughout a waterbody in order to protect beneficial uses.

Due to the variability and dynamic nature of conditions within the Lagoon (e.g., mouth closures, tidal fluctuations, sediment fate and transport, etc.), the entire modeled Lagoon area was assessed as the critical location. Load reductions for sediment were based on achieving the numeric TMDL target across the Lagoon.

8.6 Calculation of TMDLs and Allocation of Loads

Load calculations for sediment were developed using land use-based generation rates and meteorological conditions from the critical wet period (10/1/92 – 4/30/93). The TMDL was divided among point sources as a WLA and nonpoint sources as a LA. The point sources identified in the Los Peñasquitos watershed are Phase I MS4 co-permittees (San Diego County and the cities of San Diego, Poway, and Del Mar), Phase II MS4s, and Caltrans. The USEPA’s permitting regulations require municipalities to obtain NPDES requirements for all storm water discharges from MS4s. The existing loads estimated were solely the result of watershed runoff (land-use based) and streambank erosion and not other types of point sources.

8.7 Margin of Safety

A margin of safety (MOS) is incorporated into a TMDL to account for uncertainty in developing the relationship between pollutant discharges and water quality impacts (USEPA, 1991). The MOS can be incorporated in the TMDL either explicitly or implicitly. Reserving a portion of the loading capacity provides an explicit MOS, whereas, the use of conservative assumptions in the modeling and TMDL analysis provides an implicit

MOS. In either case, the purpose of the MOS is to ensure that the beneficial uses that are currently impaired will be restored, given the uncertainties in the TMDL analysis.

For this TMDL, an implicit MOS was included through the application of conservative assumptions throughout TMDL development. The following list describes several key assumptions that were used.

- **Critical condition** - The wet season that includes the 1993 El Nino storm events (10/1/92 – 4/30/93) was selected as the critical condition time period for TMDL development. This is one of the wettest periods on record over the past several decades. Because of the large amount of rainfall, sediment loads were significant higher during this period than in other years with less rainfall.

- **Soil composition** - Soils that are more easily transported typically have higher proportions of smaller particles sizes (silt and clay fractions), as compared to local parent soils, because of differences in settling rates and other sediment transport characteristics. To account for these differences in the model, soils transported by surface runoff were assumed to be composed of 5 percent sand, twice as much clay as the percentage of clay within each hydrologic soil group, and the remainder assigned to the silt fraction.

- **Numeric target** - The historical analysis involved an extensive literature search and technical analysis in order to identify an appropriate time period for development of the numeric sediment target. This comprehensive 'weight of evidence' analysis considered all available information regarding urbanization and lagoon impacts over time in order to identify a conservative reference condition.

- **Critical location** - TMDL load reductions are based on meeting the numeric target across the entire Lagoon (lagoon channels and marsh areas). This approach ensures protection of beneficial uses throughout the lagoon. .

It was determined that an explicit MOS was not needed because of use of conservative assumptions and the overall predictive capability of the modeling framework that was developed for this study.

8.8 Seasonality

The federal regulations at 40 CFR 130.7 require that TMDLs include seasonal variations. Sources of sediment are similar for both dry and wet weather seasons (the two general seasons in the San Diego region). Despite the similarity of wet/dry sources, transport mechanisms can vary between the two seasons. Throughout the TMDL monitoring period, the greatest transport of sediment occurred during rainfall events. It is recognized that dry weather will contribute a deminimus discharge of sediment;

however, model calibration and TMDL development focused on wet weather conditions as sediment transport is dramatically higher during wet weather. Model simulation was completed for the 10/1/92 – 4/30/93 wet period to account for the much greater sediment loading and associated impacts to the Lagoon during this time period.

8.9 Daily Load Expression

The load allocations for the Lagoon are presented in Section 9. Load allocations are expressed in terms of net sediment load for the critical period (tons) because sediment delivery to streams is highly variable on a daily and annual basis. Loads were also divided by the number of days in the critical period (211) to derive daily loading rates (tons/mi^2/day). EPA expects the load allocations to be evaluated using a long-term rolling average period (e.g. 15-year), because of the natural variability in sediment delivery rates. In addition, EPA does not expect each square mile within a particular source category throughout the watershed to necessarily meet the load allocation; rather, EPA expects the watershed average for the entire source category to meet the load allocation for that category.

9 Total Maximum Daily Loads and Allocations

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody while still achieving the numeric target. Allowable loadings from pollutant sources that cumulatively amount to no more than the TMDL must be established; this provides the basis to establish water quality-based controls. TMDLs can be expressed on a mass loading basis (e.g., net sediment amount per year) or as a concentration in accordance with 40 CFR 130.2(l).

A TMDL for a given pollutant and waterbody is comprised of the WLA for point sources and LA for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and water quality in the receiving waterbody. Conceptually, this definition is represented by the equation:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

A TMDL was established for the Lagoon using the methodology described above (Section 6). The WLA portion of this equation is the total loading assigned to point sources. The LA portion is the loading assigned to nonpoint sources. The MOS is the portion of loading reserved to account for any uncertainty in the data and computational methodology, as described in Section 8. An implicit MOS was incorporated for this TMDL.

9.1 Wasteload Allocations

Federal regulations (40 CFR 130.7) require TMDLs to include a WLA for point source discharges regulated under a discharge permit. The Los Peñasquitos watershed includes several MS4 municipalities and other permitted dischargers. The total sediment contribution from all dischargers in the watershed is presented as the WLA.

Twenty entities are identified in Regional Board Order R9-2007-0001 (NPDES No. CAS0108758) and are responsible for addressing water quality concerns for the MS4 (Regional Board, 2007). The Phase I MS4 municipal dischargers within the Los Peñasquitos watershed are the County of San Diego, the City of San Diego, the City of Del Mar, and the City of Poway. Sediment loads generated from land use activities within MS4 boundaries were included in the WLA. The total WLA includes the contribution from Phase II MS4 facilities within the watershed and highway areas regulated under the Caltrans MS4 permit. Permittees enrolled under the General

Statewide Construction and Industrial Storm Water Permit program are located within the permitted area of the Phase 1 MS4 municipalities and are, therefore, included in the total WLA. Additional information may be needed in the future to help determine the contribution from construction areas and industrial facilities in the watershed to assist with implementation planning. No other individual NPDES permits for point sources are located in the watershed.

9.2 Load Allocations

According to federal regulations (40 CFR 130.2(g)), load allocations are best estimates of the nonpoint source or background loading. For the Los Peñasquitos watershed, land use contributions to MS4 systems are included in the WLAs described above. A LA was assigned to sediment contributions from storm surges and wave action along the ocean boundary (ocean sediment contributions).

9.3 Summary of TMDL Results

The overall TMDL and its component loads are presented in Table 3. Daily loads are established by dividing the modeled loads by the number of days within the critical wet period (211 days). Current loads, historical loads, and required reductions are presented in Table 4. Existing loads were estimated based on modeling of current land use conditions (from the SANDAG 2000 land use coverage) and meteorological conditions from the critical wet period (10/1/92 – 4/30/93). As described in Section 4, the numeric target was calculated based on modeling of historical (mid-1970s) land use conditions and the same meteorological data in order to accurately compare the watershed and Lagoon response to the same weather conditions. Historic loads define the allowable load; therefore, required load reductions represent the difference between current sediment loads and historic (allowable) loads. Note that sediment dynamics within the Lagoon are dependent on a number of factors, including runoff volumes and the amount of sediment that is transported to the lagoon from the watershed. These factors are important components in determining the timing and magnitude of erosion and depositional processes within the Lagoon. The Lagoon model shows that a reduction in watershed sediment loading affects the amount of sediment that can deposit throughout the lagoon from oceanic inputs (considering a constant input of sediment from the ocean boundary under current and historical conditions). The model analysis for historical conditions indicates that a greater proportion of sediment that deposits in the Lagoon originates from tidal inputs during lower watershed loading periods, therefore, the TMDL results show that a net decrease in oceanic loads occurs during the critical wet period under historical landuse conditions. To meet the TMDL, the total load reduction required from the watershed is approximately 67%. Tidal input from the ocean boundary represents natural background loads, therefore, no reduction is required for this source category.

Table 3. TMDL summary

Source	Critical Wet Period Load (tons)	Daily Load (tons)
TMDL	12,360	59
Watershed contribution (WLA)	2,580	12
Ocean boundary (LA)	9,780	46
MOS	Implicit	Implicit

Table 4. Current vs. historical loads and percent reduction

Source	Current Load (tons)	Historical Load (tons)	Load Reduction (tons)	Percent Reduction Required
TMDL	13,663	12,360	1,303	10%
Watershed contribution (WLA)	7,719	2,580	5,139	**67%**
Ocean boundary (LA)	5,944	9,780	+3,836 (increase)	+39% (increase)

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Attachment 2

Modeling Report

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Los Peñasquitos Lagoon Sediment TMDL Modeling - Final

Referenced as Attachment 2 to the Staff Report for the Los Peñasquitos Lagoon Sediment/Siltation TMDL.

Also referenced as Appendix A to the Technical Support Document for the Los Peñasquitos Lagoon Sediment/Siltation TMDL.

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October 12, 2010

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Introduction

The Los Peñasquitos watershed and lagoon are located in central San Diego County (Figure 1). Both the watershed and lagoon are included in the Los Peñasquitos Hydrologic Unit (906), which also includes Mission Bay and several coastal tributaries [1]. The lagoon was included in the Clean Water Act's (CWA) Section 303(d) list for sediment/siltation and is the primary focus of this study. Increasing urban development has altered hydrology within the watershed and modified the geomorphic conditions of the three main tributaries that feed into the lagoon. These conditions have resulted in sedimentation in the lagoon-watershed interface and within lagoon channels (City of San Diego, 2009).

Tetra Tech (Tt) is supporting the City of San Diego and stakeholders by developing and calibrating models to support ongoing sediment TMDL development efforts for Los Peñasquitos Lagoon. Water quality simulation models are needed to link potential sources of sediment loading to lagoon impacts for TMDL development and analysis of management scenarios. The linked watershed and lagoon models were developed based on models that were previously configured for the U.S. Environmental Protection Agency (EPA) and the Regional Water Quality Control Board. These models were refined with additional calibration and validation based on monitoring data that were recently collected by the watershed stakeholders.

This report describes the approach that was used to develop and refine the Los Peñasquitos watershed and lagoon models. Model calibration/validation results are also presented and discussed. The watershed model used information on watershed soils, land use, topography, and stream networks to simulate the hydrology and sediment input to the lagoon. The lagoon model incorporates watershed inputs and oceanic forcings (tidal flooding) to mimic the circulation and sediment transport within the lagoon. This modeling framework will eventually be used to simulate existing (baseline) conditions within the watershed and lagoon, calculate the numeric TMDL target, identify required sediment load reductions, and evaluate possible management actions.

[1] http://www.projectcleanwater.org/html/ws_penasquitos.html

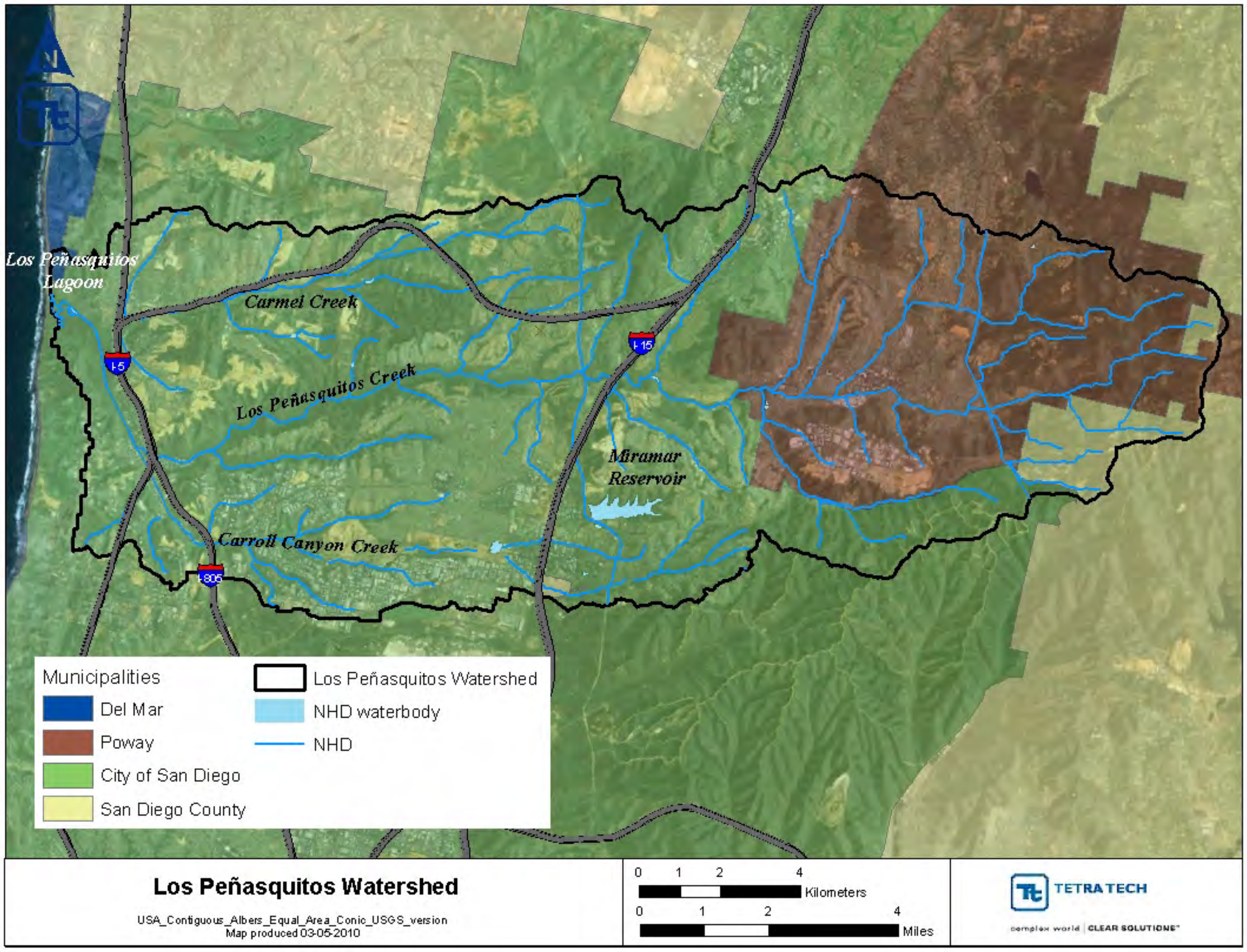

Figure 1. Location of the Los Peñasquitos watershed and lagoon

Watershed Description

The Los Peñasquitos Lagoon watershed is a 93 mi^2 coastal watershed located in central San Diego County. The watershed includes portions of the cities of San Diego, Poway, and Del Mar. In addition, a small portion of San Diego County is located in the eastern headwaters area. Three major streams drain the watershed and flow into the tidal lagoon. Los Peñasquitos Creek is the largest catchment in the watershed draining 59 mi^2 through its central portion. Carroll Canyon Creek is the second largest catchment (18 mi^2) and drains the southern portion of the watershed. Carmel Creek is located along the northern, coastal area and drains the remaining 16 mi^2. Los Peñasquitos Creek and Carroll Canyon Creek confluence together prior to entering the lagoon. There is one major dam in the Carroll Canyon Creek watershed, which drains approximately 1 mi^2 and forms Miramar Reservoir. Key watershed characteristics, including land use, soils, and other features that are important for model representation are described in later sections.

Lagoon Description

The Los Peñasquitos Lagoon is a relatively small salt marsh lagoon (0.6 mi^2) that is part of the Torrey Pines State Reserve. Given the status of "Natural Preserve" by the California State Parks, the lagoon is one of the few remaining native salt marsh lagoons in California and provides a home to several endangered species. The lagoon is ecologically diverse, supporting a variety of plant species, and providing habitat for numerous bird, fish, and small mammal populations. The lagoon also serves as a stopover for migratory birds and provides habitat for coastal marine and salt marsh species.

The lagoon is listed as impaired on the CWA's Section 303(d) list due to sediment/siltation impacts that originate from watershed sediment contributions. Tidal flows enter the lagoon during periods when the lagoon mouth is open to the ocean. Currently, the lagoon mouth is open throughout most of the year. Mouth closures are typically caused by coastal processes (deposition of sand and cobble from nearshore sources) and structures, such as the Highway 101 abutments. Mechanical dredging is used when needed to eliminate blockages and allow for tidal flow into the lagoon in order to improve water quality conditions and support salt marsh species. Most of the freshwater input flows through Los Peñasquitos Canyon into the lagoon. Carroll Canyon Creek to the south and Carmel Creek to the north also contribute freshwater to the lagoon. Historically, Los Peñasquitos Creek was the only tributary that flowed year-round, while Carroll Canyon and Carmel Creeks only flowed during significant rainfall events. Beginning in the 1980's, these drainages also began flowing year-round due to increasing urban development within the watershed. Carroll Canyon Creek confluences with Los Peñasquitos Creek upstream and the combined stream channel extends into the lagoon along the western side of the railroad track berm. This berm acts as a barrier between the eastern and western portions of the lagoon for much of its length. The railroad trestle along the northern side provides the only connection between eastern and western portions of the lagoon. The lagoon channel that receives flow from Carmel Creek crosses through this area.

The regional climate is characterized by higher precipitation during winter months and lower precipitation (and corresponding high lagoon salinity) during the dry summer months (Williams, 1997). Storm events transport sediment into the lagoon which deposits on the salt flats and within lagoon channels. These sediment deposits have gradually built-up over the years due to increased sediment loading and inadequate flushing, which directly and indirectly affects lagoon functions and salt marsh characteristics.

Data Inventory and Analysis

Multiple data sources were used to characterize the watershed and lagoon, in particular flow and water quality conditions. Much of this information was recently collected by the watershed stakeholders to assist with model development. Data describing the watershed's topography, land use, and soil characteristics were compiled and used to develop the watershed model. Stream flows and total suspended sediment concentrations were used to calibrate both the lagoon and watershed model components. The lagoon was also characterized using available bathymetric survey information, data sondes analyzing pressure and salinity, and sediment grab samples.

Land Use

Land use information was used in the model to characterize watershed imperviousness and the amount of sediment that washes off land surfaces, depending on land use type. Data detailing land use in the Los Peñasquitos watershed was based on the San Diego Association of Governments 2000 land use coverage[2] (Figure 2). The largest single land use type in the Los Peñasquitos watershed is open space. Approximately 54 percent of the watershed has been developed, with 46 percent of that area classified as impervious. The area and percent distribution of land uses within the watershed is presented in Table 1.

[2] http://www.sandag.org/resources/maps_and_gis/gis_downloads/downloads/zip/Land/CurrentLand/lu.zip

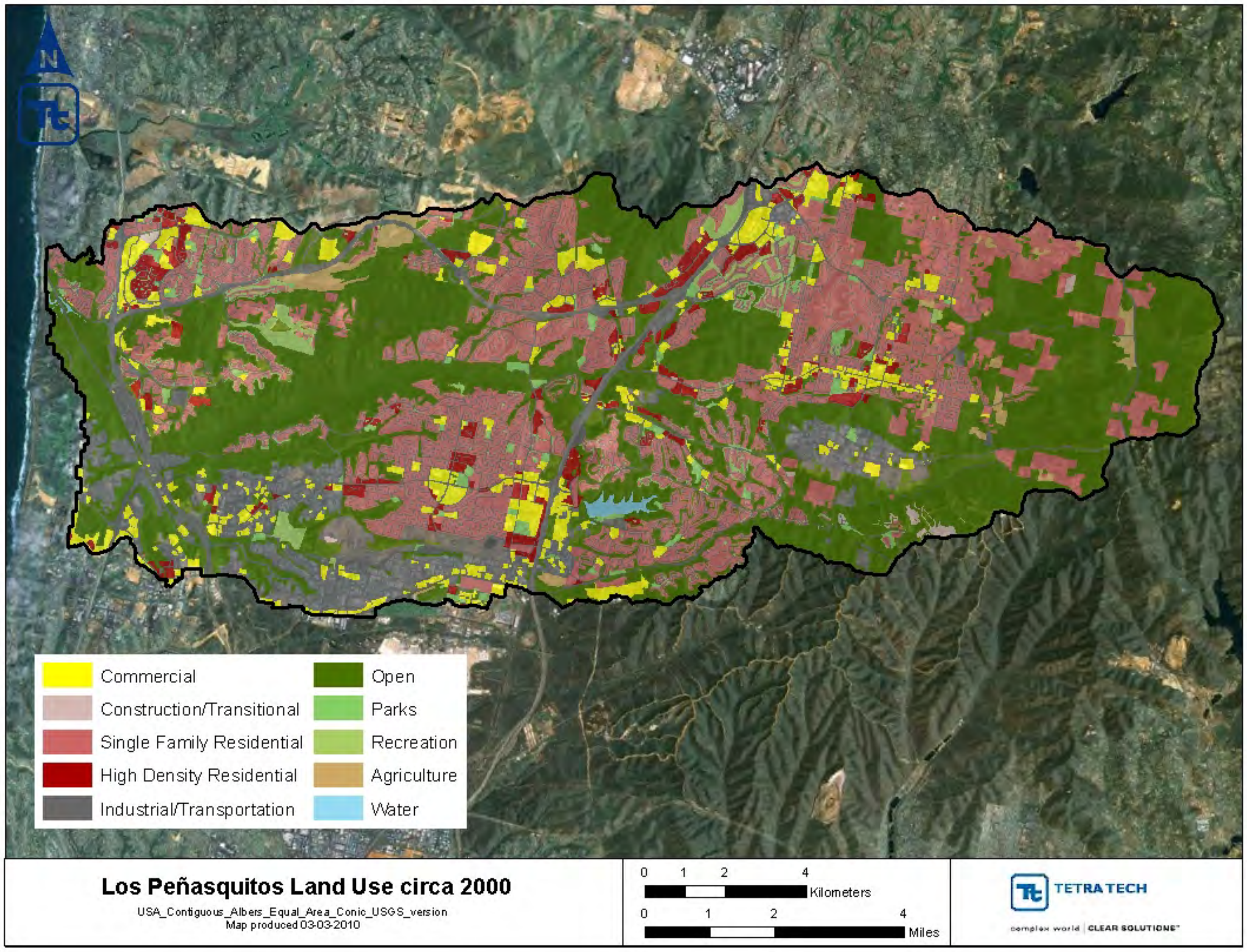

Figure 2. Land use distribution in the Los Peñasquitos watershed

Table 1. Area and percent land use distribution

Land Use Group	Land Use area (acres)	Percent Total
Agriculture	741	1.2%
Commercial Institutional	3,596	6.0%
High Density Residential	1,855	3.1%
Industrial/Transportation	11,658	19.5%
Low Density Residential	14,254	23.8%
Open	25,497	42.6%
Open Recreational	713	1.2%
Parks Recreational	1,335	2.2%
Transitional	171	0.3%

Topography

Topographical information was primarily used to describe the slope of the main tributaries within the watershed. Ten meter elevation data were obtained from the San Diego Association of Governments[3]. Elevation within the watershed rises from sea level to 2,600 ft in the headwaters (Figure 3).

[3] http://www.sandag.org/resources/maps_and_gis/gis_downloads/downloads/zip/elev10grd.zip

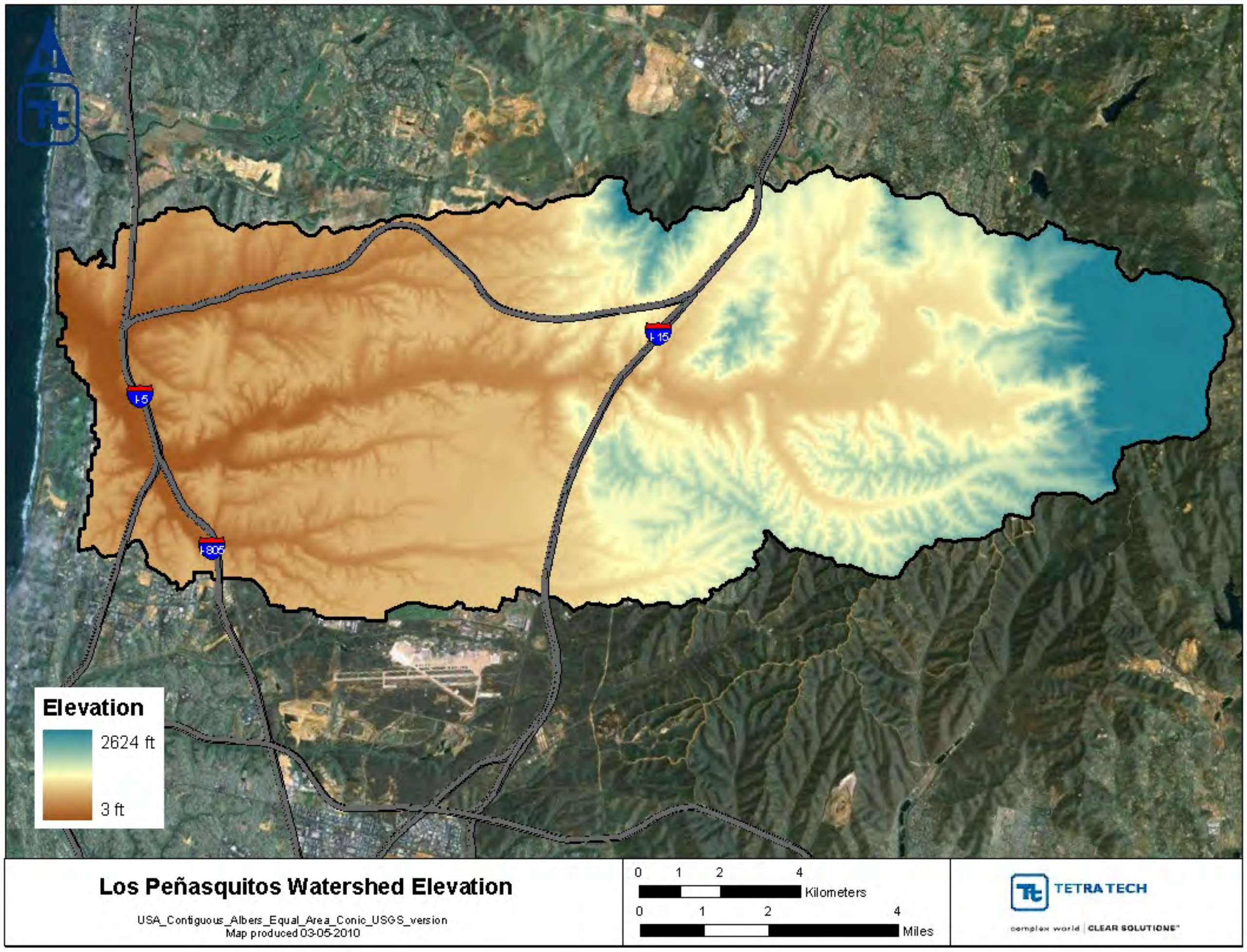

Figure 3. Topography in the Los Peñasquitos watershed

Soil Characteristics

Soils data for the Los Peñasquitos watershed were used to group watershed catchments based on differing infiltration rates. The Soil Survey Geographic (SSURGO) Database[4] was used to characterize the soils. The majority of the watershed is located within hydrologic soil group D, which is indicative of a low infiltration rate and a high potential for surface runoff (Figure 4). As a result, Group D soils are more susceptible to erosion and can contribute significant sediment loads.

Soil erodibility values (K factor) were obtained from the SSURGO database and used in conjunction with slope information to calculate the coefficient in the soil detachment equation (KRER) for each land use/hydrologic soil group combination. The proportion of sand, silt and clay within each hydrologic soil group (particle size distribution) was also extracted from the SSURGO database. Soils that are more easily transported typically have higher proportions of smaller particles sizes (silt and clay fractions), as compared to local parent soils, because of differences in settling rates and other sediment transport characteristics. To account for these differences, soils transported by surface runoff were assumed to be composed of 5 percent sand, twice as much clay as the percentage of clay within each hydrologic soil group, and the remainder assigned to the silt fraction (Table 2).

[4]http://soils.usda.gov/survey/geography/ssurgo/. National Resources Conservation Service. Accessed September 2008

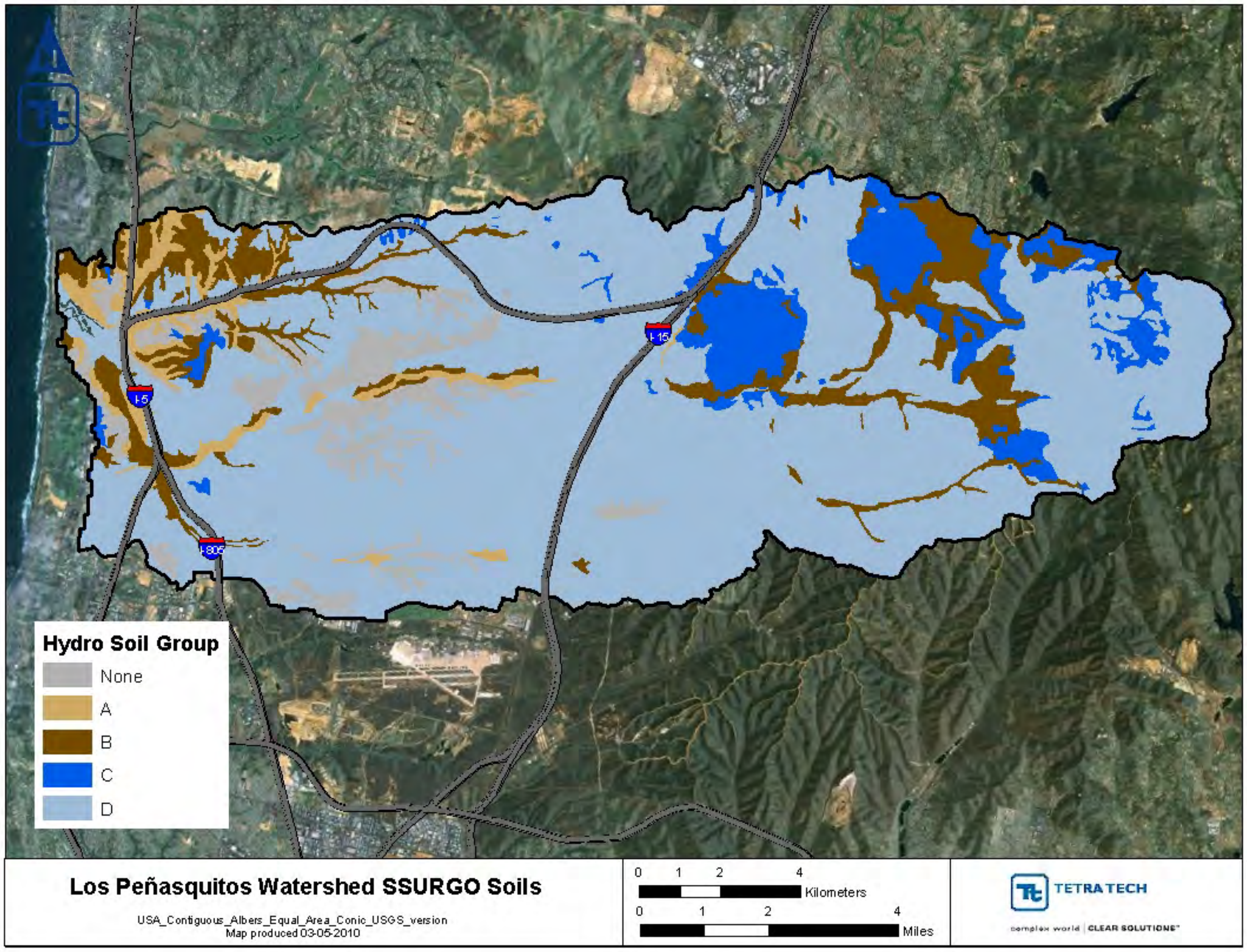

Figure 4. Hydrologic soil groups in the Los Peñasquitos watershed

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Table 2. Sand, silt, and clay distribution by hydrologic soil group

	Hydrologic Soils Group		
	B	C	D
SSURGO Soil Fractionation			
SAND	60 %	26 %	14 %
SILT	67 %	19 %	14 %
CLAY	47 %	32 %	21 %
Surface Soil Runoff Fractionation			
SAND	5 %	5 %	5 %
SILT	67 %	67 %	54 %
CLAY	28 %	28 %	41 %

Meteorological Data

Surface runoff and associated pollutant transport is dependent on the water balance, including precipitation inputs and evapotranspiration outputs. Meteorological data describing rainfall and potential evapotranspiration (PET) were compiled to describe the hydrologic cycle of the watershed. Precipitation data were obtained from two local Alert weather stations: 24 and 22 (available from the San Diego County Flood Control District) (Figure 5). Rainfall from Alert station 24 was used to represent the upper portion of the watershed and Alert station 22 the lower portion. Data collected at these stations were available from 1/1/1990 through 6/30/2008 (Table 3). Additional rainfall data were collected by the City of San Diego (2009) at three flow monitoring stations between 9/13/2007 and 6/16/2008.

The PET time series was developed from nearby California Irrigation Management Information System (CIMIS) stations[5] (Figure 5). CIMIS station 74 was primarily used to assign hourly PET values to each weather station. For days when the station did not record PET, a secondary station (CIMIS 62) was used to patch the missing dates (Table 4). CIMIS station 62 is located 30 miles to the northwest of the watershed in Temecula. A ratio of the average annual PET over the simulation period was used to scale the secondary PET values, as needed.

[5] http://wwwcimis.water.ca.gov/cimis/welcome.jsp

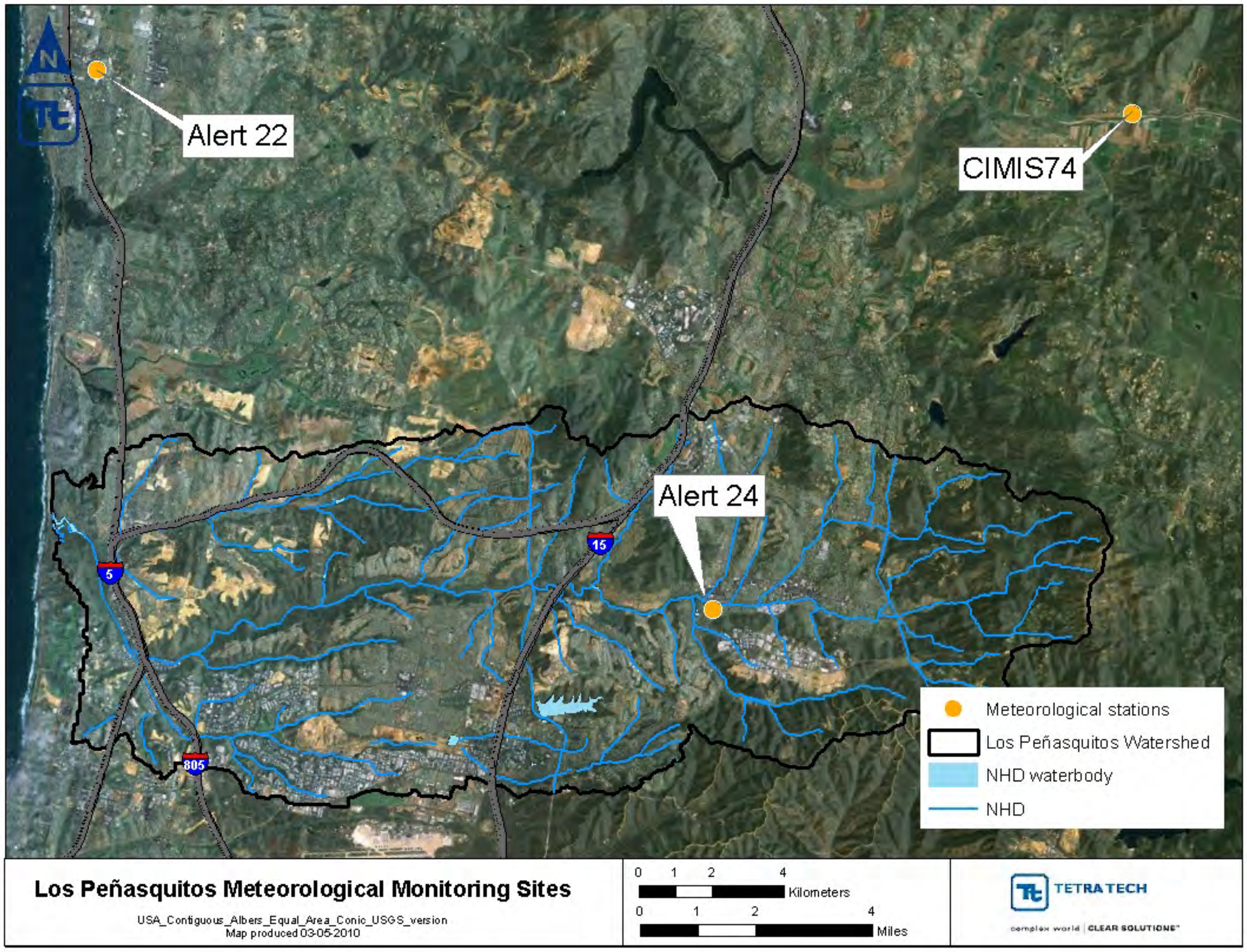


Figure 5. Meteorological stations within and near the Los Peñasquitos watershed

Table 3. Hourly rainfall gages

Station Name	Elevation (ft)	Data Collection Period		Precipitation (in/yr)
		Start	End	
Alert 24	446	1/1/1990	6/30/2008	8.14
Alert 22	250	1/1/1990	6/30/2008	6.96

Table 4. Potential evapotranspiration (PET) stations

Station Name	Elevation (ft)	Data Collection Period		Percent Missing
		Start	End	
CIMIS 74	450	1/1/1990	12/20/1998	48%
CIMIS 62	1420	1/1/1990	6/30/2008	3%

Streamflow Data

Available streamflow data collected within the watershed were compiled for model calibration and validation. The United States Geological Survey (USGS) maintains a long term flow gage (11023340) in the upper Los Peñasquitos watershed (Figure 6). Daily data from 1990 through 2008 were downloaded for calibration of model hydrologic parameters[6]. Total suspended solids (TSS) data were also collected at this location and a downstream USGS sediment monitoring station (325423117124501). Sediment monitoring data are described in the following section.

[6] http://waterdata.usgs.gov/nwis/dv/?site_no=11023340&referred_module=sw

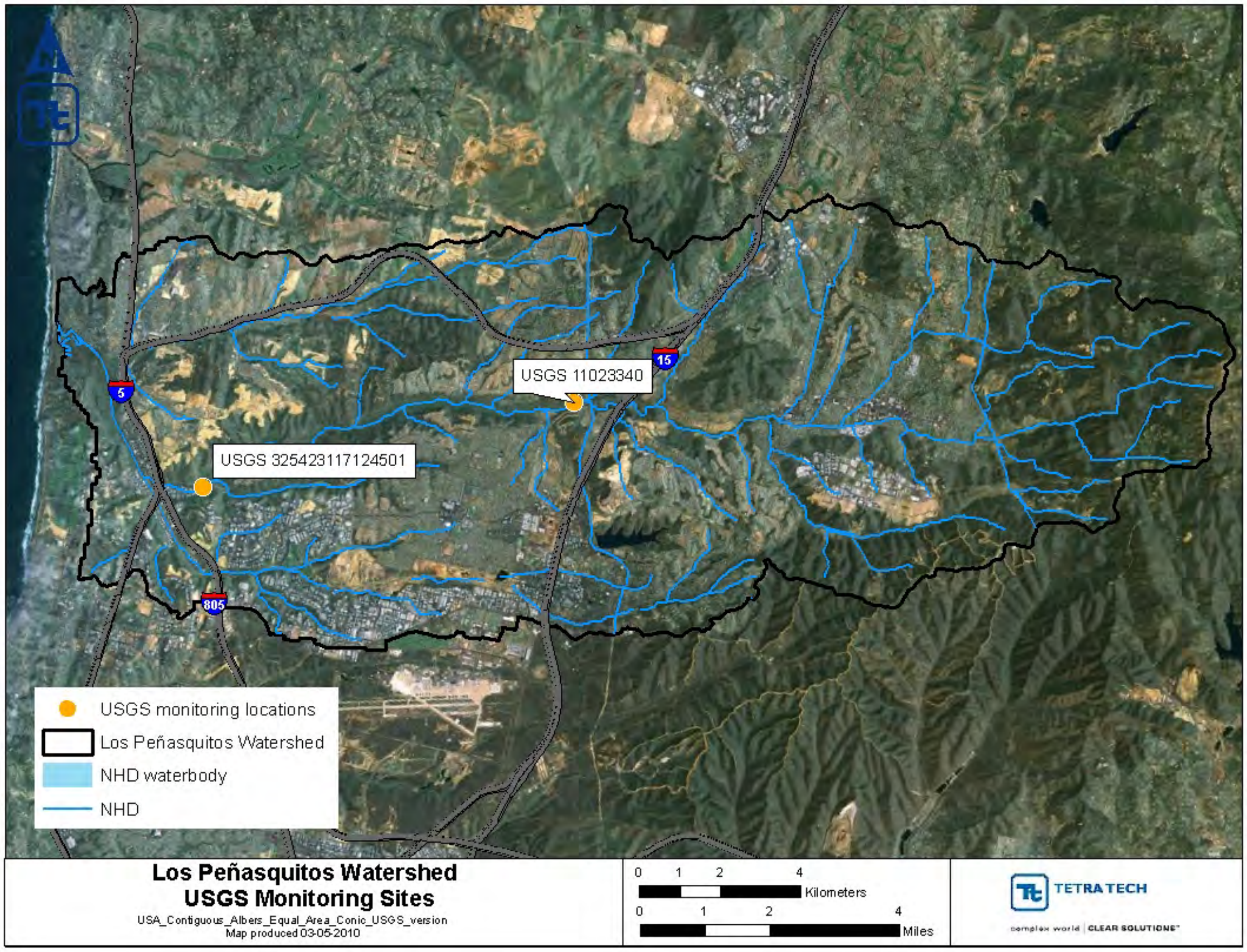


Figure 6. USGS monitoring locations in the Los Peñasquitos watershed

Additional streamflow data were collected at the base of Los Peñasquitos, Carroll Canyon, and Carmel Creeks as part of the Los Peñasquitos TMDL monitoring study (City of San Diego, 2009) (Figure 7). The Los Peñasquitos TMDL monitoring station was co-located with the long term Los Peñasquitos Creek Mass Loading Station (MLS) that undergoes routine water quality monitoring. Note that two additional monitoring stations within the watershed (LPC-TWAS-1 and LPC-TWAS-2) are shown in Figure 7 and are described in the following section. Flows were determined by applying the Manning's Equation to data collected with Sigma 950 or 920 flow meters with area velocity meters and pressure transducers. Sampling frequency ranged from 5 to 15 minute intervals. Instruments were deployed on 9/13/2007 and retrieved on 6/16/2008.

Los Peñasquitos Creek drains the largest area within the watershed and, accordingly, recorded the highest measured flows and runoff volume (Figure 8). Median flows in Los Peñasquitos Creek were roughly twice those in Carmel Creek and two orders of magnitude greater than in Carroll Canyon Creek. A continual increase in cumulative volume for Los Peñasquitos Creek and Carmel Creek indicated consistent baseflows. By contrast, streamflow data collected on Carroll Canyon Creek included periods with little change in cumulative volume, which indicates low baseflow. Low flows at this station were within the tenth percentile (Figure 8).

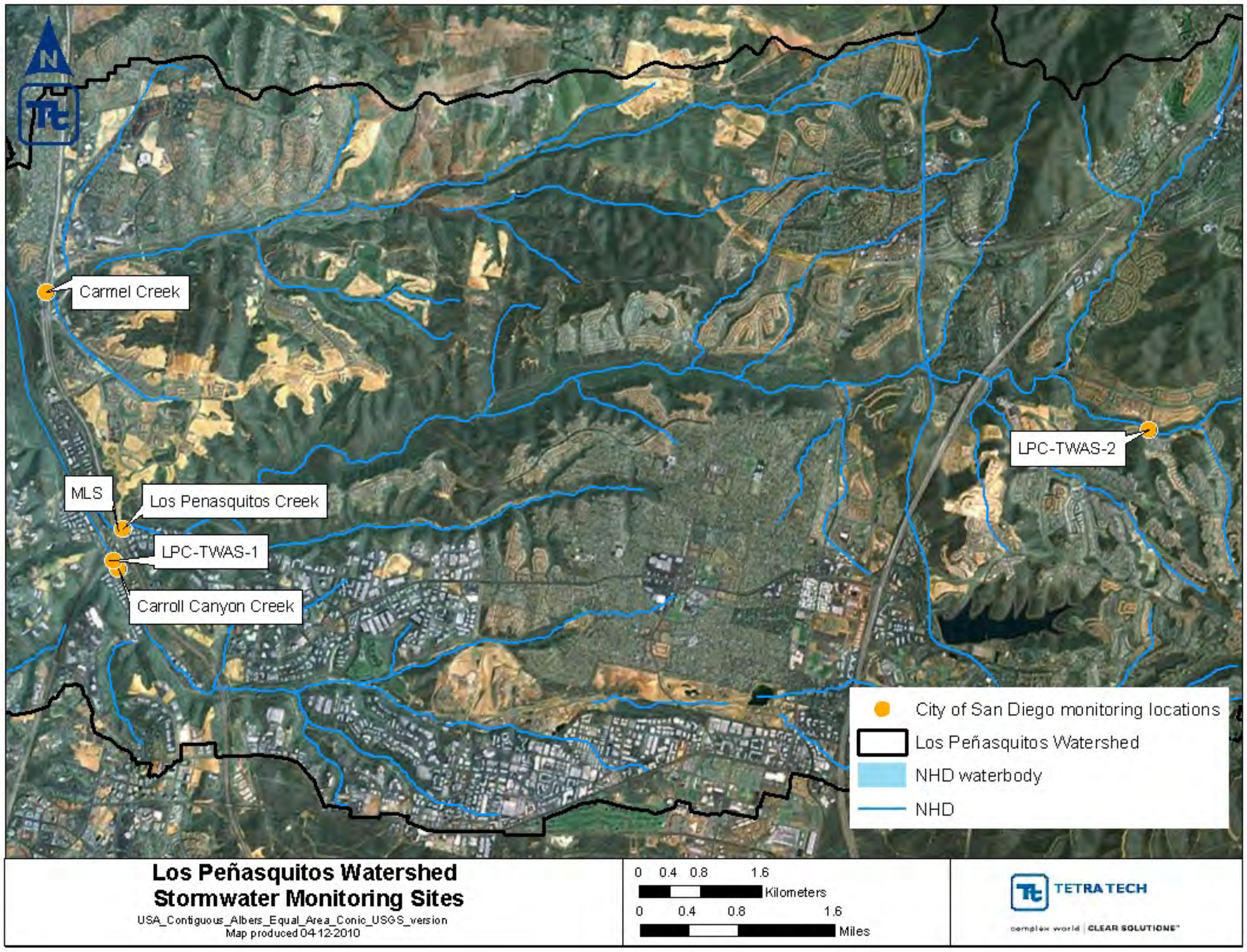


Figure 7. Stormwater monitoring locations in the Los Peñasquitos watershed

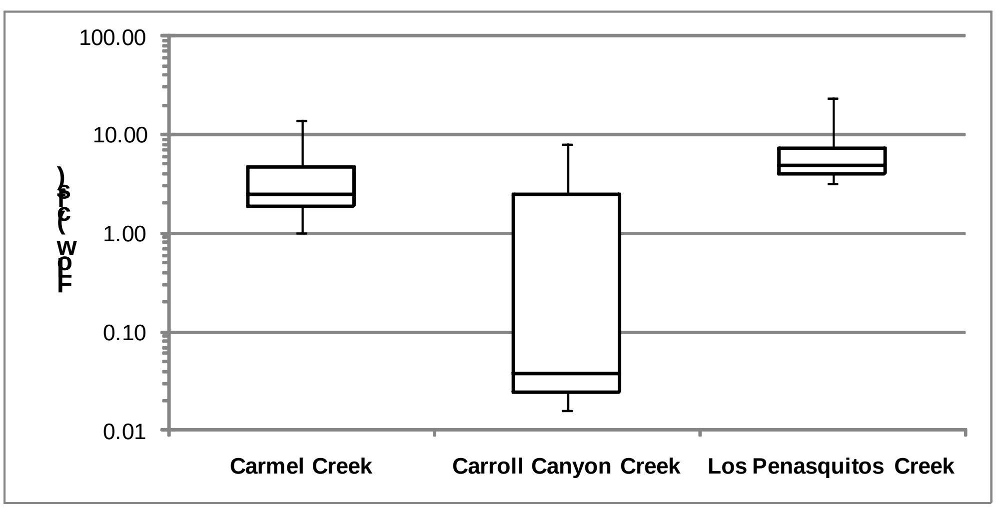


Figure 8. Measured flows at TMDL monitoring locations

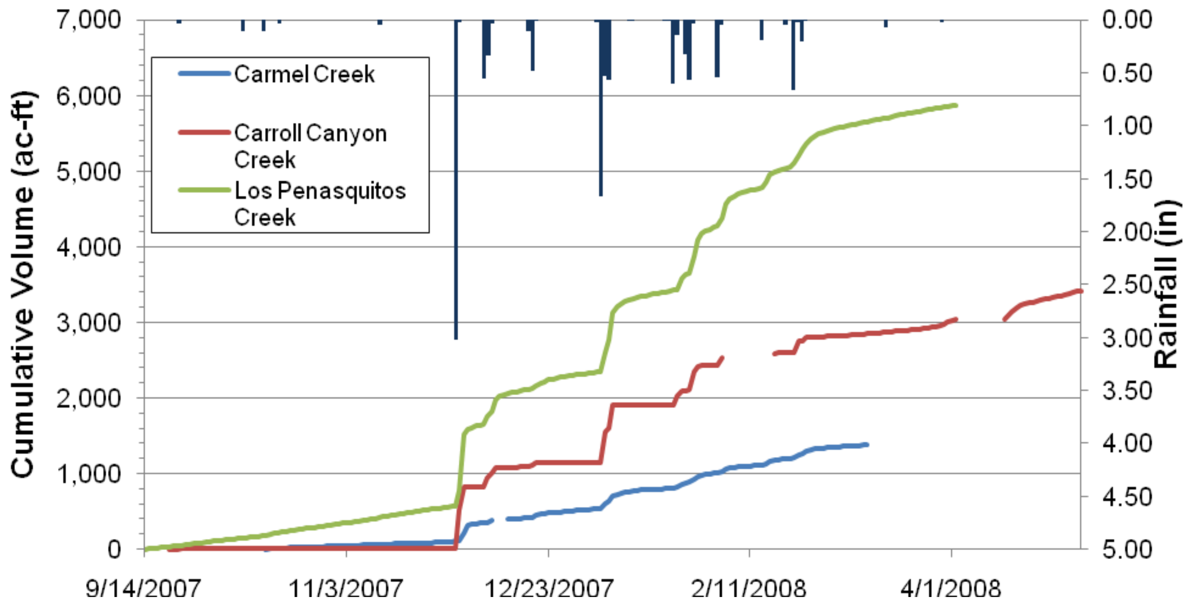


Figure 9. Cumulative volumes at TMDL monitoring locations

Measuring streamflow in the Los Peñasquitos watershed presents difficulties that are common to urban, arid watersheds. The Los Peñasquitos and Carmel Creek monitoring locations were both natural channels with heavy vegetation. During monitoring, cross section measurements were taken at each station at regular intervals with flows estimated using Manning's equation. The Carmel Creek location had ponded conditions due to a flow control structure located downstream of the box culvert. The Carroll Canyon Creek monitoring location is a concrete lined trapezoidal channel. Median depths in Los Peñasquitos, Carmel, and Carroll Canyon Creeks were 7.0, 4.8, and 0.95 inches, respectively. Because of shallow water depths, variability in natural channel cross sections, and water not distributed uniformly across the concrete channel in Carroll Canyon Creek, flows are difficult to accurately monitor over a long period (Figures 10 and 11). Also, small differences in depths or depth homogeneity across the channel can result in large differences in flows at the lower end of the station rating tables.

Figure 10. Photos near the Carroll Canyon Creek monitoring station

Figure 11. Photo at the Los Peñasquitos Creek monitoring station

Comparison of the flow record at the Los Peñasquitos Creek MLS and the USGS gaging station upstream (11023340) shows a distinct difference in recorded flows. There was small difference in average daily flow throughout the common period of record (9/13/2007 – 3/31/2008) (Figure 12). However, when cumulative volumes are compared (Figure 13), the total volume measured at the USGS station (8,000 ac-ft) is greater than the volume measured downstream at the MLS (5,870 ac-ft). An estimate of the water volume that would need to be infiltrated by the creek over the 200 days of record, assuming an average creek width of 8 ft, results in an infiltration rate of 0.6 in/hr. This estimated infiltration rate is higher than expected and may indicate an error in the rating table at the MLS station, especially at higher flows. It is difficult to develop a rating table at the MLS, or any of the monitoring locations, during storm flows because of the high velocities in the creek and safety concerns for monitoring staff. Possible data limitations were considered during model development and calibration.

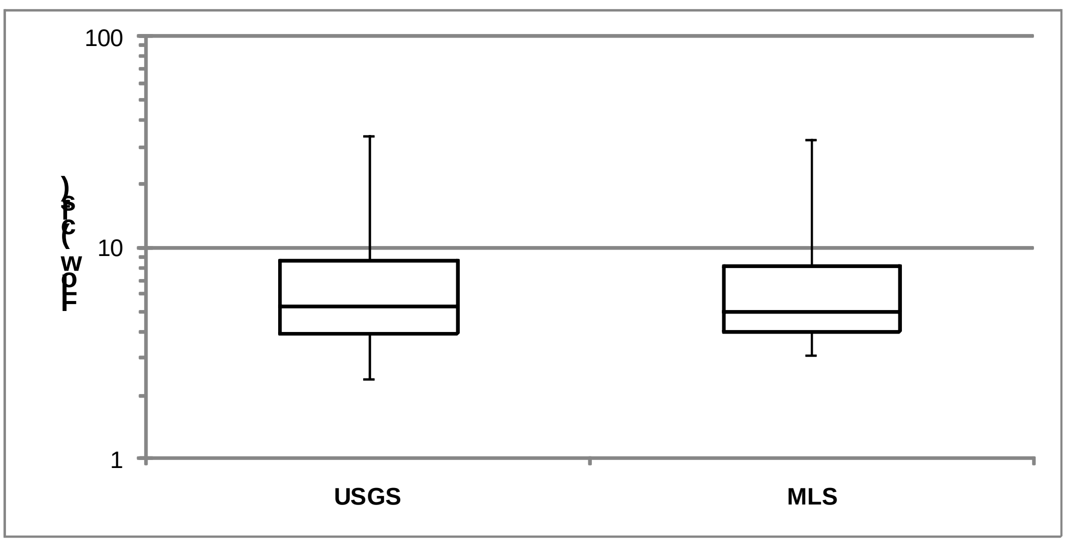


Figure 12. Comparison of flows at the MLS and USGS gaging station (11023340)

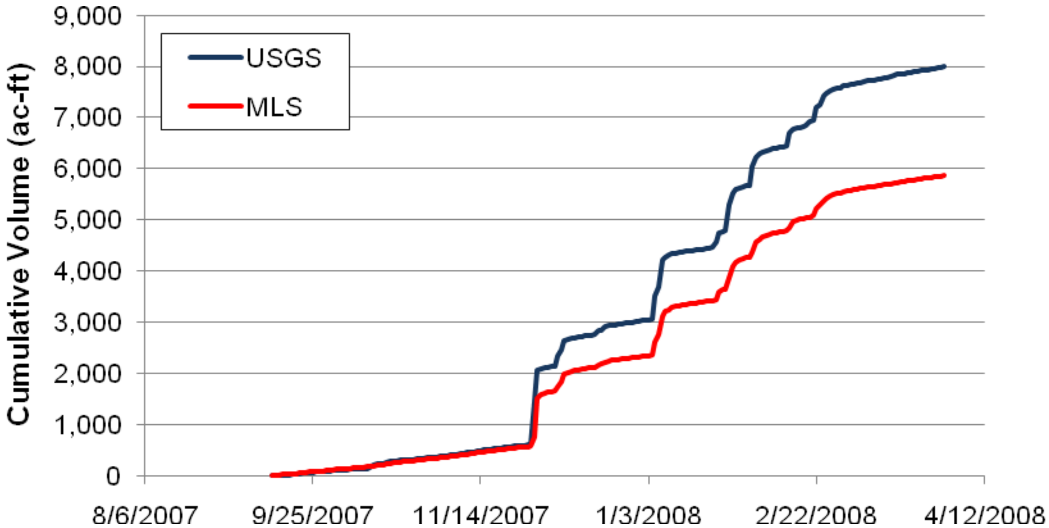


Figure 13. Comparison of cumulative volumes at the MLS and USGS gaging stations

Suspended Sediment Data

Suspended sediment and particle size data were collected at several locations within the Los Peñasquitos watershed and used to develop and calibrate the watershed model. Total suspended sediment (TSS) data were collected in the watershed by three different agencies. The USGS collected 19 samples at gage 11023340 between 11/12/1985 and 10/25/1986 and five samples at gage 325423117124501 from 1/20/1982 to 3/18/1982 (USGS, 2009) (Table 5). Event mean concentrations (EMCs) from stormwater and dry weather runoff were collected at the MLS on Los Peñasquitos Creek near the confluence with Carroll Canyon Creek. Stormwater and dry weather runoff events were also monitored at this station since 2001, in accordance with NPDES permit requirements. In addition, two Temporary Watershed Assessment Stations (TWAS) are located within the watershed on Los Peñasquitos Creek upstream (TWAS-2) and on Carroll Canyon Creek (TWAS-1). These stations were monitored on 11/30/2007 and 2/3/2008 (Figure 7 above; Table 6). The relationship between rainfall and TSS at the MLS is shown in Figure 14. Collectively, these data were used to better understand the relationship between flow and sediment loading for model development purposes.

Table 5. TSS measurements at USGS stations on Los Peñasquitos Creek

USGS 11023340			USGS 325423117124501		
Date Time	Flow (cfs)	TSS Concentration (mg/L)	Date Time	Flow (cfs)	TSS Concentration (mg/L)
11/12/1985 10:00	70	362	1/20/1982 15:15	4.87	222
11/12/1985 10:30	70	365	1/21/1982 10:20	7.9	1060
11/12/1985 15:15	93	321	3/15/1982 8:40	4.33	1070
11/12/1985 16:00	100	321	3/17/1982 11:05	6.71	366
11/25/1985 13:00	460	1640	3/18/1982 16:50	10.9	245
11/25/1985 13:45	432	1400			
11/26/1985 13:00	32	252			
11/30/1985 10:30	162	605			
12/3/1985 12:30	180	570			
1/30/1986 14:40	39	120			
2/8/1986 10:15	136	436			
2/8/1986 14:00	209	334			
2/15/1986 14:30	639	1390			
2/16/1986 9:15	146	201			
3/10/1986 12:15	130	437			
3/10/1986 13:15	93	432			
3/16/1986 8:15	375	800			
9/25/1986 12:45	75	172			
10/25/1986 12:45	75	172			

Table 6. Rainfall and TSS measurements at the MLS and TWAS stations on Los Peñasquitos Creek

Date	Station	Rain (in)	TSS (mg/L)
11/29/01	MLS	0.10	<20
2/17/02	MLS	0.14	<20
3/17/02	MLS	0.35	<20
11/8/02	MLS	0.11	35
12/16/02	MLS	0.33	58
2/11/03	MLS	0.43	38
11/12/03	MLS	0.28	27
2/3/04	MLS	0.20	<20
2/18/04	MLS	0.12	<20
10/17/04	MLS	0.16	<20
2/11/05	MLS	0.52	<20
2/18/05	MLS	0.28	108
10/17/05	MLS	0.16	20
2/20/06	MLS	0.16	30
2/28/06	MLS	0.28	182
12/10/06	MLS	0.08	22
1/30/07	MLS	0.20	<20
2/19/07	MLS	1.10	81
11/30/07	MLS	3.03	130
11/30/07	TWAS-1	3.03	260
11/30/07	TWAS-2	3.03	113
2/3/08	MLS	0.59	26
2/3/08	TWAS-1	0.59	40
2/3/08	TWAS-2	0.59	200

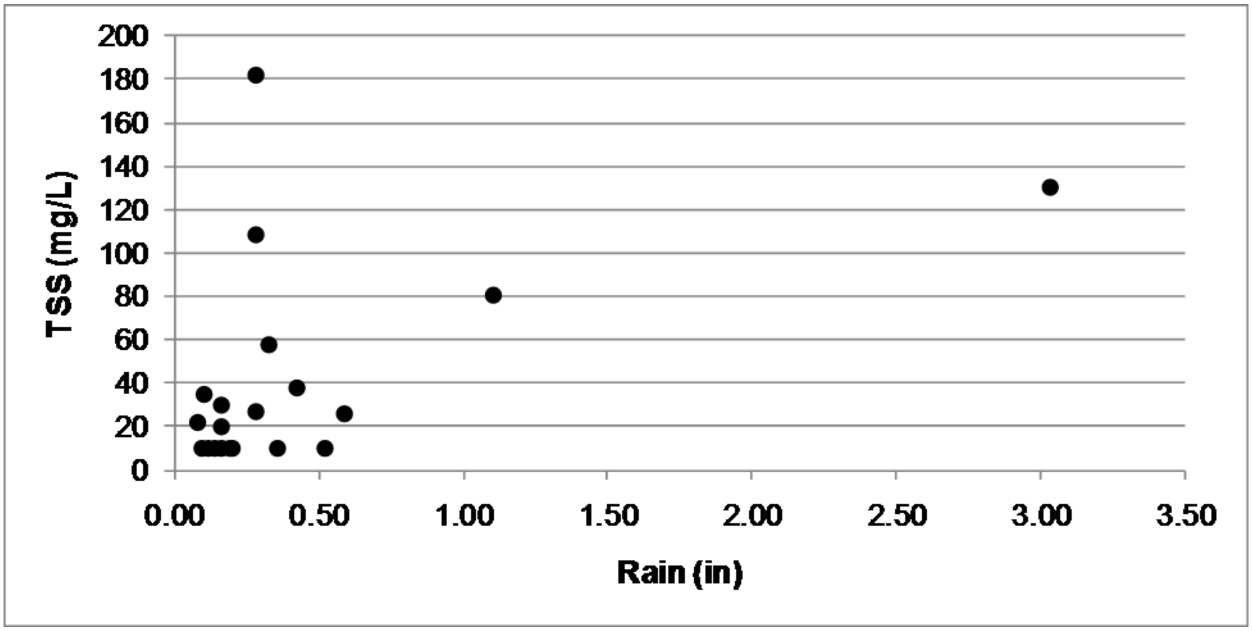


Figure 14. Relationship between rainfall and TSS measured at the MLS

Pollutograph samples characterizing suspended sediment concentration changes throughout a storm were collected during three storms in the 2007-2008 storm season as part of the TMDL monitoring study. Samples were collected from the three major streams flowing into the lagoon: Los Peñasquitos, Carroll Canyon, and Carmel Creeks (see Figure 7). The Los Peñasquitos Creek location was co-located with the MLS, which had EMC monitoring data. Pollutograph samples consist of multiple individual samples collected throughout a storm which are individually analyzed. Typically, EMCs are calculated for each monitored storm using the following equation:

$$EMC = \frac{\sum V_i * C_i}{\sum V}$$

where V is volume and C is concentration. Pollutograph samples are superior to volume- or time-weighted sampling because multiple samples provide insight into how concentrations change throughout a monitored event. The 95th percent confidence interval (1.96 * standard error of the mean) was calculated for each pollutograph sampling event and was used to compare to the median concentrations of the other sampling efforts.

$$CI = 1.96\sqrt{\frac{\sum\left[\left(c_i - \bar{c}\right)v_i\right]^2}{\left(\sum v_i\right)^2}}$$

Pollutograph TSS concentrations recorded during each storm event at the Los Peñasquitos, Carroll Canyon, and Carmel Creek TMDL stations are shown in Table 7 through 9.

Table 7. Pollutograph measurements of TSS (mg/L) at Carmel Creek

11/30/07 Storm		12/7/07 Storm		2/3/08 Storm	
Date Time	TSS	Date Time	TSS	Date Time	TSS
11/30/07 9:40	91	12/7/07 4:40	34	2/3/08 7:01	123.9
11/30/07 10:40	180	12/7/07 5:40	11	2/3/08 7:48	0.7*
11/30/07 11:40	56	12/7/07 6:40	8.5	2/3/08 8:18	4.3*
11/30/07 11:40	56	12/7/07 8:06	15.5	2/3/08 8:48	16
11/30/07 14:40	83	12/7/07 8:36	15.5	2/3/08 9:18	30
11/30/07 15:40	38	12/7/07 9:06	12	2/3/08 10:01	44
11/30/07 20:40	15	12/7/07 9:06	11.1	2/3/08 10:18	9.5
11/30/07 23:40	32	12/7/07 10:06	11	2/3/08 11:48	7.3
12/1/07 1:40	19.5	12/7/07 10:06	12.3	2/3/08 12:01	33.3
12/1/07 3:20	14	12/7/07 11:06	12.3	2/3/08 12:40	8.7
12/1/07 4:40	16	12/7/07 11:36	16	2/3/08 12:40	10
		12/7/07 13:06	14	2/3/08 13:01	32
		12/7/07 15:40	13	2/3/08 13:01	30.7
		12/7/07 21:02	38.3	2/3/08 13:40	10.7
				2/3/08 15:01	31.3
				2/3/08 15:10	14
				2/3/08 16:40	7
				2/3/08 17:01	62
				2/3/08 18:40	3.7*
				2/3/08 18:40	3.7*
				2/3/08 19:01	28.7
				2/3/08 20:10	4.7*
				2/3/08 21:15	15.3
				2/4/08 1:15	40
				2/4/08 1:15	2.7*
				2/4/08 5:15	21.3
				2/4/08 11:15	32
				2/4/08 15:15	24.7

* Less than reporting limit (RL)

Table 8. Pollutograph measurements of TSS (mg/L) at Carroll Canyon Creek

11/30/07 Storm		12/7/07 Storm		2/3/08 Storm	
Date Time	TSS	DateTime	TSS	DateTime	TSS
11/30/07 12:35	488	12/7/07 5:30	222	2/3/08 7:10	ND
11/30/07 13:36	340	12/7/07 7:10	130	2/3/08 7:10	1*
11/30/07 14:35	716	12/7/07 8:10	237	2/3/08 8:35	30.3
11/30/07 14:35	716	12/7/07 8:40	558	2/3/08 9:05	7.7
11/30/07 15:35	596	12/7/07 9:10	476	2/3/08 10:14	30
11/30/07 16:44	396	12/7/07 9:40	404	2/3/08 11:21	148
11/30/07 17:40	144	12/7/07 10:10	380	2/3/08 12:13	221
11/30/07 18:35	116	12/7/07 10:40	312	2/3/08 13:07	241
11/30/07 20:30	60	12/7/07 11:10	206	2/3/08 14:07	178
11/30/07 21:30	568	12/7/07 11:40	224	2/3/08 15:07	117.5
11/30/07 22:40	760	12/7/07 12:40	66	2/3/08 16:07	100
		12/7/07 15:31	29	2/3/08 17:07	106
				2/3/08 17:07	96
				2/3/08 21:37	31

* Less than reporting limit (RL)

Table 9. Pollutograph measurements of TSS (mg/L) at Los Peñasquitos Creek

11/30/07 Storm		12/7/07 Storm		2/3/08 Storm	
Date Time	TSS	Date Time	TSS	Date Time	TSS
11/30/07 11:14	53	12/7/07 7:52	3.7*	2/3/08 8:13	2*
11/30/07 14:14	35	12/7/07 11:52	5.3	2/3/08 8:13	3.3*
11/30/07 18:14	140	12/7/07 13:22	13.7	2/3/08 10:13	1.5*
11/30/07 18:14	134	12/7/07 15:01	22.3	2/3/08 12:13	ND
11/30/07 19:14	170	12/7/07 16:01	26.3	2/3/08 14:13	1*
11/30/07 21:14	68	12/7/07 17:01	23.3	2/3/08 16:13	6.7
11/30/07 22:14	60	12/7/07 18:01	17	2/3/08 17:13	12.7
12/1/07 1:14	40	12/7/07 19:01	15.7	2/3/08 19:13	17.3
12/1/07 4:14	23.3	12/7/07 22:01	5.7	2/3/08 21:13	12.7
12/1/07 6:14	78	12/8/07 1:01	4.3*	2/3/08 22:27	12.65
12/1/07 10:14	30	12/8/07 3:01	3.7*	2/4/08 0:27	7.3
		12/8/07 8:01	2.7*	2/4/08 6:27	3*
				2/4/08 6:27	1*
				2/4/08 12:16	4*

* Less than reporting limit (RL)

TSS data collected through all sampling efforts within the Los Peñasquitos watershed were compared (Figure 15). TSS concentrations recorded at the MLS on Los Peñasquitos Creek since 2001 were more than five times lower than the data collected by the USGS at both stations. There were no significant difference in TSS between the two USGS stations/sampling periods. A small difference in the TSS EMC was observed between TWAS-2 and the MLS during the first sampled storm (11/30/2007), which was a storm of 3.03 in. The second monitored storm was only 0.59 in, where TWAS-2 recorded TSS concentrations nearly an order of magnitude higher than the MLS.

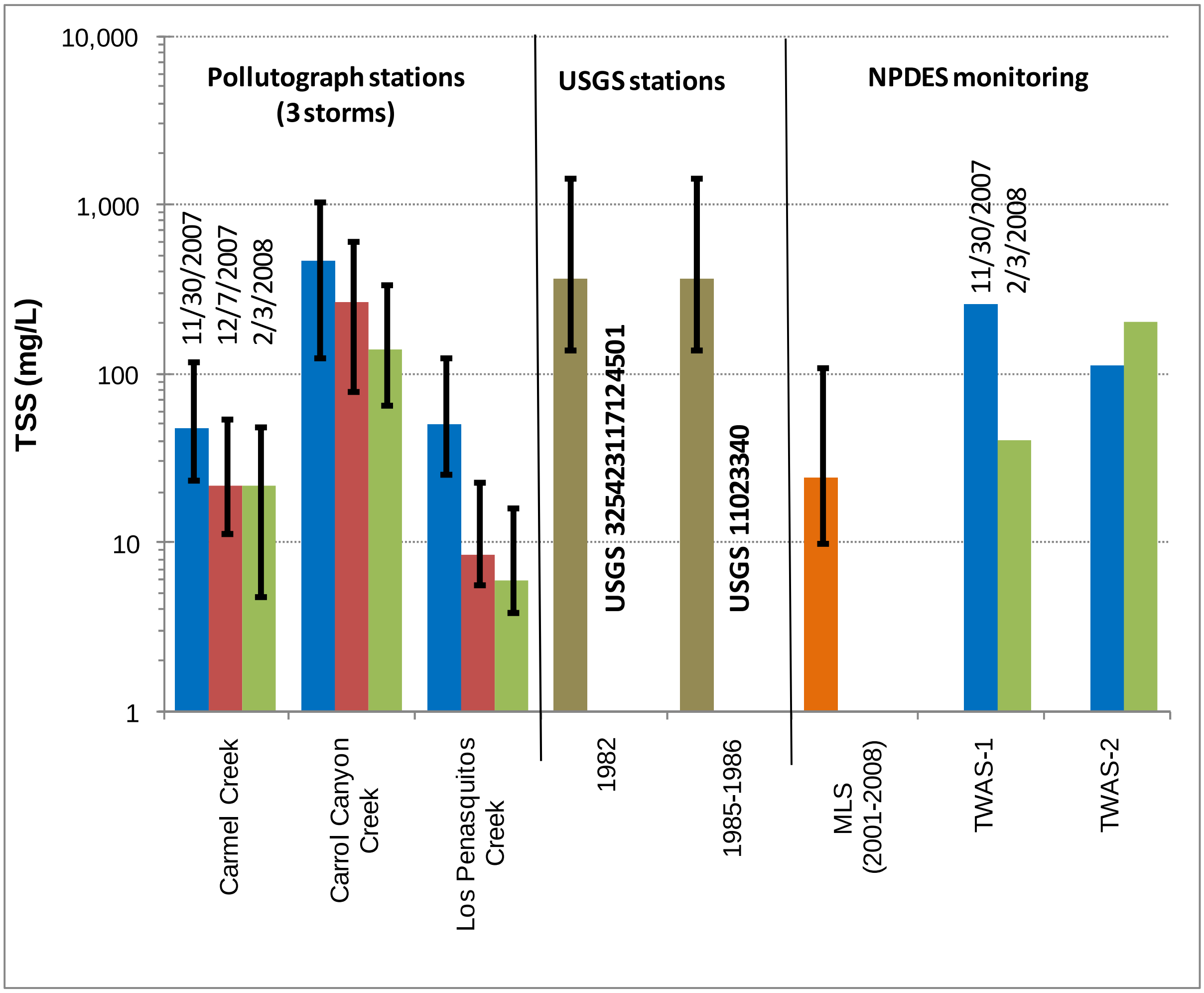


Figure 15. EMC/Median TSS and 95th percentile confidence intervals for all sampling events

Los Peñasquitos Creek was sampled using flow weighting and pollutograph sampling methods for two storms. These data showed considerable variability between the two sampling methods (Table 10). TSS EMCs were two to four times greater using the flow weighted sampling, as compared to the pollutograph sampling. The two stations were co-located and samples were collected using the same methods. Figure 11 shows this monitoring location had considerable vegetation within the creek, which may have caused significant differences in suspended particles considering depth and distance.

Table 10. TSS (mg/L) EMCs for the pollutograph and MLS stations on Los Peñasquitos Creek

	12/7/2007 Storm	2/3/2008 Storm
MLS	130	26
Pollutograph station	49.65	6.04

TSS particle size distribution was measured at the three pollutograph monitoring sites for two storms. A single composite sample was used to characterize the particle size distribution for each event. Samples were packed on ice, sent to the sample processing laboratory and analyzed with a Coulter Counter LS200. Samples from the first storm (11/30/2007) were shipped to the laboratory on 12/5/2007 and samples from the second storm (12/7/2007) were shipped on 12/11/2007. Particle size distributions for the pollutograph monitoring locations are shown in Figure 16 and 17. Note that the particle size distributions likely do not characterize the finer particles well because they likely flocculated in the days between sampling and analysis. Li et al (2005) have shown that particles tend to flocculate together within six hours, which can affect the particle size distribution.

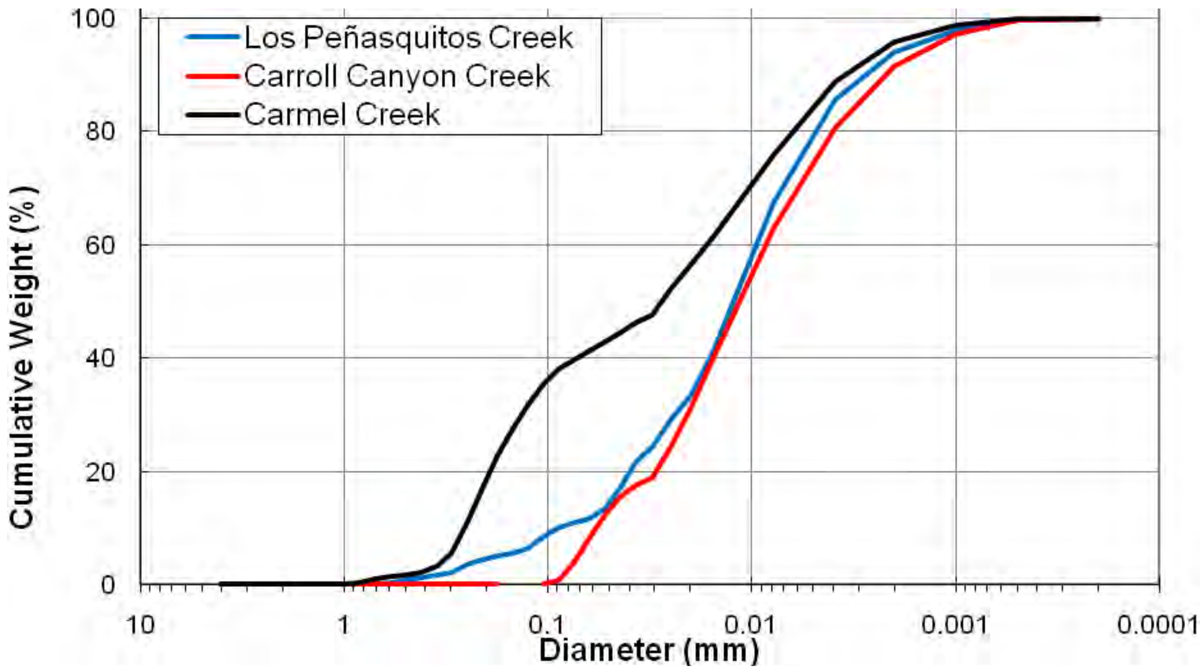


Figure 16. Particle size distribution for the 11/30/2007 storm event

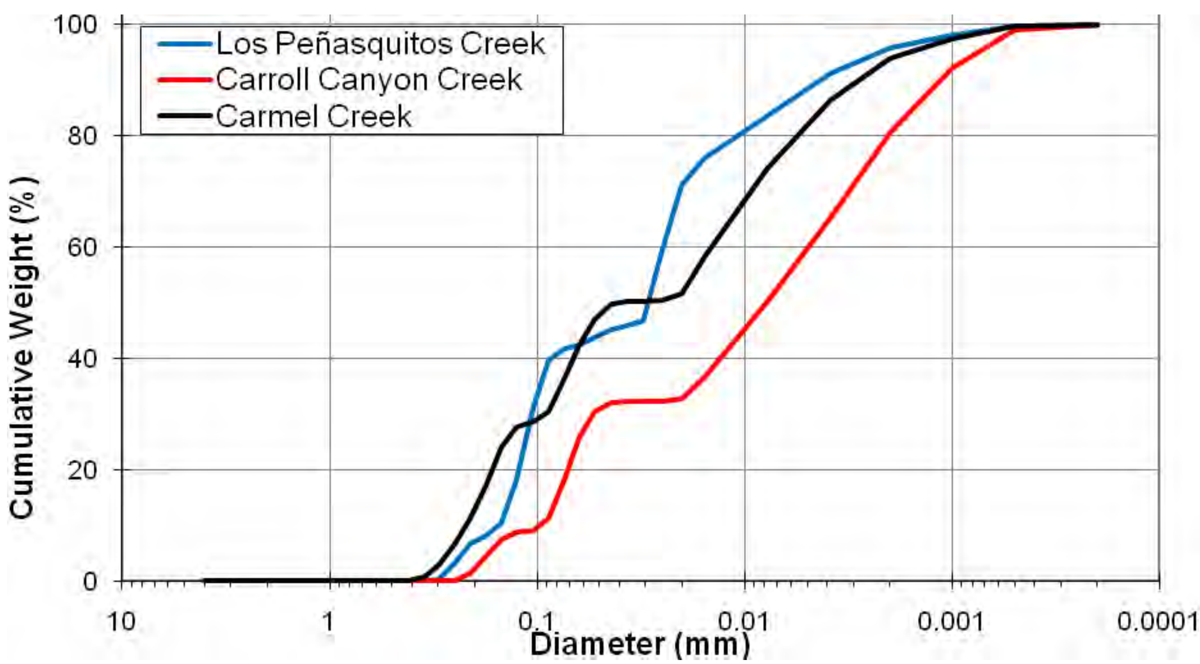


Figure 17. Particle size distribution for the 12/7/2007 storm event

Overview of Modeling Approach

The Los Peñasquitos watershed was modeled using the Loading Simulation Program in C++ (LSPC) model. The watershed model primarily uses information that details soil characteristics, land use distribution, topography, weather data, and the stream network to simulate hydrology and sediment contributions to the lagoon. Key data sources were compiled to support development of the watershed model (as described in previous sections). The Los Peñasquitos lagoon was modeled using the Environmental Fluid Dynamics Code (EFDC) model. The EFDC model incorporates meteorological data, watershed inputs, and oceanic forcings (tidal flooding). The watershed model is linked to the lagoon model through input of the LSPC results directly into the EFDC model for simulation of hydrodynamic and water quality conditions within the lagoon. Watershed model output was used to define the terrestrial inputs to the lagoon (flow and pollutant loads). Hourly watershed model flow and TSS concentrations (fractionated as sand, silt, and clay) were output for catchments 1401-1404 and 1411 and included as inputs to the EFDC lagoon model.

Watershed Model Description

LSPC (Shen et al., 2004; Tetra Tech and USEPA, 2002; USEPA, 2003) is a watershed modeling system that includes streamlined Hydrologic Simulation Program Fortran (HSPF) (Bicknell et al., 1997) algorithms for simulating hydrology, sediment, and general water quality on land, as well as a simplified stream fate and transport model. Since its original public release, the LSPC model has been expanded to include additional GQUAL components for sorption/desorption of selected water quality constituents with sediment, enhanced temperature simulation, and the HSPF RQUAL module for simulating dissolved oxygen, nutrients, and algae. LSPC has also been customized to address simulation of other pollutants such as nutrients and fecal coliform bacteria.

The hydrologic (water budget) process is complex and interconnected within LSPC (Figure 18). Rain falls and lands on various constructed landscapes, vegetation, and bare soil areas within a watershed. Varying soil types allow the water to infiltrate at different rates while evaporation and plant matter exert a demand on this rainfall. Water flows overland and through the soil matrix. There may also be point source discharge and water withdrawals/intakes. The land representation in the LSPC model environment considers three flowpaths; surface, interflow, and groundwater outflow.

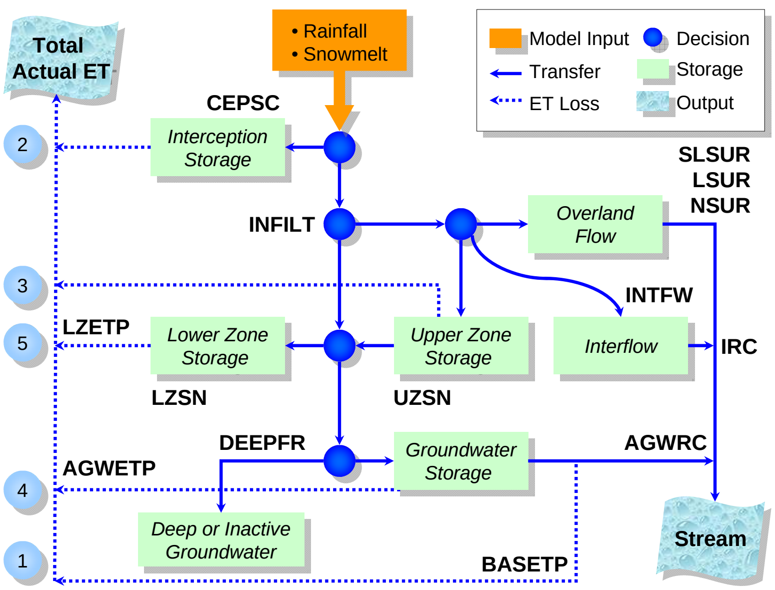


Figure 18. Schematic of LSPC Hydrology Components

The sediment routine in LSPC represents the general detachment of sediment due to rainfall, overland and instream transport, attachment when there is no rainfall, and scour. Land disturbance may occur from construction or agricultural practices, disturbing native vegetative cover and leaving the soil susceptible to erosion. With the native cover disturbed, a rainfall event may not only cause detachment, but can also provide sufficient rainfall in combination with the lack of vegetative cover to cause scour and further erosion as the overland flow proceeds to a defined channel. From impervious areas, a different process occurs where sediment builds up over time to a maximum value for each impervious land use type. For both pervious and impervious land uses, the amount of sediment that can be transported is a function of runoff. Sediment carried by runoff is fractionated into sand, silt, and clay portions depending on the underlying soil types. Once the sediment is in the stream channel, it is transported downstream where it can flow through the reach or settle out. If the stream velocity is sufficient, additional sediment can be mobilized via high shear stresses.

Watershed Model Setup

The Los Peñasquitos watershed model was developed to provide continuous sediment input to the EFDC lagoon model. Many data sources were used to develop the LSPC model of the Los Peñasquitos watershed. Smaller catchments within the watershed were delineated using available elevation data. Information about the soils and land use within each of those catchments was used to develop model parameters describing flow and sediment transport characteristics within the watershed.

Catchment Delineation

The Los Peñasquitos watershed was divided into smaller catchments for modeling efficiency based on 10 meter resolution digital elevation model (DEM) and hydrography. Catchment sizes ranged from 0.43 to 16.56 mi^2 with a median size of 7.19 mi^2 (Figure 19). The size of the catchments was determined to be adequate based on the accuracy needed for model predictions and linkage to the lagoon model. Delineation was based on several factors including, land use and soil information, stream channel characteristics, and the location of monitoring stations throughout the watershed for calibration purposes. Catchment 1404 receives flow from both Los Peñasquitos and Carroll Canyon Creeks. The lagoon is represented by Catchment 1402 and receives flow from Catchments 1401 (small direct drainage to the north), 1403 (Carmel Creek), and 1404 (Los Peñasquitos and Carroll Canyon Creeks).

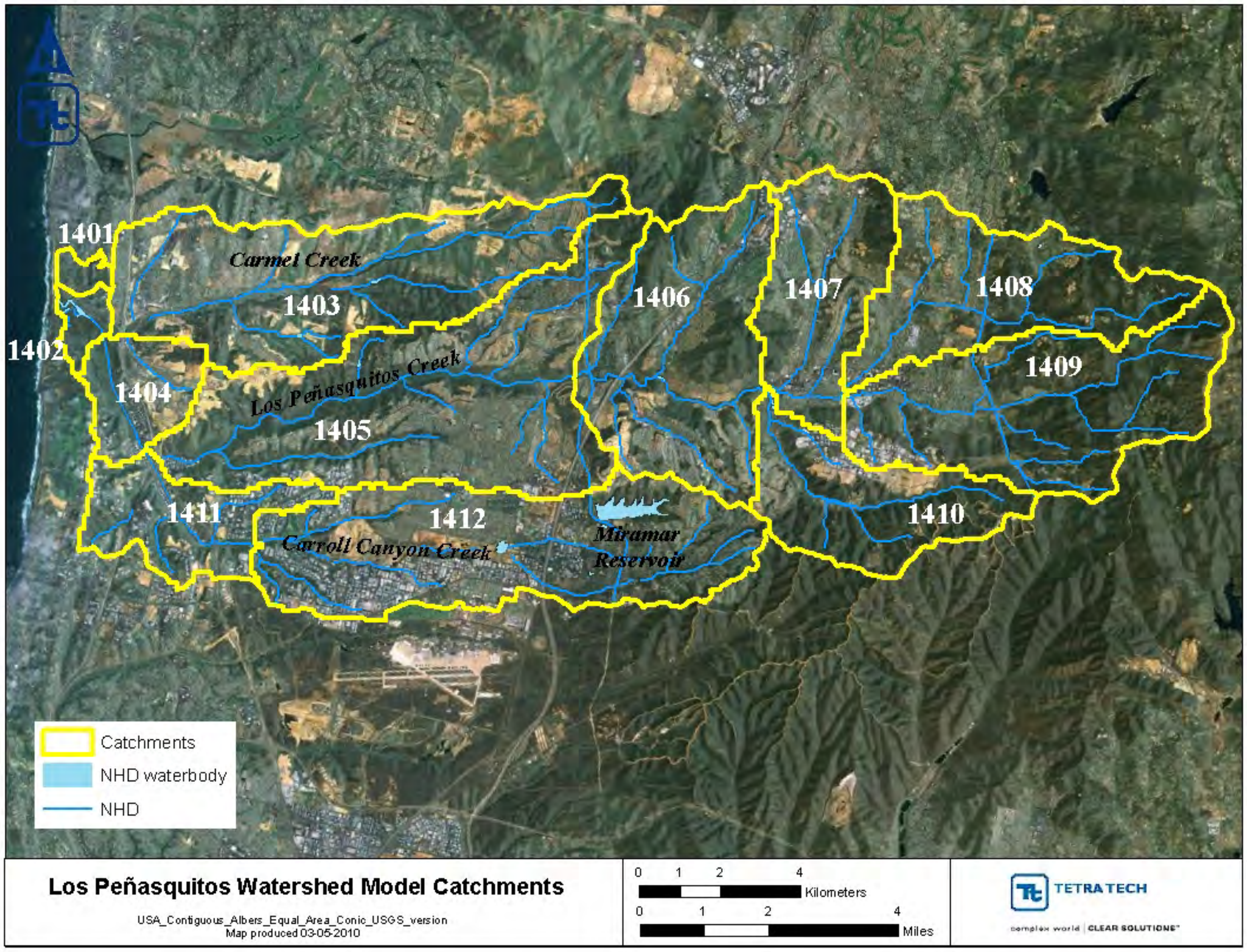


Figure 19. Catchment delineation in the Los Peñasquitos watershed

Streams

Each delineated catchment is represented with a single stream segment, as depicted in the National Hydrography Dataset (NHD), and assumed to be a completely mixed, one-dimensional segment with a trapezoidal cross-section. Once the representative reaches were identified, slopes were calculated based on elevation data (10 m DEM) and stream lengths measured from the original NHD stream coverage. In addition to stream slope and length, mean depths and channel widths are required to route flow and pollutants. Detailed cross section information did not exist for the watershed, therefore, mean stream depth and channel width were estimated using regression curves that relate upstream drainage area to stream dimensions available in the LSPC model setup spreadsheet that is described in the LSPC manual (Tetra Tech and USEPA, 2002). Manning's n values ranging from 0.03 to 0.2 reflected very different stream types, including streams with concrete channels to heavily vegetated channels.

Land Use

LSPC algorithms require land use in each catchment to be divided into pervious and impervious categories. The overall watershed land use distribution is shown above in Table 1. The estimated impervious fraction for each land use type was calculated by multiplying the total area by an impervious factor (Table 11).

Table 11. Impervious fraction by land use type

Land Use	Percent Impervious
Agriculture	0 %
Commercial Institutional	85 %
High Density Residential	65 %
Industrial/Transportation	72 %
Low Density Residential	15 %
Open	0 %
Open Recreational	0 %
Parks Recreational	12 %
Transitional	0 %

Soils

Soil characteristics within each catchment were calculated using SSURGO data, as described previously. The average soils class within each catchment was calculated. The majority of the catchments were within hydrologic soil group D areas, which typically have high surface runoff rates and low infiltration.

Irrigation

Irrigation is an important component of the water balance in Southern California. Through changes in soil moisture storages, irrigation can affect storm runoff, as well as baseflow conditions.

The irrigation demand for the Los Peñasquitos watershed model was calculated based on information presented in "A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California" (University of California Cooperative Extension, 2000). This guide recommends comparing daily precipitation to water demand to determine the amount of irrigation water.

The estimated hourly PET was based on data collected at the nearby California irrigation measurement station, CIMIS 74 (Figure 5). Hourly values were summed over each day to determine the daily PET depth in inches. To convert PET depth to the water demand for a specific crop or vegetation type, a crop-specific coefficient is multiplied by the PET. The University of California Cooperative Extension (2000) suggests a crop coefficient of 0.6 for lawns planted with warm season grasses and 0.65 for agricultural citrus production. For the purposes of this analysis, a crop coefficient of 0.8 was used to estimate the daily water demand for residential and commercial lawns and 0.85 for agricultural areas.

The difference between daily water demand and daily precipitation was calculated for each day. If precipitation exceeded water demand, then the irrigation demand was set to zero. Precipitation was used to offset water demand from the following days until all of the precipitation was lost from the system. To estimate the amount of irrigation water applied, the University of California Cooperative Extension (2000) suggests dividing the irrigation demand by the efficiency of the irrigation system. An efficiency factor of 80 percent was used for both the lawn and agricultural irrigation systems in order to estimate the depth of irrigation water applied. Finally, the irrigation water applied was added to the water balance in the LSPC simulation. The daily amount applied was assumed distributed evenly over time. The LSPC model also uses demand-based irrigation values based on the PET time series.

Sediment Fractionation

SSURGO data were used to estimate the fraction of total sediment contributed from the land within each particle size class and hydrologic soil group (Table 12). Adjustments were made to account for deposition during runoff periods based on the assumption that 50 percent of the sand fraction and 30 percent of silt is deposited using watershed delivery ratios presented in Vanoni, 1975. The resulting particle size fractions used for modeling are shown in Table 13

Table 12. Sediment fractions by hydrologic soil group

Hydrologic Soils Group	Sand	Silt	Clay
B	65 %	23 %	12 %
C	68 %	19 %	14 %
D	54 %	21 %	24 %

Table 13. Sediment fractions adjusted for watershed delivery

Hydrologic Soils Group	Sand	Silt	Clay
B	33 %	16 %	51 %
C	34 %	13 %	53 %
D	27 %	15 %	58 %

Configuration of Key Model Components

The initial basis for model parameterization was derived from “Hydrology: San Diego Region TMDL Model” (CARWQCB and USEPA, 2005). Final model hydrologic parameters are provided in Appendix A. Model calibration and validation focused on accurate characterization of precipitation in the watershed. Precipitation data from Alert gages 22 and 24 provided long term rainfall records for the lower watershed. Two catchments in the upper watershed (1408 and 1409) had increased rainfall due to higher elevation which was greater than observed at the Alert gage. Proportionally scaling the rainfall data using median rainfall from the CIMIS 74 gage and Alert 24 provided a better representation of rainfall in those catchments. Little adjustment of model parameters from the regional calibration was required once good rainfall records were established.

Sediment calibration focused on maintaining sediment balance in the streams. Sediment land use model parameters were developed following BASINS Technical Note 8 (USEPA, 2006) and Ackerman and Weisberg (2006). Sediment shear stress thresholds for deposition and scour were adjusted independently for each reach to maintain a dynamic steady state bed for silt and clay during a decadal simulation. Sand in the reaches was simulated using the average velocity power function in the reach, again, maintaining a dynamic balance throughout the decadal simulation. Several parameters were adjusted during calibration to achieve reasonable loading rates by land use type and to improve model fit to observed data collected in the Los Peñasquitos watershed.

Lagoon Model Description

The Los Peñasquitos Lagoon was simulated using the EFDC model. EFDC is a public domain, general purpose modeling package for simulating one-dimensional (1-D), two-dimensional (2-D), and three-dimensional (3-D) flow, sediment transport, and biogeochemical processes in surface water systems including rivers, lakes, estuaries, reservoirs, wetlands, and coastal regions. The EFDC model was originally developed at the Virginia Institute of

Marine Science for estuarine and coastal applications. This model is now being supported by the USEPA and has been used extensively to support TMDL development throughout the United States. In addition to hydrodynamic, salinity, and temperature transport simulation capabilities, EFDC is capable of simulating cohesive and noncohesive sediment transport, near-field and far-field discharge dilution from multiple sources, eutrophication processes, the transport and fate of toxic contaminants in the water and sediment phases, and the transport and fate of various life stages of finfish and shellfish. The EFDC model has been extensively tested, documented, and applied to environmental studies worldwide by universities, governmental agencies, and other entities.

The EFDC model includes four primary modules: (1) a hydrodynamic model, (2) a water quality model, (3) a sediment transport model, and (4) a toxics model. The hydrodynamic model predicts water depth, velocities, and water temperature. The water quality portion of the model uses the results from the hydrodynamic model to compute the transport of the water quality variables. The water quality model then computes the fate of up to 22 water quality parameters including dissolved oxygen, phytoplankton (three groups), benthic algae, various components of carbon, nitrogen, phosphorus and silica cycles, and fecal coliform bacteria (Cerco and Cole 1994). The sediment transport and toxics modules use the hydrodynamic model results to calculate the settling of suspended sediment and toxics, resuspension of bottom sediments and toxics, and bed load movement of noncohesive sediments and associated toxics. For this project, the hydrodynamics and sediment transport models were used. The hydrodynamics model simulated the circulation, water temperature, and salinity in the lagoon driven by ocean tides and watershed inflows. The sediment transport model simulated the transport of sand, silt as non-cohesive sediments, and clay as cohesive sediment. Details of the EFDC model's hydrodynamic and eutrophication components are provided in Hamrick (1992) and Tetra Tech (2002, 2006a, 2006b, 2006c, 2006d).

The EFDC model was configured to simulate hydrodynamics and sediment transport in the Los Peñasquitos Lagoon. Specifically, water temperature and salinity were both modeled for hydrodynamics. Sediment fractions considered in the model include sand, silt, and clay. Sand and silt were modeled using the non-cohesive sediment module and clay was modeled using the cohesive sediment module in EFDC.

Lagoon Model Setup

Various data sources were used to develop the EFDC model for the Los Peñasquitos Lagoon. Model development requires defining the computation domain and boundary conditions. The general steps to set up the EFDC model for the Los Peñasquitos Lagoon included generating the modeling grid, defining metrological conditions, estimating oceanic inputs, and linking the watershed (LSPC) model to EFDC. Key data sources were compiled to support development of the lagoon model. Model development steps and data used to identify initial conditions, boundary assignments, and calibration of key model parameters are further discussed below.

Grid Generation

The Los Peñasquitos Lagoon is composed of both deep and shallow channels and salt marsh areas. The lagoon connects with the ocean through a narrow inlet. Grid generation was primarily based on available bathymetry data, shoreline data, DEM data, and satellite imagery. The EFDC grid for the lagoon includes two portions—the lagoon itself and the ocean. During model development, hydrodynamic calibration was conducted first to ensure accurate exchange of salt and freshwater in the lagoon. A model grid was developed to include the ocean shoreline for hydrodynamic calibration. The grid including the ocean shoreline allowed for the use of tide elevation data for hydrodynamic calibration.

After the hydrodynamic calibration, a reduced grid was used to simulate sediment transport. The reduced grid set the ocean inlet, which is the location where the lagoon connects with the ocean, as the open boundary and does not include the ocean cells that were incorporated for hydrodynamic calibration. This was done because sediment, especially sand in the water column, are at relatively low levels in the ocean and sediment entering the lagoon are mainly due to beach erosion caused by various processes such as wave-breaking. Beach erosion processes cannot be modeled with the existing configuration which lacks wave, wave-breaking, and wave-current interaction components; therefore, sediment modeling used a reduced grid which sets the open ocean boundary immediately outside of the ocean inlet. The ocean part of the grid was not used for the sediment modeling. Note that for sediment modeling, the predicted tide elevations, water temperature, and salinity from the hydrodynamic calibration were assigned. In addition, bank erosion within lagoon channels was not simulated; therefore sediment erosion and resuspension are assumed to occur only with respect to the bottom sediment.

There are 374 computation cells in the full model grid, which includes the ocean cells, and 259 cells in the reduced grid that was used for modeling sediment transport. Lagoon channels near the ocean inlet are wider than upstream channels and have a finer resolution. Because of the complicated channel and salt marsh shapes, several grids were generated for each of the individual sections. The individual grids were then combined together to form one composite model grid for running EFDC. The full grid is shown in Figure 20. The grid includes the salt marsh area and two major channels. Two vertical layers were also included within the grid to better represent differences between upper and lower sections.

The channel that receives the flow and sediment loadings from Carmel Creek is called the Carmel Branch in this report. The channel that receives the flow and sediment from the merged Los Peñasquitos Creek and Carroll Canyon Creek is called the Los Peñasquitos Branch in this report. The small channels are coarsely represented together with the salt marsh area. In addition, the railroad track that bisects the lagoon was represented as a continuous berm that blocks flow and separates eastern and western portions of the lagoon, except for the railroad trestle (bridge) that crosses Carmel Branch. The model grid includes an opening at this location and allows flow through.

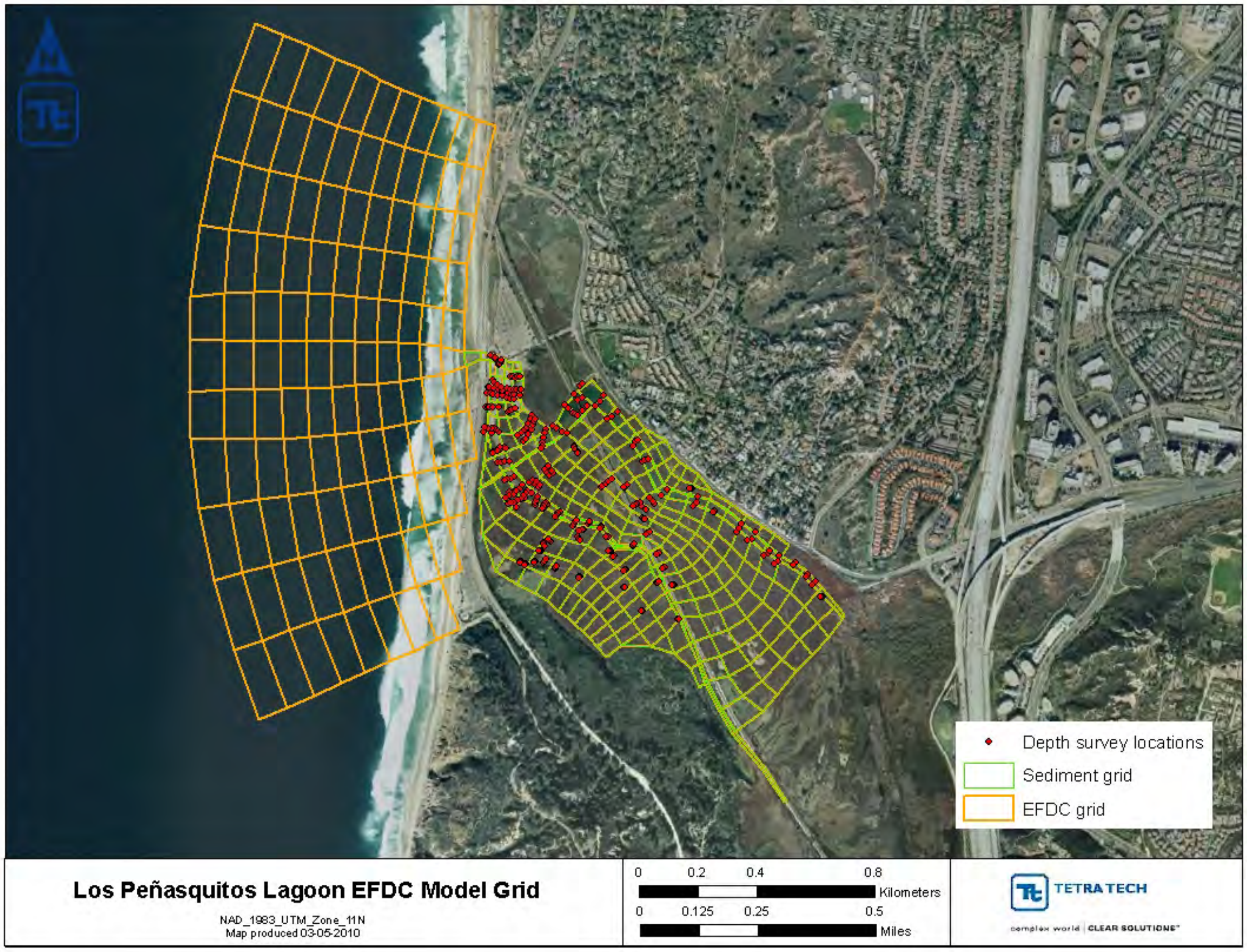


Figure 20. EFDC grid and bathymetry data for Los Peñasquitos Lagoon

As stated above, grid generation was based on available bathymetry data. A bathymetric survey of the Los Peñasquitos Lagoon was performed in March 2008 as part of the TMDL monitoring study (City of San Diego, 2009). The bathymetry for the two major channels were based on these data. These data include bottom elevations that were measured at several locations throughout the lagoon. Bottom elevation data were used to determine average grid bottom elevations. In addition, four lagoon mouth surveys were completed between October 2007 and April 2008 and were used to refine the ocean inlet. EFDC represents rectangular cross-sections; therefore, determination of grid bottom elevations cannot be assumed using average or lowest bottom elevations. Initial bottom elevations were estimated by reviewing these data and assigning the near deepest elevation values to each grid cell, where data are available. For grid cells where bottom elevations were not measured, initial bottom elevations were obtained through interpolation. Bottom elevations were refined during calibration for better hydrodynamic simulation.

For the salt marsh area, the more detailed USGS 1/9 arc second DEM data were downloaded. Average elevation within each EFDC cell was calculated using the DEM data. In addition to the DEM data, the 2006 Los Peñasquitos Lagoon Foundation monitoring report includes monitored elevation profiles in the lagoon (Hany et al, 2007). The elevations from the DEM were compared to the elevations in the report, and were adjusted slightly.

Boundary Conditions

As an open water system, conditions within the Los Peñasquitos Lagoon are continuously changing due to external forces. For example, flood tides allow for ocean water to flow into the lagoon, which increases salinity. Air temperature and solar radiation also have a strong influence on lagoon water temperature. These external forces are represented in the model using boundary conditions. In order to simulate water circulation and sediment transport using the EFDC model, boundary conditions must be specified. Boundary conditions include watershed freshwater inflows and associated sediment loading rates, the exchange of salt water and freshwater in the lagoon, and sediment carried by flood tide.

Watershed Inflow

Watershed inflows determine the amount of freshwater that is contributed to the lagoon and associated sediment loading rates. The lagoon primarily receives water from three main tributaries: Los Peñasquitos Creek, Carroll Canyon Creek, and Carmel Creek. Watershed hydrology and sediment loading were modeled using the LSPC model, as described earlier. Flow rates and sediment concentrations from catchments 1401, 1403, and 1404 were assigned as boundary conditions from the watershed to the EFDC model (Figure 21).

Modeled watershed flows were converted to EFDC format and assigned to the corresponding EFDC grid cells. Catchment 1401 is a small direct drainage to the lagoon and is input to grid cell (28,14). The reach in catchment 1403 is Carmel Creek and feeds into grid cell (26, 5), Los Peñasquitos Creek and Carroll Canyon Creek merge in catchment 1404 and feeds into grid cell (19, 3), and a small direct drainage area was specified at grid cell (19, 3). Water temperature for the watershed inflows were obtained from continuous temperature data provided by the City of San Diego (2009) and converted to EFDC format. Salinity from the direct drainage area was set to zero, and salinities from the three creeks were specified based on monitored salinity data. The LSPC model simulated three sediment particle sizes: sand, silt, and clay. LSPC modeled sand, silt, and clay concentrations were converted to EFDC format.

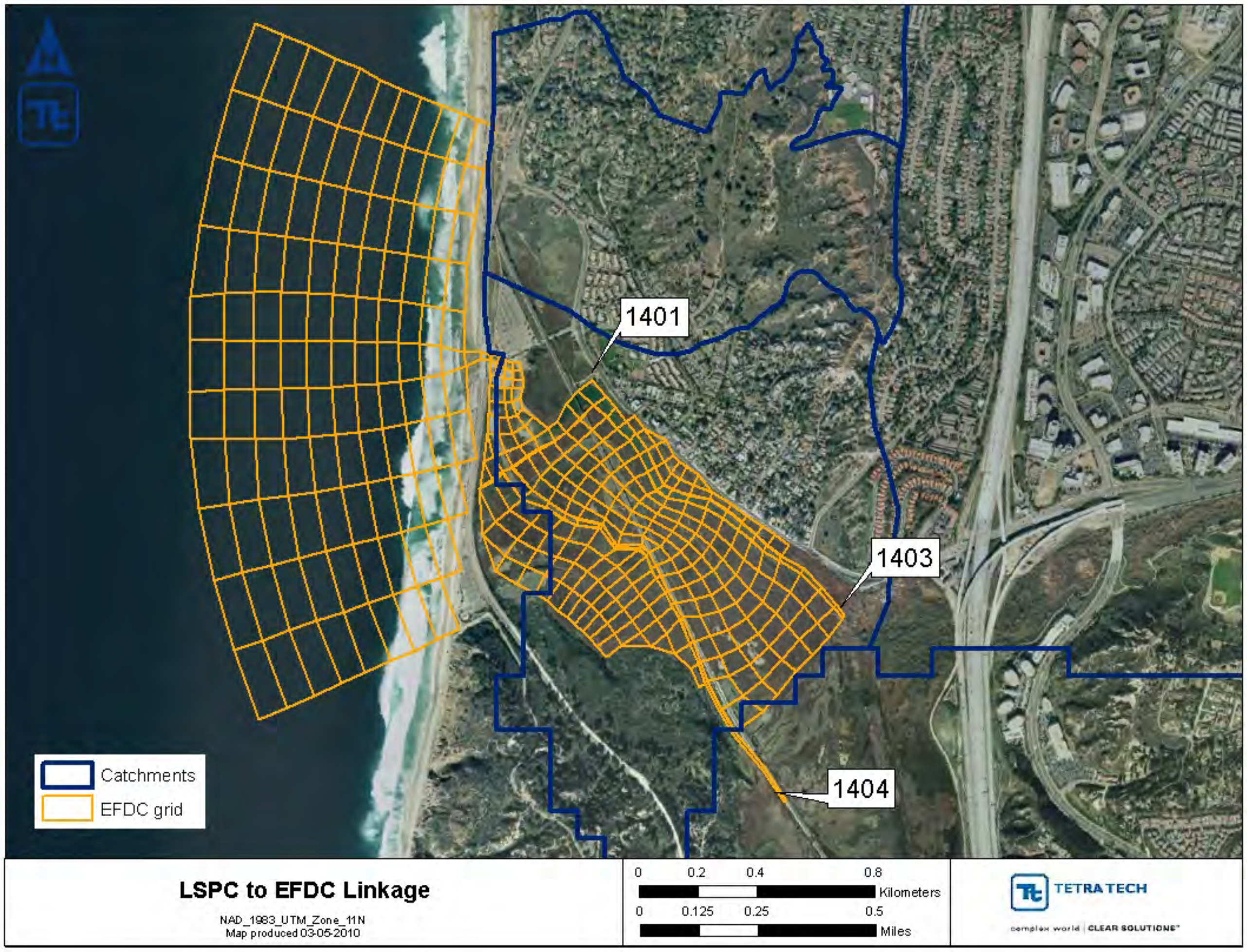


Figure 21. Assignment of watershed inputs to the EFDC grid

Representation of Ocean Boundary

In addition to the watershed, the ocean has both hydrodynamic and water quality influences on the lagoon. A narrow channel exists between the lagoon and the open ocean. The ocean is one of the major driving forces that influences lagoon circulation. Ocean water enters the lagoon during flood tides and leaves the lagoon during ebb tides. Changes in ocean water surface elevation determine the direction of flow and the transport of water quality constituents. Ocean water also increases or decreases the pollutant concentrations in the lagoon depending on water quality conditions along the ocean boundary. Required data for the ocean boundary include tidal elevation in the ocean, water temperature and salinity in the ocean water, and suspended sediment concentrations.

There are no monitoring stations located along the ocean boundary outside the lagoon mouth. Ocean inlet monitoring was conducted, however, this station is located at the lagoon/ocean interface. Conditions at this location are impacted by both the ocean and lagoon; therefore, data collected at the ocean inlet are not representative of ocean conditions. Tide data collected at the closest NOAA station in La Jolla were used to determine the open ocean water surface elevation boundaries for the lagoon model. The La Jolla station is located approximately 5 miles south of the Los Peñasquitos Lagoon. Tide data from La Jolla were used because it is similar to other available tide data in the vicinity and provides a more complete dataset in terms of the time period available. Mean sea level elevation data were downloaded from the NOAA site and were converted to EFDC format (Figure 22). Water temperature data were also obtained from the La Jolla NOAA station, although salinity data were not available at this station. The salinity boundary condition was set to 35 psu at the ocean open boundary location.

For sediment simulations, the modeled water surface elevation, salinity, and water temperature immediately outside the lagoon (predicted from the full grid simulation) were specified as boundary conditions. Ocean sediment concentration data were not available. It is assumed that sediment entering the lagoon during flood tides primarily originates from beach erosion. The concentrations of sand, silt, and clay fractions were set to constant values initially and then adjusted during calibration.

Meteorological Data

Meteorological data are an important component of the EFDC model. Surface boundary conditions are determined by the meteorological conditions. Data required for model setup include atmospheric pressure, air temperature, relative humidity, precipitation, cloud cover, solar radiation, wind speed, and wind direction.

Meteorological data from station KCASAND153 located east of Interstate 5 in Torrey Woods Estates/Carmel Valley was downloaded from the website: www.weatherunderground.com. This website allows download of daily (5-minuted resolution) rainfall, wind speed and direction, air temperature, and percent humidity measurements (Figure 22). Solar radiation was estimated based on the latitude of the station and then adjusted based on the sky cover condition for each time-step. Sky condition data (i.e. cloud cover data) were not available and the estimated clear sky solar radiation data were adjusted/interpreted based on when precipitation occurred. Solar radiation data were further refined during calibration. Data for each day were provided by the City of San Diego (2009) from October 2007 through April 2008. These data were converted to the appropriate units and formatted for input into the EFDC model.

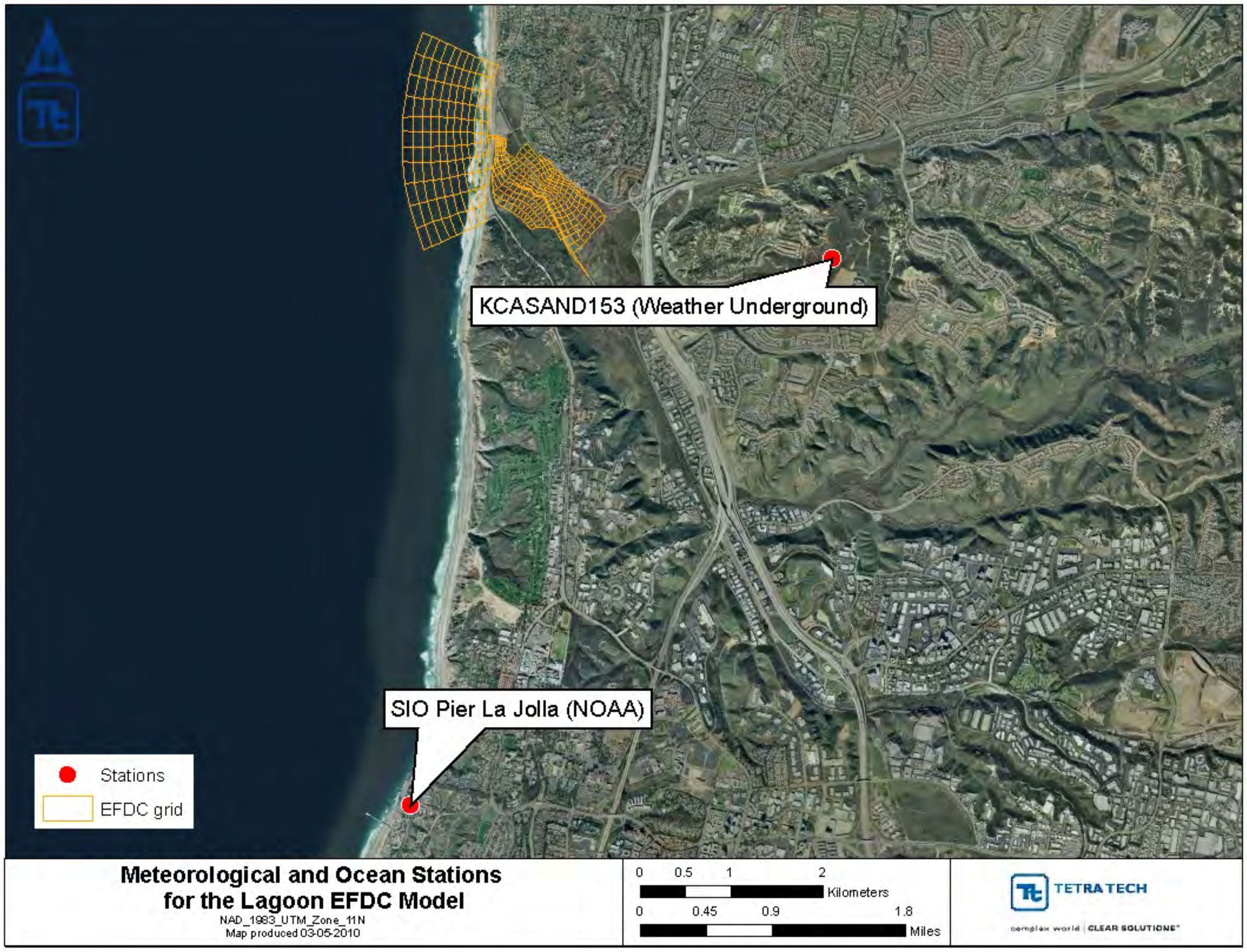


Figure 22. Meteorological and Ocean Boundary stations

Initial Conditions

For a dynamic model such as EFDC, initial conditions of water surface elevation, water temperature, salinity, water column sediments, and bottom sediments must be specified. Because the lagoon is an open system that is flushed by ocean water and watershed inflows frequently, the initial conditions of water surface elevation, water temperature, salinity, and water column sediments can be quickly replaced by boundary conditions. Model initial conditions were found to not be very sensitive to the model predictions. Initially assigned water surface elevation, water temperature, salinity, and water column sediment concentrations changed quickly as the model responds more readily to the driving boundary conditions from the ocean and watershed. Initial conditions were set to reasonable values based on modeling judgment. Water surface elevations were set to 0.92 meters above mean sea level (MSL) to ensure that all the grid cells were wet during the start of the simulation. Initial water temperatures were set to 10 degrees Celsius; salinities were set to 10 psu, and sand, silt, and clay fractions in the water column were set to 10 mg/L.

Sediment bottom conditions in the lagoon are the result of the long-term balance between deposition and erosion. Initial lagoon sediment depth at the beginning of the model simulation period determines the amount of sediment that can be eroded. Bottom sediment conditions were measured at the beginning of the modeling period on 10/1/2007. The only available data were collected (post storm) during 2/11/2008 and 2/15/2008 at 26 locations in the lagoon for sediment size distributions as part of the TMDL monitoring study. Sand, silt, and clay percentages from the sediment size distributions were set as the initial mass fractions for the sediment bed in the lagoon with the assumption that the sediment components have reached an equilibrium status and did not change dramatically from the beginning of the modeling period to the survey dates. In addition to mass fractions, other sediment properties including porosity and density must be specified in the model. These data were not collected; therefore default values for porosity (0.4) and density (1.99 gm/cm3) were used (Tetra Tech, 2007).

Model Calibration and Validation

Modeling parameters for the watershed and lagoon models were adjusted based on available monitoring data, as detailed below. For both models, it was essential that the physics of the system (hydrology and hydrodynamics) be accurately characterized in order to provide a sound foundation for simulating water quality conditions within the lagoon. Simulations of sediment fate and transport processes are dependent on an accurate representation of runoff, water movement and circulation, and other dynamic components. The time-step for the LSPC model is hourly and the time-step for the EFDC model is 0.5 seconds.

Watershed Model Calibration and Validation

Long term hydrology (1993-2008) was calibrated and validated using streamflow data from USGS gage 11023340 at the bottom of catchment 1406 (Figure 6). The period of record was divided into separate calibration and validation periods. Additional flow data were collected during TMDL monitoring by the City of San Diego (2009) at the bottom of catchments 1403 (Carmel Creek), 1405 (Los Peñasquitos Creek), and 1411 (Carroll Canyon Creek) were used for validation of the model hydrology (see Figure 19).

Hydrology

Measured and modeled average daily flows compared well throughout the model calibration and validation periods. Overall summary statistics comparing observed and simulated hydrology were within the recommended criteria based on HSPEXP (Lumb et al., 1994) for all metrics except summer volume error. Summer volume was primarily a function of the irrigation factor which was developed to balance observed summer low flows throughout the entirety of the simulation period.

Figure 23 through 30 compare modeled and measured flows during the calibration (1993-2000) and validation (2000-2008) periods. Table 4 presents the statistical comparison of modeled and measured flows at the USGS gage on Los Peñasquitos Creek (11023340).

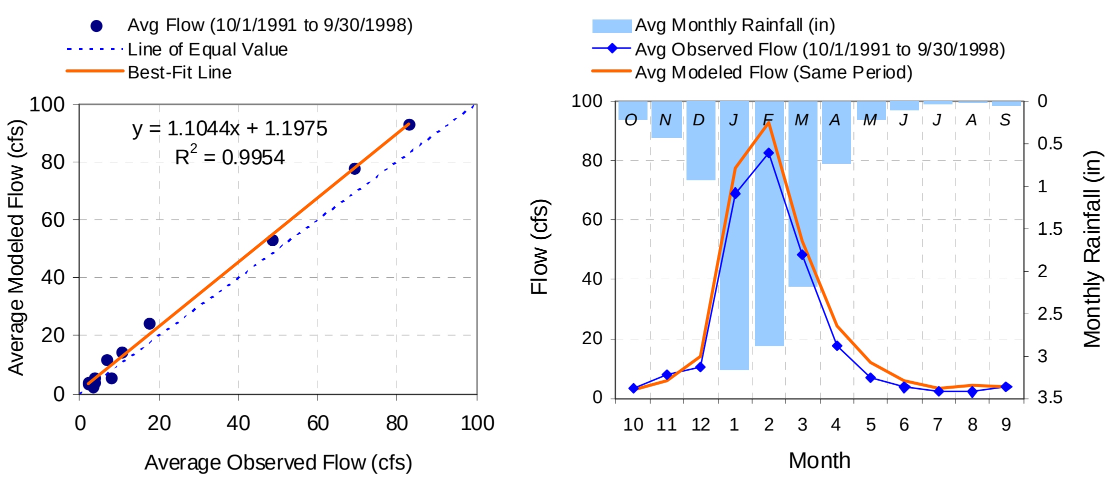


Figure 23. Mean monthly flow for calibration period (USGS 11023340)

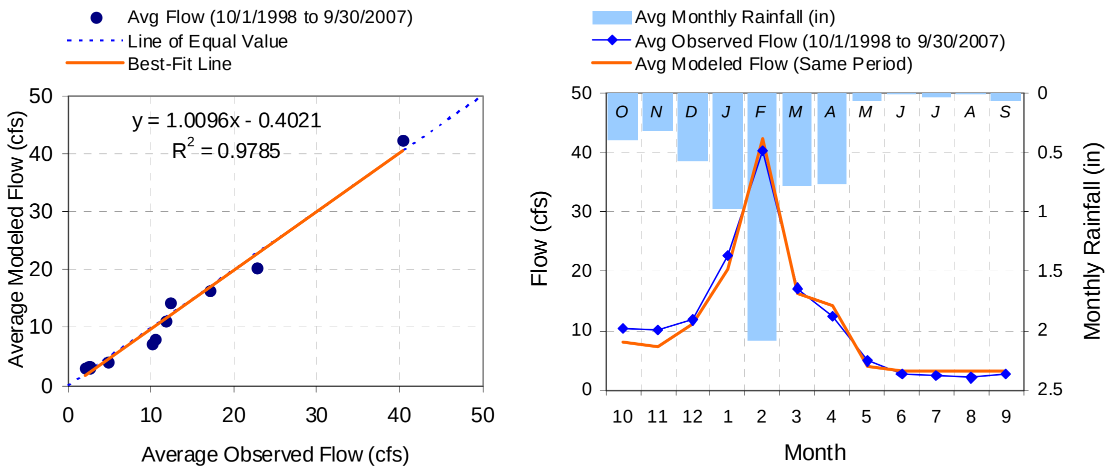


Figure 24. Mean monthly flow for validation period (USGS 11023340)

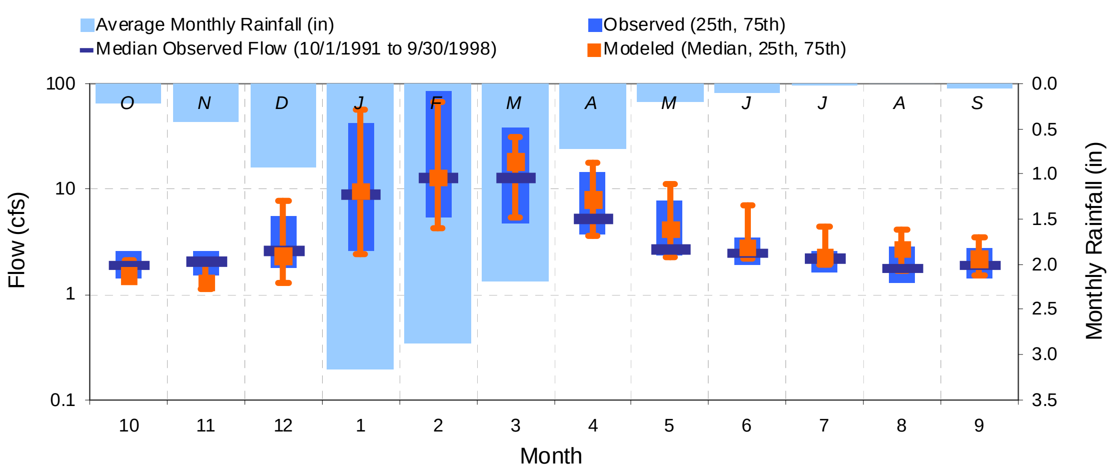


Figure 25. Monthly median and percentile flow comparison – calibration period

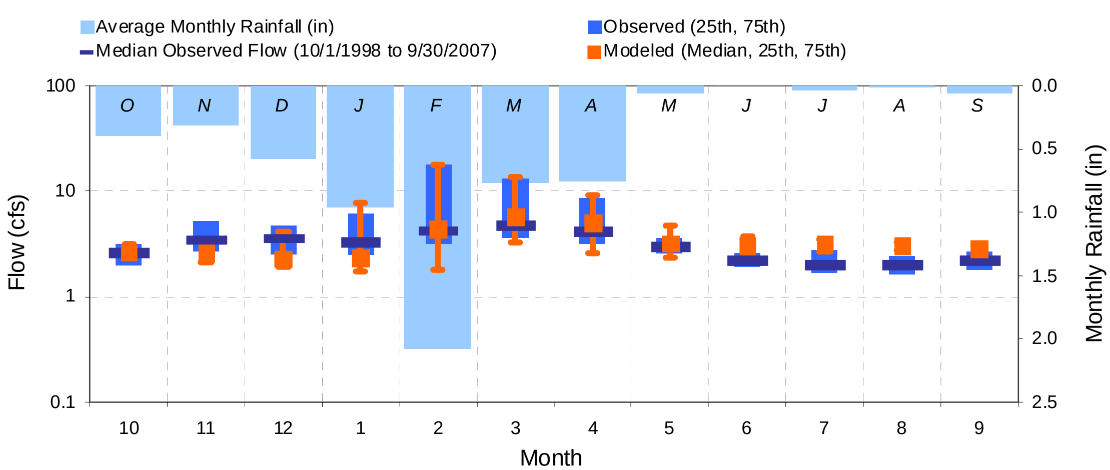


Figure 26. Monthly median and percentile flow comparison – validation period

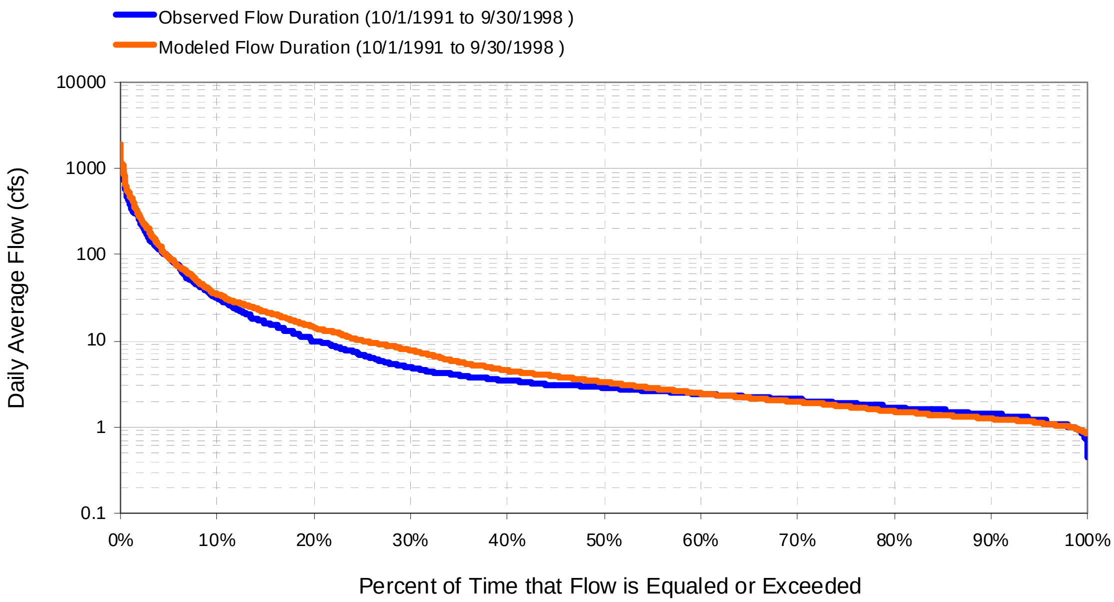


Figure 27. Flow exceedence output comparison – calibration period

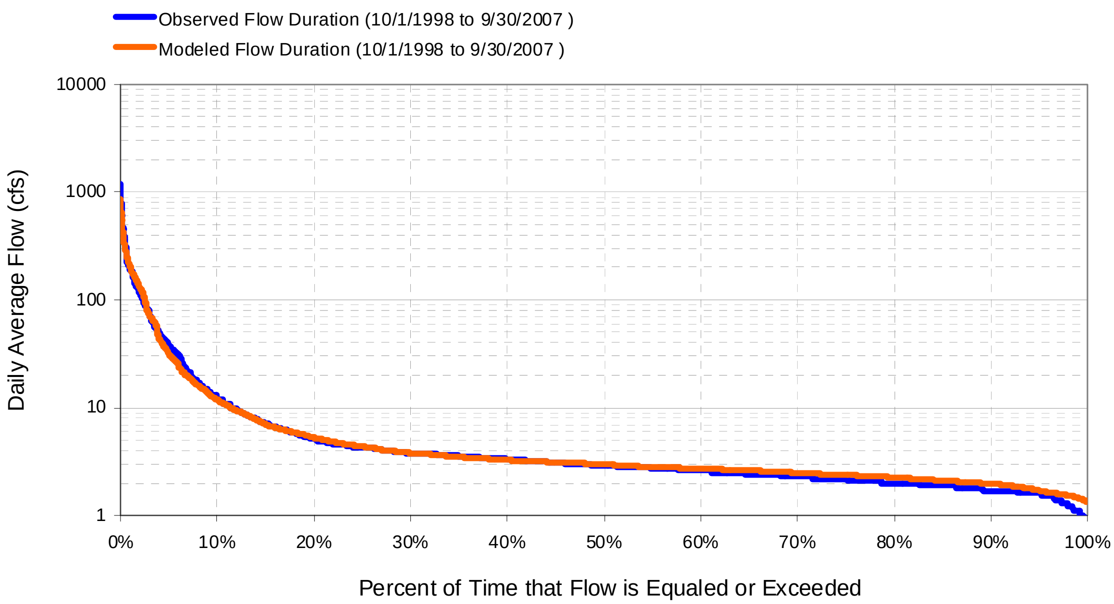


Figure 28. Flow exceedence output comparison – validation period

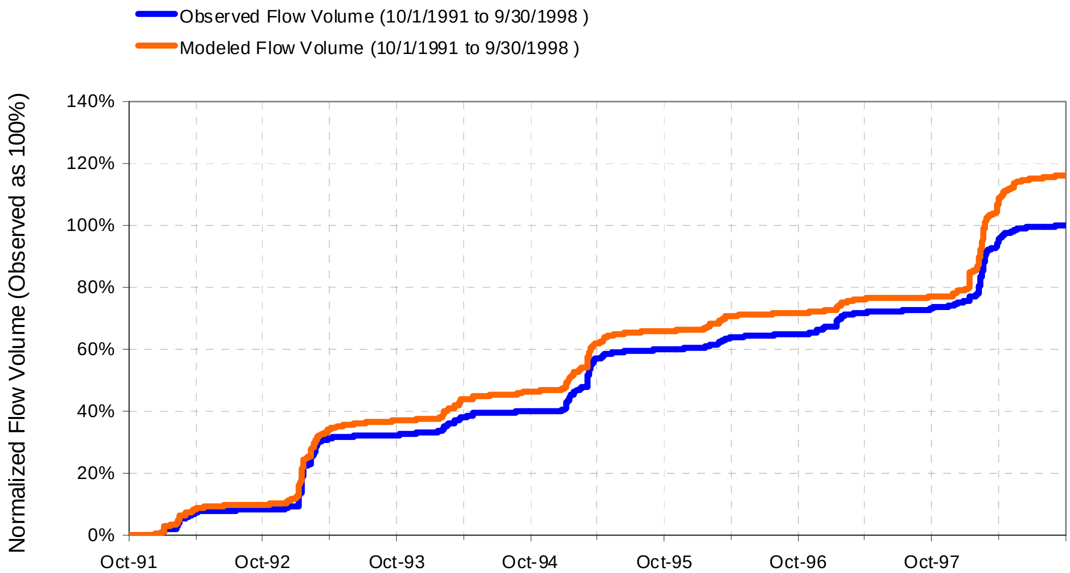


Figure 29. Cumulative volume comparison – calibration period

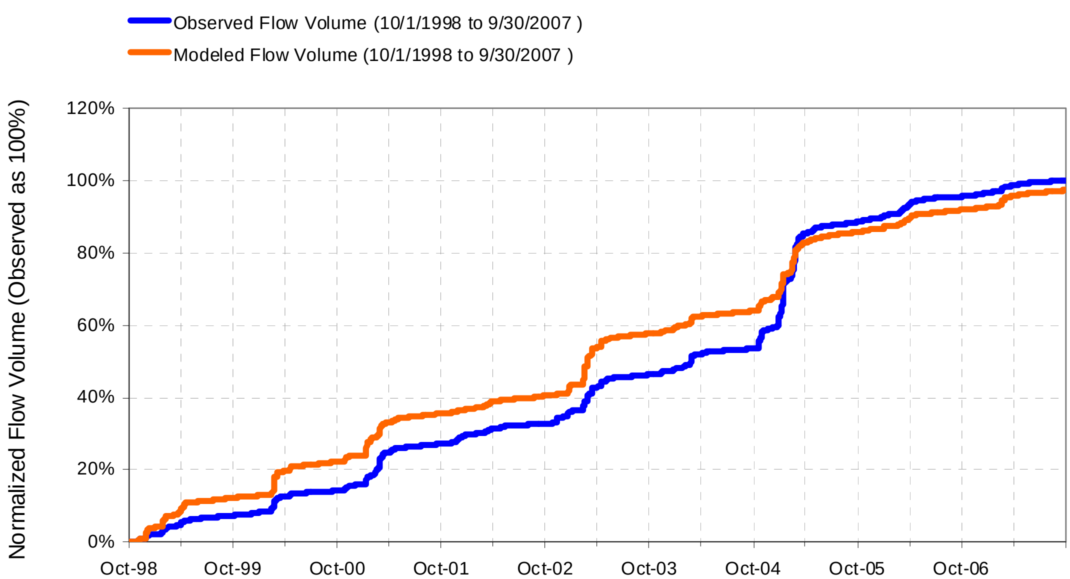


Figure 30. Cumulative volume comparison – validation period

Table 14. LSPC hydrologic model performance - entire simulation period

LSPC Simulated Flow		Observed Flow Gage	
OUTFLOW FROM CATCHMENT 1406 15.16-Year Analysis Period: 1/1/1993 - 2/29/2008 Flow volumes are normalized, with total observed as 100		USGS 11023340 USGS Home	
Total Simulated In-stream Flow:	116.10	Total Observed In-stream Flow:	100
Total of simulated highest 10% flows:	91.68	Total of Observed highest 10% flows:	80.58
Total of Simulated lowest 50% flows:	4.36	Total of Observed Lowest 50% flows:	4.45
Simulated Summer Flow Volume (months 7-9):	4.60	Observed Summer Flow Volume (7-9):	3.23
Simulated Fall Flow Volume (months 10-12):	9.01	Observed Fall Flow Volume (10-12):	8.58
Simulated Winter Flow Volume (months 1-3):	86.17	Observed Winter Flow Volume (1-3):	77.20
Simulated Spring Flow Volume (months 4-6):	16.33	Observed Spring Flow Volume (4-6):	11.00
Total Simulated Storm Volume:	54.53	Total Observed Storm Volume:	44.74
Simulated Summer Storm Volume (7-9):	0.85	Observed Summer Storm Volume (7-9):	0.76

Errors (Simulated-Observed)	Error Statistics	Recommended Criteria	1995-1999	2000-2004
Error in total volume:	16.10	10	-1.43	7.35
Error in 50% lowest flows:	-2.00	10	-1.60	-3.91
Error in 10% highest flows:	13.77	15	2.26	1.75
Seasonal volume error - Summer:	42.46	30	13.27	-2.52
Seasonal volume error - Fall:	5.02	30	4.49	12.42
Seasonal volume error - Winter:	11.62	30	-18.21	13.31
Seasonal volume error - Spring:	48.44	30	1.90	6.11
Error in storm volumes:	21.88	20	1.13	12.07
Error in summer storm volumes:	11.76	50	3.16	15.42
Nash-Sutcliffe Coefficient of Efficiency, E:	0.675	Model accuracy increases as E or E' approaches 1.0	0.688	0.814
Baseline adjusted coefficient (Garrick), E':	0.683		0.517	0.549

Additional validation flow data from the City of San Diego (2009) were available for comparison to model output. Los Peñasquitos Creek flows were monitored by the USGS (15 minute data at gage 11023340) and the City of San Diego (5 minute data at MLS) which represent drainages of 42 and 59 mi^2, respectively. Flows at the two monitoring stations reflected the amount of rainfall that was received within each drainage area. Peak stormflow (Figure 31) and storm volume (Figure 32) were greater at the upstream USGS gage (11023340) than measured at the MLS near the bottom of the watershed. Baseflow volume, defined as daily flows with more than 50% of flow from surface runoff using hydrograph separation techniques, was 9% greater at the downstream gage. For each of the three sampling events that were monitored, model output compared well to streamflow measurements at the USGS gaging station as opposed to the MLS (Figure 33 through 35). Timing differences may be due to several factors including possible data limitations, as described below.

Flows typically increase further downstream barring withdrawals and/or infiltration; however, storm volumes during the monitoring period at the downstream station were significantly lower than reported at the upstream USGS gaging station. This may indicate that the flow rating table for the downstream station may not characterize higher flows well, especially since the model calibrated well to the upstream USGS gaging station. As a result, significant adjustments were not made to the model in order to match the measured flows at the MLS.

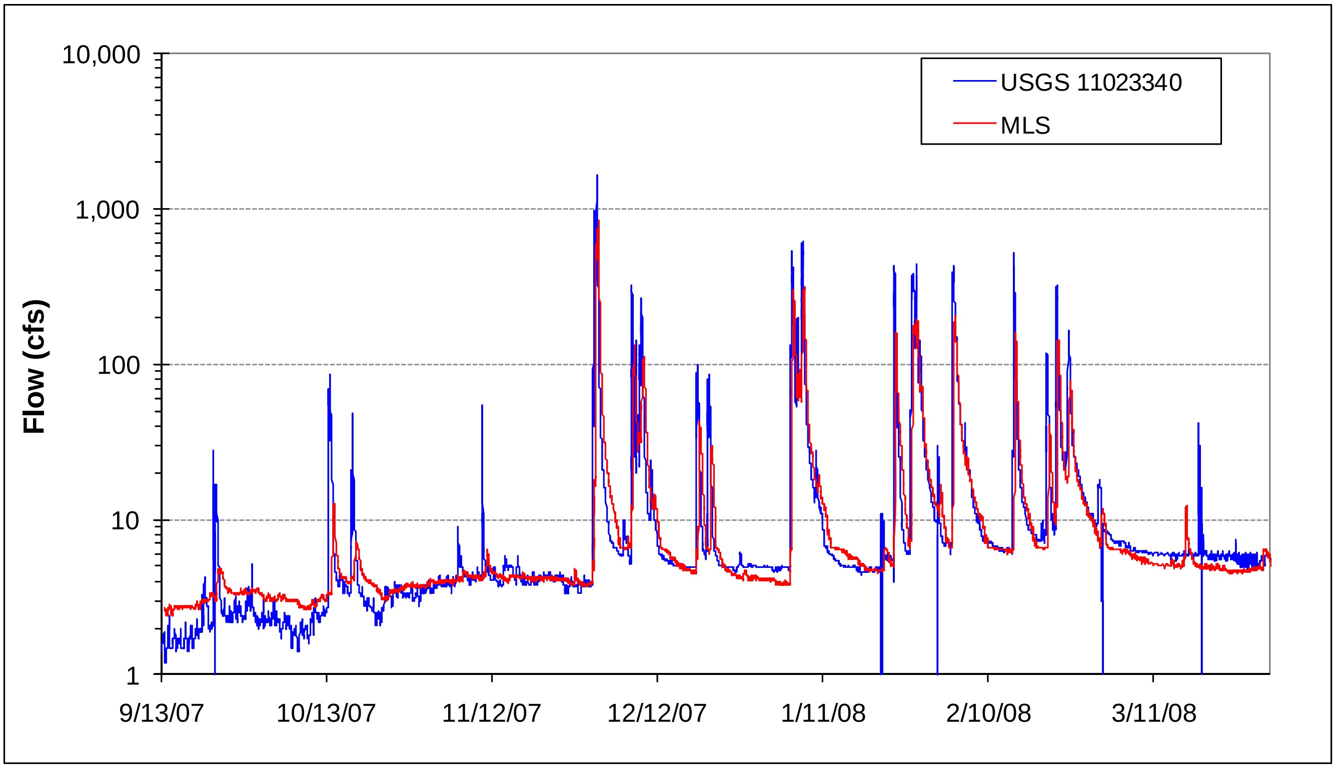


Figure 31. Time-series streamflow measured on Los Peñasquitos Creek

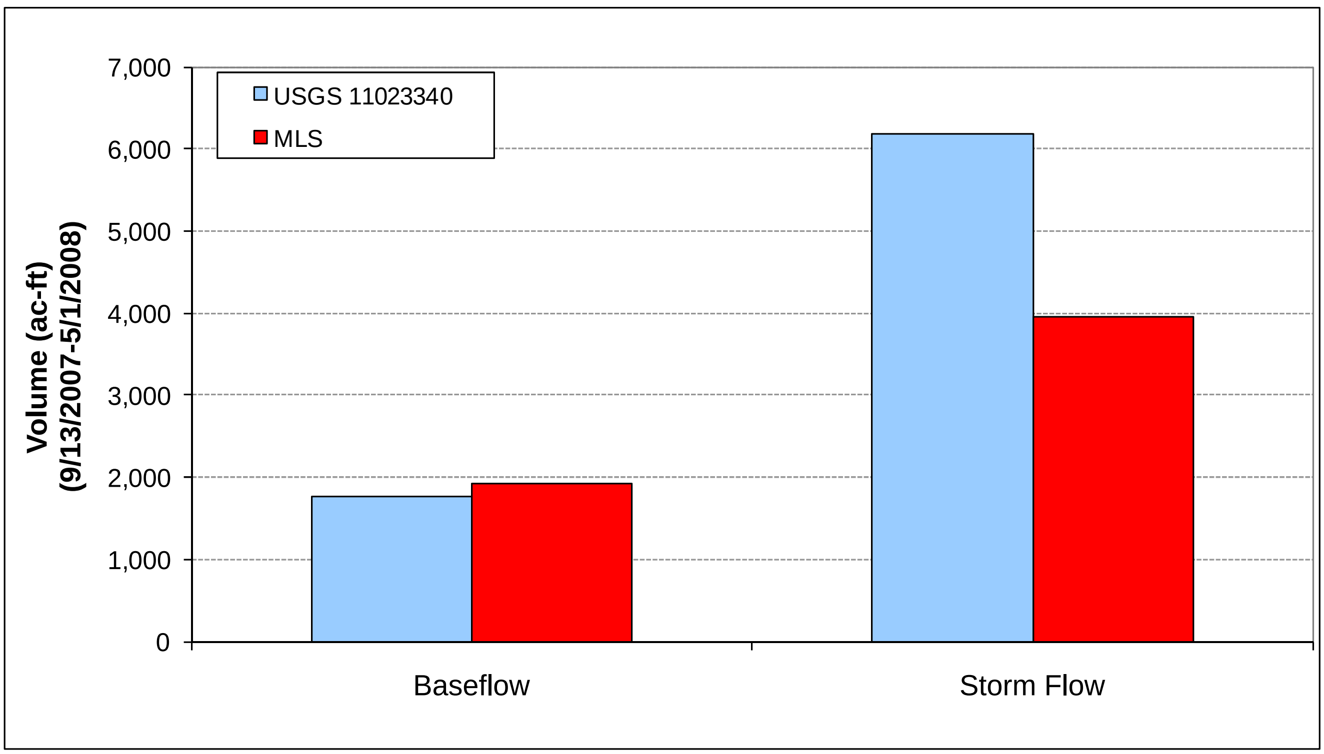


Figure 32. Baseflow and storm volumes measured on Los Peñasquitos Creek

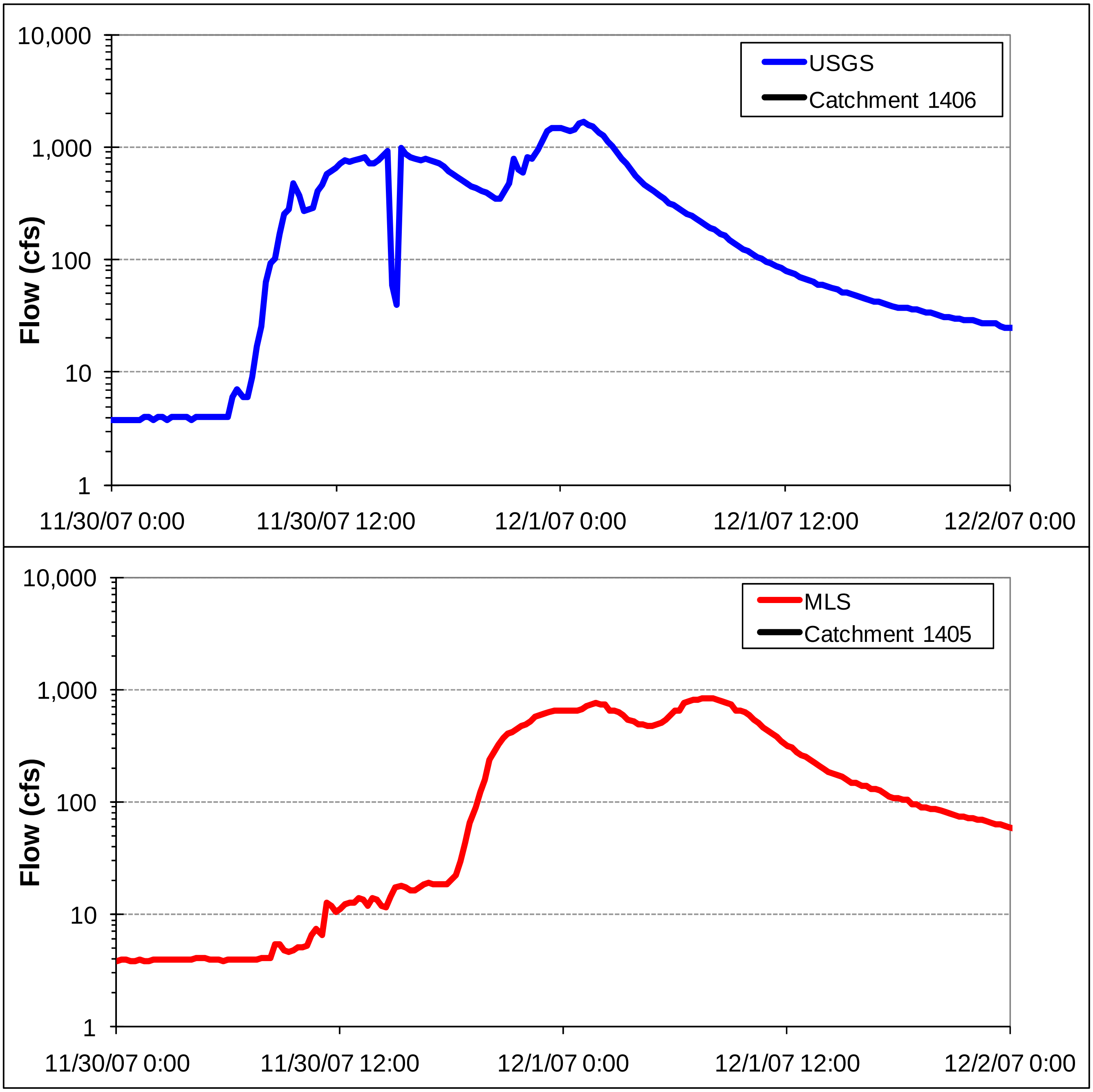


Figure 33. Comparison of modeled and observed flows at the USGS and MLS stations – 11/30/2007 storm

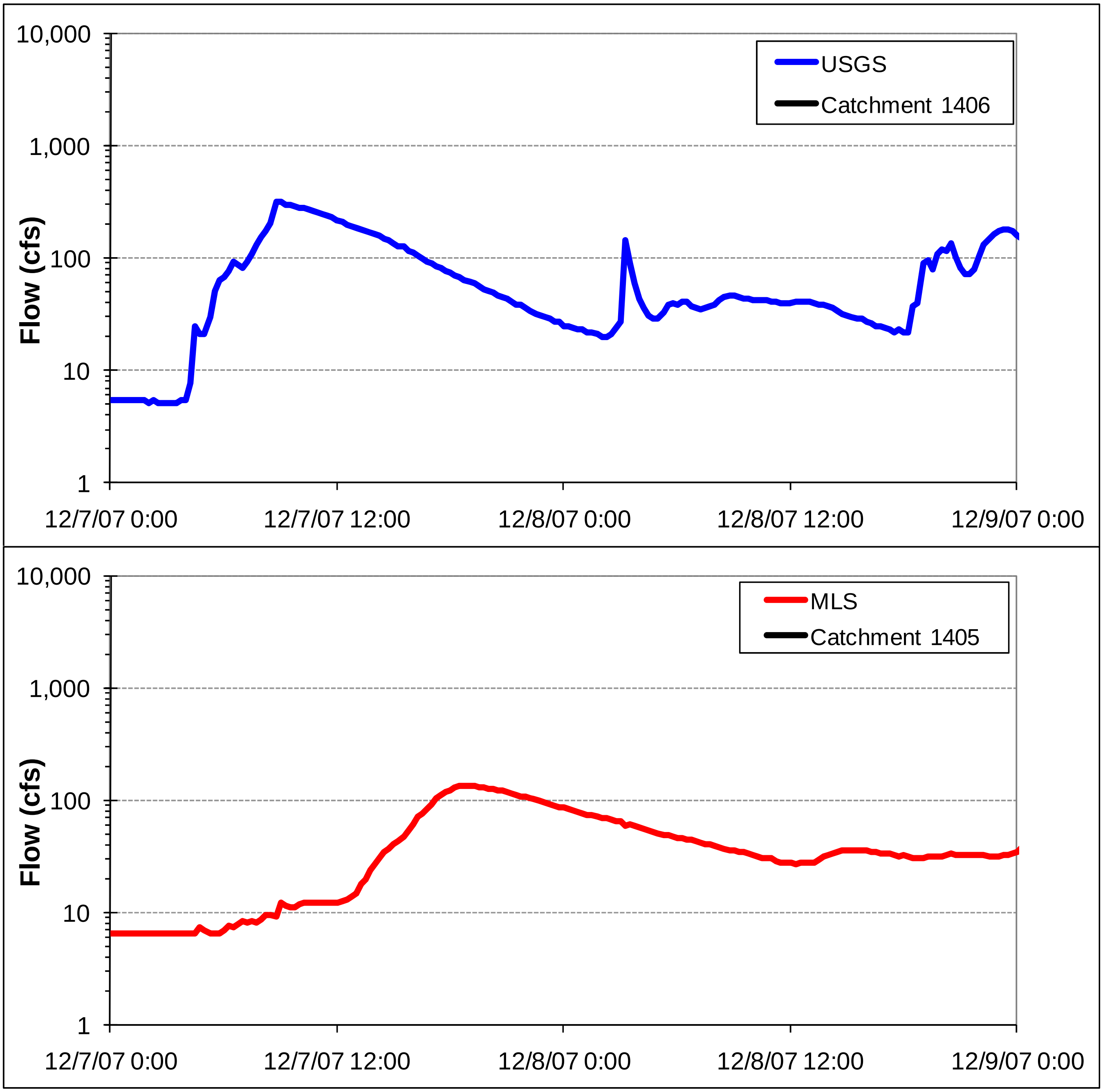


Figure 34. Comparison of modeled and observed flows at the USGS and MLS stations – 12/7/2007 storm

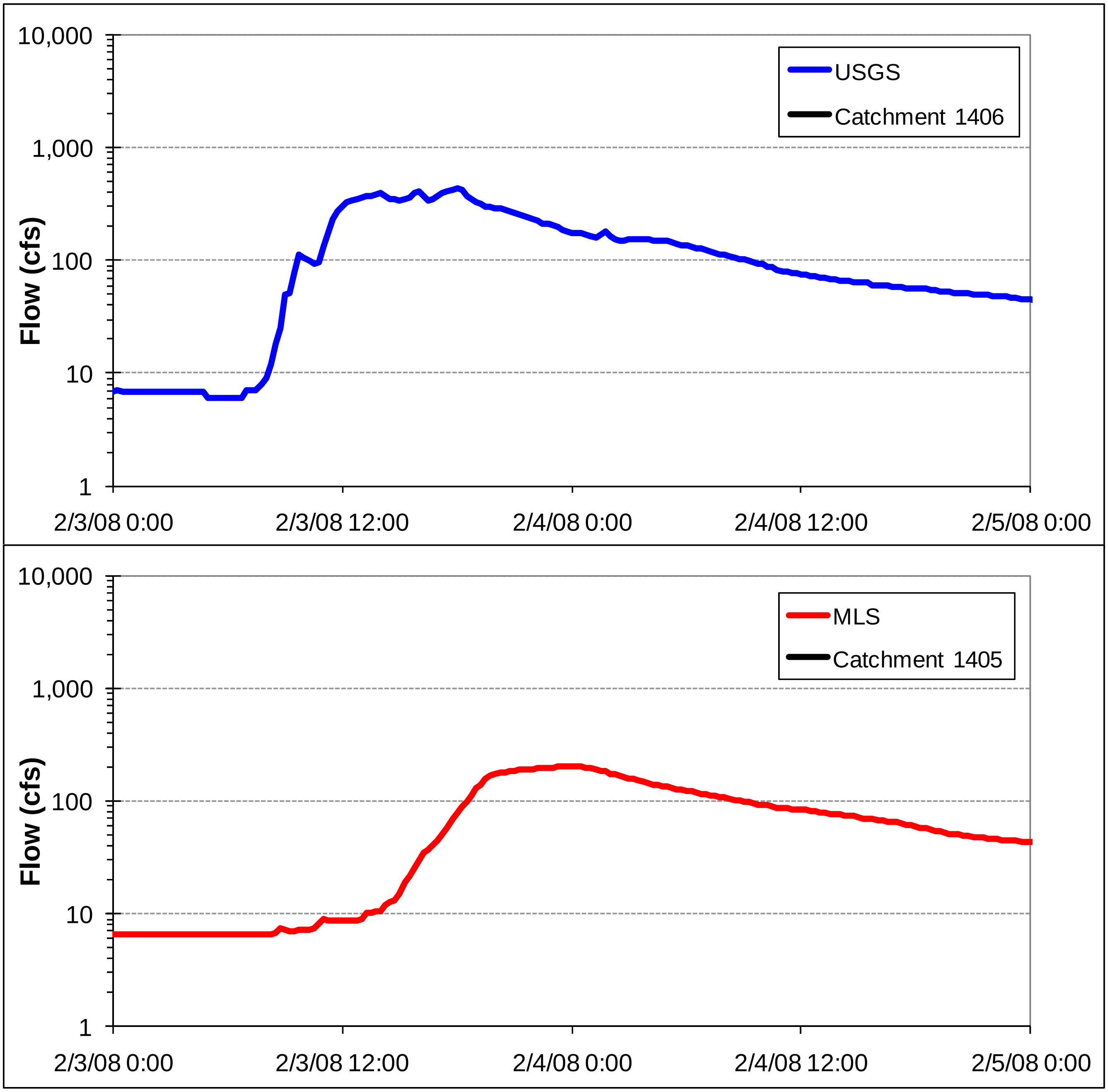


Figure 35. Comparison of modeled and observed flows at the USGS and MLS stations – 2/3/2008 storm

Suspended Sediment

Sediment deposition and scour can add or remove sediment from the modeled catchment reaches. Sand carrying capacity was assumed to be represented by a power function of velocity. The coefficient and exponent of the equation were modified to achieve a dynamic steady state where the sand in the bed remained relatively constant throughout a 16 year simulation period. The reach-specific shear stress required for deposition and resuspension of silt and clay were determined following the same methodology that was employed to define the sand dynamics.

At two of the monitoring locations, land use inputs were insufficient to replicate the observed suspended sediment concentrations. Both Carroll Canyon Creek and Carmel Creek required additional sediment inputs from the streambanks. The streambank erosion module in LSPC was used to account for the additional sediment load to the system (see Appendix B for those coefficients). The incorporation of streambank erosion provided a much improved calibration of the model at those two sites; however, care must be used in interpreting those results.

The stream cross sections in the model were based on an algorithm relating stream cross section to upstream drainage basin. Sensitivity analyses were performed on the bank erosion processes where the linear term of the bank erosion equation was modified by ±25 percent. Carmel Canyon Creek was relatively insensitive to the stream bank coefficients with a ±7 percent change in total sediment load from the catchment. Carroll Canyon Creek was more sensitive with load changes of ±21 percent when the stream bank coefficient was changed. To more accurately model the system, and the contribution from streambank erosion, accurate measurement of stream cross sections throughout the watershed would be required.

The primary dataset used in the calibration was pollutograph data for three storms that were sampled between November 2007 and February 2008 by the City of San Diego (2009) as part of the TMDL monitoring study. Both pollutograph samples and storm EMCs from the three events were used for comparison at the three monitoring sites (Figures 36 through 39). Note that flow calibration discrepancies shown in Figures 37 through 39 are likely due to possible problems with the flow rating tables and resulting streamflow estimates for these stations, as discussed in the previous section.

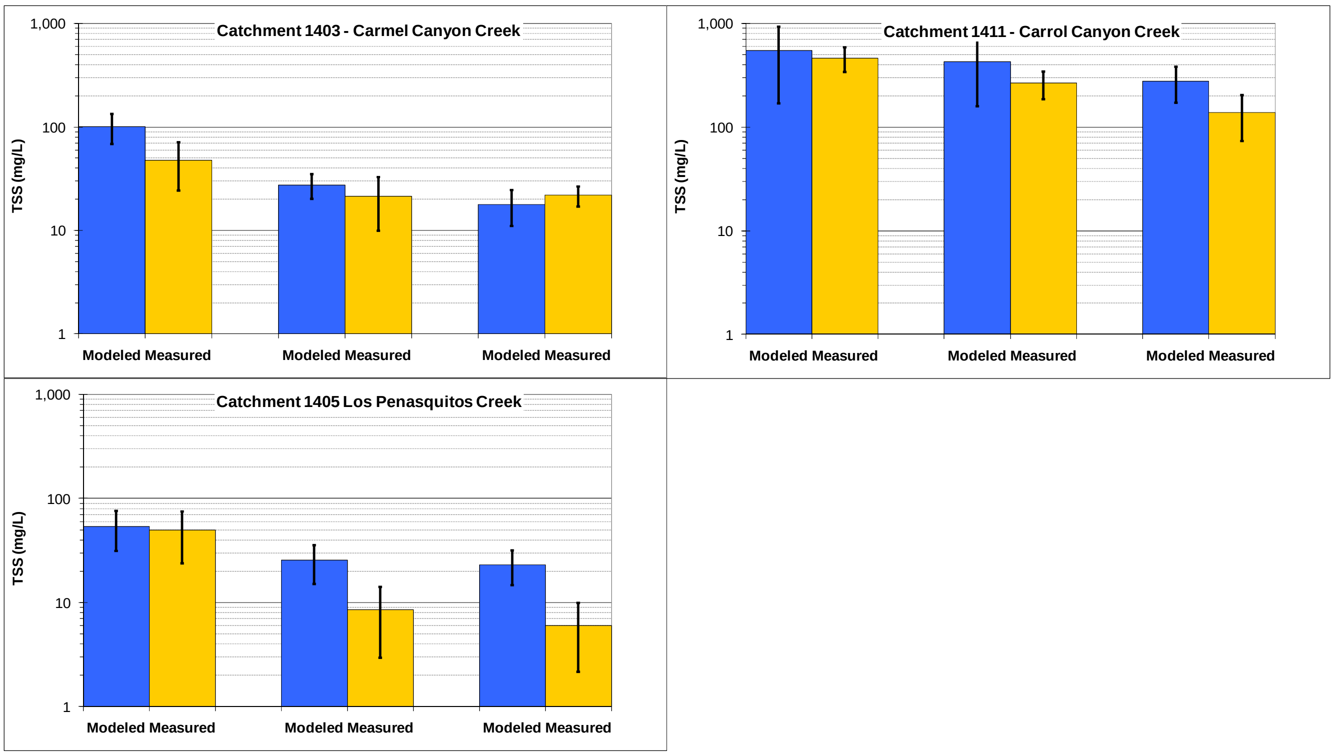


Figure 36. Comparison of EMC and 95th Percentile TSS data collected during each storm event

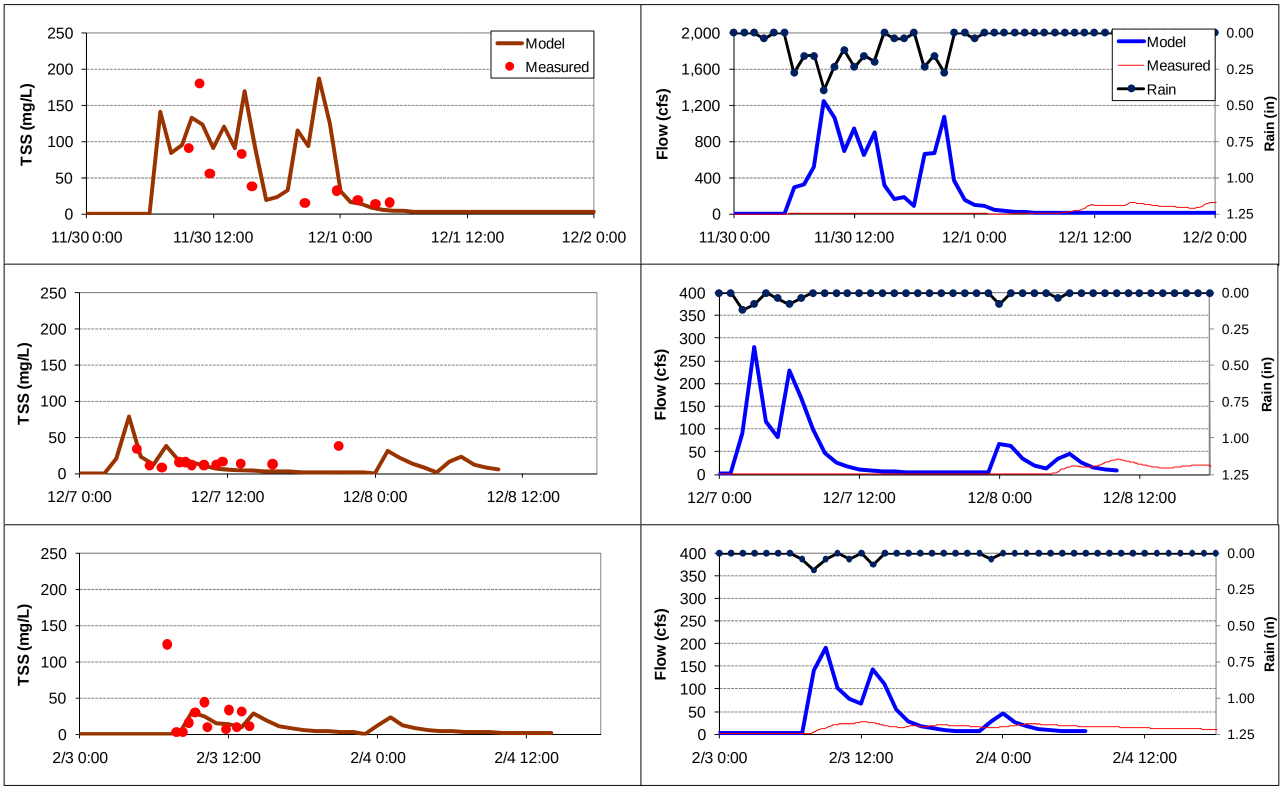


Figure 37. Pollutograph TSS calibration at Carmel Creek

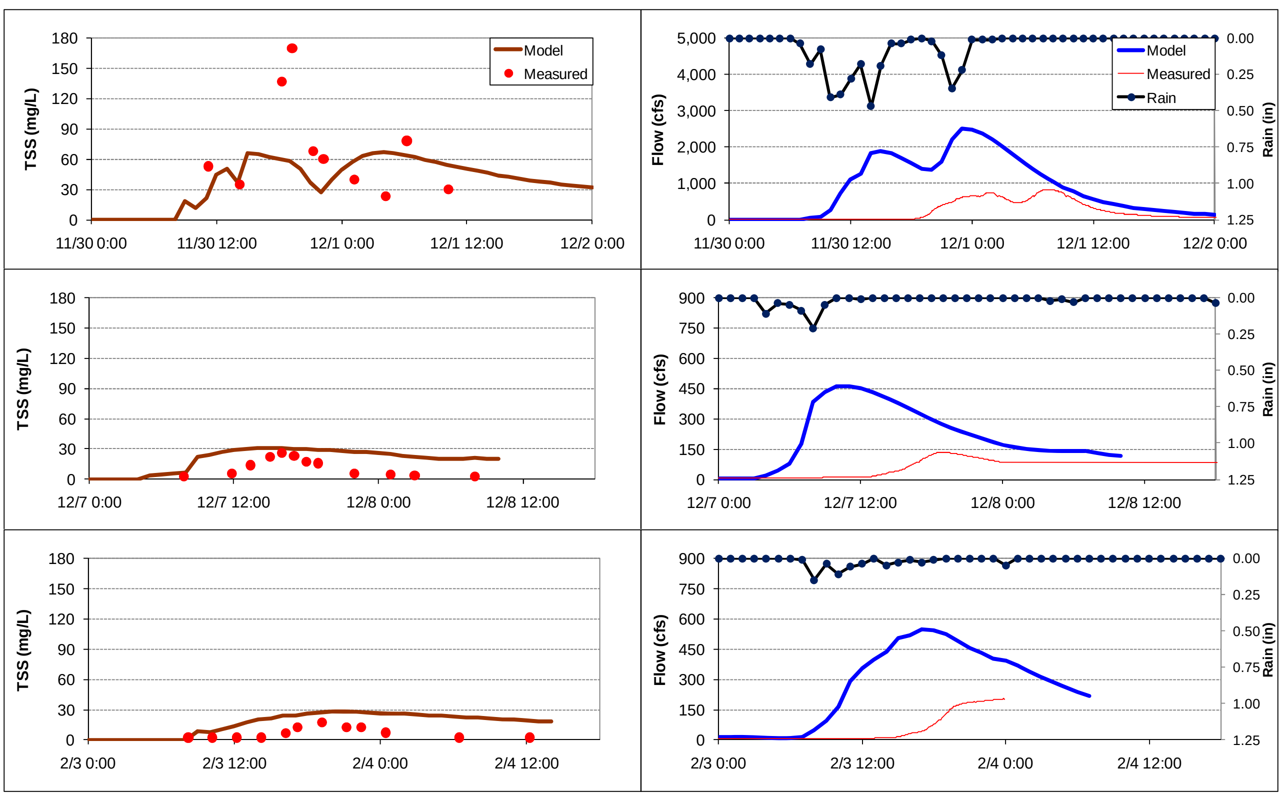


Figure 38. Pollutograph TSS calibration at Los Peñasquitos Creek

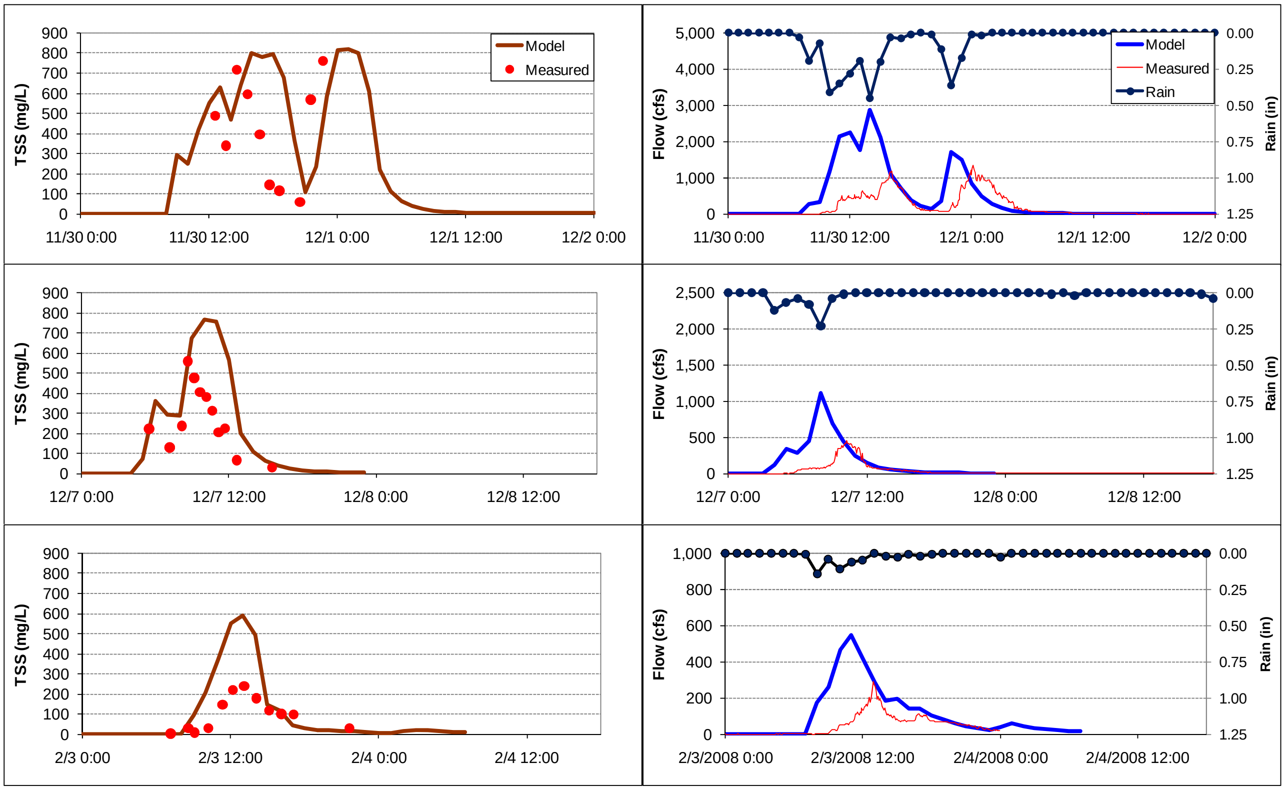


Figure 39. Pollutograph TSS calibration at Carroll Canyon Creek

Modeled particle size distributions were compared to the measured data presented in Figure 16 and 17. The measured particle size distributions were aggregated into sand (62.5-4000 µm), silt (3.1 – 53 µm) and clay (0.2 – 2 µm) fractions. Model output indicates a reasonable representation of the sand, silt and clay distributions observed in the 11/30/2007 and 12/7/2007 storms (Table 15).

Table 15. Comparison of modeled and measured sediment fractions for each storm event

	Sand	Silt	Clay

	Sand		Silt		Clay	
11/30/2007	Measured	Modeled	Measured	Modeled	Measured	Modeled
Carmel Creek	41 %	32 %	48 %	36 %	11 %	32 %
Los Peñasquitos Creek	12 %	21 %	74 %	44 %	14 %	35 %
Carroll Canyon Creek	8 %	33 %	72 %	34 %	19 %	33 %
12/07/2007						
Carmel Creek	42 %	41 %	44 %	30 %	14 %	29 %
Los Peñasquitos Creek	42 %	28 %	49 %	38 %	9 %	34 %
Carroll Canyon Creek	26 %	32 %	40 %	34 %	34 %	34 %
02/03/2008						
Carmel Creek	n/a	36 %	n/a	32 %	n/a	32 %
Los Peñasquitos Creek	n/a	29 %	n/a	38 %	n/a	33 %
Carroll Canyon Creek	n/a	32 %	n/a	34 %	n/a	34 %

The model performed reasonably well with respect to the observed concentrations at the three monitoring locations. The average difference between modeled and measured EMCs for Carmel Creek, Los Peñasquitos Creek, and Carroll Canyon Creek was 83%, 51%, and 65%, respectively. However these predictions are highly influenced by mis-timing or simply a poor comparison of measured and modeled hydrographs. The difficulties of establishing a good relationship between flow and depth is discussed in the previous section. While the measured and modeled EMCs were dissimilar, the predicted concentrations agreed well with observed data (see Figure through 39).

Additional sampling efforts within the Los Peñasquitos watershed included stormwater TSS measurements. The USGS had two separate sampling efforts in the watershed in the 1980's (Table 5). NPDES monitoring on Los Peñasquitos Creek began in 2001 and is currently an ongoing effort. Two pollutograph sampling events (11/30/2007 and 12/7/2007) were also sampled during NPDES monitoring, providing both pollutograph and EMC data.

Output from a long term simulation (1/1/1998 – 2/28/2008) was used to validate the model. Storm TSS EMCs from the model output (Model) were compared against the USGS sampling results (USGS), NPDES monitoring (MLS), and paired NPDES (MLS-1 and -3)/pollutograph monitoring (Storms 1 and 3) (Figure 40). Model results were an order of magnitude lower than the USGS grab samples but were not significantly different at the 95th percentile level. Median model output was comparable to the long term NPDES EMC sampling. It is interesting to note that the EMCs from the two common storms for the pollutograph and NPDES sampling differed by more than double.

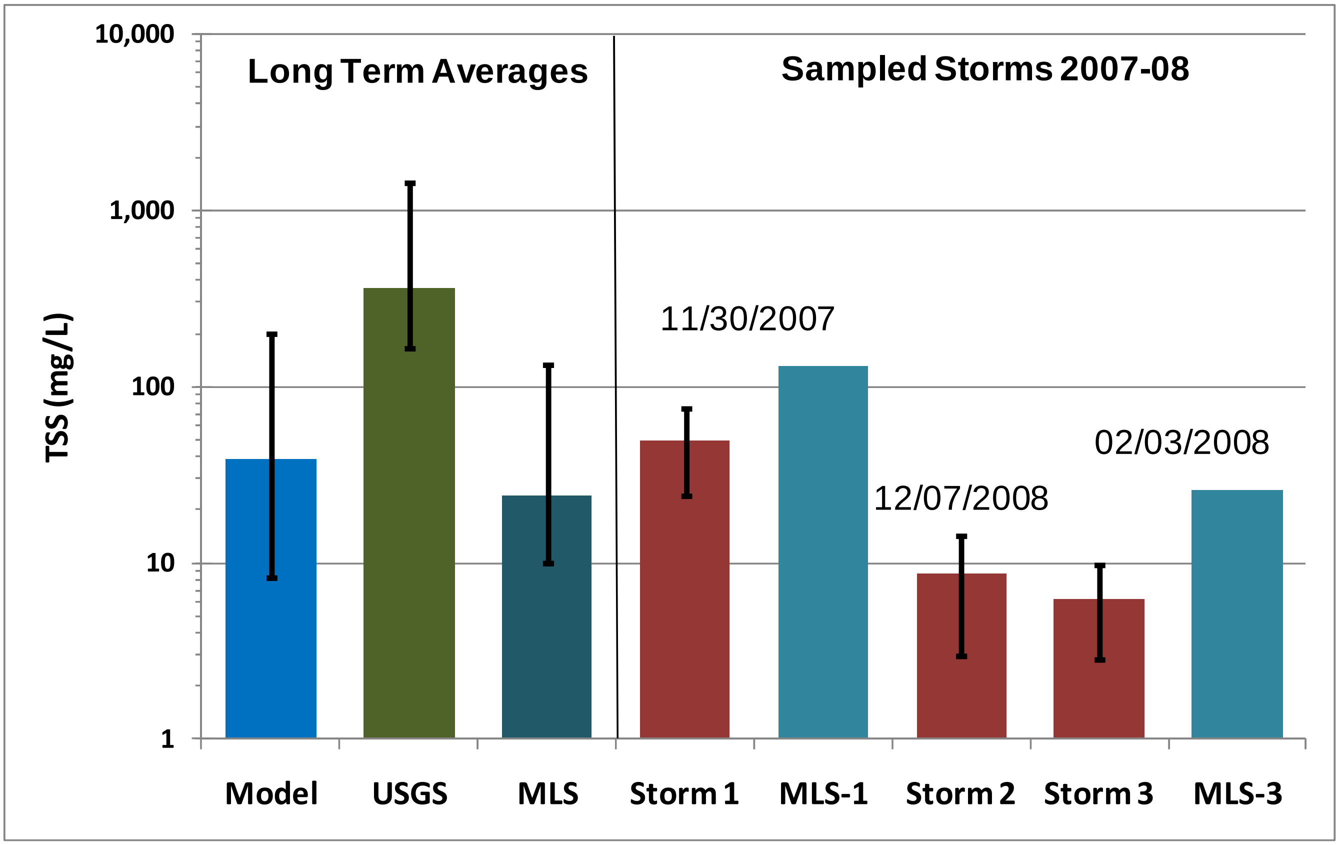


Figure 40. Comparison of modeled and measured TSS with 95th percentile confidence intervals

In 2005, the El Cuervo Norte wetlands were built upstream of the long-term MLS monitoring station. Flows from Los Peñasquitos Creek are diverted into the wetlands, creating the potential for solids to settle out and thus reduce the TSS measured at the MLS. Historic stormwater EMC monitoring data from the City of San Diego has not shown a significant reduction in TSS concentrations at the 95th percent confidence level (Figure 41).

Suspended sediment simulations reasonably predicted the observed stormwater TSS concentrations in the Los Peñasquitos watershed. Sediment transported via diffusive bed load processes also has the potential to be a significant source of sediment loadings; however, this source was neither characterized in the LSPC modeling or would be with traditional TSS sampling. Perennial flows into the lagoon were modeled with little to no sediment inputs throughout the majority of the simulation period. Because of the length of those periods without TSS at low levels, bed flow has the potential to be the dominate sediment transport pathway and could add significant sediment to the lagoon.

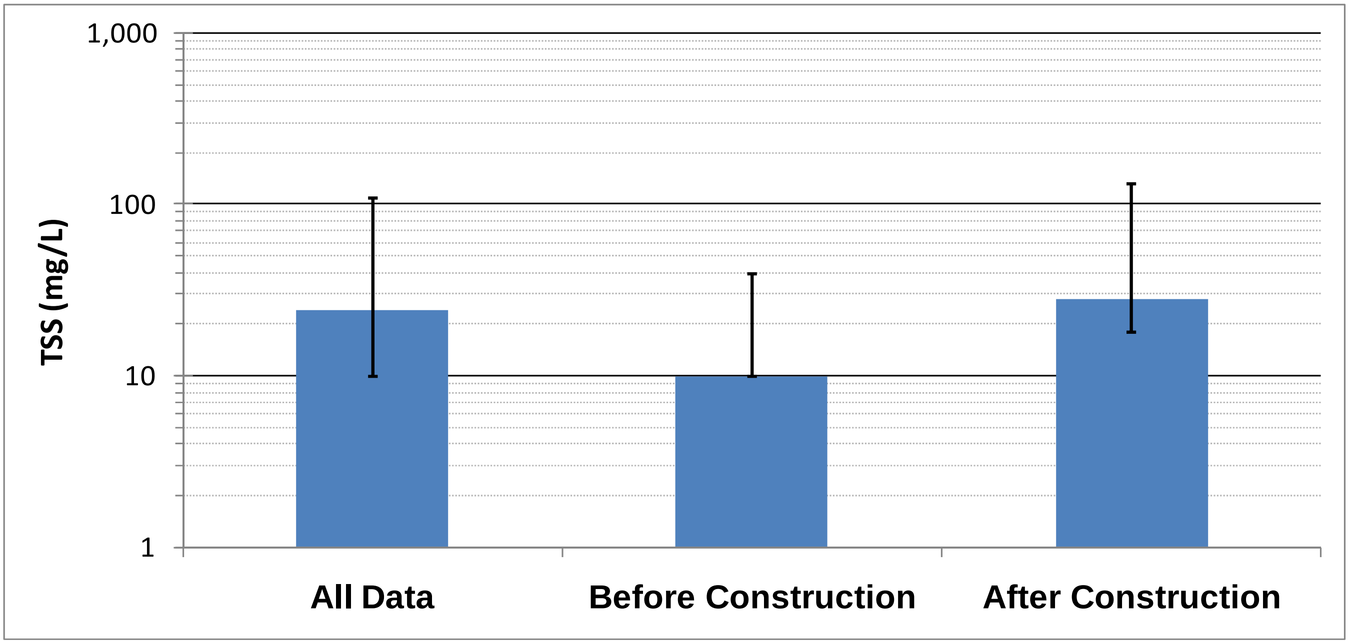


Figure 41. Measured TSS before/after construction of the El Cuervo Norte wetlands

Lagoon Model Calibration

Based on the TMDL monitoring study conducted by the City of San Diego (2009), two lagoon stations were available for model calibration. One station is located near the ocean inlet and one is located on the Carmel Branch lagoon segment. Figure 42 shows the locations where grab samples and continuous data were collected at these two locations within the lagoon. An inventory of all available monitoring data that were used during model calibration is provided in Table 16.

Table 16. Lagoon calibration data summary

Dates	Media	Sample type	Parameters	Location
11/30-12/1/07 12/07-12/8/07 2/02-2/04/08	Water	Pollutograph	TSS and Conductivity	Lagoon and ocean Inlet
11/30-12/1/07	Water	Storm composite	Percent composition of gravel, sand, silt, and clay	Lagoon segment and ocean inlet
10/07-4/08	Water	Continuous	Temperature, Conductivity, and Water Level (15 min data)	Lagoon segment and ocean inlet

In addition to these monitoring stations, the Los Peñasquitos Lagoon Foundation also routinely monitors salinity at station W2 (railroad trestle) (Figure 42). The EFDC model was calibrated based on monitoring data that were collected at these three locations. Note that monitoring data were not collected along the Los Peñasquitos/Canyon Creek lagoon segment (Los Peñasquitos Branch); therefore, comparisons could not be made to determine if the lagoon model results accurately predict conditions in this portion of the lagoon.

Model calibration involved adjusting parameters to achieve agreement between model results and observed data. The Los Peñasquitos lagoon model was calibrated in two steps. First, hydrodynamic parameters were calibrated, including examining the modeled water surface elevation, water temperature, and salinity at the two TMDL monitoring locations with the full grid. After hydrodynamics were calibrated, sediment processes were checked to ensure reasonable model representation of the lagoon using the reduced grid. The model was run from 10/1/2007 through 3/1/2008 in order to include the TMDL sampling events conducted by City of San Diego (2009).

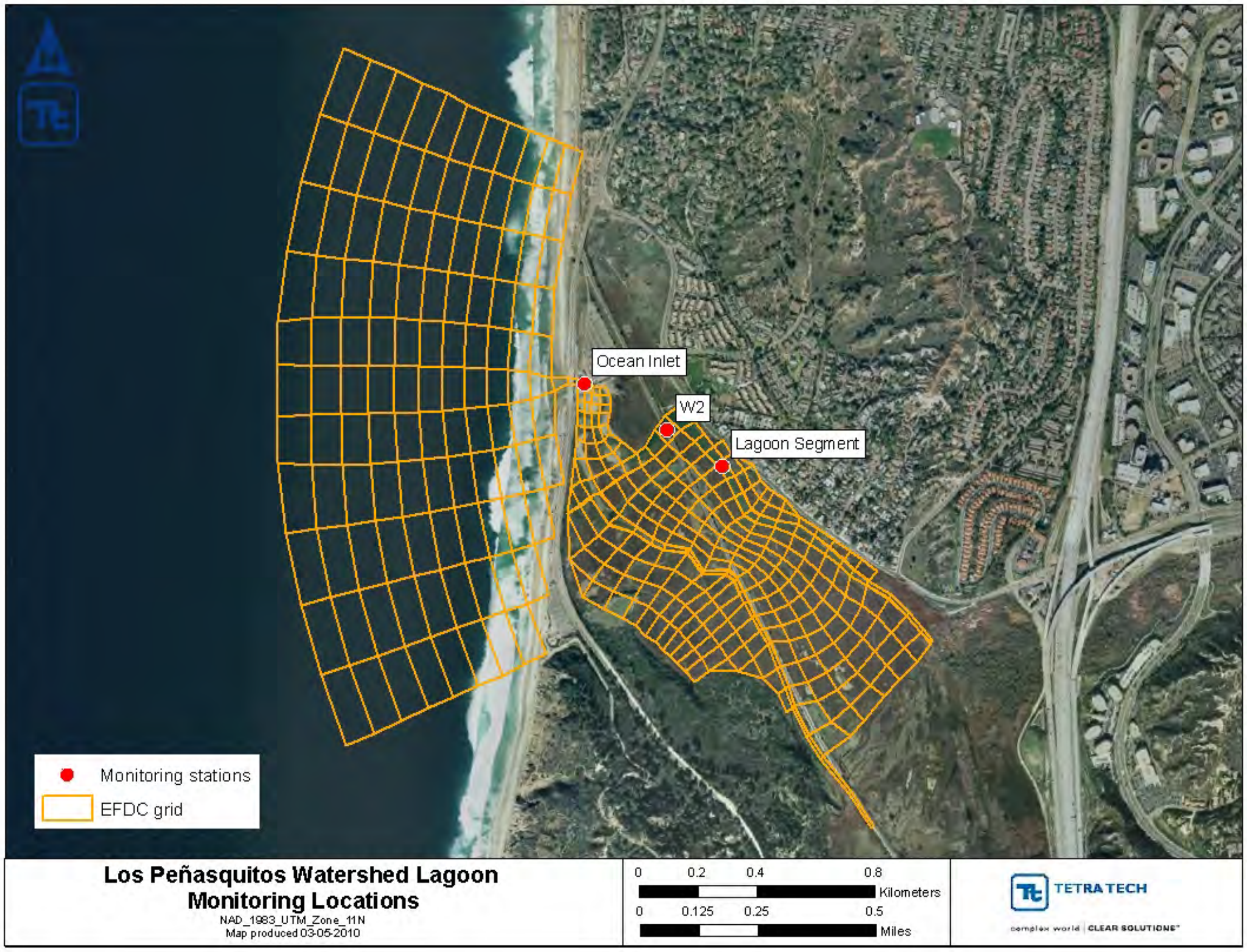


Figure 42. Calibration stations within Los Peñasquitos Lagoon

Hydrodynamics Calibration

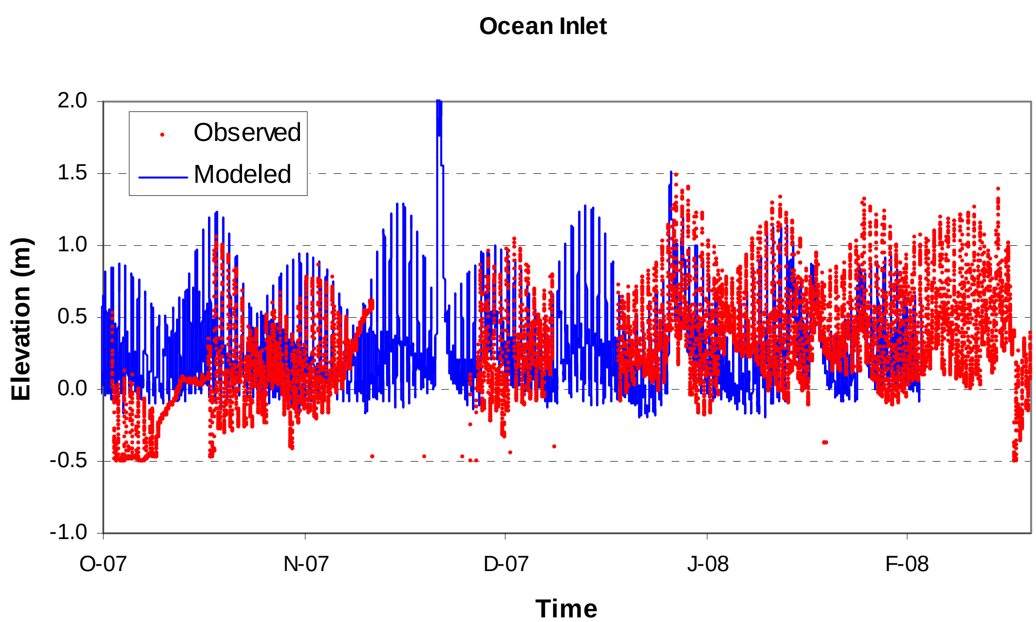
During hydrodynamic calibration, roughness height and lagoon bottom elevations for the model grid cells were adjusted slightly. The cross-section of EFDC cells is rectangular; therefore, measured cross-section data cannot be used directly. Original bottom elevations were estimated using the relatively deep measurements across the cross-section data. Final bottom elevations were determined during calibration.

Modeled water surface elevations, water temperature, and salinities were compared against observed data. Available observed data do not include water surface elevations and salinity measurements. Instead, TMDL monitoring data collected by City of San Diego (2009) included depth and specific conductance. Because model results are average depths and observed depths were determined at the sampling points, they cannot be compared directly. As a result, observed depths were converted to water surface elevations. The datum used for depth measurements was not recorded; therefore, conversion from depths to water surface elevations were estimated by assuming that average depths were near 0.5 meters above MSL.

Specific conductance data were measured continuously at the two sampling locations. EFDC can directly simulate the specific conductance as tracer. However, the impact of specific conductance on density cannot be considered as a tracer, therefore, salinity was modeled for the lagoon. Salinities were converted from specific conductance using the UNESCO algorithm (UNESCO, 1983). An Excel VBA function was developed to convert the specific conductance to salinity using the UNESCO algorithm.

Model calibration results for water surface elevation are shown in Figure 43. In general, modeled water surface elevations agree well with the elevations converted from observed depths at both of the locations. The model was able to capture the magnitude and timing of the fluctuations of water surface elevations driven by the tide and watershed inflows. The modeled elevations show some spikes with much higher elevations. These spikes are caused by modeled peak flows from the watershed, which can be different from the actual flows due to the uncertainties caused by rainfall and other parameters. In addition to uncertainty associated with the watershed inflows, the ocean inlet can change due to the sediment deposition and erosion by strong wave and/or flood tides during the simulation period. Changes in ocean inlet bathymetry can also affect the exchange of ocean water and the resulting water surface elevation. Note that for the entire calibration period (10/1/2007 – 2/28/2008), the ocean inlet was open with closures starting to occur sometime in March of 2008 as indicated in the Los Peñasquitos Lagoon TMDL monitoring report (City of San Diego, 2009)

Lagoon water temperature is mainly governed by the temperature associated with watershed inflows, ocean water temperature, and meteorological conditions. Modeled water temperature agrees well with observed water temperature at both of the monitoring locations. The model slightly over-predicted water temperature in the beginning of the simulation. This was mainly due to the open boundary water temperature data used in the model. Water temperature data were from the La Jolla station, which is approximately 5 miles south of the lagoon.
4 shows the temperature calibration at the two locations.



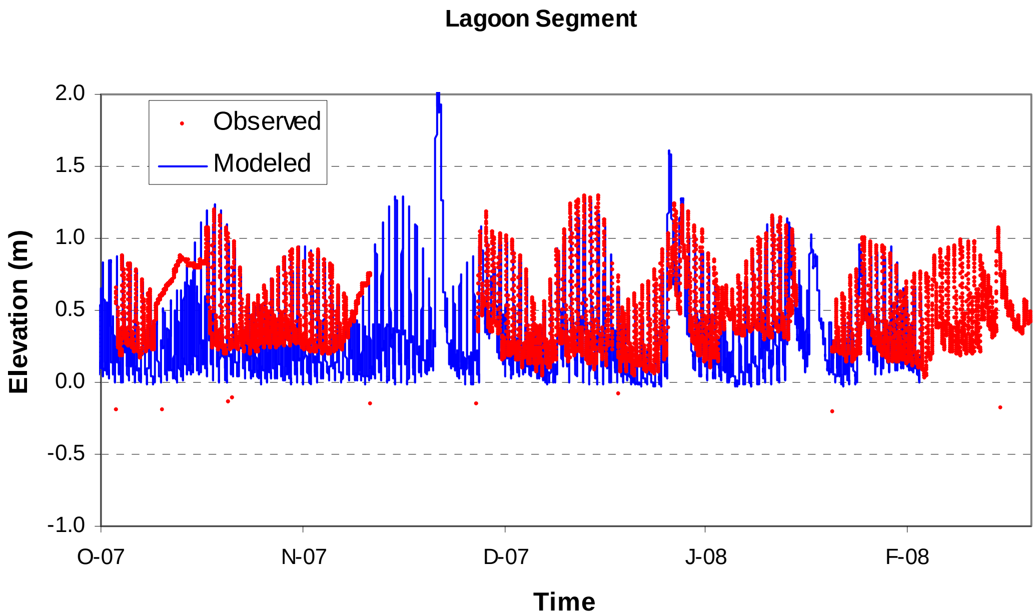


Figure 43. Water surface elevation calibration results

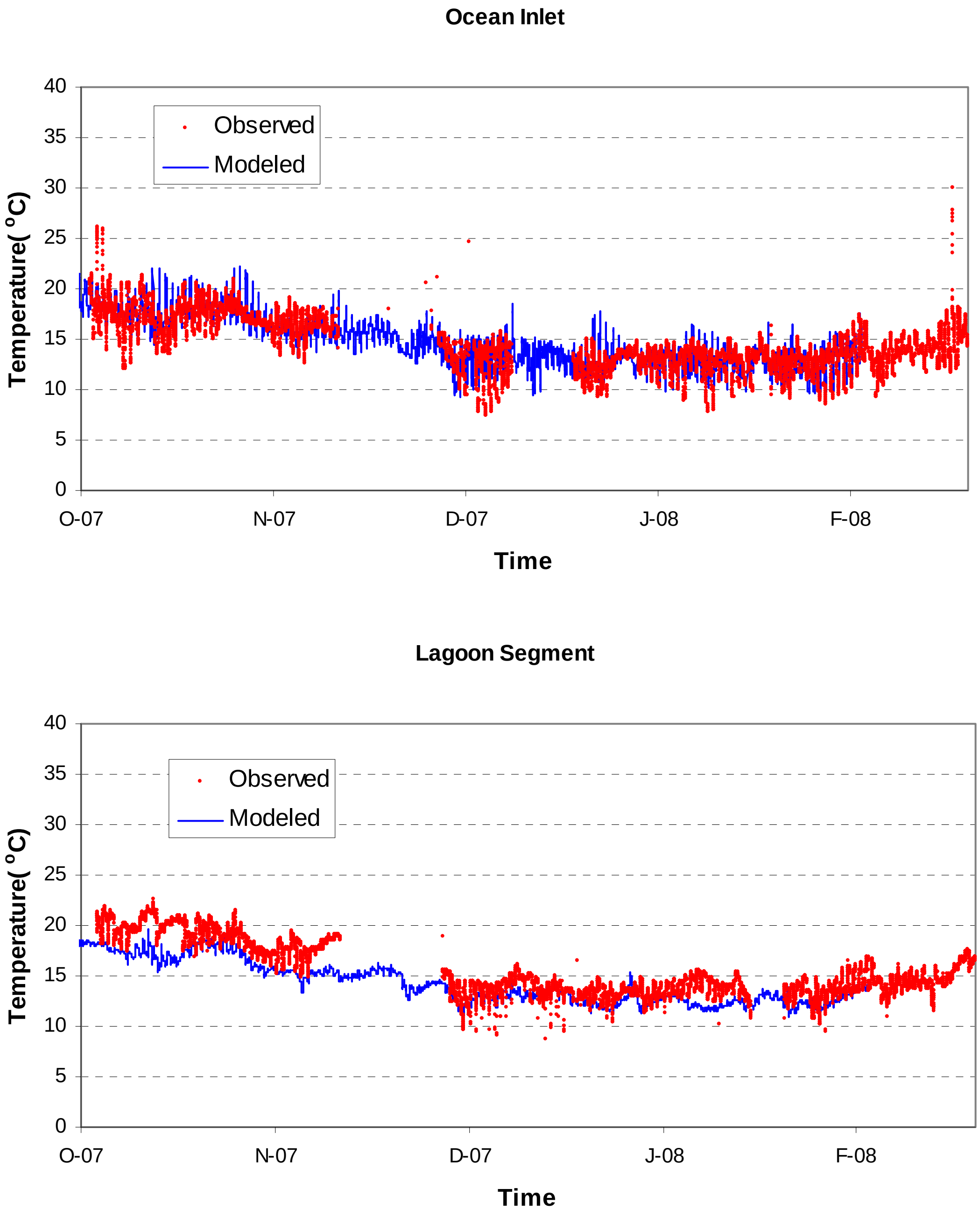
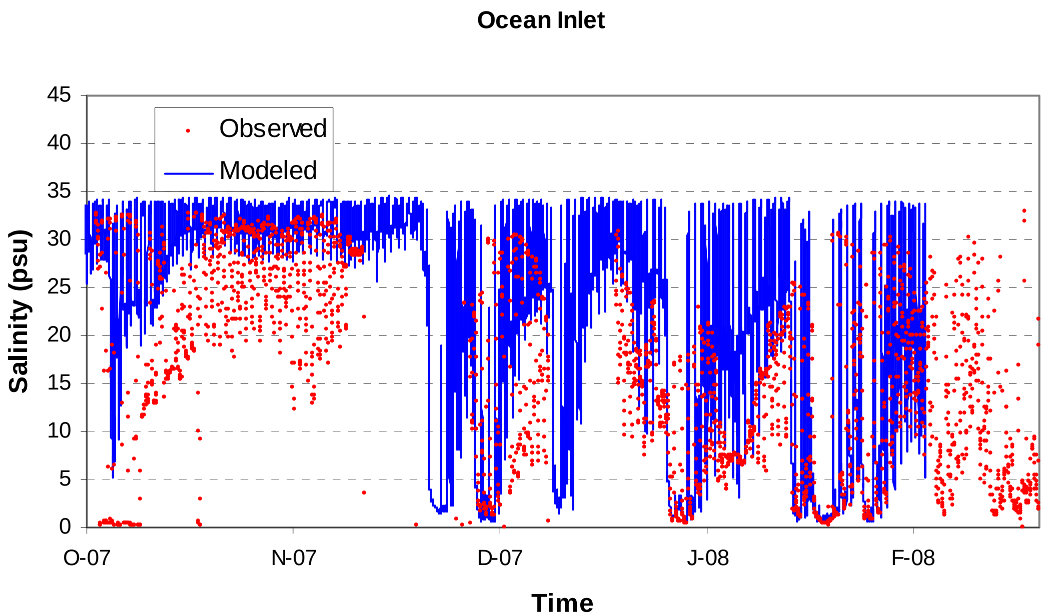
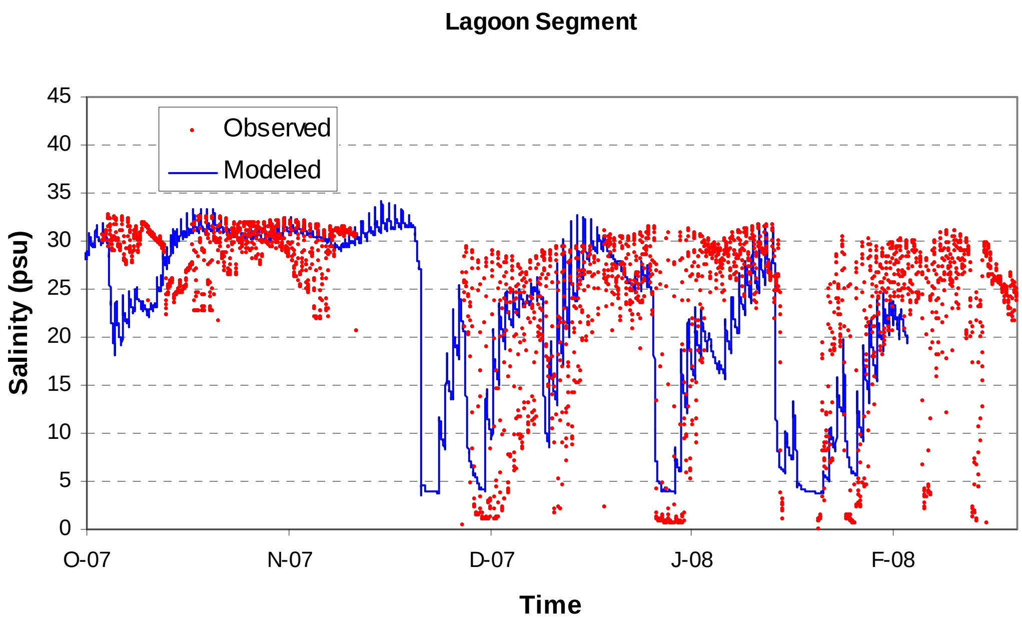


Figure 44. Temperature calibration results

Figure 45 presents the modeled and measured salinity results at the three lagoon monitoring stations. Overall, the model captured the fluctuation of salinity caused by the exchange of the ocean water and freshwater from watershed. Whenever there are storm events, the lagoon salinity decreases significantly. Salinity also changes along with the flood and ebb tides. Modeled salinity at the Ocean Inlet location agrees well with salinity data which were converted from specific conductance in terms of magnitude and fluctuation. The model under-predicted the fluctuation frequency of salinity at the Lagoon Segment location. Because the lagoon is very small compared to the watershed area, freshwater inflow has significant impact on salinity in the lagoon. The uncertainties associated with the estimation of the watershed inflows can be transported to the lagoon. In addition, the lagoon mouth is constantly changing, but the model can only represent a fixed configuration. This approximation also brings in uncertainties in the model to calculate the salt water entering the lagoon. There are also questions related to the accuracy of the monitoring data. For example, salinity levels at the Lagoon Segment location are frequently higher than salinity levels at the Ocean Inlet location. Salinity levels at the Lagoon Segment and Ocean Inlet show a strong fluctuation in a relatively short time period, while salinities observed by the Los Peñasquitos Lagoon Foundation at station W2 show consistent high salinity during dry weather conditions. Therefore, these data can only serve for qualitative evaluation of the model performance.





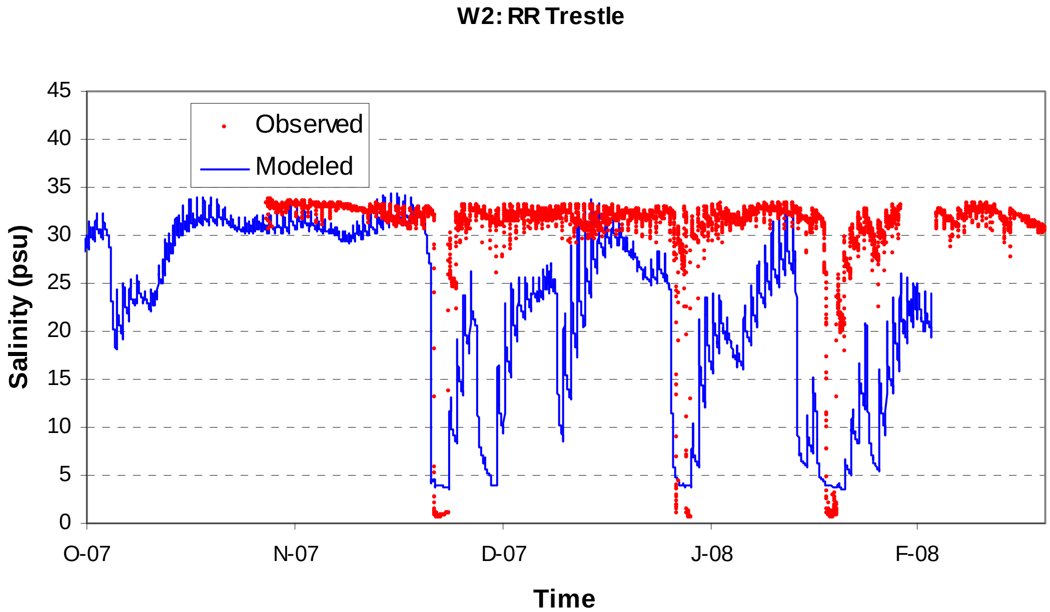


Figure 45. Salinity Calibration results for all stations (including Station W2)

Sediment Calibration

Sediment modeling in the lagoon mainly focused on the deposition and re-suspension of sand, slit, and clay fractions. The bed load transport of sand and silt was not modeled due to the lack of data needed for model representation. Sediment calibration mainly included adjustment of settling velocities for sediment deposition and critical shear stresses for sediment re-suspension. In addition, sand carried into the lagoon from the beach by flood tide represents a major source of sand based on the sediment bottom monitoring results. Monitoring was not conducted to measure the sand carried by the flood tide entering the lagoon; therefore, the concentrations of sediment at the open ocean boundary of the reduced grid were estimated during calibration. Modeled sediment components were compared against observed data during calibration.

TSS calibration plots for the Ocean Inlet and Lagoon Segment monitoring locations are shown in Figures 46 through 71. The entire calibration period is shown (Figures 46 and 59), as well as individual plots for each of the three storm events that occurred during the calibration period (Figures 47 through 49; Figures 60 through 62). In general, the model is able to capture the main pattern of sediment transport in the lagoon, which is related to storm events. The lagoon sediment in the water column increases during storm events due to the high watershed loading of sediment associated with storm events. Because the lagoon is sensitive to the watershed loadings, uncertainties associated with watershed modeling are transported to the lagoon modeling. The timing of modeled peak flow can be shifted several hours (earlier or later) and the peak concentrations of sediment may be different as compared to the observed data. For example, there appears to be a time lag in the TSS calibration results at the Lagoon Segment station (refer to Figure 60). Flow data collected at the MLS station on Los Peñasquitos Creek also indicate possible timing differences with the watershed model results, however, other information including the flow calibration results at the USGS gage upstream, TSS calibration results at each pollutograph station, and TSS calibration results at the Ocean Inlet station all indicate a good correlation with respect to time. Note that TSS grab samples were not collected at the Lagoon Segment station on 11/30/07 due to sampling problems; therefore, TSS samples were first collected on 12/1/07. Other data limitations are discussed below.

The calibration results for the Lagoon Segment station for the two later storm events (12/7/2007 and 2/3/2008) do not match because watershed flow into the lagoon during these storm events is relatively low in comparison to the first storm event (11/30/2007) (refer to Figures 59 through 62). Watershed contributions have a much greater influence on water quality conditions at this station, versus the Ocean Inlet station which showed better agreement in the calibration results. TSS calibration results for the watershed model showed good agreement for Carmel Creek; therefore, it is expected that TSS contributions from the watershed were correct. The lagoon model response for TSS was proportionate to the flow and sediment contributions from the watershed for all three storm events. It is also interesting to note that the TSS measurements from the Lagoon Segment station were similar in magnitude between the first and third storms, although watershed flows into the lagoon were much higher during the first storm. There may also be significant localized processes that affected TSS concentrations. For example, localized scour of bed or bank sediment may occur during storm events with high water velocity. The model represents the averaged condition of the channel and uses average width and depth for each grid cell. The modeled velocity for each grid cell represents average velocity and is, therefore, lower than the actual maximum velocity that can occur. Higher velocities can cause scouring and increase the sediment concentration locally, while the model will not mimic such local phenomenon. Other factors may also cause a discrepancy in the calibration results, including possible data quality issues, sample collection methods, and spatial differences in TSS concentration within lagoon channels (depth, distance from bank, etc.).

A detailed comparison of the three sediment size classes for both stations is also shown (Figures 50 through 58; Figures 63 through 71). Observed sand, silt, and clay fractions were estimated based on the TSS measurements and particle size distribution data that were derived from water column samples collected during the 11/30/07 monitoring event at these two locations. Among the three sediment classes modeled, sand is under-predicted. Sand from the ocean and watershed can settle out quickly due to its high settling velocity. Sand also moves throughout the lagoon primarily through bed load transport processes; therefore, sand concentrations near the bottom can be much higher than concentrations near the water surface. Modeled silt and clay fractions show better agreement with observed data at both stations. Note that the watershed model was calibrated using TSS rather than the individual sediment fractions. Also, particle size distributions for the observed data were based on sample results from one monitored storm event (11/30/2007). TSS data for all three storm events were separated into the three sediment classes based on the results from this single event. In addition, the particle size distribution for suspended sediment is highly time variable because of the different settling velocities for sand, silt, and clay fractions; therefore the size distribution from one storm sample cannot fully represent the size distribution of sediment throughout each storm event. Given the uncertainty of the sediment particle size distributions, model calibration focused on TSS and individual sediment class data only serve as supplemental evaluation of model performance.

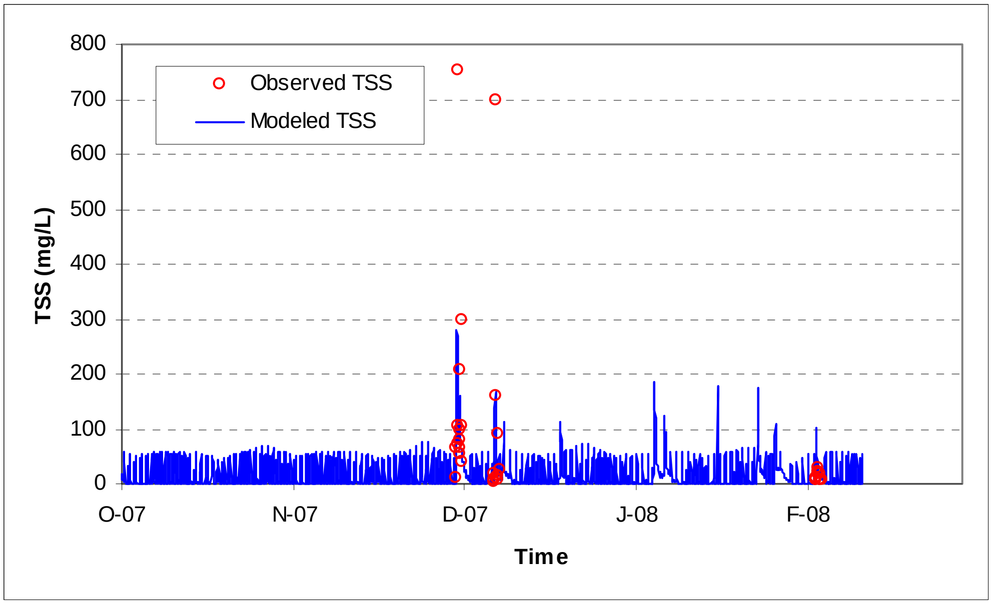


Figure 46. TSS calibration at Ocean Inlet – entire calibration period

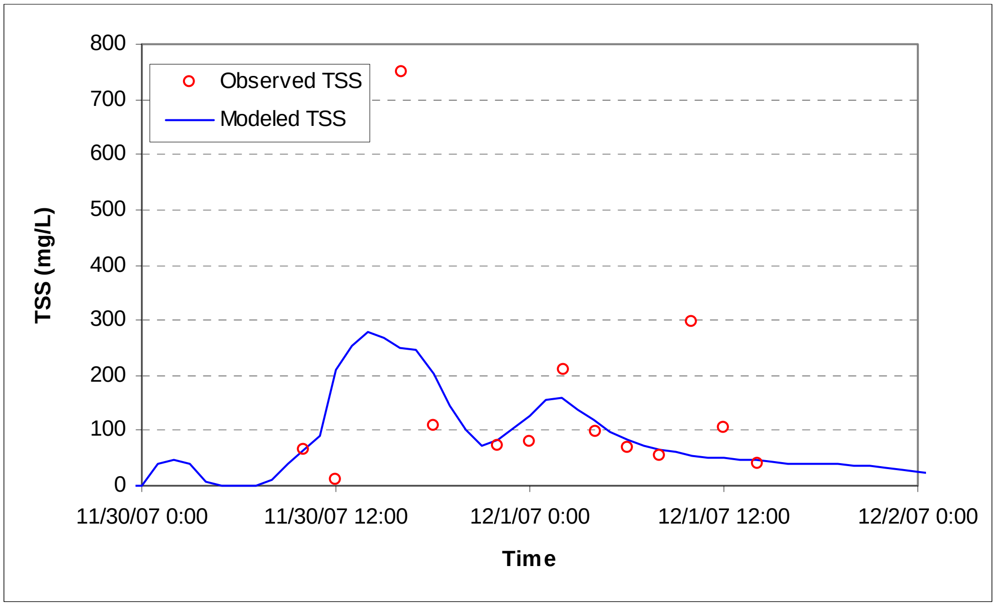


Figure 47. TSS calibration at Ocean Inlet – 11/30/2007 storm

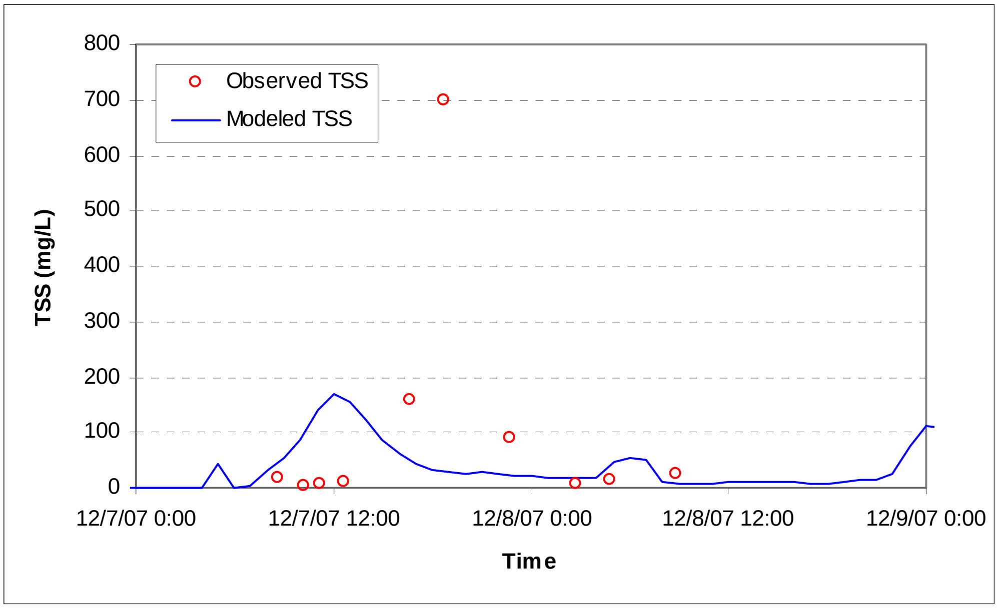


Figure 48. TSS calibration at Ocean Inlet – 12/7/2007 storm

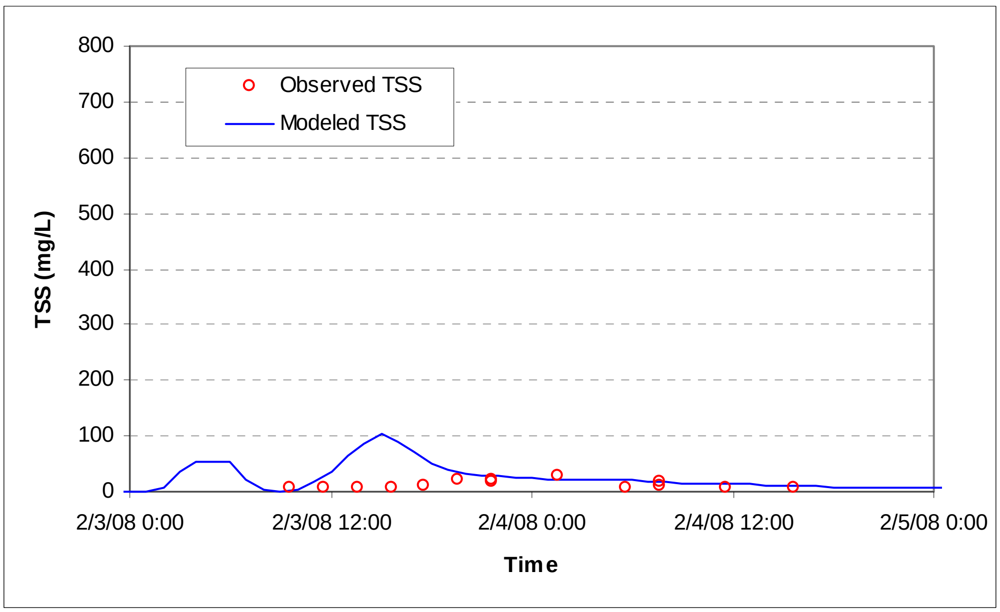


Figure 49. TSS calibration at Ocean Inlet – 2/3/2008 storm

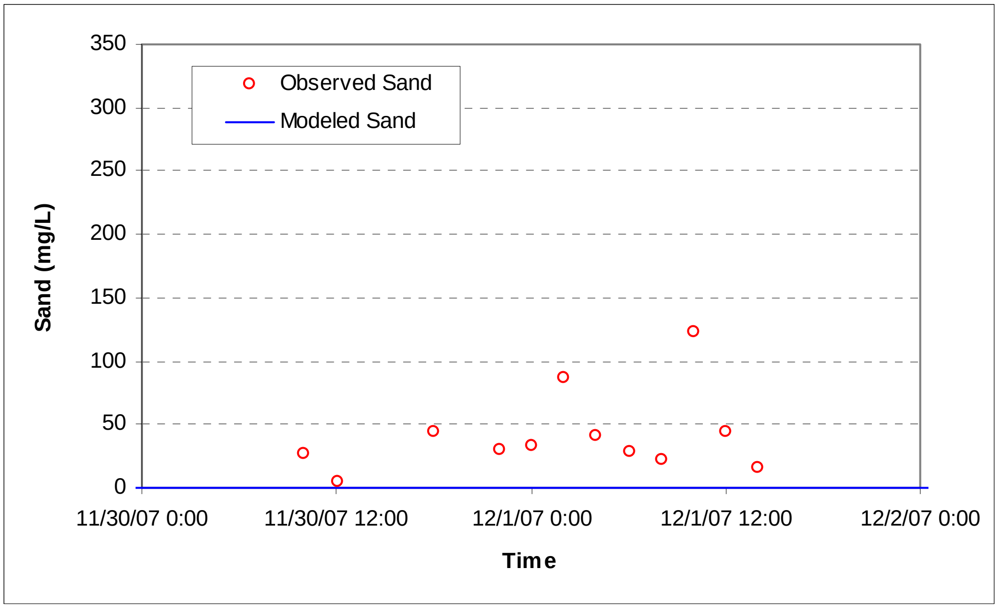


Figure 50. Modeled vs. observed sand fraction at Ocean Inlet – 11/30/2007 storm

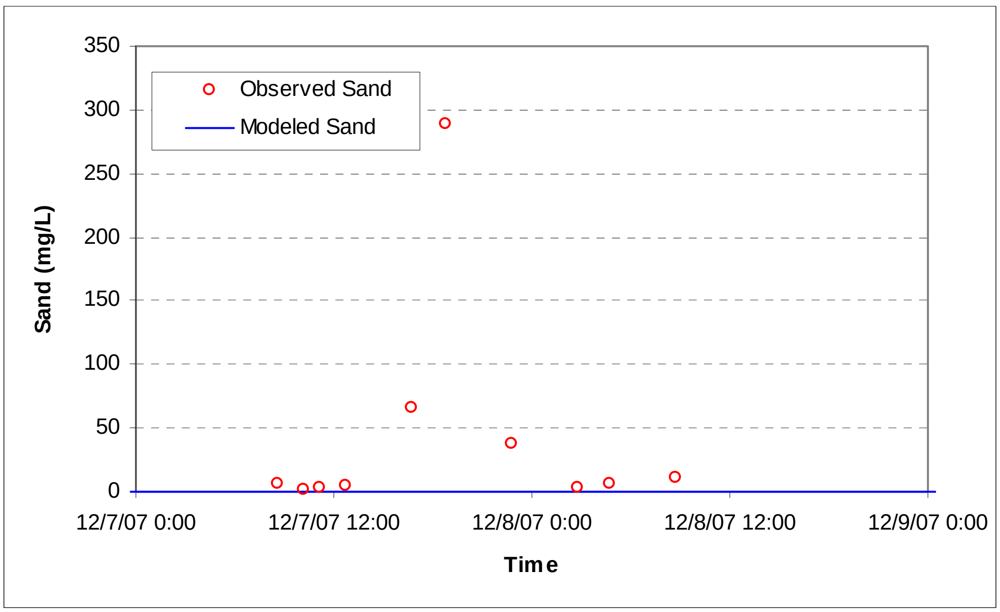


Figure 51. Modeled vs. observed sand fraction at Ocean Inlet – 12/7/2007 storm

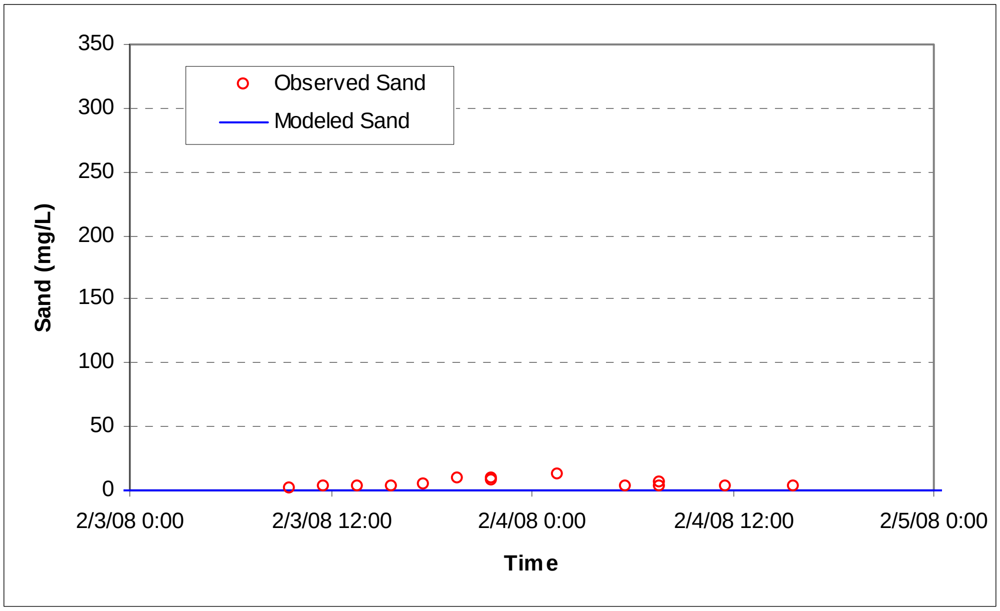


Figure 52. Modeled vs. observed sand fraction at Ocean Inlet – 2/3/2008 storm

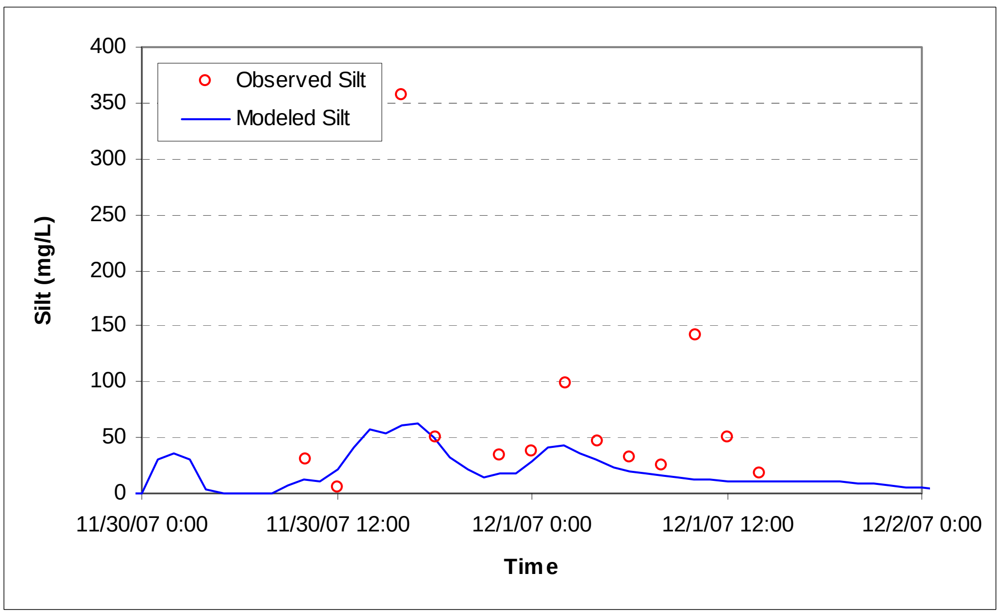


Figure 53. Modeled vs. observed silt fraction at Ocean Inlet – 11/30/2007 storm

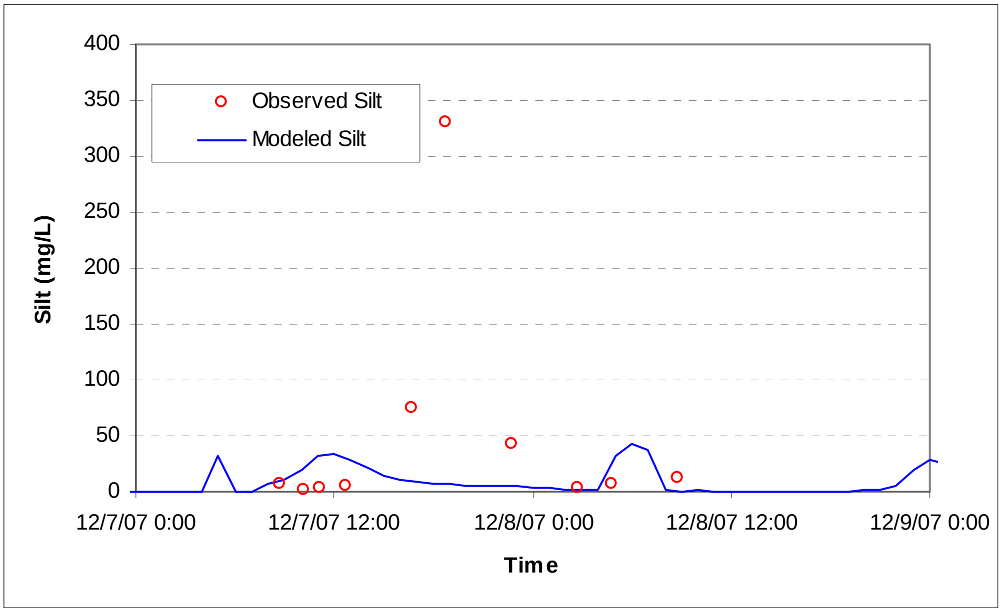


Figure 54. Modeled vs. observed silt fraction at Ocean Inlet – 12/7/2007 storm

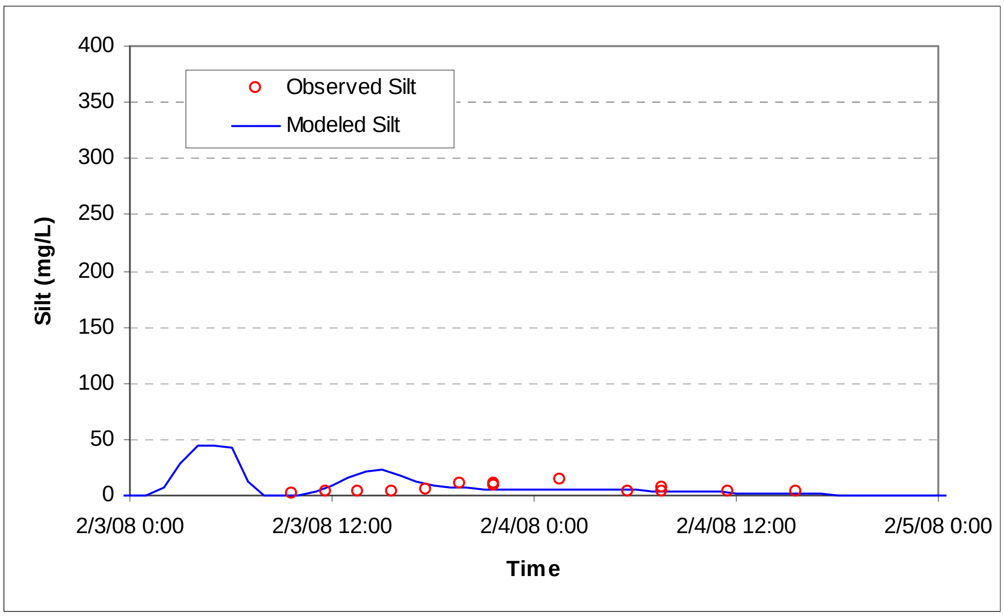


Figure 55. Modeled vs. observed silt fraction at Ocean Inlet – 2/3/2008 storm

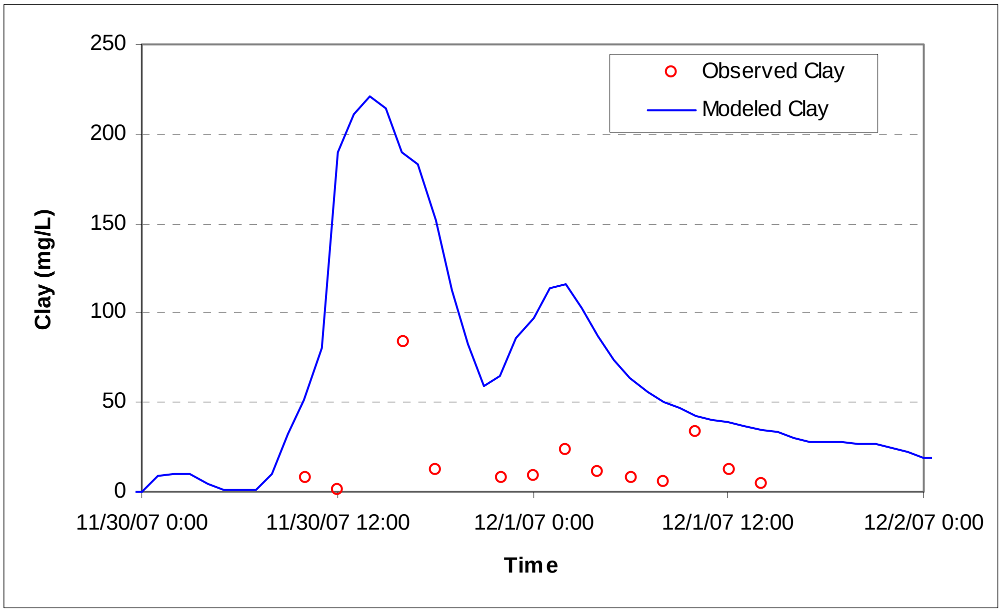


Figure 56. Modeled vs. observed clay fraction at Ocean Inlet – 11/30/2007 storm

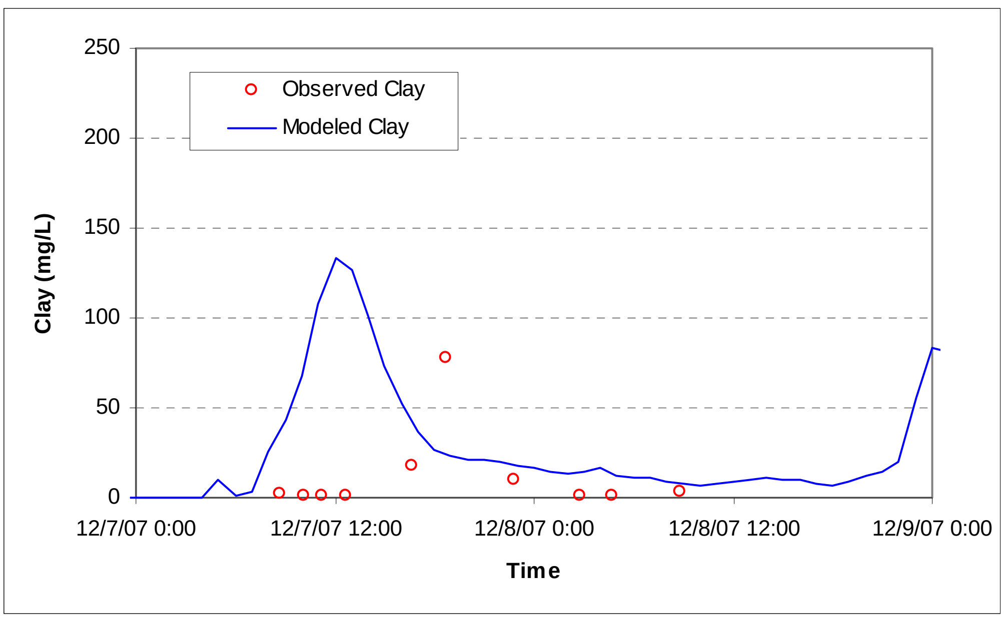


Figure 57. Modeled vs. observed clay fraction at Ocean Inlet – 12/7/2007 storm

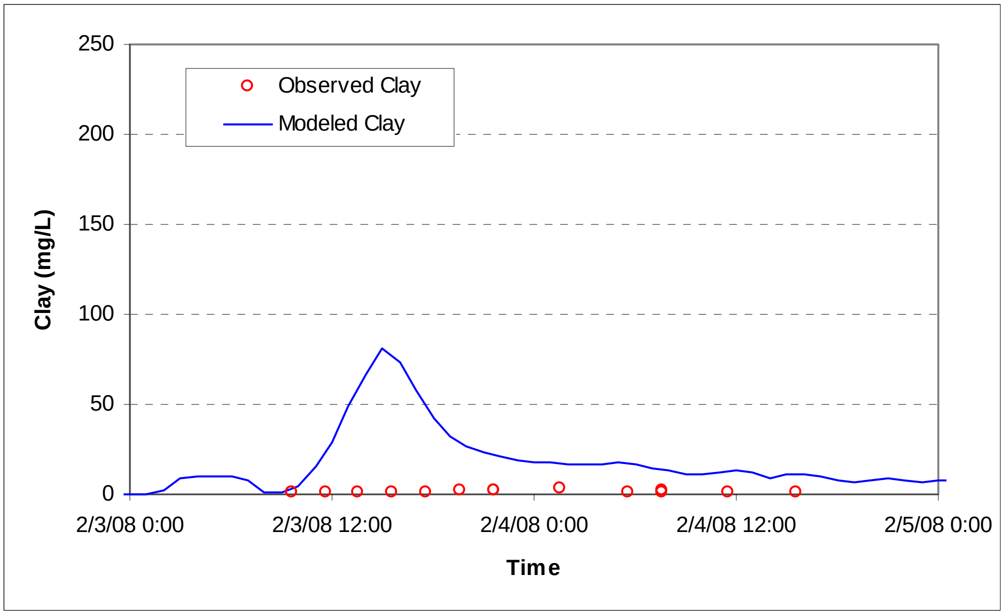


Figure 58. Modeled vs. observed clay fraction at Ocean Inlet – 2/3/2008 storm

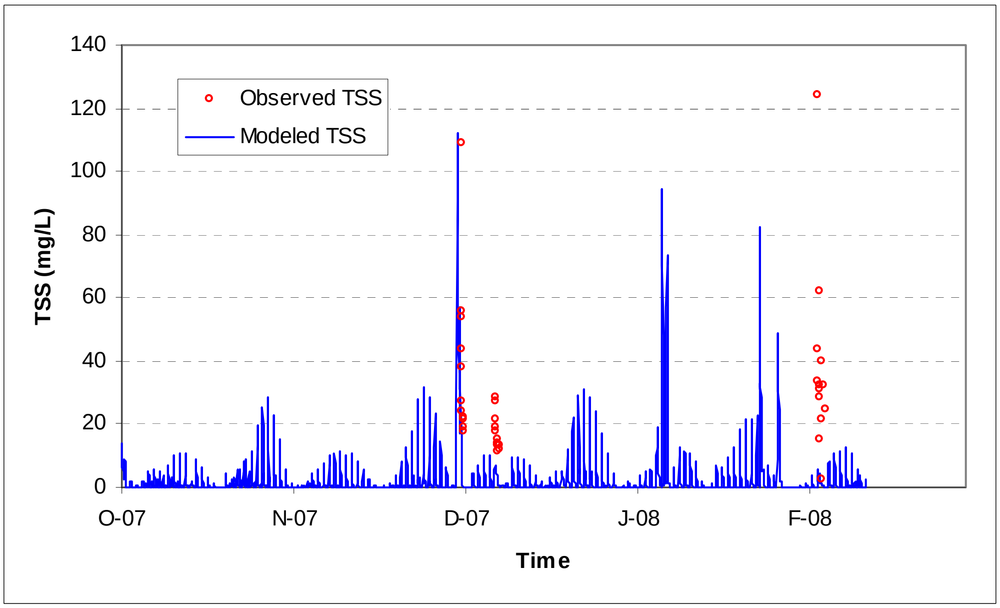


Figure 59. TSS calibration at Lagoon Segment – entire calibration period

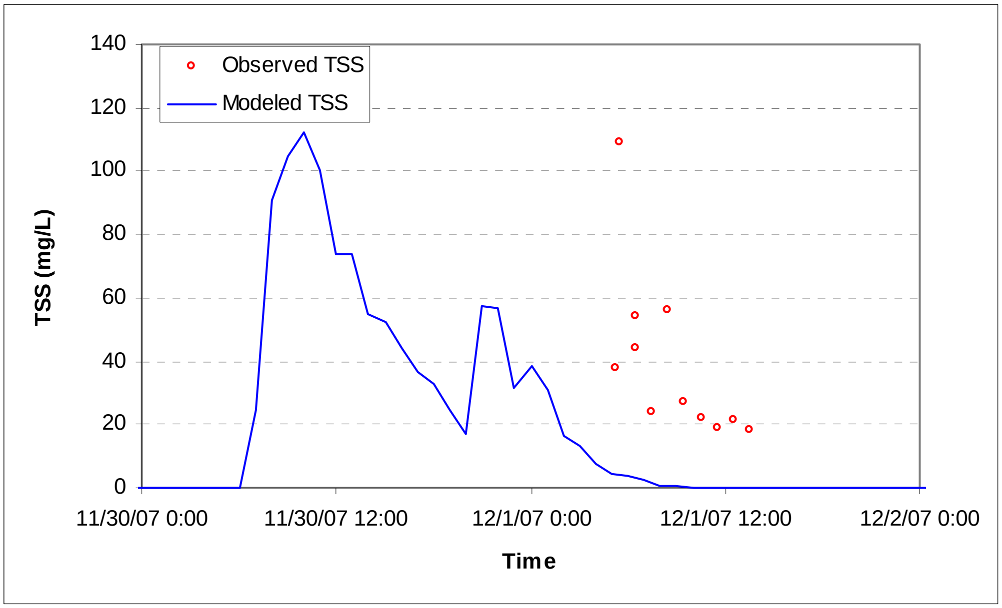


Figure 60. TSS calibration at Lagoon Segment – 11/30/2007 storm

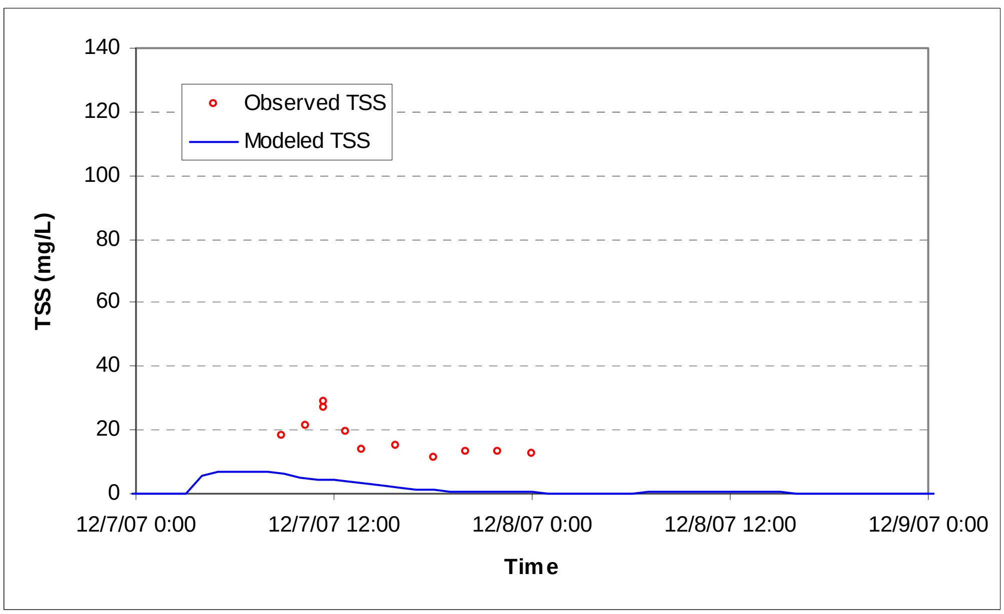


Figure 61. TSS calibration at Lagoon Segment – 12/7/2007 storm

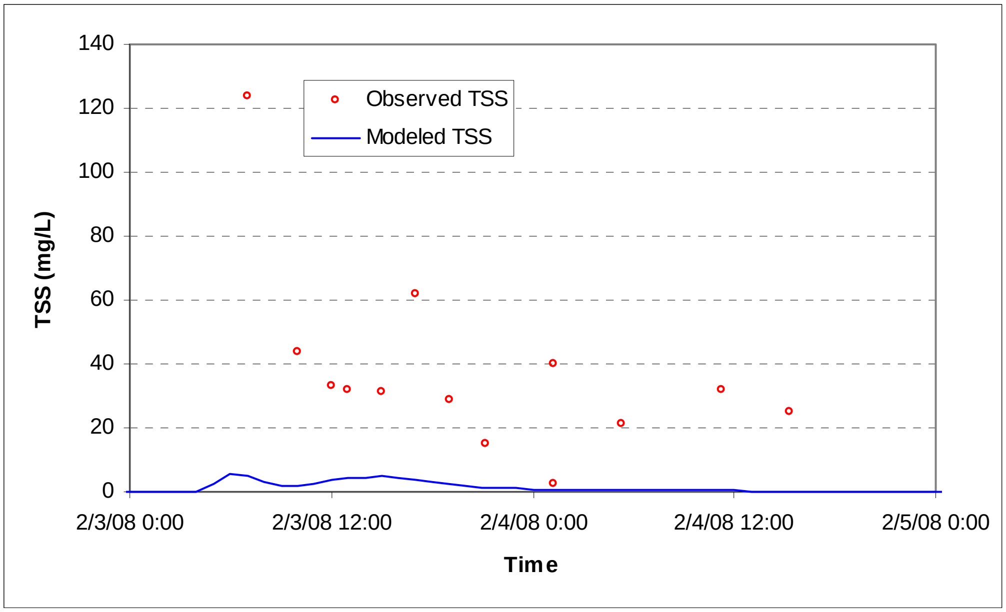


Figure 62. TSS calibration at Lagoon Segment – 2/3/2008 storm

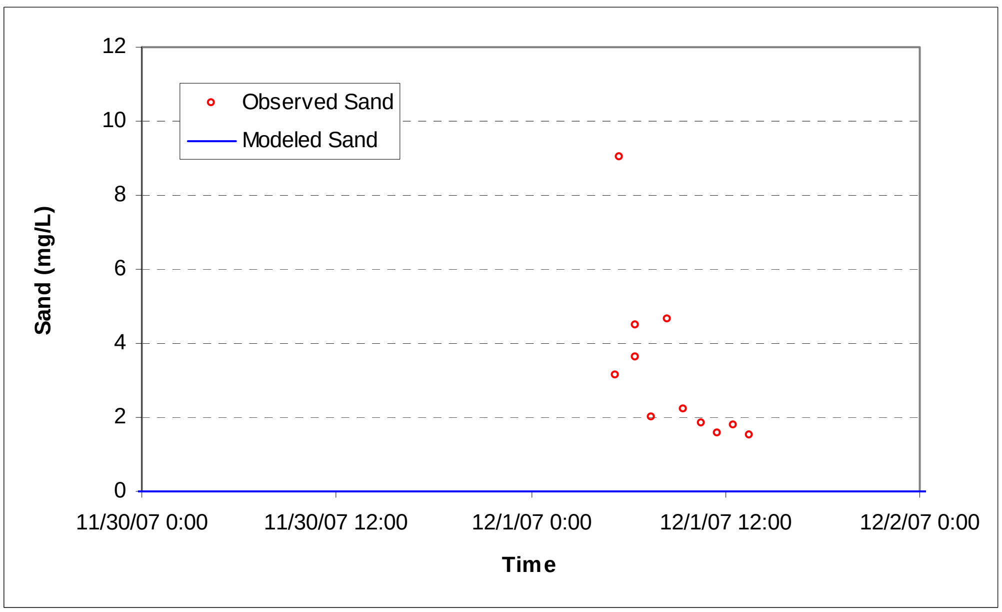


Figure 63. Modeled vs. observed sand fraction at Lagoon Segment – 11/30/2007 storm

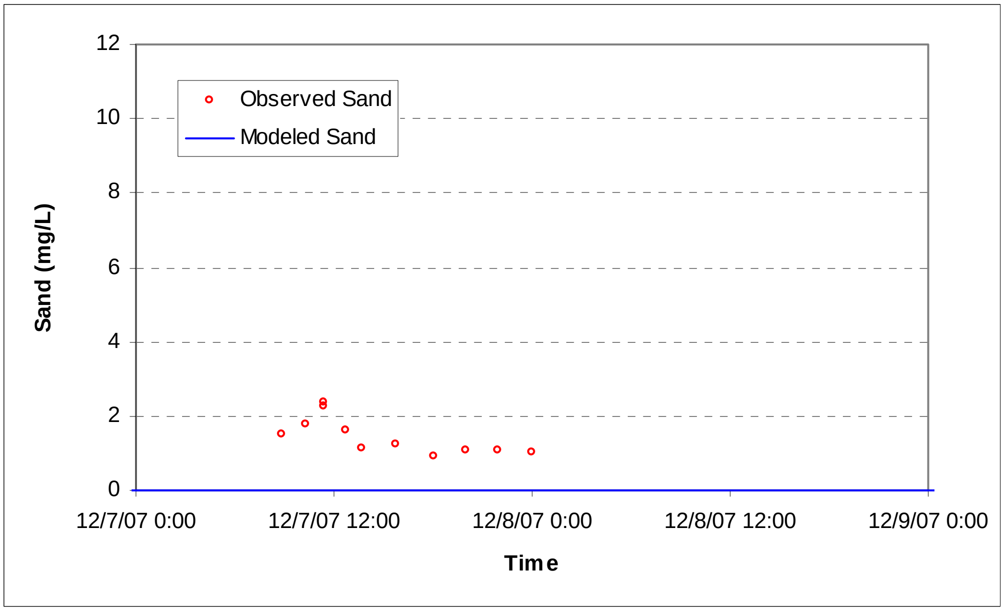


Figure 64. Modeled vs. observed sand fraction at Lagoon Segment – 12/7/2007 storm

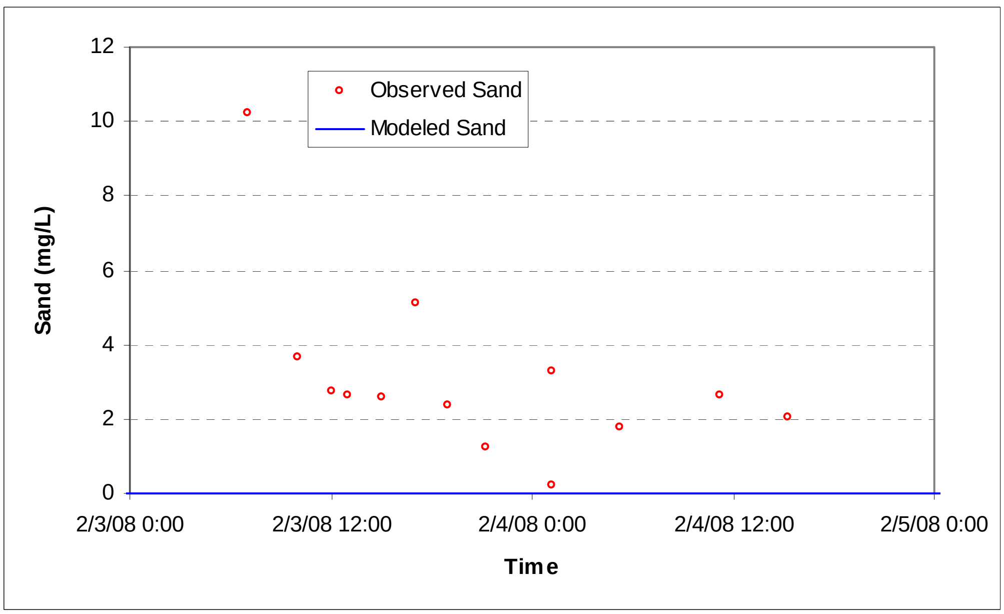


Figure 65. Modeled vs. observed sand fraction at Lagoon Segment – 2/3/2008 storm

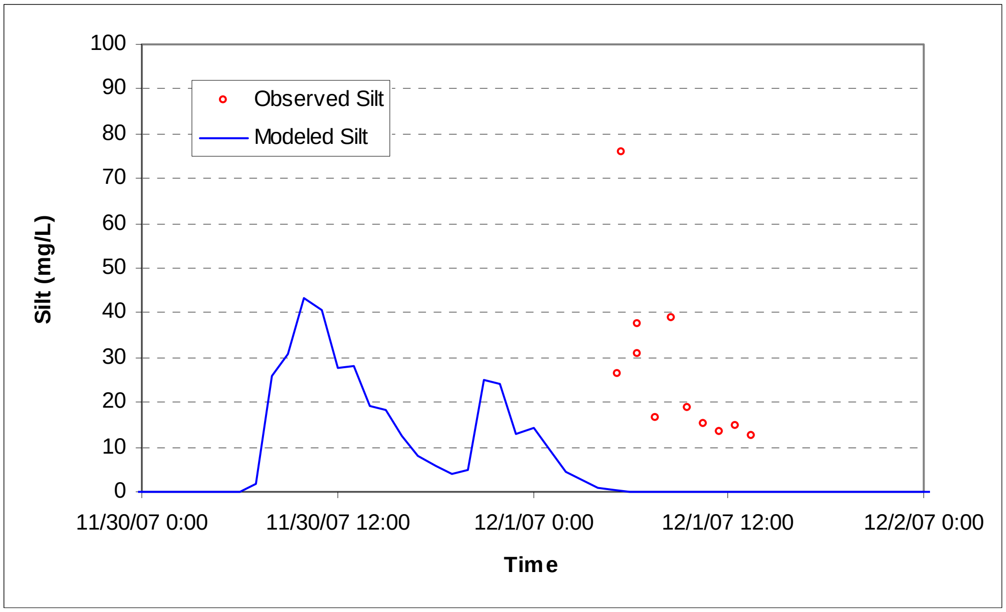


Figure 66. Modeled vs. observed silt fraction at Lagoon Segment – 11/30/2007 storm

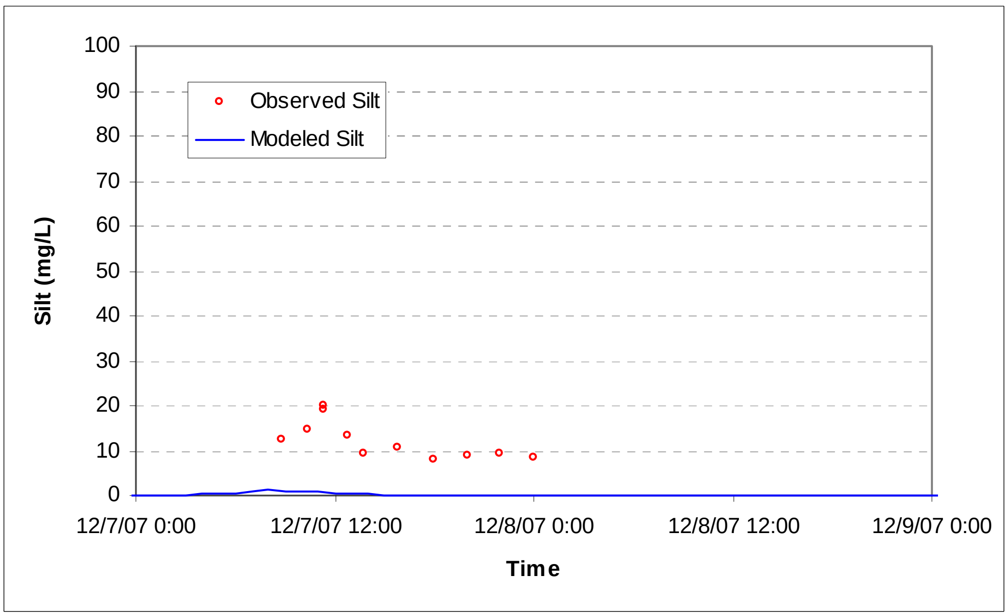


Figure 67. Modeled vs. observed silt fraction at Lagoon Segment – 12/7/2007 storm

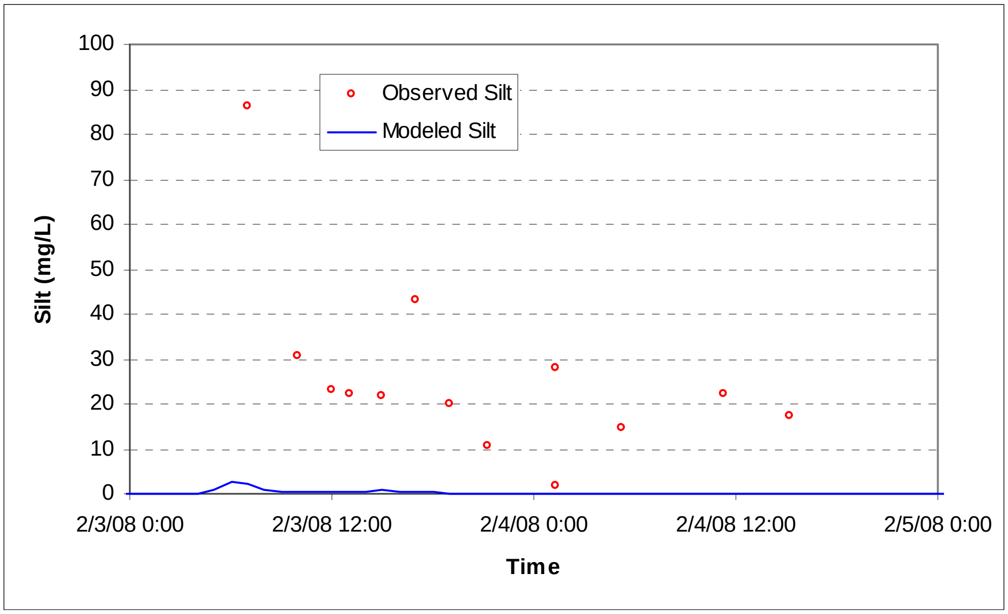


Figure 68. Modeled vs. observed silt fraction at Lagoon Segment – 2/3/2008 storm

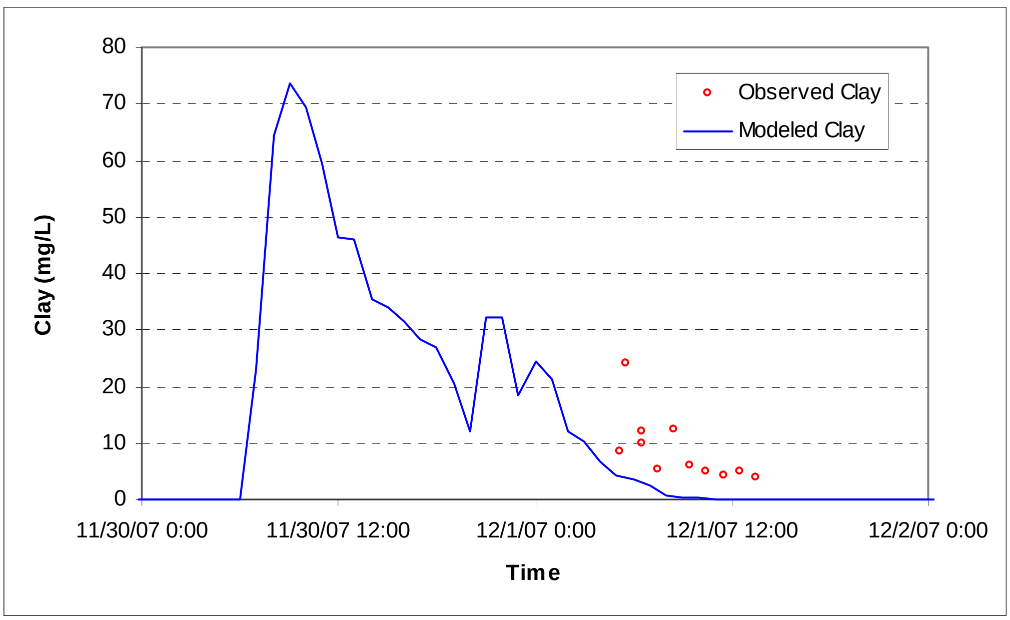


Figure 69. Modeled vs. observed clay fraction at Lagoon Segment – 11/30/2007 storm

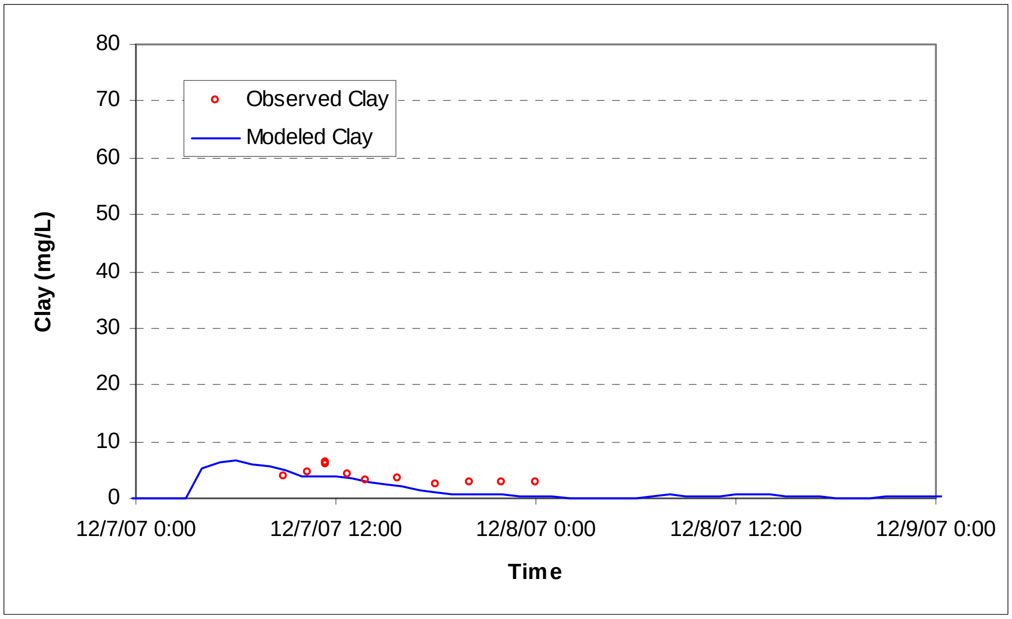


Figure 70. Modeled vs. observed clay fraction at Lagoon Segment – 12/7/2007 storm

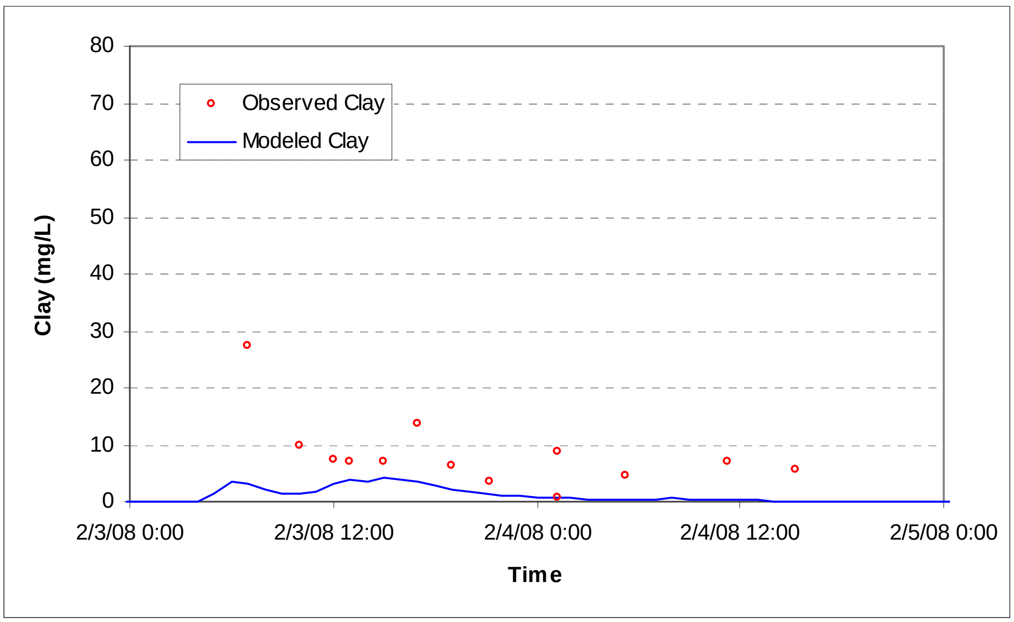


Figure 71. Modeled vs. observed clay fraction at Lagoon Segment – 2/3/2008 storm

Summary and Conclusions

A dynamic model was developed for the Los Peñasquitos Lagoon for simulating the transport of sediment through the lagoon using the EFDC framework. The model considered the ocean and watershed contributions of sediment. Model development involved two steps. In the first step, the model grid was extended into the ocean to use the tide elevation, salinity, and water temperature in the open ocean to drive the simulation of hydrodynamic conditions. After hydrodynamic calibration, the model was run using a reduced grid that incorporated the modeled water surface elevation, salinity, and water temperature at the immediate outside of the ocean inlet as the driving boundary conditions because the open ocean sediment conditions are significantly different from those at the ocean inlet. The sediment model was then calibrated using the reduced grid.

The Los Peñasquitos modeling framework can be used to simulate various management scenarios and for TMDL development purposes. In order to examine management scenarios related to controlling ocean and/or watershed inputs of sediment, model boundary conditions, the watershed model configuration, and the lagoon model grid can all be modified accordingly. For example, if the ocean inlet is widened, the model grid size can be increased at the ocean inlet. The application of BMPs within the watershed to control sediment input to the lagoon can also be examined through modifications to the sediment time series from the watershed, based on estimated BMP efficiencies, which can then be used to examine future changes in lagoon conditions. For management scenarios that involve dredging and other lagoon modifications, initial sediment bed conditions, such as the particle size distributions, can be updated accordingly.

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Appendix A: Model Hydrology Parameters

Table A-1. 110 pwat-parm2

defid	deluid	lzsn	infilt	kvary	agwrc
2	1	3.4	0.01	0.2	0.99
2	2	3.4	0.01	0.2	0.99
2	3	3.4	0.01	0.2	0.99
2	4	3.4	0.01	0.2	0.99
2	5	8	0.33	0.2	0.99
2	6	4	0.01	0.2	0.99
2	7	4.5	0.3	0.2	0.99
2	8	6.2	0.35	0.2	0.99
2	9	6.2	0.35	0.2	0.99
2	10	6.2	0.35	0.2	0.99
2	11	6.3	0.4	0.2	0.99
2	13	4.5	0.4	0.2	0.99
2	14	4	0.01	0.2	0.99
2	15	4	0.01	0.2	0.99
2	16	4	0.01	0.2	0.99
2	17	4	0.01	0.2	0.99
2	18	4	0.01	0.2	0.99
2	19	4	0.01	0.2	0.99
2	1	3.5	0.01	0.2	0.99
2	2	3.5	0.01	0.2	0.99
2	3	3.5	0.01	0.2	0.99
2	4	3.5	0.01	0.2	0.99
2	5	6.4	0.31	0.2	0.99
2	6	5	0.01	0.2	0.99
2	7	5.3	0.25	0.2	0.99
2	8	6.4	0.3	0.2	0.99
2	9	6.4	0.3	0.2	0.99
2	10	6.4	0.3	0.2	0.99
2	11	5	0.2	0.2	0.99
2	13	4.7	0.05	0.2	0.99
2	14	3.7	0.01	0.2	0.99
2	15	3.7	0.01	0.2	0.99
2	16	3.7	0.01	0.2	0.99
2	17	3.7	0.01	0.2	0.99
2	18	3.7	0.01	0.2	0.99
2	19	3.7	0.01	0.2	0.99
2	1	3.6	0.01	0.2	0.99
2	2	3.6	0.01	0.2	0.99
2	3	3.6	0.01	0.2	0.99
2	4	3.6	0.01	0.2	0.99
2	5	8	0.3	0.2	0.99
2	6	5.3	0.01	0.2	0.99
2	7	5.5	0.23	0.2	0.99
2	8	6.5	0.23	0.2	0.99
2	9	6.5	0.23	0.2	0.99

defid	deluid	lzsn	infilt	kvary	agwrc
2	10	6.5	0.23	0.2	0.99
2	11	5	0.1	0.2	0.99
2	13	4.7	0.05	0.2	0.99
2	14	3.8	0.01	0.2	0.99
2	15	3.8	0.01	0.2	0.99
2	16	3.8	0.01	0.2	0.99
2	17	3.8	0.01	0.2	0.99
2	18	3.8	0.01	0.2	0.99
2	19	3.8	0.01	0.2	0.99
2	1	3.4	0.01	0.2	0.99
2	2	3.4	0.01	0.2	0.99
2	3	3.4	0.01	0.2	0.99
2	4	3.4	0.01	0.2	0.99
2	5	8	0.33	0.2	0.99
2	6	4	0.01	0.2	0.99
2	7	4.5	0.3	0.2	0.99
2	8	6.2	0.35	0.2	0.99
2	9	6.2	0.35	0.2	0.99
2	10	6.2	0.35	0.2	0.99
2	11	6.3	0.4	0.2	0.99
2	13	4.5	0.4	0.2	0.99
2	14	4	0.01	0.2	0.99
2	15	4	0.01	0.2	0.99
2	16	4	0.01	0.2	0.99
2	17	4	0.01	0.2	0.99
2	18	4	0.01	0.2	0.99
2	19	4	0.01	0.2	0.99

defid parameter group id
deluid land use id
lzsn lower zone nominal soil moisture storage (inches)
infilt index to the infiltration capacity of the soil (in/hr)
kvary variable groundwater recession (1/inches)
agwrc base groundwater recession (none)

Table A-2. 120 pwat-parm3

defid	deluid	petmax	petmin	infexp	infild	deepfr	basetp	agwetp
2	1	40	35	2	2	0.1	0	0.01
2	2	40	35	2	2	0.1	0	0.01
2	3	40	35	2	2	0.1	0	0.01
2	4	40	35	2	2	0.1	0	0.01
2	5	40	35	2	2	0.1	0.03	0.05
2	6	40	35	2	2	0.1	0	0.01
2	7	40	35	2	2	0.1	0	0.01
2	8	40	35	2	2	0.1	0	0.01
2	9	40	35	2	2	0.1	0	0.05
2	10	40	35	2	2	0.1	0	0.05
2	11	40	35	2	2	0.1	0.03	0.03
2	13	40	35	2	2	0.1	0	0.03
2	14	40	35	2	2	0.1	0	0
2	15	40	35	2	2	0.1	0	0
2	16	40	35	2	2	0.1	0	0
2	17	40	35	2	2	0.1	0	0
2	18	40	35	2	2	0.1	0	0
2	19	40	35	2	2	0.1	0	0
3	1	40	35	2	2	0.1	0	0.01
3	2	40	35	2	2	0.1	0	0.01
3	3	35	30	2	2	0.1	0	0.01
3	4	35	30	2	2	0.1	0	0.01
3	5	40	35	2	2	0.1	0.03	0.05
3	6	40	35	2	2	0.1	0	0.01
3	7	40	35	2	2	0.1	0	0.01
3	8	40	35	2	2	0.1	0	0.01
3	9	40	35	2	2	0.1	0	0.05
3	10	40	35	2	2	0.1	0	0.05
3	11	40	35	2	2	0.1	0.02	0.03
3	13	40	35	2	2	0.1	0	0.03
3	14	35	30	2	2	0.1	0	0
3	15	40	35	2	2	0.1	0	0
3	16	40	35	2	2	0.1	0	0
3	17	35	30	2	2	0.1	0	0
3	18	40	35	2	2	0.1	0	0
3	19	40	35	2	2	0.1	0	0
4	1	40	35	2	2	0.1	0	0.01
4	2	40	35	2	2	0.1	0	0.01
4	3	40	35	2	2	0.1	0	0.01
4	4	40	35	2	2	0.1	0	0.01
4	5	40	35	2	2	0.1	0.03	0.05
4	6	40	35	2	2	0.1	0	0.01
4	7	40	35	2	2	0.1	0	0.01
4	8	40	35	2	2	0.1	0	0.01
4	9	40	35	2	2	0.1	0	0.05
4	10	40	35	2	2	0.1	0	0.05
4	11	40	35	2	2	0.1	0.02	0.03
4	13	40	35	2	2	0.1	0	0.03

defid	deluid	petmax	petmin	infexp	infild	deepfr	basetp	agwetp
4	14	40	35	2	2	0.1	0	0
4	15	40	35	2	2	0.1	0	0
4	16	40	35	2	2	0.1	0	0
4	17	40	35	2	2	0.1	0	0
4	18	40	35	2	2	0.1	0	0
4	19	40	35	2	2	0.1	0	0

defid parameter group id

deluid land use id

petmax air temperature below which e-t will is reduced (deg F)

petmin air temperature below which e-t is set to zero (deg F)

infexp exponent in the infiltration equation (none)

infild ratio between the maximum and mean infiltration capacities over the PLS (none)

deepfr fraction of groundwater inflow that will enter deep groundwater (none)

basetp fraction of remaining potential e-t that can be satisfied from baseflow (none)

agwetp fraction of remaining potential e-t that can be satisfied from active groundwater (none)

Table A-3. 130 pwat-parm4

defid	deluid	cepsc	uzsn	nsur	intfw	irc	lzetp
2	1	0.08	0.204	0.2	1	0.5	0.3
2	2	0.08	0.204	0.2	1	0.5	0.3
2	3	0.08	0.204	0.2	1	0.5	0.3
2	4	0.08	0.204	0.2	1	0.5	0.2
2	5	0.27	0.48	0.3	1	0.5	0.5
2	6	0.15	0.24	0.2	1	0.5	0.3
2	7	0.15	0.27	0.3	1	0.5	0.4
2	8	0.15	0.372	0.3	1	0.5	0.7
2	9	0.3	0.372	0.3	1	0.5	0.6
2	10	0.3	0.372	0.3	1	0.5	0.6
2	11	0.15	0.378	0.3	1	0.5	0.55
2	13	0.15	0.27	0.3	1	0.5	0.4
2	14	0.05	0.24	0.08	1	0.5	0.3
2	15	0.05	0.24	0.08	1	0.5	0.3
2	16	0.05	0.24	0.08	1	0.5	0.3
2	17	0.05	0.24	0.08	1	0.5	0.3
2	18	0.05	0.24	0.08	1	0.5	0.3
2	19	0.1	0.24	0.08	1	0.5	0.3
3	1	0.08	0.21	0.2	1	0.5	0.2
3	2	0.08	0.21	0.2	1	0.5	0.15
3	3	0.08	0.21	0.2	1	0.5	0.15
3	4	0.08	0.21	0.2	1	0.5	0.15
3	5	0.27	0.384	0.3	1	0.5	0.5
3	6	0.15	0.3	0.2	1	0.5	0.3
3	7	0.15	0.318	0.3	1	0.5	0.4
3	8	0.15	0.384	0.3	1	0.5	0.7
3	9	0.3	0.384	0.3	1	0.5	0.6
3	10	0.3	0.384	0.3	1	0.5	0.6
3	11	0.15	0.3	0.3	1	0.5	0.5
3	13	0.15	0.282	0.1	1	0.5	0.2
3	14	0.05	0.222	0.08	1	0.5	0.3
3	15	0.05	0.222	0.08	1	0.5	0.3
3	16	0.05	0.222	0.08	1	0.5	0.2
3	17	0.05	0.222	0.08	1	0.5	0.2
3	18	0.05	0.222	0.08	1	0.5	0.3
3	19	0.1	0.222	0.08	1	0.5	0.3
4	1	0.08	0.216	0.2	1	0.5	0.2
4	2	0.08	0.216	0.2	1	0.5	0.15
4	3	0.08	0.216	0.2	1	0.5	0.15
4	4	0.08	0.216	0.2	1	0.5	0.15
4	5	0.27	0.48	0.3	1	0.5	0.65
4	6	0.15	0.318	0.2	1	0.5	0.3
4	7	0.15	0.33	0.3	1	0.5	0.4
4	8	0.15	0.39	0.3	1	0.5	0.7
4	9	0.3	0.39	0.3	1	0.5	0.6
4	10	0.3	0.39	0.3	1	0.5	0.6
4	11	0.15	0.3	0.3	1	0.5	0.5
4	13	0.15	0.282	0.1	1	0.5	0.2

defid	deluid	cepsc	uzsn	nsur	intfw	irc	lzetp
4	14	0.05	0.228	0.08	1	0.5	0.3
4	15	0.05	0.228	0.08	1	0.5	0.3
4	16	0.05	0.228	0.08	1	0.5	0.2
4	17	0.05	0.228	0.08	1	0.5	0.2
4	18	0.05	0.228	0.08	1	0.5	0.3
4	19	0.1	0.228	0.08	1	0.5	0.3

defid parameter group id
deluid land use id
cepsc interception storage capacity (inches)
uzsn upper zone nominal storage (inches)
nsur Manning's n for the assumed overland flow plane (none)
intfw interflow inflow parameter (none)
irc interflow recession parameter (none)
lzetp lower zone evapotranspiration parameter (none)

Appendix B: Model Sediment Parameters

Based on the SCWRRP regional sediment approach, the following parameters for the sediment module were used as initial values. Some adjustment was necessary based on local conditions and observed data.

Pervious Lands (PERLNDs)

SMPF 1.0

KRER The presented model varies this parameter by soil group and land use (area-weighted average) as follows:

SSUGRO soil data for San Diego County was utilized to calculate weighted KRER values for each land use and soil hydrologic group (HSG) within the Los Peñasquitos watershed. A weighted average of soil slope (*S*) and soil erodibility factors (*K*) were calculated for each soil map unit in ArcGIS using Soil Data Viewer. The land use classification layer (which contained HSG values for each parcel) was subsequently intersected with both the aggregated slope and K factor layers. In a spreadsheet program, slope and K factor values were subtotaled and area weighted for each land use classification and soil hydrologic group across the watershed. In order to calculate *KRER* values, length-slope (*LS*) factors were first calculated according to the Wischmeier and Smith (1978) equation:

$$LS = (0.045\ L)^b \cdot (65.41 \sin^2 \theta_k + 4.56 \sin \theta_k + 0.065)$$

where $\theta_k = \tan^{-1}(S/100)$, S in the slope in percent, L is the slope length, and b equals the following values: 0.5 for $S \geq 5$, 0.4 for $3.5 \leq S \leq 5$, 0.3 for $1 \leq S \leq 3$, and 0.2 for $S < 1$. An L value of 15 meters was used for all LS calculations, and LS values were not allowed to exceed 5. Finally, KRER values were calculated using the following equations:

$$KRER = G \cdot K \cdot LS$$

where G accounts for unit conversion and was assigned a value of 4.102.

JRER Set all to 1.81 (SCWRRP used 2.0)

AFFIX All set at 0.005

COVER All set at 0.10 by SCWRRP

NVSI Set to 0

KSER Set to 1.8

JSER Set to 2.0

KGER Set to 0

JGER Set to 2.0 (inactive)

DETS 0.5 tons/ac

Impervious Lands (IMPLNDs)

KEIM and JEIM varies by land use. The following values for impervious surfaces for general land use categories were used.

Table B-1. Impervious surface coefficients (KEIM and JEIM) by landuse

	Industrial	LDR	HDR	Commercial	Open/Park
KEIM	soils B = 0.10 soils C/D = 0.07	0.03	0.015	0.10	0.20
JEIM	2.5	2.5	2.5	2.5	2.5

ACCSDP 0.1 tons/ac/d
REMDSP Set at 0.20

Upland Sediment Fractions

SSURGO data was used to set the fraction of total sediment from land that is sediment class (Table). Adjustments to account for deposition en route were made based on the assumption that 50 percent of the sand and 30 percent of silt is deposited using watershed delivery ratios in Vanoni, 1975. Table provides the resulting land fractions for the model.

Table B-2. Sediment fractions by hydrologic soil group

HSG	Sand	Silt	Clay
B	65	23	12
C	68	19	14
D	54	21	24

Table B-3. Sediment fractions adjusted for watershed delivery

HSG	Sand	Silt	Clay
B	33	16	51
C	34	13	53
D	27	15	58

Reaches (RCHRES)

The primary calibration parameters for maintaining dynamic steady state in each reach was defining the stresses for deposition and scour. The stream cross sections were defined by internal LSPC algorithms based on upstream watershed area. Properties for fall velocity in still water (w) and density (Rho) were set uniformly for all reaches (Table).

Table B-4. Model reach parameters

	Sand	Silt	Clay
Fall velocity (in/s)	1.0	0.05	0.0002
Rho (g/cm^3)	2.5	2.2	2.0

Sand transport in the reaches was simulated using the power function of velocity subroutine. The KSAND parameter was set to 1.0 and EXPSND to 2.0 within each reach. Critical shear stress deposition and scour stress and erodibility coefficient were unique by reach and calibrated to maintain a dynamic steady state during the long term calibration simulations.

Table B-5. Model reach sand and silt stress and erodibility coefficients

Reach	Sediment Class	Critical shear stress		Erodibility coefficient (m) ($lb/ft^2 \cdot d$)
		Deposition (lb/ft^2)	Scour (lb/ft^2)	
1	Silt	0.7	1.3	0.001
1	Clay	0.6	1.1	0.001
2	Silt	0.4	0.9	0.001
2	Clay	0.35	0.7	0.001
3	Silt	0.08	0.8	0.001
3	Clay	0.07	0.7	0.001
4	Silt	0.35	1	0.001
4	Clay	0.3	0.95	0.001
5	Silt	0.35	0.75	0.001
5	Clay	0.3	0.6	0.001
6	Silt	0.35	0.8	0.001
6	Clay	0.3	0.6	0.001
7	Silt	0.5	1	0.001
7	Clay	0.4	0.9	0.001
8	Silt	1.5	2.2	0.001
8	Clay	1.2	1.8	0.001
9	Silt	1.2	2	0.001
9	Clay	1	1.5	0.001
10	Silt	0.48	1.2	0.001
10	Clay	0.4	1	0.001
11	Silt	0.35	0.75	0.001
11	Clay	0.3	0.6	0.001
12	Silt	0.6	1.2	0.001
12	Clay	0.5	1	0.001

kber coefficient for scour of the bank matrix soil (calibration)

jber exponent for scour of the bank matrix soil (calibration)

qber bank erosion flow threshold causing channel bank soil erosion (cfs)

RCHID	KBER	JBER	QBER	Sand	Silt	Clay
1	0	0.001	8.972199	0.34	0.33	0.33
2	0	0.001	94.98709	0.34	0.33	0.33
3	1.0	0.001	238.4284	0.34	0.33	0.33
4	0	0.001	92.76765	0.34	0.33	0.33
5	0	0.001	81.77471	0.34	0.33	0.33
6	0	0.001	68.26335	0.34	0.33	0.33
7	0	0.001	62.12131	0.34	0.33	0.33
8	0	0.001	78.1442	0.34	0.33	0.33
9	0	0.001	101.9106	0.34	0.33	0.33
10	0	0.001	43.68436	0.34	0.33	0.33
11	0.5	0.1	154.2955	0.34	0.33	0.33
12	0.5	0.1	223.6453	0.34	0.33	0.33

Attachment 3

Environmental Analysis and Checklist

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ATTACHMENT 3: ENVIRONMENTAL ANALYSIS AND CHECKLIST

Contents of this Attachment

3.1 Purpose and Objectives of the Basin Plan Amendment Project

Los Peñasquitos Lagoon (Lagoon) is designated by US Environmental Protection Agency (US EPA), under Section 303(d) of the federal Clean Water Act, as impaired by sediment. Sediment in the lagoon compromises designated beneficial uses, including contact water recreation; non-contact water recreation; biological habitats of special significance; estuarine habitat; wildlife habitat; rare, threatened or endangered species; marine habitat; migration of aquatic organisms; fish spawning, reproduction and/or early development; and shellfish harvesting.

The Project under consideration is the adoption of an amendment to the *Water Quality Control Plan for the San Diego Basin* (Basin Plan) incorporating a total maximum daily load (TMDL) for sediment in Lagoon.

The purpose of the Basin Plan amendment project is to attain the water quality standard for sediment that will protect all uses. This will require dischargers of sediment to meet numeric sediment reduction targets, as stated in the Sediment TMDL for Los Peñasquitos Lagoon Draft Staff Report (Draft Staff Report).

3.2 California Environmental Quality Act Requirements

The basic purposes of the California Environmental Quality Act (CEQA) are to: 1) inform decision makers and the public about potential significant environmental effects of a proposed project and give them opportunities to comment to the lead agency, 2) identify ways that environmental damage may be mitigated, 3) prevent significant, avoidable damage to the environment by requiring changes in projects, through the use of implementation alternatives or mitigation measures when feasible, and 4) disclose to the public why an agency approved a project if significant effects may occur.[1]

The California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) must comply with the CEQA when amending the Basin Plan as proposed in this project. Under CEQA, the San Diego Water Board is the Lead Agency for evaluating potential environmental impacts of the proposed project.

Adoption of a Basin Plan amendment is an activity subject to CEQA requirements because Basin Plan amendments constitute rules or regulations requiring the installation of pollution control equipment, establishing a performance standard, or establishing a treatment requirement.[2] Sections 3.2.1 and 3.2.2 below describe in detail the statutory requirements and scope of this environmental analysis required by CEQA for adoption of Basin Plan amendments and water quality standards.

This TMDL Basin Plan amendment (TMDL) contains numeric targets designed to meet the narrative water quality objective for sediment and restore the beneficial uses in the Lagoon. The TMDL also includes wasteload allocations for point sources and load allocations for nonpoint sources and natural background. The numeric targets, together with the allocations, may be considered a new performance standard.[3] Because development of a performance standard does not constitute development of a new water quality objective, but rather implements existing objectives to protect beneficial uses, the San Diego Water Board is not required to consider the factors in Water Code section 13241 (a) through (f).

3.2.1 Exemption from Requirement to Prepare Standard CEQA Documents

CEQA authorizes the Secretary for Natural Resources to certify State regulatory programs designed to meet the goals of CEQA as exempt from requirements to prepare an Environmental Impact Report (EIR), Negative Declaration, or Initial Study. The Water Boards' Basin Plan amendment process is a certified regulatory program and is therefore exempt from CEQA's requirements to prepare such documents.[4] As such, the "substitute environmental documents" that support the San Diego Water Board's proposed basin planning action contain the required environmental documentation under CEQA.[5] The substitute environmental documents (SED) include the environmental checklist, the detailed Staff Report, peer review and public comments and responses to comments, this resolution, and the Basin Plan Amendment.

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[1] 14 CCR section 15002(a)
[2] 14 CCR section 15187 (a) and Public Resources Code sections 21159-21159.4.
[3] The term "performance standard" is defined in the rulemaking provisions of the Administrative Procedure Act [Government Code sections 11340-l 1359]. A "performance standard" is a regulation that describes an objective with the criteria stated for achieving the objective [Government Code section 11342(d)].
[4] 14 CCR section 15251(g) and Public Resources Code section 21080.5.
[5] 23 CCR section 3777

3.2.2 Scope of Environmental Analysis

The State Water Board's CEQA implementation regulations[6] describe the substitute environmental documents (SED) required for Basin Plan amendment actions. For this project, those documents include the Draft Staff Report, the draft Basin Plan amendment, and the environmental analyses contained in this Appendix. Specifically, these analyses include:[7]

1. A brief description of the proposed project, including a description of the environmental setting. In this case, the proposed project is the Basin Plan amendment adopting the Sediment TMDL for Los Peñasquitos Lagoon. This amendment is described in Section 3.3 of this attachment.

2. Identification of reasonably foreseeable environmental impacts of the proposed project (Section 3.7).

3. Reasonable alternatives to the proposed project and mitigation measures to avoid or reduce any significant or potentially significant adverse environmental impacts (discussed in Section 3.7 and 3.9).

4. An analysis of reasonably foreseeable methods of compliance. The analysis includes:

    a. Identification of reasonably foreseeable methods of compliance with the project (Section 3.6);

    b. A completed Environmental Checklist, with analysis of reasonably foreseeable significant adverse environmental impacts associated with those methods of compliance (Section 3.7);

    c. An analysis of reasonably foreseeable alternative means of compliance, which would have less significant adverse environmental impacts (Section 3.9); and

    d. An analysis of reasonably foreseeable mitigation measures that would minimize any unavoidable environmental impacts of the reasonably foreseeable methods of compliance (Section 3.7).

[6] 23 CCR section 3720 et seq. "Regulations for Implementation of the Environmental Quality Act of 1970."
[7] 23 CCR section 3777

Additionally, the environmental analysis takes into account a reasonable range of:[8]

- Environmental factors
- Economic factors
- Technical factors
- Population
- Geographic areas
- Specific sites

A "reasonable range" does not require an examination of every site, but a reasonably representative sample of the sites. The CEQA statute specifically states that the agency shall not conduct a "project level analysis."[9] Rather, a project level analysis must be performed by the responsible parties that are required to implement the TMDLs.[10] Actual environmental impacts will necessarily depend upon the compliance strategy selected by the responsible parties identified in the Staff Report. If not properly implemented or mitigated at the project level, there could be adverse environmental impacts from implementing this TMDL.

The SED identifies broad mitigation approaches that could be considered at the project level. Consistent with CEQA, the analysis in the SED does not engage in speculation or conjecture, but rather considers reasonably foreseeable environmental impacts of reasonably foreseeable methods of compliance, reasonably foreseeable mitigation measures, and reasonably foreseeable alternative means of compliance that would avoid, eliminate, or reduce the identified impacts. In preparing this environmental analysis, the San Diego Water Board has considered the pertinent requirements of state law,[11] and intends this analysis to serve as a program level environmental review.[12]

3.3 Project Description

As stated in Section 3.1 above, the project is adoption of an amendment to the San Diego Water Board's Basin Plan, incorporating a sediment TMDL for the Lagoon and an implementation plan to achieve the TMDL. As the San Diego Water Board's master planning document for water quality enhancement, restoration, and protection, the Basin Plan establishes the regulatory framework requiring actions that will reduce sediment inputs to the Lagoon to levels that will support the Lagoon's beneficial uses.

3.3.1 Environmental Setting

The Los Peñasquitos watershed is located in central San Diego County. Along with the Lagoon, the entire watershed is included in the Peñasquitos Hydrologic Unit (906), which also includes Mission Bay and several coastal tributaries. The Peñasquitos watershed includes portions of the following jurisdictions: City of San Diego, the City of

[8] 23 CCR section 3777(c); 14 CCR section 15187(d)
[9] Public Resources Code section 21159(d)
[10] Public Resources Code section 21159.2
[11] Public Resources Code section 21159 and 14 CCR section 15187
[12] 14 CCR section 15152; 14 CCR section 15168

Poway, the City of Del Mar, and San Diego County. Approximately 54 percent of the Peñasquitos watershed has been developed (e.g., low density residential, industrial/transportation, and commercial institutional land uses), with 46 percent of that area classified as impervious according to San Diego Association of Governments 2000 land use coverage. The largest single land use type in the Peñasquitos watershed is open space. A map of the watershed can be found in Section 3 of the Staff Report.

The watershed extends approximately 19 miles east, rising to an elevation of 2,600 feet above sea level. Los Peñasquitos, Carroll Canyon, and Carmel Creeks constitute the three sub-watersheds.

Freshwater drains from the 93 square mile Los Peñasquitos watershed into the Lagoon. The Lagoon is a 0.6 square mile coastal salt marsh lagoon located in Torrey Pines State Park. The Lagoon is designated as a "State Preserve," a label reserved for the rarest and most fragile state-owned lands. The Lagoon was formed when sea levels rose and flooded the young Los Peñasquitos River to form a deep embayment, which has filled with sediment over the millennia. Under present conditions, a permanent mouth opening to the ocean cannot be naturally maintained, except during exceptionally wet winters; therefore, the channel is often mechanically dredged to alleviate the danger of flooding and to improve the health of the Lagoon. Mouth closures are typically caused by coastal processes (deposition of sand and cobbles due to storms surges and wave action) and structures, such as the US Highway 101 abutments and railroad trestles.

The Lagoon is listed on the 2010 Clean Water Act section 303(d) list as impaired for sedimentation/siltation.[13] Los Peñasquitos Creek, a Lagoon tributary, is listed as impaired by enterococcus, fecal coliform, selenium, total dissolved solids, total nitrogen as N, and toxicity.

The Lagoon and its contributing watershed support a variety of sensitive species (state or federal endangered, threatened, candidate, or species of special concern). Important resources in this area include saltmarsh, coastal sage scrub and southern maritime chaparral. Furthermore, the San Diego Multiple Species Conservation Program identifies multiple covered species within the Peñasquitos watershed including San Diego thorn-mint, Shaw's agave, Del Mar manzanita, Encinitas baccharis, Orcutt's brodiaea, wart-stemmed ceanothus, short-leaved dudleya, variegated dudleya, San Diego button-celery, San Diego barrel cactus, willowy monardella, San Diego goldenstar, Torrey pine, San Diego mesa mint, Riverside fairy shrimp, southwestern pond turtle, San Diego horned lizard, orange-throated whiptail, California brown pelican, white-faced ibis, Canada goose, northern harrier, Cooper's hawk, golden eagle, western snowy plover, California least tern, burrowing owl, coastal cactus wren, California gnatcatcher, California rufous-crowned sparrow, Belding's savannah sparrow, grasshopper sparrow, mountain lion and mule deer. (City of San Diego, 1997)

[13] 2010 Integrated Report – Clean Water Act Section 303(d) List and 305(b) Report. Available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

The climate in coastal San Diego County is generally mild. Annual temperatures average 65°F near the ocean. Average annual rainfall ranges from nine to eleven inches along the coast. There are three distinct seasons in the region: summer dry, winter dry, and winter wet weather. The winter wet weather season accounts for 85 to 90 percent of the annual rainfall.

3.3.2 Existing Local, Specific, and Regional Plans and Habitat Conservation Plans

Multiple Species Conservation Program

The entire Peñasquitos watershed lies within the San Diego Multiple Species Conservation Program (MSCP) Plan. The City of San Diego, City of Del Mar, City of Poway, and County of San Diego implement their respective portions of the MSCP Plan through subarea plans, which describe specific implementing mechanisms for the MSCP. The majority of the Peñasquitos watershed lies within the City of San Diego MSCP Subarea Plan.

The MSCP is a comprehensive, long-term habitat conservation plan that addresses the needs of multiple covered species and the preservation of natural vegetation communities in San Diego County. The MSCP addresses the potential impacts of urban growth, natural habitat loss, and species endangerment; and includes a plan to mitigate for the potential loss of the multiple covered species and their habitat due to the direct impacts of future development of both public and private lands within the MSCP area (City of San Diego, 1997).

Los Peñasquitos Lagoon Enhancement Plan and Program

The Los Peñasquitos Lagoon Foundation is dedicated to the restoration of the Lagoon, its associated uplands and the preservation of land for scenic, historic, educational, recreational, agricultural, scenic and open space opportunities. The Foundation regularly updates its Los Peñasquitos Lagoon Enhancement Plan and Program to reflect current Lagoon conditions and management needs and priorities. Current efforts the Foundation is undertaking include monitoring of the Lagoon and operation of a restoration basin.

Physical, Chemical, and Biological Monitoring

The Pacific Estuarine Research Laboratory (PERL), based at San Diego State University, was contracted by the Foundation to monitor lagoon resources and use the data in its studies of regional wetland ecosystems. PERL monitored the physical and chemical characteristics of Lagoon channel water from 1987-2007 and sampled benthic invertebrates, fish, and saltmarsh vegetation from 1988-2004. These studies have led to the timely opening of the mouth and an increase in knowledge of the biology of southern California's estuaries. In July 2004, Lagoon monitoring was transferred to the Southwest Wetlands Interpretive Association and the Tijuana River National Estuarine Research Reserve.

Los Peñasquitos Creek Restoration Basin
Located in the western reach of the Los Peñasquitos Canyon Preserve, the 2.8-acre restoration basin is designed to intercept sediment (4,400 cubic yard capacity) during moderate to large storm events, thereby helping protect the Lagoon from the impacts associated with sediment and siltation. In addition, the basin constructed by the Los Peñasquitos Lagoon Foundation was designed to minimize impacts to nearby sensitive habitats and the creek, view corridors for the public, and flooding risks to a nearby industrial park. All disturbed areas have been revegetated with native species of vegetation, replacing an area that was previously dominated by invasive plant species.

Los Peñasquitos Canyon Preserve Natural Resource Management Plan
The *Los Peñasquitos Canyon Preserve Natural Resource Management Plan (1998)* was developed to provide guidance for the present and future development and maintenance of the Los Peñasquitos Canyon Preserve. The City of San Diego Development Services and Park and Recreation Departments are responsible for the administration of this plan. The County Planning Department is responsible for the administration of land use permits for County-owned land in the Los Peñasquitos Canyon Preserve and review of all public and County development proposals to determine conformity with County policies, Natural Resource Management Plan, and CEQA. Funding for enhancement, management, and maintenance for the Los Peñasquitos Canyon Preserve can come from a variety of sources. Some of the objectives of this plan include:

- To establish management practices and means for implementation that will foster cooperative County-City management strategies to preserve and protect cultural and biological resources while providing for future recreational use, maintenance, and land use in the Los Peñasquitos Canyon Preserve
- To enhance and restore native habitats in the Los Peñasquitos Canyon Preserve
- To manage native wildlife species for their survival
- To identify and maintain important wildlife corridors
- To control erosion along trails and streambeds throughout the Los Peñasquitos Canyon Preserve and further protect the watersheds
- To facilitate public use which is compatible with the protection and preservation of the natural and historical resources, such as picnicking, hiking, and other low-intensity recreational activities
- To ensure individual projects within the Los Peñasquitos Canyon Preserve meet federal, state, and local environmental standards and requirements
- To conduct education, outreach, and research programs which increase public awareness of the unique natural and cultural resources within the Preserve
- The Los Peñasquitos Canyon Preserve will eventually house two interpretative facilities, one run by the County focusing on cultural and historical resources and second run by the City focusing on natural history and biological resources with a

proposed location somewhere in the eastern portion of the Los Peñasquitos Canyon Preserve. (CVCC, 2006)

Peñasquitos Watershed Urban Runoff Management Plan

The Peñasquitos Watershed Urban Runoff Management Plan 2008 (WURMP) was prepared by the City of Poway, as lead agency, in collaboration with the cities of San Diego, Del Mar, and the County of San Diego – all local agencies that have jurisdiction over the Peñasquitos Watershed. The WURMP meets the requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Storm Water Permit for San Diego Copermittees (San Diego Water Board Order No. 2007-01; "Order"). The Order requires development and implementation of WURMPs for each of nine watershed management areas within San Diego County, including the Peñasquitos watershed.

The primary goal of the Order is to positively affect the water resources of the Peñasquitos Watershed while balancing economic, social, and environmental constraints. The Order identifies four primary objectives to strive towards this goal: (1) develop and expand methods to assess and improve water quality within the watershed; (2) integrate watershed principles into land use planning; (3) enhance public understanding of sources of water pollution; and (4) encourage the development of stakeholder participation.

To help reach these goals and objectives, the WURMP identifies and prioritizes water quality related issues within the watershed that can be potentially attributed (wholly or partially) to discharges from the municipal storm drain systems and may be addressed through a cross-jurisdictional approach. Additionally, activities to abate sources of pollution and restore and protect beneficial uses are also identified.

The WURMP was designed as an iterative process of watershed assessment, priority setting, monitoring, and implementation. At the conclusion of each yearly cycle, the process begins anew, allowing participants to respond to changing conditions or adjust strategies that have not performed as anticipated. This framework establishes mechanisms for the participants to evaluate priorities, improve coordination, assess program goals, and allocate finite resources in a cost-effective manner.

Local General Plans and Municipal Codes

The County of San Diego and Cities of Del Mar, Poway, and San Diego each have their own General Plans and Municipal Codes that establish policies of acceptable land uses and practices in their jurisdictions. General Plans and Municipal Codes form the framework for the growth and land development for each community.

3.4 Regulatory Authorities

The following agencies have approval authority over the Basin Plan amendment, oversight on related regulatory and/or environmental matters, or responsibility for implementation of reasonably foreseeable means of compliance.

3.4.1 Federal Regulatory Agencies

U. S. Environmental Protection Agency

The US Environmental Protection Agency (US EPA) is responsible for implementing the Clean Water Act. Section 305(b) of the Clean Water Act mandates biennial assessments of the nation's water resources. These water quality assessments are used, with any other available data and information solicited from the public, to identify and prioritize waters not attaining water quality standards. The resulting amalgamation of waters is referred to as the "303(d) List" or the "Impaired Waters List." Clean Water Act section 303(d)(1)(C) and (d)(1)(D) require that the state establish TMDLs for each listed water. Those TMDLs, and the 303(d) List itself, must be submitted to USEPA every two years for approval under section 303(d)(2).

The Clean Water Act mandates TMDLs or other actions to resolve listings for all pollutant-water body pairs on the 303(d) List. In California, US EPA delegates responsibility for developing TMDLs to the Water Boards.

National Oceanic Atmospheric Administration/National Marine Fisheries Service (NOAA/NMFS)

With the US Fish and Wildlife Service, NOAA/NMFS conducts Endangered Species Act Section 7 consultation for effects to migratory and endangered fish species; NOAA/NMFS also enforces the Magnuson-Stevens Fishery Conservation and Management Act, under which it regulates projects that may have a significant effect on such species within the Los Peñasquitos watershed.

US Fish and Wildlife Service

The US Fish and Wildlife Service enforces the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. With NOAA/NMFS, the agency conducts Endangered Species Act Section 7 consultation for possible effects to listed species with federal status.

US Army Corps of Engineers

The US Army Corps of Engineers issues Clean Water Act section 404 permits for discharges to waters of the United States and dredging and fill projects in navigable waters.

3.4.2 California State Regulatory Agencies

State Water Resources Control Board and the San Diego Regional Water Quality Control Board (Water Boards)

The primary responsibility for water quality protection in California rests with the State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Water Boards). The State Water Board and Regional Water Boards share responsibility for regulating storm water discharges. The State Water Board issues statewide NPDES permits for the California Department of Transportation (Caltrans); for construction that disturbs more than one acre (Construction General Permit Order 2009-0009-DWQ; and for small municipal separate storm sewer systems (MS4s) under a General Permit for the Discharge of Storm Water from Small MS4s (WQ Order No. 2003-0005-DWQ).

The Porter-Cologne Water Quality Protection Act of 1972 requires that water quality control plans in California, including basin plans and basin plan amendments, incorporate a plan of implementation.

The Water Quality Control Plan for the San Diego Basin, in which the TMDL for sediment in the Lagoon will be incorporated, is the master planning document for water quality in San Diego. Basin Plan provisions, including TMDL implementation plans, are carried out and enforced by the San Diego Water Board through its various permitting authorities, orders, and prohibitions.

The San Diego Water Board regulates storm water discharges from the NPDES Phase I MS4s that discharge to the Peñasquitos watershed. These permits require the municipalities to develop and implement comprehensive Storm Water Management Plans, which provide the framework for local government storm water programs.

NPDES municipal storm water permits generally have five-year update cycles. Following adoption of the TMDL, the San Diego Water Board will incorporate the TMDL's waste load allocations and associated milestone requirements into the permits, and require the co-permittees to amend their Storm Water Management Plans accordingly. While the California Department of Transportation is a Responsible Party to this TMDL and required to comply with the Water Quality Plan for the San Diego Basin when this TMDL is incorporated, the statewide NPDES permit regulating discharges from Caltrans will also be amended to include similar planning and waste load allocation requirements.

The San Diego Water Board regulates other storm water discharges in the watershed, including surface discharges from agricultural and grazing activities, through waste discharge requirements and waivers of waste discharge requirements for individual dischargers. Waste discharge requirements issued to a number of large commercial property owners require implementation of best management practices to address storm water discharges.

In addition, Army Corps of Engineers cannot issue its Clean Water Act Section 404 permits until the San Diego Water Board has certified those projects under Section 401.

California Department of Fish and Game
The California Department of Fish and Game issues permits for incidental takes of state listed species under sections 2081(b) and (c) of the California Endangered Species Act and provides section 2081 consultation for effects to listed species.

If the Department determines that an activity may substantially adversely affect fish and wildlife resources, the applicant must prepare a Stream Alteration Agreement that includes reasonable conditions necessary to protect those resources. Compliance with CEQA is also required.

California Coastal Commission
The Coastal Commission, in partnership with coastal cities and counties, plans and regulates the use of land and water in the coastal zone. Development activities, which are broadly defined by the California 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 development permit from either the Coastal Commission or the local government.

California State Lands Commission
The California State Lands Commission (CSLC) manages nearly 4 million acres of "sovereign lands," which includes the beds of (1) more than 120 rivers, streams, and sloughs; (2) nearly 40 non-tidal navigable lakes; (3) tidal navigable bays and lagoons; and (4) tidal and submerged lands adjacent to the entire coast and offshore islands of California from the mean high tide line to 3 nautical miles offshore. The CSLC manages this watery domain. The sovereign lands can only be used for public purposes consistent with provisions of the Public Trust such as fishing, water-dependent commerce and navigation, ecological preservation, and scientific study (CSLC, 2010).

3.4.3 Local Regulatory Agencies

The County of San Diego, City of San Diego, City of Del Mar, and City of Poway have plans, policies, and ordinances that may be used to require mitigation of impacts caused by the kinds of controls proposed in Basin Plan amendment. The municipalities' ordinances cover construction, grading, and development plans for land use regulations, community plans, and environmental statutes.

City of San Diego
The City of San Diego's General Plan establishes the citywide policies for growth and development. The City of San Diego's Community Plans provide refinement of the General Plan's citywide policies, designates land uses, and offers additional location-based recommendations. The Los Peñasquitos Watershed contains portions of the following communities within the City of San Diego: Torrey Pines, Torrey Hills, Carmel

Valley, Los Peñasquitos Canyon Preserve, Mira Mesa, Del Mar Mesa, Pacific Highlands Ranch, Torrey Highlands, Rancho Peñasquitos, Carmel Mountain Ranch, Sabre Springs, Miramar Ranch North, Scripps Miramar Ranch, and Rancho Encantada.

The City of San Diego implements and enforces the Elements of the General Plan (Land Use and Community Planning; Mobility; Economic Prosperity; Public Facilities, Services and Safety; Urban Design; Recreation; Historic Preservation; Conservation; Noise; and Housing) and Community Plans through its various departments including, but not limited to: Development Services, Environmental Services, Public Utilities, Park & Recreation, Public Works, and Transportation & Storm Water.

City of Poway
The City of Poway Public Works Department is responsible for the maintenance of public infrastructure and environmental programs including storm water and flood control. The City of Poway Department of Development Services administers and implements the City's planning, land use, building, and engineering functions. Other activities include providing customer service for all permit activities, developing land use ordinances and various specific plans, and reviewing development plans. These departments enforce the City of Poway's Municipal Code, which includes such ordinances as Stormwater Management and Discharge Control, Wildland-Urban Interface Code, Building Code, Excavating and Grading, Drainage and Watercourse, Floodplain Management, Standard Urban Stormwater Mitigation Plan, and Zoning.

City of Del Mar
The City of Del Mar Planning and Community Development Department is responsible for a variety of services ranging from updating the City's General Plan and Zoning standards, managing key programs and projects such as the Clean Water Program, to preparation of new standards. This department oversees building services, code enforcement, and new development and construction for compliance. The City of Del Mar enforces local ordinances including, but not limited to: Noise Regulations, Fire Code, Stormwater Management and Discharge Control, Building and Construction, and Zoning Ordinances through issuance of permits. Permits include, but are not limited to land conservation, excavation, and grading permits.

County of San Diego
Within the County of San Diego, the Land Use and Environmental Group coordinates the County's efforts in land use, environmental protection and preservation, recreation, and infrastructure development and maintenance. The Land Use and Environmental Group consists of seven departments: Air Pollution Control District; Agriculture, Weights and Measures; Environmental Health; Farm and Home Advisor; Parks and Recreation; Planning and Land Use; and Public Works. These departments issue a variety of permits to enforce County Ordinances including, but not limited to: Biological Mitigation; Resource Protection; Zoning; Watershed Protection, Stormwater Management, and Discharge Control; Noise; Flood Damage Protection; Habitat Loss Permit; Grading, Clearing, and Watercourses Ordinances.

Air Pollution Control District
The County of San Diego Air Pollution Control District evaluates and issues construction and operating permits to ensure proposed new or modified commercial and industrial equipment and operations comply with air pollution control laws.

Planning and Land Use
The County of San Diego Department of Planning and Land Use (DPLU) issues various permits including building and discretionary permits. The DPLU is home to the Green Building Program and Multiple Species Conservation Program. In general, DPLU helps create and maintain the general plan; maintain and improve the zoning ordinance; and advise the Board of Supervisors and San Diego County Planning Commission on land use projects.

Public Works
The County of San Diego Public Works Department issues a variety of permits including: construction, drainage easement encroachment, encroachment, excavation, grading, moving, planting, and traffic control permits. The Public Works Department is responsible for: County-maintained roads; traffic engineering; land development civil engineering review; design engineering and construction management; land surveying and map processing; cartographic services; watershed quality and flood protection; County Airports; solid waste planning and diversion; inactive landfills; wastewater systems management; and special districts, such as the Flood Control District.

3.5 Public Participation and Consultation

3.5.1 Consultation with other agencies

The Notice of Filing noticing the availability of the substitute environmental documents for this project was posted on the San Diego Water Board website and in the San Diego Union Tribune on February 15, 2012. The Notice of Filing indicated that the formal public comment period began on Wednesday, February 15, 2012 and ended on Monday, April 2, 2012, for a total of 47 days. The February 15, 2012, Notice of Filing indicated the public hearing date of May 9, 2012. Following the cancelation of the May 9, 2012, public hearing, a notice of the cancelation and rescheduling of the public hearing was posted on the San Diego Water Board website and e-mailed to interested parties. The Notice of Filing serves as the notification to Responsible Agencies requesting consultation on the project and Trustee Agencies. As Trustee Agencies with resources affected by the project, the California Coastal Commission, California State Lands Commission, California Department of Fish and Game, US Fish and Wildlife Service, Office of Historic Preservation, and California Natural Resources Agency were provided the Notice of Filing by mail on Wednesday, February 15, 2012.

3.5.2 Public participation

CEQA's requirement for "Early Public Consultation" was met by holding a CEQA Scoping Meeting.[14] Notice of the CEQA Scoping Meeting for this project was issued on January 6, 2011 for the February 15, 2011 CEQA Scoping Meeting. The notice was posted on the San Diego Water Board website on January 6, 2011, published in the North County Times on January 14, 2011, and published in the Union Tribune on January 13, 2011. The CEQA scoping meeting was held at the office of the San Diego Water Board on February 15, 2011 and was attended by city, county, and industry representatives. Comments received during the meeting have been incorporated into the substitute environmental documents.

A stakeholder advisory group (SAG) was formed at the onset of this project. Participants included representatives of the Cities of Del Mar, Poway, and San Diego, County of San Diego, Caltrans, US EPA, California State Parks, Los Peñasquitos Lagoon Foundation, Coast Law Group, Tetra Tech, and AMEC. During 2008-2011, the SAG met frequently to discuss project development. The SAG provided insightful technical comments on early drafts of reports, suggested issues for technical peer review, raised important policy issues, and assisted with drafting the Implementation Plan.

3.6 Implementation Plan: Reasonably Foreseeable Methods of Compliance with the Basin Plan amendment

The Basin Plan amendment implementation plan would require actions to achieve the TMDL targets and allocations for sediment, and other actions to enhance sediment-related habitat attributes essential to water quality in the Lagoon. The proposed Basin Plan amendment would affect all segments of the Lagoon and its tributaries.

The proposed Basin Plan amendment contains sediment allocations for dischargers. The amendment does not prescribe specific projects through which dischargers and discharge categories are to meet the sediment allocations.

The San Diego Water Board would not directly undertake any actions that could physically change the environment. Adoption of the proposed Basin Plan amendment, however, would result in future actions by landowners, municipalities and other agencies to comply with the requirements of the Basin Plan amendment and these actions could result in physical changes to the environment. The environmental impacts of such physical changes are evaluated below to the extent that they are reasonably foreseeable. Additionally, the Basin Plan amendment may result in future actions by municipalities to revise or adopt local permits, enforce local ordinances and permits, or educate watershed residents and businesses. In accordance with CEQA, changes that are speculative in nature do not require environmental review.

Until the parties that must comply with a permit or other requirements derived from the Basin Plan amendment propose specific projects, many physical changes cannot be anticipated. That said, it is reasonably foreseeable that the following environmental changes may result from reasonably foreseeable methods of compliance: (1) minor

[14] 14 CCR section 15083

construction, (2) earthmoving, (3) vegetation enhancement, and (4) decrease storm flows in channels. Although these activities are reasonably foreseeable methods of compliance, the implementation plan does not specify the nature of these actions. Therefore, this analysis considers these actions in general programmatic terms. To illustrate the possible nature of these activities, some examples are described following the table.

Table 3-1. Reasonable Foreseeable Compliance Projects

Possible Actions	Environmental Change Subject to Review
Install treatment facilities, for example, retention/infiltration basins, vegetated/bio-swales, buffer zones, and/or constructed wetlands)	Earthmoving, minor construction, and/or decrease storm flows in channels
Use of surface erosion source control BMPs (e.g., straw/fiber rolls, silt fencing, geotextile covers/mats, hydroseeding, and/or storm drain inlet protection)	Earthmoving, minor construction, and/or enhanced vegetation cover
Stabilize slopes (e.g., terracing, geotextile covers/mats, and/or hydroseeding)	Earthmoving, minor construction, and/or enhanced vegetation cover
Install bypass channels and/or dissipaters to slow storm water discharge velocity to canyons	Earthmoving and/or minor construction
Perform stream or Lagoon habitat restoration actions	Earthmoving, minor construction, and/or enhanced vegetation cover
Decrease storm water runoff from impervious surfaces through Low Impact Development	Earthmoving, minor construction, enhanced vegetation cover, and/or decrease storm flows in channels

- **Minor construction**. Basin Plan amendment-related construction projects would generally be small. Examples may include: a) construction of retention or infiltration basins to capture sediment and/or reduce surface runoff during storms; b) construction of vegetated swale/bioswales to deposit sediment entrained in surface runoff; c) retrofitting or replacement of road crossings over stream channels to increase capacity to convey peak runoff; d) construction of bypass channels and/or energy dissipaters immediately downstream of stormdrain outfalls to control or prevent channel erosion.
- **Earthmoving operations**. Adoption of the Basin Plan amendment would likely result in earthmoving to reduce sediment supply to the Lagoon and its tributaries. For example, earthmoving may involve constructing and maintaining retention/infiltration basins or terracing steep slopes and banks to reduce erosion rates. As a consequence of rapid channel incision, some channel reaches have become disconnected from the floodplain due to the narrow channels and high, steep, erosive stream banks. Earthmoving would occur to re-establish stable channel geometry in these channel reaches. Also, some actions can be undertaken to stabilize gullies or steep slopes, maintain BMPs, and/or to enhance stream channel habitat may involve earthmoving. Earthmoving may also be employed to re-contour portions of the Lagoon to support habitat diversity.

- **Decrease Flows in Channels.** Adoption of the Basin Plan amendment would foreseeably result in a decrease of wet weather flows in channels due to a reduction in peak discharge and a decrease in runoff volume from impermeable areas. A decrease in wet weather flows reduces erosion and the transport of sediment and pollutants. In addition, as the volume of dry weather flows decrease, nuisance flows are prevented from entering channels, resulting in a reduction of the channel's base flow. Resultant potential decreases in flow may contribute to a decrease in the amount of riparian vegetation on gravel bars, flood plains, and lower channel banks in some stream reaches as well as in the amount of riparian vegetation in the Lagoon.

These examples are not intended to be exhaustive or exclusive. Other conceivable actions that could be taken as a result of the Basin Plan amendment require speculation, and therefore, cannot be evaluated. For example, although the implementation plan recognizes coordinated planning efforts among local, state, and federal government agencies to enhance water quality within the Peñasquitos watershed, actual outcomes and specific actions resulting from the proposed partnership are too speculative to determine at this time. Also, as discussed above, even in cases where some physical changes are foreseeable, the exact nature of these changes is speculative pending specific project proposals that will be ultimately put forth by those subject to requirements derived from the Basin Plan amendment. Under CEQA, the permitting agencies will be the Lead Agencies for such future projects.

3.7 Environmental Checklist

This section contains the Lead Agency's analysis of reasonably foreseeable environmental effects of the proposed Basin Plan amendment in each category in the environmental checklist.[15] The proposed amendment does not define the specific actions that responsible parties would take to achieve water quality objectives. The San Diego Water Board has chosen not to specify methods of compliance with its regulations,[16] and accordingly, actual environmental impacts will necessarily depend upon compliance strategies selected by the responsible parties.

This analysis considers a reasonable range of compliance measures, as described in Section 3.6, above, and takes into account environmental and technical factors, population and geographic areas, and specific sites.

[15] Appendix A to 23CCR sections 3720-3781
[16] Water Code section 13360

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
I. AESTHETICS: Would the project:				
a) Have a substantial adverse effect on a scenic vista	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Discussion:

a) Potential implementation projects resulting from this Basin Plan amendment that include minor construction for sediment reduction installations and habitat restoration activities would not substantially affect the scenic resource or vista, nor the existing visual character or quality of any scenic site and its surroundings. Any physical changes to the aesthetic environment as a result of the Basin Plan amendment would be small in scale and short-term in nature until vegetation re-establishes in any disturbed areas.

In addition, any potential implementation project will be required to comply with local ordinances, such as the County's Scenic Area Regulations[17] that regulate development in areas of high scenic value. Projects must also be consistent with general land use plans that exclude incompatible uses and structures to preserve and enhance the scenic resources in adjacent areas.[18]

Furthermore, one of the goals/objectives for urban habitat lands in the City of San Diego MSCP Subarea Plan is to afford visual enjoyment and psychological relief from urbanization, while supporting habitat for the maintenance of both common and rare species. Therefore, specific City of San Diego regulations that afford protection to MSCP areas also afford the protection of aesthetic and visual value. These regulations include the Resource Protection Ordinance; the Sensitive Coastal Resource Overlay Zone; the Environmentally Sensitive Lands Ordinance; and the Steep Hillside Guidelines.

For these reasons, the Water Board finds that implementation of the TMDL will cause a less than significant impact, if any, on any scenic vistas in the area.

[17] San Diego County Zoning Ordinance, Part 5 Special Area Regulations, section 5200
[18] San Diego County General Plan, Chapter 5 Conservation and Open Space Element, Visual Resources

b) Potential implementation projects would not result in adverse aesthetic impacts to state scenic highways because there are no officially designated State or County scenic highways within the Los Peñasquitos watershed (Caltrans, 2011).

c) Construction and installation of structural BMPs may create an aesthetically offensive view during construction and installation, but this would be temporary until construction is completed and re-vegetated areas become established. Potential implementation projects will be subject to permit review and compliance with local ordinances, such as the County's Scenic Area Regulations[19] that regulate development in areas of high scenic value and general land use plans that exclude incompatible uses and structures to preserve and enhance the scenic resources in adjacent. Structural BMPs can and should be designed to provide aesthetically pleasing wildlife habitat, recreational areas, and green spaces in addition to improving storm water quality. Appropriate architectural and landscape design practices, including screening, should be implemented to mitigate any adverse aesthetic effects or be constructed underground.

Furthermore, one of the goals/objectives for urban habitat lands in the City of San Diego MSCP Subarea Plan is to afford visual enjoyment and psychological relief from urbanization, while supporting habitat for the maintenance of both common and rare species. Therefore, City of San Diego regulations, which afford protection to MSCP areas, also afford protection of aesthetic and visual value in that area. These regulations include the Resource Protection Ordinance; the Sensitive Coastal Resource Overlay Zone; the Environmentally Sensitive Lands Ordinance; and the Steep Hillside Guidelines.

For these reasons, the Water Board finds that implementation of the TMDL will cause a less than significant impact on the existing visual character or quality of the site and its surroundings.

d) Actions and projects that implement the Basin Plan amendment would not foreseeably include new lighting or installation of large structures that could generate reflected sunlight or glare. Adoption of the Basin Plan amendment would not result in adverse light and glare impacts.

[19] Ibid.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
II. AGRICULTURE AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☒	☐
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☒	☐

Discussion:

a) According to the California Department of Conservation's (DOC) Farmland Mapping and Monitoring Program, the Los Peñasquitos watershed has a small amount of unique farmland acreage in the Cities of San Diego and Poway and the County of San Diego (DOC, 2010). DOC (2010) indicates that there is no prime farmland or farmland of statewide importance in the watershed. Potential BMP installations to reduce sediment discharge or storm flow and potential stream channel restoration activities will not cause a change in unique farmland land use. Therefore, adoption of the Basin Plan amendment will not result in conversion of prime farmland, unique farmland, or farmland of statewide importance to non-agricultural use and will not cause an impact.

b) According to the DOC's San Diego County Williamson Act Lands 2008 Map, there are no Williamson Act lands designated in the Los Peñasquitos watershed (DOC, 2009). Neither the City of San Diego nor the County has any exclusively zoned agricultural zoning in the Los Peñasquitos watershed.[20] The City of Poway also does not have specific zoning for agriculture; however, agricultural lands are included in the Open Space-Resource Management zones.[21] BMP installations to reduce sediment discharges to protect downstream resources would not displace agricultural operations themselves. Additionally, potential implementation projects that include sediment reduction installations and habitat restoration activities would be relatively small in scale, be located in existing developed areas or on public lands along water courses, and would not conflict with existing agricultural zoning. Impacts on existing agricultural zones would be less than significant.

c) Potential implementation projects resulting from this Basin Plan amendment will not conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production because forest land or timberland do not exist in the Los Peñasquitos watershed (Shih, 2002).[22] Therefore, no impacts will occur.

d) Potential implementation projects will not result in the loss of forest land or conversion of forest land to non-forest use because forest land does not exist in the Los Peñasquitos watershed.[23] Therefore, no impacts will occur.

e) Adoption of the Basin Plan amendment could increase the level of landowner participation in cooperative efforts to minimize soil disturbance in sensitive areas (on steep slopes and adjacent to stream channels), which could result in localized, minor reductions in the amount of land cultivated, particularly adjacent to stream channels. However, because less than 1 percent of the Los Peñasquitos watershed is used for unique farmland (DOC, 2010), any buffer or setback areas, which would be fallow, would comprise a small amount of land area. Therefore, less than significant impacts would result.

[20] City of San Diego General Plan, Land Use and Community Planning Element, Figure LU-2; County of San Diego County General Plan Land Use Map.
[21] Poway General Plan, Community Development Element.
[22] City of San Diego General Plan, Land Use and Community Planning Element, Figure LU-2; Poway General Plan, Community Development Element; and County of San Diego County General Plan, Chapter 3 Land Use Element, Figure LU-1.
[23] City of San Diego General Plan, Land Use and Community Planning Element, Figure LU-2; County of San Diego County General Plan Land Use Map.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Discussion:

a) The California Air Resources Board (ARB) and local air districts are responsible for developing clean air plans to demonstrate how and when California will attain air quality standards established under both federal and California Clean Air Acts. The 1976 Lewis Air Quality Management Act established the San Diego Air Pollution Control District (APCD) and other air districts throughout the State. In San Diego, the US EPA has designated the San Diego Association of Governments (SANDAG) as the Metropolitan Planning Organization responsible for ensuring compliance with the requirements of the Clean Air Act for the San Diego Air Basin.

The San Diego Regional Air Quality Strategy (RAQS) outlines APCD's plans and control measures designed to bring the area into compliance with the requirements of federal and State air quality standards. The RAQS uses the assumptions and projections of local planning agencies to determine control strategies for regional compliance status (LSA Associates Inc., 2011). Since the RAQS is based on local General Plans, projects that are deemed consistent with the General Plan are found to be consistent with the air quality plan. Reasonably foreseeable methods of compliance would be assessed for consistency with local General Plans on a project specific basis. The proposed project in its entirety will not result in any population growth and thus lead to long-term regional air quality impacts.

Considering the above information, the project will not conflict with the RAQS, and no impact will result with respect to implementation of the air quality plan.

b) Both the state of California and the federal government have established health-based ambient air quality standards for seven air pollutants. These pollutants include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), coarse particulate matter with a diameter of 10 microns or less (PM_{10}), fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and lead. In addition, the State has set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. These standards are designed to protect the health and welfare of the populace with a reasonable margin of safety.

Ambient air quality is in nonattainment with the federal 8-hour ozone standard, the state's 8-hour and 1-hour ozone standards, and the state's coarse and fine particulate matter standards (PM_{10} and $PM_{2.5}$, respectively; San Diego APCD, 2009).

In general, reasonably foreseeable air quality impacts from implementation of the Basin Plan amendment would be the result of construction activities and operation and maintenance.

Construction impacts predominantly result from two sources: fugitive dust from surface disturbance activities; and exhaust emissions resulting from the use of construction equipment (including, but not-limited to: graders, dozers, back hoes, haul trucks, stationary electricity generators, and construction worker vehicles). One of the pollutants of concern during construction is particulate matter, since PM_{10} is emitted as windblown (fugitive) dust during surface disturbance and as exhaust of diesel-fired construction equipment (particularly as $PM_{2.5}$). The potential for an incremental cancer risk resulting from diesel-fired construction equipment exists. Other emissions of concern include architectural coating products off-gassing (VOCs) and other sources of mobile source (on-road and off-road) combustion (NOx, SOx, CO, PM_{10}, $PM_{2.5}$, and VOCs) associated with the project (County of San Diego, 2007b).

Operational and maintenance emissions are those that would occur after project construction activities have been completed and the project becomes operational. These emissions are a result of increased average daily vehicle trips as well as any proposed stationary sources associated with the reasonably foreseeable method of compliance. Depending on the characteristics of the individual project, operational activities have the potential to generate emissions of criteria pollutants. Operational impacts are predominantly the result of vehicular traffic associated with projects. Combustion emissions (NOx, SOx, CO, PM_{10}, $PM_{2.5}$, and VOCs) associated with mobile sources are generally the primary concern. This includes diesel particulate emissions from that portion of the mobile fleet that runs on diesel fuel (County of San Diego, 2007b).

In September 2000, the ARB adopted the Diesel Risk Reduction Plan (Diesel RRP), which recommends many control measures to reduce the risks associated with DPM and to achieve goals of 75 percent diesel particulate matter reduction by 2010 and 85 percent by 2020. The Diesel RRP presents the ARB's proposal for a comprehensive plan to significantly reduce diesel PM emissions by requiring all new diesel-fueled vehicles and engines to use state-of-the-art catalyzed diesel particulate filters and very low-sulfur diesel fuel. In addition, all existing vehicles and engines should be evaluated, and wherever technically feasible and cost-effective, retrofitted with diesel particulate filters (ARB, 2000).

Considering the above information, violation of any air quality standard or contribution to an existing or projected air quality violation will be less than significant.

c) See discussion to section (b), above.

Ambient air quality is in non-attainment with the federal 8-hour ozone standard, the state's 8-hour and 1-hour ozone standards, and the State's coarse and fine particulate matter standards (PM_{10} and $PM_{2.5}$, respectively) (San Diego APCD, 2009).

The project will result in a less than significant net increase of any criteria pollutant for which the San Diego Air Basin is non-attainment under an applicable federal or state ambient air quality standard.

d) Sensitive receptors may exist in areas where construction and operational emissions will occur and subject sensitive receptors to diesel-fired particulates and carbon monoxide. In San Diego County, APCD Rule 1210 implements the public notification and risk reduction requirements of state law, which requires facilities with high potential health risk levels to reduce health risks below significant risk levels. In addition, APCD Rule 1200 establishes acceptable risk levels and emission control requirements for new and modified facilities that may emit additional toxic air contaminants (TACs). Under Rule 1200, permits to operate may not be issued when emissions of TACs result in an incremental cancer risk greater than 1 in 1 million without application of Toxics-Best Available Control Technology (T-BACT), an incremental cancer risk greater than 10 in 1 million with application of T-BACT, or a health hazard index (chronic and acute) greater than one. The human health risk analysis is based on the time, duration, and exposures expected (County of San Diego, 2007b). Emissions from the potential implementation projects resulting from this Basin Plan amendment would be short in duration, infrequent, and occur on a small scale, and therefore would not have a high health risk potential.

Considering the above information, impacts to sensitive receptors will be less than significant.

e) The Basin Plan amendment would not involve the construction of any permanent sources of odor and therefore would not create objectionable odors affecting a substantial number of people. No odor impacts would result from the project.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Discussion:

a) The MSCP Plan is a comprehensive, long-term habitat conservation plan that addresses the needs of multiple covered species and the preservation of natural vegetation communities in San Diego County. The MSCP addresses the potential impacts of urban growth, natural habitat loss, and species endangerment; and includes a plan to mitigate for the potential loss of the multiple covered species and their habitat due to the direct impacts of future development of both public and private lands within the MSCP area. The MSCP identifies special status species; see the Environmental Setting section of this analysis (City of San Diego, 1997).

The Basin Plan amendment was developed specifically to benefit, enhance, restore and protect biological resources, including fish, wildlife, rare and endangered species, and habitat. Nonetheless specific projects involving construction and earthmoving activities could potentially affect candidate, sensitive or special status species (collectively, special status species), either directly or through habitat modifications. Although minor construction and earthmoving operations would likely occur in already disturbed areas and might involve reconstruction, recontouring, or replacement of existing roads and structures, it is possible that these and other activities to reduce erosion and restore stream or Lagoon habitat could occur in and impact areas where there are special status species and habitats.

Some proposed projects that could affect sensitive species would be subject to review and approval by the San Diego Water Board. The San Diego Water Board, in the course of carrying out its statutory duties to protect water quality and beneficial uses (including preservation of rare and endangered species and wildlife habitat as set forth in the Basin Plan), will either not approve compliance projects with significant adverse impacts on special status species and habitats or require avoidance or mitigation measures to reduce impacts to less than significant levels. It is not reasonably foreseeable that the San Diego Water Board would approve earthmoving work that would disrupt or destroy habitat of a known special status species (since protection of rare and endangered species is one of the beneficial uses we are protecting in the Lagoon). Furthermore, it is the San Diego Water Board's standard practice to work with the proponents of compliance projects to come up with actions that not only meet and further the proposed Basin Plan amendment's requirements and goals, but also all other components of the Basin Plan, such as protection of rare and endangered species and habitat. For example, where avoidance of impacts is not possible, the San Diego Water Board requires mitigation measures for work it approves that may impact special status species, riparian habitats, or other sensitive natural communities. These include but are not limited to requiring pre-construction surveys; construction buffers and setbacks; restrictions on construction during sensitive periods of time; employment of on-site biologists to oversee work; and avoidance of construction in known sensitive habitat areas or relocation and restoration of sensitive habitats.

In sum, through the course of the San Diego Water Board discharging its mandate to protect beneficial uses including rare and endangered species and wildlife habitat, impacts to special species and their habitats would be avoided or mitigated to less than significant levels.

If, however, impacts to the special status species and their habitats occur outside the San Diego Water Board's jurisdiction (e.g., in areas with no proximity or relation to waters of the state), then impacts must be addressed through other local, state, and federal regulatory programs. For example for projects that fill Clean Water Act Section 404 wetlands, the Army Corps of Engineers explicitly conditions its permits to require that impacts to federally listed species be less than significant. State and federal laws prohibit the take of special status species and their habitats except where incidental take permits have been issued. When issuing incidental take permits, state and federal agencies must ensure that the impacts of the take are minimized and mitigated to the maximum extent possible and ensure that the take will not appreciably reduce the likelihood of the survival and recovery of the species.

Proposed projects would be subject to the County of San Diego's Biological Mitigation Ordinance (BMO).[24] The BMO is the implementing ordinance for the Multiple Species Conservation Program County Subarea Plan. Compliance with this ordinance allows

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[24] San Diego County Code, Title 8, Division 6, Chapter 5 Biological Mitigation Ordinance

the County to issue Incidental Take Permits for projects that impact sensitive habitats. The BMO establishes the criteria for avoiding impacts to Biological Resource Core Areas, to plant and animal populations within those areas, and the mitigation requirements for all projects requiring a discretionary permit. The BMO explains how mitigation for impacts is determined and establishes specific mitigation requirements for impacts to certain species. In addition, proposed projects would be subject to the County of San Diego's Resource Protection Ordinance (RPO).[25] The RPO requires that a Resource Protection Study must be completed prior to approval of any of the discretionary applications listed in section 86.603(a) of the San Diego County Code. If the Resource Protection Study identifies the presence of environmentally sensitive lands, one or more of the following actions may be required as a condition of approval for the discretionary permit: 1) Apply open space easements to portions of the project site that contain sensitive lands; 2) Rezone the entire project site through the application of a special area designator for sensitive lands; or 3) Other actions as determined by the decision-making body.[26]

Considering the above information, impacts, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service will be less than significant with mitigation.

b) As indicated in section a) above, the Basin Plan amendment is designed to benefit biological resources, particularly riparian habitat and other sensitive natural communities. Nonetheless activities to improve riparian conditions, such as channel restoration and Lagoon restoration, could result in minor and short term disruption to riparian habitat.

Projects proposed to comply with the Basin Plan amendment implementation plan involving grading or construction in the riparian corridor, are subject to review and approval by the San Diego Water Board. As described in section a) above, the San Diego Water Board, in the course of discharging its statutory duties to protect water quality and their beneficial uses will either not approve compliance projects with significant adverse impacts on riparian habitats and sensitive natural communities, or would require mitigation measures to reduce impacts to less than significant levels. Furthermore, it is the San Diego Water Board's standard practice to work with California Department of Fish and Game, US Fish and Wildlife Service, and proponents of compliance projects to come up with actions that not only meet and further the project objective, but also have minimal impacts. Mitigation measures routinely required by the San Diego Water Board include (but are not limited to) requiring pre-construction surveys; construction buffers and setbacks; restrictions on construction during sensitive periods of time; employment of on-site biologists to oversee work; and avoidance of construction in known sensitive habitat areas or relocation and restoration of sensitive habitats, but only if avoidance is impossible.

[25] San Diego County Code, Title 8, Division 6, Chapter 6 Resource Protection Ordinance
[26] San Diego County Code, Title 8, Division 6, Chapter 6, Section 86.603(c)

However, if impacts to sensitive natural communities occur outside the San Diego Water Board's jurisdiction, such as in upland communities, then impacts must be addressed through other local, state, and federal regulatory programs (as described in section a), above).

Considering the above information, impacts to any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service would be less than significant with mitigation.

c) Basin Plan amendment-related implementation actions may contribute to an increase in the acreage of land where habitat enhancement and/or erosion control projects are undertaken, a fraction of which could be within wetlands. The adverse impacts on wetlands would not be substantial. Under the Nationwide or Individual Permit programs administered by the US Army Corps of Engineers (per Section 404 of the Clean Water Act) there are general conditions that require that, for projects that may adversely affect wetlands, responsible parties must demonstrate that avoidance, minimization, and mitigation has occurred to the maximum extent practicable to ensure that adverse impacts to the aquatic environment are minimal. In addition, before the Army Corps can issue section a 404 permit, San Diego Water Board staff must certify the project (Section 401 certification) as compliant with state water quality standards, such as the Porter Cologne Water Quality Control Act, the California Wetland Conservation Policy, and the Basin Plan.

If a water or wetland, although delineated under the 404(b)(1) guidelines is not considered a Water of the United States (and therefore subject to Section 404 permitting by the Army Corps), as a water of California it is still protected by state laws. Proposed discharges to non-federal waters of the state are subject to Waste Discharge Requirements pursuant to Water Code section 13260.

This gives assurance that any potential impacts will be mitigated to a less than significant level.

d) The Basin Plan amendment would not substantially interfere with the movement of any native resident or migratory fish or wildlife species, with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. The main goal of the Basin Plan amendment is to improve and enhance the saltmarsh habitat in the Lagoon. Thus, compliance projects would entail improving habitat as wildlife corridors, not adversely affecting them. Therefore, no impacts will occur to the movement of any native resident or migratory fish or wildlife species, with established native resident or migratory wildlife corridors, or impacts to use of native wildlife nursery sites.

e) The Basin Plan amendment itself does not conflict with any local policies or ordinances protecting biological resources. Therefore, no impacts will occur.

f) The Basin Plan amendment itself does not conflict with any adopted Habitat Conservation Plan, Natural Community Plan, or other approved local, regional or state habitat conservation plan, including the Los Peñasquitos Lagoon Enhancement Plan and Los Peñasquitos Canyon Preserve Natural Resource Management Plan. Therefore, no impacts will occur.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES: Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☒	☐	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☒	☐	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☒	☐	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

Discussion:

a) In 1824, Los Peñasquitos canyon became a Mexican land grant named *Rancho Santa Maria de los Peñasquitos. Rancho Peñasquitos* was continuously managed as a ranch under several owners until the entire Rancho was bought in 1962 for a proposed residential development. San Diego County's second oldest standing residence, Rancho de Los Peñasquitos, is a historic landmark.

Projects involving earthmoving or minor construction to comply with requirements of the proposed Basin Plan amendment are reasonably foreseeable. The activities could occur in areas of California State Park lands and in Los Peñasquitos Creek where historic artifacts are present. Development in the Los Peñasquitos watershed is subject to the San Diego County's Resource Protection Ordinance (RPO).[27] This ordinance requires that resources be evaluated with a Resource Protection Study and a finding that the use or development permitted by the application is consistent with the provisions of the RPO prior to approval of any of the following types of discretionary applications, which are not limited to: tentative maps, revised tentative maps, rezones, major use permit modifications, certificates of compliance, site plans, administrative permits, vacations of open space easements. The RPO prohibits development, trenching, grading, clearing, and grubbing, or any other activity or use that may result in damage to significant prehistoric or historic site lands, except for scientific investigations with an approved research design prepared by an archaeologist certified by the Society of Professional Archaeologists.[28]

[27] San Diego County Code, Title 8, Division 6, Chapter 6 Resource Protection Ordinance
[28] San Diego County Code, Resource Protection Ordinance, sections 86.601-86.608

Projects occurring within the City of San Diego are subject to the City of San Diego's Historical Resources Regulations,[29] which are intended to assure that development occurs in a manner that protects the overall quality of historical resources. It is further the intent of these regulations to protect the educational, cultural, economic, and general welfare of the public, while employing regulations that are consistent with sound historical preservation principles and the rights of private property owners.[30]

Furthermore, city and county General Plans contain policies that protect historic resources including the Conservation Element of the San Diego County General Plan, the Historical Preservation Element of the City of San Diego's General Plan, the Historical Structures Chapter of the City of Poway's Municipal Code, and the Historic Preservation Overlay Zone of the City of Del Mar's Municipal Code. In addition, California Public Resources Code section 5024.5 requires that all state agencies consult with the Office of Historic Preservation when any proposed project may adversely affect any historical resources on state-owned property (including state parks), and section 5024 requires that all state agencies inventory, register, preserve, and maintain all historical resources within their jurisdiction.

Considering the above information, the proposed projects that would occur as a result of the Basin Plan amendment would have a potentially significant impact on historical resources, but mitigation measures are available to reduce impacts to less than significant levels. However, implementation of these mitigation measures is within the jurisdiction of the local regulatory agencies listed in this document (Section 3.4.3). These agencies have the ability to implement these mitigation measures, can and should implement these mitigation measures, and are required under CEQA to implement mitigation measures unless mitigation measures are deemed infeasible through specific considerations.[31]

b) The Los Peñasquitos watershed is known to contain archeological sites, with artifacts found showing indigenous people living there for over 6,000 years. In addition, considerable archeological interest has been centered on the Lagoon because of the proximity of many Indian middens and campsites. Because these sites were occupied by La Jolla Indians between four and five thousand years ago, they usually contain many shells of both lagoon and ocean mollusks, some animal bones, and primitive stone implements (Mudie et al., 1974).

Projects involving earthmoving or construction to comply with requirements of the proposed Basin Plan amendment are reasonably foreseeable. Construction would generally be small in scale, and earthmoving would likely occur in areas already disturbed by recent human activity (i.e., existing roads, and housing and industrial developments)—not at or in areas containing archaeological resources as defined by section 15064.5 of the CEQA Guidelines. In the event that unique archaeological resources are found, the project would be subject to California Public Resources Code section 21083.2, which requires that if a project will cause damage to a unique

[29] City of San Diego Municipal Code, Chapter 14, Article 3, Division 2 Historical Resources Regulations
[30] City of San Diego General Plan, Historic Preservation Element
[31] 14 CCR section 15091(a)(3)

archaeological resource, the lead agency for the project level environmental review may require reasonable efforts to be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. Examples of that treatment, in no order of preference, may include, but are not limited to, any of the following: 1) planning construction to avoid archaeological sites, 2) deeding archaeological sites into permanent conservation easements, 3) capping or covering archaeological sites with a layer of soil before building on the sites, and/or 4) planning parks, greenspace, or other open space to incorporate archaeological sites.

Furthermore, city and county General Plans contain policies that protect archaeological resources including the Conservation Element of the San Diego County General Plan, the Historical Preservation Element of the City of San Diego's General Plan, the Historical Structures Chapter of the City of Poway's Municipal Code, and the Historic Preservation Overlay Zone of the City of Del Mar's Municipal Code.

Considering the above information, the proposed projects that would occur as a result of the Basin Plan amendment would have a potentially significant impact on archaeological resources, but mitigation measures are available to reduce impacts to less than significant levels. However, implementation of these mitigation measures is within the jurisdiction of the local regulatory agencies listed in this document (Section 3.4.3). These agencies have the ability to implement these mitigation measures, can and should implement these mitigation measures, and are required under CEQA to implement mitigation measures unless mitigation measures are deemed infeasible through specific considerations.[32]

c) Potential projects will involve earthmoving or construction to comply with requirements of the proposed Basin Plan amendment. These projects will occur near sea cliffs, on valley slopes, within the Lagoon, and/or in floodplains. Paleontological resources are typically found in the geologic deposits of sedimentary rock (e.g. sandstone, siltstone, mudstone, claystone, or shale) under surficial soil deposits within these types of areas. The Torrey Sandstone, Santiago Peak Volcanics Metasedimentary, and Lusardi Formation geologic units occur within the Peñasquitos watershed. The Torrey Sandstone and Lusardi Formation units have high resource sensitivities whereas the Santiago Peak Volcanics Metasedimentary unit has moderate resource sensitivity (City of San Diego, 2007). In general, formations with high resource potential are considered to have the highest potential to produce unique invertebrate fossil assemblages or unique vertebrate fossil remains and are, therefore, highly sensitive.

However, any project that is implemented will have to comply with local regulations and standards including the County of San Diego Grading Ordinance and the Conservation Element of the San Diego County General Plan. Section 87.430 of the Grading Ordinance provides for the requirement of a paleontological monitor at the discretion of the County. In addition, the suspension of grading operation is required upon the discovery of fossils greater than twelve inches in any dimension. The ordinance also

[32] 14 CCR section 15091(a)(3)

requires notification of the County Official (e.g. Permit Compliance Coordinator). The ordinance gives the County Official the authority to determine the appropriate resource recovery operations, which the permittee shall carry out prior to the County Official's authorization to resume normal grading operations. For projects occurring within the City of San Diego, resources are identified and protected through the environmental review process for discretionary projects. Through the City of San Diego's environmental process and prior to issuance of a Notice to Proceed (NTP) for any construction permits, including but not limited to, the first Grading Permit, Demolition Plans/Permits and Building Plans/Permits, the environmental review manager environmental designee shall verify that the requirements for Paleontological Monitoring have been noted on the appropriate construction documents.

Considering the above information, the proposed projects that would occur as a result of the Basin Plan amendment would have a potentially significant impact on paleontological resources, but mitigation measures are available to reduce impacts to less than significant levels. However, implementation of these mitigation measures is within the jurisdiction of the local regulatory agencies listed in this document (Section 3.4.3). These agencies have the ability to implement these mitigation measures, can and should implement these mitigation measures, and are required under CEQA to implement mitigation measures unless mitigation measures are deemed infeasible through specific considerations.[33]

d) Projects involving earthmoving or construction to comply with requirements of the proposed Basin Plan amendment are reasonably foreseeable. Construction would generally be small in scale, and earthmoving would likely occur in areas already disturbed by recent human activity (i.e., existing roads, and housing and industrial developments)—not at or in areas human remains, such as the El Camino Memorial Park located in Sorrento Valley.

In the event that human remains are discovered during a project level activity, the project proponent would be subject to Health and Safety Code section 7050.5, which requires that there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlay adjacent remains until the County Coroner has examined the remains. If the Coroner determines the remains to be those of an American Indian, or has reason to believe that they are those of an American Indian, the Coroner contacts, by telephone within 24 hours, the Native American Heritage Commission.

Considering the above information, the proposed projects that would occur as a result of the Basin Plan amendment would not adversely affect human remains, and impacts would be less than significant.

[33] 14 CCR section 15091(a)(3)

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS: Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

Discussion:

a) The project area is not located near Alquist-Priolo fault zone (Holocene faults) or a County Special Study fault zone (Late-Quaternary faults) (County of San Diego, 2007e, Figure 1 and 2); the Near-Source Zones for ground-shaking (County of San Diego, 2007e, Figure 3); or the Potential Liquefaction Areas (County of San Diego, 2010b, Figure 4.3.6). The project area does include landslide prone formations near the canyon and along the coast where steep slope and bluff exist (County of San Diego, 2010b, Figure 4.3.5). However, the Basin Plan amendment would not involve the construction of habitable structures; therefore, it would not result in any human safety risks of loss, injury, or death related to fault rupture, seismic ground-shaking, ground failure including liquefaction, or landslides. Therefore, no impacts will occur.

b) Specific projects involving earthmoving or construction activities to comply with requirements of the Basin Plan amendment are reasonably foreseeable. Such activities in general would not result in substantial soil erosion or the loss of topsoil since implementation of the Basin Plan amendment should reduce erosion rather than increase it. Temporary earthmoving operations could result in short-term, limited erosion. Construction projects affecting an area of one acre or more would require a general construction National Pollutant Discharge Elimination System (NPDES) permit from the State Water Board, and implementation of a storm water pollution prevention plan to control sediment erosion and runoff. These projects will be subject to the review and inspection by the San Diego Water Board, and will require implementation of routine and standard erosion control best management practices and proper construction site management. Other grading projects would be subject to non-discretionary requirements of local ordinance and code to reduce potential soil erosion from grading. Therefore, the Basin Plan amendment would not result in substantial soil erosion, and any impacts would be less than significant with mitigation.

c) Even though the project area includes landslide prone formations near the canyon and along the coast where steep slope and bluff exist (County of San Diego, 2010b), implementation of the Basin Plan amendment will not cause or result in further instability of these areas. On the contrary, implementation of the Basin Plan amendment will require actions to reduce sediment sources that may include landslide areas, eroding gullies, river banks and roads. Potential implementation projects would be designed to increase the stabilities of these unstable areas, both onsite and off-site, including minimization of any potential for landslides. Therefore, the Basin Plan amendment would not involve activities that would create or trigger landslide, lateral spreading, subsidence, liquefaction or collapse, and its impacts would be less than significant.

d) The Basin Plan amendment would not involve construction of buildings (as defined in the Uniform Building Code) or any habitable structures. Minor grading and construction could occur in areas with expansive soils but this activity would not create a substantial risk to life or property. Therefore, the Basin Plan amendment would not result in impacts related to expansive soils.

e) The Basin Plan amendment would not require wastewater disposal systems; therefore, affected soils need not be capable of supporting the use of septic tanks or alternative wastewater disposal systems. No impacts would result from the project with respect to septic tanks or alternative wastewater disposal systems.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
VII. GREENHOUSE GAS EMISSIONS: Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☒
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

Discussion:

a) Several reasonably foreseeable methods of compliance are likely to require additional motor vehicle trips and increased traffic during construction and maintenance of structural BMPs, which would increase greenhouse gas emissions from mobile sources. Considering the likely small contributions of the reasonably foreseeable methods of compliance relative to major facilities (i.e. cement plants, oil refineries, fossil-fueled electric-generating facilities/providers, cogeneration facilities, hydrogen plants, and other stationary combustion sources), the contribution from this implementation program is small in scale and the same as typical construction and maintenance activities in urbanized areas, such as road and infrastructure maintenance and building activities, and would not result in a significant impact on the environment.

b) In 2006, California passed AB 32, the Global Warming Solutions Act of 2006, which set the 2020 greenhouse gas emissions reduction goal into law. In December 2007, the California Air Resources Board (ARB) approved the 2020 emission limit of 427 million metric tons of CO_2 equivalents (CO_2e) of greenhouse gases. The 2020 target of 427 million metric tons of CO_2e requires the reduction of 169 million metric tons of CO_2e, or approximately 30 percent, from the state's projected 2020 emissions of 596 million metric tons of CO_2e (ARB, 2008).

AB 32 requires ARB to adopt mandatory reporting for the largest industrial sources to report and verify their greenhouse gas emissions. In 2007, ARB adopted the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions. Currently, the regulation is being revised. A final rulemaking package was filed by ARB with the Office of Administrative Law on October 28, 2011. The regulation language applies to facilities on Table A-3 of 40 CFR Part 98, including cement plants, oil refineries, fossil-fueled electric-generating facilities/providers, cogeneration facilities, hydrogen plants, and other stationary combustion sources, regardless of emissions level. The regulation language also applies to facilities on Table A-4 of 40 CFR Part 98, including electronics manufacturing, fluorinated gas production, and glass production, that generate more than 10,000 metric tons/year CO_2e.[34] By requiring these largest facilities to report their emissions, approximately 94 percent of greenhouse gas emissions from industrial and commercial stationary sources in California will be accounted (ARB, 2007).

[34] 17 CCR sections 95100 – 95133 http://www.arb.ca.gov/regact/2010/ghg2010/mrrfro.pdf

On December 11, 2008, ARB adopted its Climate Change Scoping Plan with re-approval occurring on August, 24, 2011. The Scoping Plan proposes a comprehensive set of actions designed to reduce overall carbon emissions in California. Key elements of California's recommendations for reducing its greenhouse gas emissions to 1990 levels by 2020 include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;
- Achieving a statewide renewables energy mix of 33 percent;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related greenhouse gas emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the state's long term commitment to AB 32 implementation. (ARB, 2008)

Implementation of this TMDL will not conflict with implementation of the Climate Change Scoping Plan and no impact will occur.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
VIII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒	☐
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

Discussion:

a) Compliance with the Basin Plan amendment implementation plan does not involve the routine transport, use, or disposal of hazardous materials. Therefore, no impacts from the use, transport or disposal of hazardous materials would result.

b) The Basin Plan amendment does not include actions that are likely to result in upset or accident conditions involving the release of hazardous materials. Potential implementation projects that include sediment reduction installations and habitat restoration activities would be relatively small in scale, be located in existing developed areas or on public lands along water courses, and would not contain, handle, or store any potential sources of chemicals or compounds that would present a significant risk of accidental explosion or release of hazardous substances. Therefore, no impacts will occur.

c) Basin Plan amendment actions such as minor construction to reduce erosion and habitat restoration projects would be located along the storm water conveyance system right of way and stream channels in areas used as open space, which are not likely to contain schools. In any case, the Basin Plan amendment and TMDL implementation actions would not emit hazardous materials, substances, or waste. Therefore, no impact from hazardous materials would occur within one-quarter mile of an existing or proposed school.

d) It is unlikely that Basin Plan amendment actions would occur on sites that are included on lists of hazardous material sites compiled pursuant to Government Code Section 65962.5, such as leaky underground storage tank sites or sites where hazardous materials violations have occurred. The possibility that hazardous materials or substances will be encountered during project activities on or near these sites is speculative and need not be considered in this analysis. Therefore, there would be no impacts from hazardous materials sites.

e) The Basin Plan amendment does not include actions that would result in a safety hazard to people residing or working in any potential project areas from a public airport. The Los Peñasquitos watershed is not within an airport land use plan, or within two miles of a public airport or public use airport; therefore, the Basin Plan amendment would not result in an air safety hazard for people residing or working in the project area.

f) A large portion of the watershed lies within the overflight influence of the Marine Corps Air Station Miramar (MCAS Miramar), which is located in the Rose Canyon Creek watershed immediately to the south of Los Peñasquitos watershed (ALUC, 2010). MCAS Miramar Airport Land Use Compatibility Plan (MCAS Miramar ALUCP) indicates that a portion of the Lagoon and the lower part of Carroll Canyon are in Accident Potential Zone II (APZII) bordered by a narrow Transition Zone (TZ) around the perimeter (ALUC 2010). APZII and TZ are the third and final tiers of the safety-related zones identified by the US Marine Corps and have the lowest potential for occurrence of aircraft accidents of the safety zones, which is based on distance from the ends of the runways. MCAS Miramar ALUCP necessitates restrictions on land uses in these safety zones for infill development (construction of residential and nonresidential buildings where people will inhabit or congregate). Potential implementation projects that include minor construction for sediment reduction installations and habitat restoration activities are not identified as the type of development requiring restriction. However, the construction and maintenance activities associated with these types of projects would be expected to meet or be below the APZII Maximum Intensity Limit of 50 people per acre, as set by the MCAS Miramar ALUCP for the “Water, Rivers, Creeks, Canals, Wetlands, Bays, Lakes, and Reservoirs” land use. These types of implementation projects in these two safety zones have a low potential for ground hazard from flight-related accidents during the construction phase and periodic maintenance work and represent a less than significant impact.

There are several private heliports in the vicinity of the Lagoon and preserve and Carroll Canyon Creek: San Diego Heliport, Qualcomm Building T Heliport, Henley Heliport, the

Plaza La Jolla Village Heliport, and Scripps Memorial Hospital La Jolla Heliport. The Federal Aviation Administration published an Advisory Circular for Heliport Design (AC) that provides guidance with respect to the design of the touchdown and liftoff pad for helicopters and requirements for obstruction-free approach/departure paths (FAA, 2004). The AC recommends helipad protection zones for public use facilities. These zones, equivalent to runway protection zones at airports, extend 280 feet from the edge of the Final Approach and Takeoff Area (FATO). A FATO is generally larger than the physical pad itself and its size usually depends on the size of the helicopters that will utilize the helipad. Potential implementation projects that include minor construction for sediment reduction installations and habitat restoration activities are not likely to be within the protection zone of any of the local helipads. There would be no impact from the presence of these local helipads.

Considering the above information as a whole, potential implementation projects result in a less than significant impact to the safety for people residing or working in the project area.

g) The following applicable emergency response plans or emergency evacuation plans are evaluated for potential project consistency.

<u>Unified San Diego County Emergency Services Organization Operational Area Emergency Plan</u>
The Operational Area Emergency Plan is a comprehensive emergency plan that defines responsibilities, establishes an emergency organization, defines lines of communications, and is designed to be part of the Emergency Plan (County of San Diego, 2010d). It provides guidance for emergency planning and requires subsequent plans to be established by each jurisdiction that has responsibilities in a disaster situation. Potential implementation projects resulting from this Basin Plan amendment will not interfere with this plan because it will not prohibit subsequent plans from being established or prevent the goals and objectives of existing plans from being carried out.

<u>Dam Evacuation Plans</u>
Built in 1960, Lake Miramar Dam is made of earth and has a high relative hazard rating (County of San Diego, 2010b, Figure 4.3.2). The dam inundation area impacts the length of Carroll Canyon and the Lagoon. Potential implementation projects that include minor construction for sediment reduction installations and habitat restoration activities may be located in the dam inundation area, but will not interfere with the Dam Evacuation Plan because the project will not involve building of structures that would contain large concentrations of people or special needs individuals that would limit the ability of the County Office of Emergency Services to implement a dam evacuation plan.

<u>Emergency Air Support</u>
Emergency and fire air support services tend to fly lower to the ground than passenger airplanes for law enforcement activities, to carry out search and rescue missions, to collect water for firefighting, and to evacuate victims from remote areas (County of San Diego, 2007d). Emergency response aircraft require sufficient ground clearance to safely and efficiently function during an emergency response. Potential implementation

projects resulting from this Basin Plan amendment would not involve building structures that would create an obstruction that could compromise the safety of emergency response aircraft and their ability to effectively respond in an emergency could result in physical interference in the implementation of an emergency response.

In general, potential implementation projects that include minor construction for sediment reduction installations and habitat restoration activities resulting from the Basin Plan amendment would not interfere with any emergency response plans or emergency evacuation plans. Therefore, no impact would occur.

h) Potential implementation projects resulting from this Basin Plan amendment that include minor construction for sediment reduction installations and habitat restoration activities may be adjacent to wildlands that have the potential to support wildland fires. The natural areas within the Lagoon and the canyons that drain to the lagoon have wildfire hazard risk level designations of moderate, high, and very high (County of San Diego, 2010b, Figure 4.3.7). However, these potential projects will be required by the local permitting agencies to comply with regulations relating to emergency access, water supply, and defensible space specified in the 2010 California Fire Code (ICC 2010; as adopted, amended, or modified by the Cities of San Diego[35], Poway[36], and Del Mar[37]) and the 2011 Consolidated Fire Code for the County and 16 unincorporated Fire Protection Districts in San Diego County, as adopted and amended by the local fire protection district (County of San Diego, 2011b). Project proponents will have to prepare fire protection plans that describe the level of fire hazard and the methods proposed to minimize the hazard, as required by the applicable jurisdiction’s regulations. Therefore, it is not likely that a potential project related to this Basin Plan amendment would increase fire hazards, nor would a potential project expose people or structures to a significant risk of loss, injury or death involving wildland fires. The impact would be less than significant.

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[35] City of San Diego, San Diego Municipal Code, Chapter 5, Article 5: Fire Protection and Prevention. Adoption of portions of the California Fire Code (2007 Edition), except as otherwise provided in this article.

[36] City of Poway, Poway Municipal Code, Chapter 15.24, Fire Code. Adoption of 2010 California Fire Code including Appendix Chapters 1 and 4 and Appendices B and F, as published by the International Code Council, except those portions that are deleted, modified, or amended by this chapter.

[37] City of Del Mar, Del Mar Municipal Code, Chapter 10.04, Fire Code. Adoption of 2010 California Fire Code, including Appendix Chapters; Appendix Chapter 4, Appendix B and H, as published by the International Code Council.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
IX. HYDROLOGY AND WATER QUALITY: Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☒	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?	☐	☒	☐	☐
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☒	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
j) Inundation by seiche, tsunami, or mudflow	☐	☐	☐	☒

Discussion:

a) The Basin Plan amendment articulates applicable water quality standards; therefore, once compliance with the WLAs and numeric targets are met in the watershed, there would be no violation of water quality standards or waste discharge requirements, and no adverse impacts to water quality would result.

b) This Basin Plan amendment may result in implementation projects that involve construction of facilities, such as retention basins, infiltration basins, or vegetated swales, which may increase storm water infiltration and subsequently return groundwater recharge rates to pre-development rates. Potential implementation projects will not necessitate use of groundwater for any purpose, including irrigation, domestic or commercial demands. Potential implementation projects will not result in a decrease in groundwater supplies. No adverse impacts to groundwater recharge would result.

c) Potential implementation projects resulting from this Basin Plan amendment may involve earthmoving or minor construction activities during the installation of BMPs. These BMPS would reduce or eliminate soil erosion and sediment runoff and reduce wet-weather flows. The purpose of these types of projects would be to reduce overall soil erosion. Such projects would affect existing drainage patterns, but result in more stable hydrology. For example, installation of facilities such as retention/infiltration basins or bioswales would modify the drainage; however, the facility would ultimately reduce peak wet-weather flows to a lower-flow condition that would be less erosive than existing conditions. Installation of implementation projects would not result in substantial erosion or siltation on- or off-site and would be less than significant.

Potential habitat restoration projects in any of the creek channels or the Lagoon, including projects designed to improve tidal flushing, improve salt marsh habitat, and ultimately restore beneficial uses in the lagoon, could include activities such as removing accumulated sediments, stabilizing banks, restoring natural channels, and revegetating affected land areas. Such projects could also affect existing drainage patterns and result in substantial short-term impacts from erosion on- and off-site, until system stabilization occurred.

Restoration projects such as these, which involve fill or dredging in wetlands or riparian areas, require federal and state review pursuant to the Federal Clean Water Act (CWA), California Water Code, and California State Policies. The San Diego Water Board will require that project proponents implement standard erosion control best management practices and utilize proper construction site management through its CWA section 401 Water Quality Certification Program. In addition, construction projects greater than one acre in size would require a general construction NPDES permit and implementation of a storm water pollution prevention plan. Therefore, any identified substantial impacts from these potential implementation projects would be mitigated by Water Board-issued permit requirements and be less than significant with mitigation incorporated.

d) Potential implementation projects resulting from this Basin Plan amendment could involve earthmoving operations that could substantially affect existing drainage patterns. Some projects may be performed to terrace steep slopes to reduce erosion rates and landslide potential or to re-establish stable channel geometry in some channel reaches for the purpose of reconnecting stream channels with the floodplain. The purpose of these projects is to reduce sedimentation in streams, which has the effect of reducing flooding and is environmentally beneficial. The numeric target in this TMDL will encourage responsible parties to implement erosion control measures for compliance purposes.

Potential implementation projects will not substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site of project areas; therefore, there will be no adverse impact.

e) Activities related to potential implementation projects resulting from this Basin Plan amendment are, by design, intended to decrease peak runoff rates from upland land uses to reduce sediment input to the Lagoon. These potential implementation projects will likely result in a decrease of wet weather flows and associated pollutant loads to channels. Therefore, potential implementation projects resulting from this Basin Plan amendment would not result in creating or contributing additional runoff water that would exceed the capacity of the existing storm water drainage system.

Potential implementation projects that involve minor construction activities and earthmoving operations could result in additional sources of polluted runoff due to accidental release of sediment into the waterway and pollutants such as petroleum products from construction equipment during the construction-phase. Construction projects affecting an area of one acre or more would require a general construction National Pollutant Discharge Elimination System (NPDES) permit from the State Water Board and implementation of a storm water pollution prevention plan to control sediment erosion and runoff. The San Diego Water Board will require proper construction site management and implementation of standard best management practices to control erosion and prevent spills. Additionally, implementation projects will receive local planning and environmental review through mandatory permitting processes that evaluate projects, minimize environmental impacts, and assure project consistency with plans, policies, and ordinances, such as local grading ordinances.

The impact of potential implementation projects creating or contributing substantial additional sources of polluted runoff will be less than significant with mitigation.

f) Activities related to potential implementation projects resulting from this Basin Plan amendment are intended to reduce erosion and sediment inputs to the Lagoon. The purpose of the Basin Plan amendment is to correct the water quality impairment and restore beneficial uses. Therefore, the Basin Plan amendment would not substantially degrade water quality and no long-term adverse water quality impacts would occur as a result of potential implementation projects.

g) The Basin Plan amendment will not result in construction of housing. Therefore, no housing would be placed within the 100-year flood hazard zone as a result of the proposed action. No flood hazard impacts would occur.

h) The 100-year floodplain is located along the stream drainages in the canyons of the TMDL area (County of San Diego, 2010b, Figure 4.3.4). Potential implementation projects may be performed to terrace steep slopes to reduce erosion rates and landslide potential or to re-establish stable channel geometry in some channel reaches for the purpose of reconnecting stream channels with the floodplain. While these types of activities would be near or in the floodplain, it is not likely that it would interfere with the floodplain. Other projects are likely to involve habitat restoration activities that would increase salt marsh habitat, improve tidal flushing, and improve the water body's capacity to absorb flood water.

The purpose of these projects is to reduce sedimentation in streams, which has the effect of reducing flooding and is environmentally beneficial. The Basin Plan amendment will therefore result in less than significant impacts to the impediment or redirection of flood flows within a 100-year flood hazard zone.

i) Built in 1960, Lake Miramar Dam is made of earth and has a high relative hazard rating (County of San Diego, 2010b, Figure 4.3.2). The dam inundation area impacts the length of Carroll Canyon and the Lagoon. Potential implementation projects that include minor construction for sediment reduction installations and habitat restoration activities may be located in the dam inundation area of the Lake Miramar Dam. People working on these projects could be exposed to significant risk of loss, injury or death involving flooding as a result of dam failure; but this risk is speculative as failure is unlikely to be caused by the small projects resulting from the Basin Plan amendment. Any such risk would be very small because of the short-term nature of the construction-phase of such projects. Furthermore, the Basin Plan amendment does not include construction of buildings or housing in the inundation area and will not expose people or structures to a significant risk from flooding. The project's impact would be less than significant.

j) Potential implementation projects resulting from this Basin Plan amendment are likely to be located in upland, in canyons, or within lagoon areas. None of these locations would be impacted by seiche inundation or tsunami. County of San Diego (2010b) has produced maps illustrating the hazards for coastal storms/erosion/tsunami and rain-induced landslide based on historic disaster information. The projected hazard of the maximum tsunami projected run-up affects 0.5 to 0.75 miles inland from the coastline at the estuary mouth (County of San Diego, 2010b, Figure 4.3.1). High risk hazard from coastal storm surge is not indicated for the coastline of the Lagoon mouth. The cliffs lining the canyon areas along Carmel, Los Peñasquitos, and lower Carroll Canyon Creeks are indicated as most susceptible for landslide (County of San Diego, 2010b, Figure 4.3.5); however, BMP construction or lagoon restoration activities would be unlikely to occur during wet weather. Potential implementation projects would not expose people or property of inundation due to seiche, tsunami, or mudflow and would create no impact.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
X. LAND USE AND PLANNING: Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b)Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Discussion:

a) Potential implementation projects resulting from this Basin Plan amendment that include earthmoving and minor construction for sediment reduction installations and would not be of any size or configuration likely to physically divide an established community. Habitat restoration activities would likely occur within stream channels or the lagoon itself and would not introduce a new physical divide. Therefore, no adverse impact would occur.

b) Potential implementation projects that include earthmoving and minor construction for sediment reduction installations and habitat restoration activities would not conflict with any land use plan, policy, or regulation.

Installation of treatment control BMPs, such as infiltration/retention basins, buffer zones, or vegetated swales, would potentially reduce sediment; improve water quality, reduce peak storm water flows, increase infiltration of surface water, and/or decrease dry-weather flows. These types of BMPs are also used in Low Impact Development (LID) for the purpose of decreasing storm water runoff from impervious surfaces and reducing erosion hazards. LID is already required for land development and capital improvement projects within the cities and county jurisdictions (City of San Diego, 2011; City of Del Mar, 2011; County of San Diego, 2011a; Brown and Caldwell, 2011).[38]

Other potential BMPs that may be used are vegetation stabilization to prevent the occurrence of erosion, installation of energy dissipaters at the outlets of storm drains, culverts, conduits, or channels to slow storm water velocity in the canyons to prevent channel incision, and stabilization of steep or eroded slopes to reduce or eliminate erosion and landslide hazards. Stream channel restoration activities may be used to re-establish stable channel geometry to protect wetland function and minimize erosion. Additionally, the Basin Plan Amendment may require some restoration of lagoon habitat

[38] City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, section 43.0307; Poway Municipal Code, Title 16, Division VI, Chapter 16.100; City of Del Mar Municipal Code, Title 11, Chapter 11.30; and County of San Diego Watershed Protection Ordinance, section 67.806.

to restore and enhance the biological value and hydrologic function of the coastal wetland.

These types of BMPs and activities may be used by the jurisdictions to maintain and improve infrastructure, conveyance system, and wetland resources and are consistent with the cities' and county general plan elements and ordinances.[39] Projects proposed to comply with Basin Plan amendment requirements would be subject to the review of these local agencies, assuring consistency with local land use plans or policies. For all of these reasons, no conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project is anticipated. Therefore, no impact would occur.

c) The Basin Plan amendment would not conflict with any habitat conservation plan or natural community conservation plan. Projects proposed to comply with Basin Plan amendment requirements would be subject to local agency review and would be conducted in accordance with the Multiple Species Conservation Plan (MSCP), the Los Peñasquitos Lagoon Enhancement Plan, and Los Peñasquitos Canyon Preserve Natural Resource Management Plan. The purposes of these plans are as follows:

- The MSCP addresses the potential impacts of urban growth, natural habitat loss, and species endangerment; and includes a plan to mitigate for the potential loss of the multiple covered species and their habitat due to the direct impacts of future development of both public and private lands within the MSCP area (City of San Diego, 1997).
- The Los Peñasquitos Lagoon Enhancement Plan and Program maintains an open lagoon mouth to support salt marsh habitat, maintains a native plant re-vegetation program to replace invasive species, and maintains a restoration basin to intercept sediment during moderate to large storm events.
- The City of San Diego Development Services and Park and Recreation Departments are responsible for the administration of the Los Peñasquitos Canyon Preserve Natural Resource Management Plan. Relevant objectives of this plan are to control erosion along trails and streambeds throughout the Los Peñasquitos Canyon Preserve, further protect the watersheds, and ensure individual projects within the Los Peñasquitos Canyon Preserve meet federal, state, and local environmental standards and requirements.

Potential projects resulting from this Basin Plan amendment will be consistent with existing habitat conservation plans, and no impact will occur.

[39] City of San Diego General Plan, Conservation and Public Facilities Elements; City of San Diego Municipal Code, Chapter 14, Article 2, Division 2, section 142.0220; City of San Diego Municipal Code, Chapter 14, Article 3, Division 1; City of Poway General Plan, Natural Resources Element; City of Del Mar Community Plan, Local Coastal Program Land Use Plan and Implementing Ordinances (Chapter 30.52); County of San Diego General Plan, Conservation and Open Space Element and Safety Element; and County of San Diego Grading Ordinance, Watershed Protection Ordinance, and Resource Protection Ordinance.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XI. MINERAL RESOURCES: Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Discussion:

a) The watershed has large areas classified by the California Department of Conservation – Division of Mines and Geology as areas underlain by mineral deposits (MRZ-2) and areas of undetermined mineral resources (MRZ-3) (County of San Diego, 2008). There are two active aggregate facilities (i.e., sand, gravel, and crushed rock) located in Carroll Canyon, operated by Vulcan Materials Company and Hanson Aggregates, and an inactive rock quarry in Beeler Canyon located in Poway, currently operated as a concrete ready mix production facility by Vulcan Materials Company.

These facilities will be directly affected by the TMDL in that they may be subject to more stringent regulation to control the discharge of sediment by the San Diego Water Board through the Industrial Storm Water Permit or some other permitting or enforcement action. However, BMP installations to reduce sediment discharge or storm flow and stream/lagoon restoration activities will not prevent existing or future facilities from operating nor directly result in the loss of availability of known mineral resources of value to the region. Additionally, potential implementation projects that include sediment reduction installations and habitat restoration activities would be relatively small in scale, be located in existing developed areas or on public lands, and would not involve the construction of new buildings that would encroach upon existing or potential future mining sites.

Considering this information, the project will not impact the availability of mineral resources.

b) The City of San Diego's Conservation Element of the General Plan identifies a large area that includes Carroll Canyon, Mira Mesa, Scripps Ranch, and part of Rancho Peñasquitos as high quality mineral resource areas that are classified as MRZ-2. Many of these areas are already developed, and existing mining operations are in conflict with the MSCP. New facilities could be permitted provided the operation could be demonstrated to be compatible with the MSCP preserve goals for covered species and their habitats by protecting adjacent preserved areas and covered species, mitigating biological impacts, and restoring mined areas.

BMP installations would be used by facilities such as these to control and reduce sediment discharge from industrial operation areas to protect downstream resources and would not displace or prevent the operations themselves. Additionally, potential implementation projects that include sediment reduction installations and habitat restoration activities would be relatively small in scale, be located in existing developed areas or on public lands along water courses, and would not involve the construction of new buildings that would encroach upon existing or potential future mining sites. Potentially significant loss of availability of a known mineral resource or locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan will not occur as a result of this project.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XII. NOISE: Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐

Discussion:

a) Potential implementation projects resulting from this Basin Plan amendment that include earthmoving and construction could temporarily generate noise during the construction phase of those projects. In general, potential sediment reduction installations and habitat restoration activities would occur in discrete, localized areas throughout the watershed and would be located in outdoor and open space areas. Construction noise levels would be temporary in nature and similar to typical construction site projects. Potential projects will not generate construction noise that exceeds local noise ordinances for discretionary projects.[40] For this reason, a less than significant impact would occur.

[40] City of San Diego Municipal Code, Chapter 5, Article 9.5; Poway Municipal Code Chapter 8.08; City of Del Mar Municipal Code, Title 9, Chapter 9.20; County of San Diego Noise Ordinance, Title 3, Division 6, Chapter 4, sections 36.404 and 36.409.

b) To comply with requirements derived from the Basin Plan amendment, potential implementation projects involving earthmoving or minor construction could occur near noise sensitive land uses, such as a hospital, school, hotel, or library. These projects would be in discrete, localized areas throughout the watershed and would be located in outdoor and open space areas. Construction noise levels would be temporary in nature and similar to typical construction site projects. The possibility that potential projects would include blasting or boring activity is speculative and need not be considered in this analysis. Therefore, there would be no impacts from groundborne vibration and noise.

c) The Basin Plan amendment would not cause any permanent increase in ambient noise levels.

d) To comply with requirements derived from the Basin Plan amendment, potential implementation projects involving earthmoving or construction could result in a temporary increase in ambient noise levels. In general, potential sediment reduction installations and habitat restoration activities would be located in outdoor and open space areas, would not be a facility that contains noise-generating equipment, and would have construction noise levels similar to typical construction site projects. Potential projects will not generate construction noise levels that exceed local noise ordinances for discretionary projects.[41] Therefore, impacts from temporary increases in ambient noise would be less than significant.

e) The Los Peñasquitos watershed is not within an airport land use plan, or within two miles of a public airport or public use airport; therefore, the Basin Plan amendment would not result in exposure of people residing or working in any potential project areas to excessive noise levels.

f) The Los Peñasquitos watershed does not contain any private airstrips. However, a large portion of the watershed lies within the overflight influence of the MCAS Miramar. MCAS Miramar ALUCP indicates that Carroll Canyon, Sorrento Valley, parts of Mira Mesa, and a portion of the Los Peñasquitos Reserve are within the noise exposure contours for 60 – 65 dB CNEL[42] future average exposure and 65 – 70 dB CNEL annual day exposure (ALUC, 2010, Map MIR-1: Noise Compatibility Policy Map). Additionally, there are several private heliports in the vicinity of the Lagoon and preserve, and Carroll Canyon Creek: San Diego Heliport, Qualcomm Building T Heliport, Henley Heliport, the Plaza La Jolla Village Heliport, and Scripps Memorial Hospital La Jolla Heliport.

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[41] City of San Diego Municipal Code, Chapter 5, Article 9.5; Poway Municipal Code Chapter 8.08; City of Del Mar Municipal Code, Title 9, Chapter 9.20; County of San Diego Noise Ordinance, Title 3, Division 6, Chapter 4, sections 36.404 and 36.409.

[42] Community Noise Equivalent Level (CNEL) is the noise metric adopted by the State of California for land use planning purposes, including describing airport noise impacts. This noise metric compensates for the increase in people's sensitivity to noise during nighttime hours. The noise impacts typically are depicted by a set of contours, each of which represents points having the same CNEL value (ALUC, 2010).

Potential implementation projects in these areas resulting from this Basin Plan amendment would not cause any permanent exposure of residents to additional sources of noise above airport or heliport noise. Any persons constructing or maintaining BMPs within this area would be exposed to short-term noise levels from air traffic. Therefore, the impacts from private airstrip-generated noise to people working in potential project areas would be less than significant.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING: Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion:

a) The Basin Plan amendment would not induce substantial population growth in the Los Peñasquitos watershed. Potential implementation projects resulting from this Basin Plan amendment will not propose a physical or regulatory change that would construct new public facilities that foster population or economic growth, construct new housing or businesses, or extend roads or infrastructure. Therefore, no impacts would occur.

b) Potential implementation projects resulting from the Basin Plan amendment would be contained within the storm water conveyance system right of way. Therefore, such projects would not be located to displace existing housing or any people that would need replacement housing. Therefore, no impact would occur.

c) The Basin Plan amendment would not displace substantial numbers of people or create a need for the construction of replacement housing (see discussion to section (b), above), and no impacts would occur.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XIV. PUBLIC SERVICES:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☒
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

Discussion:

a) Compliance with the Basin Plan amendment would not involve provision or alteration of government facilities. Therefore the Basin Plan amendment would not affect service ratios, response times, or other performance objectives for fire protection, schools, or other public facilities and no impact would occur.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XV. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Discussion:

a) Potential implementation projects resulting from this Basin Plan amendment that occur within the Los Peñasquitos Canyon Preserve could affect public access of trails during construction activities. However, projects would be small in scale, short in duration, and would not substantially affect park usage. In any case, such short-term shifts in use patterns would not result in substantial physical deterioration of park or recreation facilities and no impact would occur.

b) Although the Basin Plan amendment could result in some changes in road and trail configurations or permitted uses that could alter recreational use patterns, these changes would not result in the need for construction of or expansion of recreational facilities that could have an adverse effect on the environment. No impact is anticipated.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XVI. TRANSPORTATION/TRAFFIC: Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☒	☐

Discussion:

a) Adoption of the Basin Plan amendment will not interfere with public transit routes or pedestrian/bicycle trails and paths. Potential implementation projects would not create substantial traffic in relation to the existing load and capacity of existing street systems, and therefore, will not be in conflict with local general plans, the Regional Transportation Plan and Congestion Management Program,[43] the County Transportation Impact Fee Ordinance,[44] the Pedestrian Master Plan (City of San Diego, 2006), and other policies.

b) Potential implementation projects resulting from this Basin Plan amendment would require mobilization of construction vehicles to perform minor construction and habitat restoration activities. Any increase in traffic would be temporary and would be limited to local areas in the vicinity of individual construction or restoration projects. It is anticipated that individual projects would mobilize equipment at the beginning and end of the work and not generate a significant increase in traffic congestion. Additionally, potential implementation projects would not increase population or provide employment;

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[43] SANDAG 2050 Regional Transportation Plan, Appendices, and Technical Appendices: http://www.sandag.org/index.asp?projectid=349&fuseaction=projects.detail (SANDAG, 2011)

[44] San Diego County, Ordinance to Amend the San Diego County Code Related to The Transportation Impact Fee. Effective April 27, 2008.

therefore, they would not generate any permanent increase in traffic congestion and would not affect level of service standards established by the SANDAG Congestion Management Program,[45] Poway Comprehensive Master Plan (Transportation Element),[46] or County Public Road Standards.[47] Therefore, the Basin Plan amendment would not result in permanent, substantial increases in traffic above existing conditions and not be in conflict with applicable congestion management programs and road standards. No impacts would occur.

c) Potential implementation projects would not result in a change in air traffic patterns or air traffic levels. The Basin Plan amendment would not affect air traffic that would result in substantial safety risks. No impacts would occur.

d) This Basin Plan amendment does not include provisions to construct new roads or modify existing roads to add sharp curves or dangerous intersections. No new hazards due to the design or engineering of the road network in the Los Peñasquitos watershed will occur and no incompatible uses will be introduced; therefore, there will be no impact from this project.

e) Potential implementation projects resulting from this Basin Plan amendment may be located in canyon and natural areas that may have limited access points. These areas are public lands that are managed by local municipalities, including the local fire and emergency response services agency. For this reason, it is not expected that emergency access would be an issue. Adoption of the Basin Plan amendment would not result in inadequate emergency access. No impacts would occur.

f) To the extent that potential implementation projects that include minor construction for sediment reduction installations and habitat restoration activities are conducted in locations near pedestrian or bike paths in the canyon and lagoon areas, there exists the potential to temporarily hinder access points or affect trails depending on the proximity to construction equipment. However, projects are not expected to permanently affect or reduce existing or future pedestrian, bicycle, or equestrian facilities. If pedestrian, bicycle, or equestrian safety issues are present, then conditions are placed on the project prior to approval to address those concerns. Also, potential implementation projects will not generate additional, ongoing motor vehicle trips that would increase traffic or congestion nor create design features on road segments/intersections that would create a hazard to pedestrians, bicyclists, or mass transit. In general, adoption of this Basin Plan amendment will not conflict with local plans and policies, including the City of San Diego's Mobility and Recreation Elements (General Plan) and the Pedestrian Master Plan (City of San Diego, 2006) supporting alternative transportation. Any impacts would be less than significant.

[45] SANDAG, Final 2008 Congestion Management Program Update.
[46] Poway Comprehensive Plan: General Plan, Transportation Element.
[47] San Diego County Ordinance No. 10040 (N.S.), An Ordinance Amending Section 81.102 (bb) of the San Diego County Code to Provide a Reference to Amended Public Road Standards, February 24, 2010. http://www.sdcounty.ca.gov/dpw/docs/pbrdstds.pdf

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XVII. UTILITIES AND SERVICE SYSTEMS: Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Discussion:

a) Potential implementation projects resulting from this Basin Plan amendment will not involve any uses that discharge any wastewater to sanitary sewer or on-site wastewater treatment systems. Therefore, there will not be any exceedance of any wastewater treatment requirements and no impacts will occur.

b) The Basin Plan amendment does not require, nor will potential implementation projects resulting from this Basin Plan amendment involve, the construction or expansion of water or wastewater treatment facilities. No impacts would be caused by this project.

c) Basin Plan amendment-related projects will likely include construction of new or expanded storm water drainage facilities that will treat accelerated storm water flows by slowing them and reducing both sediment and associated pollutants in storm water runoff and dry weather flows. Construction of these facilities affecting an area of one acre or more would require a general construction NPDES permit from the State Water Board, and implementation of a storm water pollution prevention plan to control sediment erosion and runoff. These projects will be subject to the review and inspection by the San Diego Water Board, and will require implementation of routine and standard erosion control best management practices and proper construction site management. Overall, any new facilities will improve water quality, reduce erosion, improve hydrology, and/or restore wetland function. The environmental impact from the construction of implementation projects such as these would be less than significant with mitigation incorporated.

d) The Basin Plan amendment does not require, nor will potential implementation projects resulting from this Basin Plan amendment involve, water supply or services from a water district. Construction and maintenance of structural and non-structural BMPs would not rely on water service. Therefore, no impacts would occur.

e) The Basin Plan amendment and any potential implementation projects resulting from the amendment would not increase population or provide employment, and therefore, would not require an ongoing water supply or additional wastewater treatment services. No impacts would occur from this project.

f) Basin Plan amendment implementation may affect municipal solid waste generation or landfill capacities related to ongoing maintenance of BMPs. Such maintenance is likely to result in removal of debris and sediments from culverts, sedimentation basins, etc. The net volume of waste will be relatively small and infrequent; therefore, impacts will be less than significant.

g) The waste generated from BMP maintenance will be subject to federal, state, and local statutes and regulations related to solid waste. Such waste would not be expected to contain pollutants or materials that would violate statutes and regulations related to solid waste. Thus, no impacts would occur.

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

Discussion:

a) As discussed in the checklist, reasonably foreseeable methods of compliance would not substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels~~, or eliminate important examples of the major periods of California history or prehistory~~. The proposed Basin Plan amendment is intended to increase the extent of areas with high biological importance. It is expected that reduced sediment loading from stormwater discharges consistent with the watershed sediment reduction target will encourage the establishment of native vegetation in degraded areas through various mechanisms. BMP implementation actions designed to reduce sedimentation will also likely reduce nuisance freshwater flows into the Lagoon that have historically contributed to observed habitat and beneficial use impacts. Reasonably foreseeable methods of compliance will facilitate recovery of beneficial uses that have been affected by various complex processes, including sedimentation, nuisance flows, reduced tidal circulation, and other factors. An adaptive management approach will be used to determine the most effective course of action to achieve the numeric targets and improve beneficial uses in the Lagoon with the least environmental impact. ~~Considering the above information, no impacts will occur.~~ The reasonably foreseeable methods of compliance may cause some impacts to historical resources, but the impact by individual projects cannot be determined at the program level; a project level CEQA analysis will be performed by a local lead agency. However, regardless of the level of CEQA analysis, it is unlikely that the reasonable foreseeable methods of compliance are unavoidable as to cause elimination of important examples of the major periods of California history or prehistory. First of all, according to CEQA section 15064.5, a historical resource must be eligible as determined by the State Historical Resources Commission, and must be listed in the California Register of Historical Resources.

Secondly, should a specific project identify significant impacts to historical resources, according to CEQA section 15091, no public agency shall approve or carry out the project unless changes or alterations are made to avoid or alleviate the significant effects. The changes or alterations include those that are within the responsibility and jurisdiction of other public agency and not the agency making the finding; that have been adopted by such other agency or can and should be adopted by such other agency. In fact, the following regulations have been adopted by other agencies: the Conservation Element of the San Diego County General Plan, the Historical Preservation Element of the City of San Diego's General Plan, the Historical Structures Chapter of the City of Poway's Municipal Code, and the Historic Preservation Overlay Zone of the City of Del Mar's Municipal Code. The project not only will be reviewed and cleared before being approved by appropriate public agencies, but also will be closely monitored during the whole process, and will require mitigation measures to avoid and reduce such impact. However, despite the above information, as specific mitigation measures cannot be identified as specific projects are not identified, the impacts remain potentially significant.

Therefore, cConsidering the above information, potentially significant impacts may no impacts will occur.

b) This SED concludes that reasonably foreseeable methods of compliance may result in potentially significant impacts to historical, archaeological, and paleontological resources (see explanation above for Cultural Resources). In examining the potential for cumulatively considerable effects, impacts to these historical, archaeological, and paleontological resources together with the effects of other known projects in or near the Los Peñasquitos watershed were considered that also involve minor construction and earthmoving. The contribution of the proposed Basin Plan amendment could be relatively major due to the wide-distribution of reasonably foreseeable methods of compliance throughout the watershed. However, as discussed in the checklist, these impacts could be fully offset if adequately mitigated on the project level by the lead agency. Therefore, the proposed Basin Plan amendment will have a less than significant cumulative effect on historical, archaeological, and paleontological resources. No other resources have the potential to be directly or indirectly impacted by the project.

c) The Basin Plan amendment would not cause any substantial adverse effects to human beings, either directly or indirectly. The Basin Plan amendment is intended to benefit human beings through implementation of actions to improve water quality and enhance habitat in the Lagoon. No impacts would occur.

3.8 Economic Factors

This section presents the San Diego Water Board's economic analysis of the most reasonably foreseeable methods of compliance with the Basin Plan amendment to incorporate the sediment TMDL for the Lagoon.

3.8.1 Legal Requirement for Economic Analysis

Porter-Cologne Section 13241(d) requires staff to consider costs associated with the establishment of water quality objectives. This TMDL does not establish water quality objectives. It is merely a plan for achieving existing water quality objectives. Therefore, cost considerations required in Section 13241 are not required for this TMDL.

The purposes of this cost analysis are to provide the San Diego Water Board with information concerning the potential cost of implementing this TMDL and to address concerns about costs that may be raised by responsible parties. Potential costs are analyzed for the most reasonably foreseeable methods of compliance with this Basin Plan amendment, as discussed in Section 3.6.

Furthermore, the San Diego Water Board must comply with CEQA when amending the Basin Plan.[48] The CEQA process requires the San Diego Water Board to analyze and disclose the potential adverse environmental impacts of a Basin Plan amendment that is being considered for approval. The San Diego Water Board must consider the economic costs of the methods of compliance in this analysis.[49]

3.8.2 TMDL Project Implementation Costs

The cost of implementing this TMDL will range widely, depending on methods that the responsible parties select to meet the Waste Load and Load Allocations. The specific controls to be implemented for sediment reduction will be chosen by the responsible parties after adoption of this Basin Plan amendment. All costs are preliminary estimates only since particular elements of a control, such as type, size, and location, would need to be developed to provide a basis for more accurate cost estimations. Identifying the specific controls that responsible parties will choose to implement is speculative at this time, and the controls presented in this section serve only to demonstrate potential costs. Additional controls for storm water runoff from agriculture, livestock, and horse ranch facilities other than what is already required in existing WDRs for these facilities and in the Basin Plan WDR Waiver Policy is not reasonably foreseeable. Therefore, there will be no additional costs to agricultural and livestock facility owners and operators to comply with these TMDLs.

3.8.3 Cost Estimates of Typical Controls for Urban Runoff Discharges

Approximate costs associated with typical structural BMPs that might be implemented as reasonably foreseeable methods of compliance are provided below. Cost estimates for structural BMPs cited from "*Stormwater Best Management Practice Handbook – New Development and Redevelopment. 2003*" are for new construction costs only (CASQA, 2003). These estimates generally do not take into account retrofit of existing structures or the potential purchase on land needed for the BMP. Cost estimates provided by Caltrans' *BMP Pilot Retrofit Pilot Program* were from BMPs retrofitted on existing state owned land (Caltrans, 2004).

[48] Public Resources Code section 21080
[49] See Public Resources Code section 21159(c)

Treatment Facilities

Vegetated Swales:

Vegetated swales are constructed along drainage ways where storm water runoff is conveyed. Vegetation in swales and strips allows for the filtering of pollutants and infiltration of runoff into groundwater. Densely vegetated swales can be designed to add visual interest to a site or to screen unsightly views. They reduce runoff velocities, which allows sediment and other pollutants to settle out.

The effectiveness of vegetated swales depends on slopes of swales, soil permeability, grass cover density, contact time of storm water runoff and intensity of storm events. Vegetated swales, based on case studies, are capable of managing runoff from small drainage areas with approximate sizes of 10 acres.

Construction of swales begins with site clearing, grubbing, excavation, leveling and tilling, thereafter followed with seeding and vegetation planting. The cost of developing a swale unit is estimated in the range of $7,300 to $20,800 (CASQA, 2003). Routine maintenance activities include keeping up the hydraulic and removal efficiency of the channel, periodic mowing, weed control, watering, reseeding and clearing of debris and blockages for a dense, healthy grass cover.

Little data is available to estimate the difference in cost between various swale designs; however, with considerations of inflation rate to bring the monetary value to current and the vast areas, the unit price of constructing a vegetated swale is assumed to be $8,800 dollars each. Acreage of the Los Peñasquitos watershed requires approximately 2,738 units of vegetated swales to treat the 42.78 square miles of impervious surfaces in the watershed, which results in the overall cost of $24.1 million. Amortized with interest rate of 6 percent annually and into 20 years based on the implementation schedule, and with the average annual maintenance rate of 5 percent, the total annual cost is $2.17 million.

Maintenance costs derive primarily from mowing because all operation and maintenance is related to vegetation management requiring no special training. In addition, it is important to note that the special attention to the presence of gophers is a factor that can make operations and maintenance cumbersome.

Table 3-2. Summary of estimated cost for vegetative swales

Items	**Unit Cost**	**Total Cost**
Construction	$8,800 per unit swale for each 10-acre drainage area	$24.1 million $2.07 million annually if amortized with an interest rate of 6% for 20 years.
Maintenance	5 percent of construction cost annually	$104,000 annually
Total Cost		$2.17 million annually

Extended Detention Basins

Extended detention basins are basins whose outlets have been designed to detain the storm water runoff to allow particles to settle. These facilities differ from wet ponds in the sense that they do not offer a large permanent pool. Extended detention basins also provide flood control due to additional flood detention storage.

The construction costs associated with extended detention basins vary considerably. Using the equation $C=12.4V^{0.760}$, where C is the cost and V is the volume, adjusted to 2011 dollars, a one acre-foot pond costs $50,855, and a 100 acre-foot pond costs $1,687,000 (CASQA, 2003). Designing for the 85th percentile storm (ranges from 0.55 to 0.85 inches; average 0.7 inches; County of San Diego, 2011a), the Los Peñasquitos watershed requires approximately 1,598 one acre-foot ponds or 16 100 acre-foot ponds to treat the 42.78 square miles of impervious surfaces in the watershed, which results in overall cost ranges from $27 million to $81.3 million. The total annual cost ranges from $2.55 million to $7.69 million, amortized with interest rate of 6 percent annually for 20 years (based on the implementation schedule) and using a maximum maintenance rate of 10 percent.

Maintenance costs are between 3 and 10 percent, not including any cost to dispose of the accumulated sediment (CASQA, 2003). Necessary operation and maintenance activities include, but are not limited to, mowing side slopes, managing pesticides and nutrients, mosquito control, repairing undercut or eroded areas, as well as removing litter and debris on an as needed basis. Larger maintenance projects include the removal of accumulated sediment and regrading roughly about every 10-25 years or when sediment volume exceeds 10-20 percent of the basins volume or accumulates to 6 inches. The removal of sediment from the forebay every 3-5 years can slow the overall accumulation of sediments within the basin.

Table 3-3. Summary of estimated cost for extended detention basins

Items	**1 Acre-Foot Basin Cost**	**100 Acre-Foot Basin Cost**
Construction	$50,855 per basin treating for 1 acre-foot of stormwater	$1,687,000 per basin treating for 100 acre-foot of stormwater
Construction Cost	$81.3 million for 1,598 basins $6.99 million if amortized with an interest rate of 6% for 20 years.	$27.0 million for 16 basins $2.32 million annually if amortized with an interest rate of 6% for 20 years.
Maintenance	10 percent of construction cost annually	10 percent of construction cost annually
Maintenance Cost	$699,000 annually	$232,000 annually
Total Cost	$7.69 million annually	$2.55 million annually

<u>Surface Erosion Controls</u>

Straw Fiber Rolls

Straw fiber rolls are tube shaped erosion control devices that are most effective in low shear stress areas. Straw fiber rolls are especially useful in preventing surface erosion as they complement best management practices aimed at source control and vegetation.

Material costs for fiber rolls range from $20 to $30 per 25-foot roll (CASQA, 2003). Labor costs vary, however they should be factored in for the installation, maintenance, and short-term maintenance. The maintenance requirements of fiber rolls are minimal, but short-term inspection is recommended to ensure that the rolls remain firmly anchored in place and are not crushed or damaged by equipment traffic. There is no labor cost associated with removing these devices as they are biodegradable.

Slope Stabilization

Terracing

Terracing is a technique using earthen embankments and/or ridge and channel systems that reduce erosion by slowing, collecting, and redistributing surface runoff to stable outlets. This technique is especially applicable to the San Diego region because terracing is most effective in arid climates with expected water erosion problems.

Costs associated with terrace construction ranges between $1 and $6 per linear foot in addition to varying costs related to the construction of waterways and underground outlets (Natural Resources Conservation Service). Operations and maintenance cost derive from labor costs associated with sediment removal and periodic terrace repair.

Geotextile Covers/Mats

Geotextiles are porous fabrics that protect ground surfaces susceptible to storm water and wind erosion. These devices also increase stability by allowing for more vegetation growth as they hold in place fertilizers, seeds, and top soil. The effectiveness of geotextile covers is dependent upon their material.

The costs of using is geotextiles range between $1 and $17 per square yard, depending on the type used (State Water Board, 1991). Operations and maintenance cost derive from labor associated with regular inspection to determine the existence of cracks, tears, or breaches in the fabric.

Bypass Channels and/or Dissipaters

Storm Drain Repair and Replacement

Repairing and replacing existing storm drain systems will allow the existing controls to properly function, thus minimizing and/or eliminating erosion below storm drain outfalls. Such projects may include replacement of existing pipes and work on existing drainage easements. Repair and replacement projects can be done gradually at a minimal impact to residents in the area. The 7017 Keighley Court Storm Drain Repair Project in the City of San Diego is estimated to cost $277,714 (City of San Diego, 2012a). Similarly the Wenrich Drive Storm Drain Repair Project costs roughly $213,150 (City of San Diego, 2012b).

Stream or Lagoon Habitat Restoration Actions

Lagoon Restoration

Throughout the southern California region rapid development has yielded unprecedented levels of sedimentation compromising the overall health of surrounding streams and lagoons. The restoration of lagoons is important in the San Diego region for protection of the few remaining coastal wetlands to benefit fish, birds, and various wildlife species. In addition to the scenic beauty lagoons provide, continued maintenance protects public health from stagnant water and the accumulation of mosquitos and dead fish.

The overall cost of enhancing the larger, neighboring Batiquitos Lagoon was approximately $57.3 million in 1996 dollars, which adjusted for inflation would cost $82.1 million. This cost included planning, permitting, design, and management/administrative costs, as well as funding of the long-term maintenance program. The major project components included: construction of two low-profile rock jetties at the ocean entrance of the lagoon to maintain a permanent non-navigable tidal opening to the ocean without cutting off the southerly littoral drift, physical reconfiguration of the lagoon through dredging and contouring to create shallow subtidal and intertidal habitats, nourishment of adjacent ocean beaches with clean sands mined from the lagoon as part of the overall dredging and disposal plan, construction of approximately 32 acres of least tern nesting sites, and pilot planting of vegetation that requires tidal flushing and that did not occur in the lagoon including cordgrass (*Spartina foliosa*) and eelgrass (*Zoastera marina*) (Appy, 2012).

The San Dieguito Lagoon restoration project was completed in 2011 at a cost of $90 million (SDRVC, 2012). The project was proposed by Southern California Edison to fulfill permit conditions for the creation or substantial restoration of at least 150 acres of Southern California coastal wetlands as compensatory mitigation for fish losses caused by the San Onofre Nuclear Generating Station. Project elements included: cut and fill, water control structures, stormwater control measures, buffers and transition areas, removal of exotic species, and protection of existing salt marsh plants. The project provided the following habitat benefits: increased acreage of tidal habitats with beneficial impacts on associated species; improved functions and values of existing tidal habitats with beneficial impacts on associated species; enhanced functions and values of seasonal wetlands with beneficial impacts on associated species; restoration of native upland habitats with beneficial impacts on associated species; and creation of nesting sites benefiting California least tern, Western snowy plover, and other waterbirds contributing to the restoration of ecosystem functions and values (Southern California Edison, 2005).

While restoration activities in the Lagoon are not expected to occur at the scale experienced in the neighboring Batiquitos and San Dieguito Lagoons, these case studies provide a reasonable estimation of the maximum cost associated with lagoon restoration. Lagoon restoration in the Lagoon is estimated to cost $90 million. Amortized with interest rate of 6 percent annually and into 20 years based on the implementation schedule, the total annual cost is $7.74 million.

<u>Low Impact Development</u>

Low Impact Development (LID)

LID emphasizes conservation and use of on-site natural features to protect water quality. LID can significantly increase the protection of water quality through the implementation of engineered small-scale hydrologic controls that replicate the pre-development hydrologic regime of watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source. Hazards associated with storm water runoff, such as increased sedimentation and the pollution of water bodies can greatly be decreased through the implementation of LID techniques in both new and redesigned developments. Provided below are a number of various methods to aid in the reduction of hazardous storm water runoff into San Diego's regional water bodies.

Cisterns and rain barrels are LID techniques used to harvest, store, and release rain water from a roof downspout into the soil. This technique is useful in areas covered primarily with impervious surfaces. Rain barrels are used for smaller residential environments and cisterns for large scale commercial and industrial developments. The cost of a rain barrel is approximately $216 for a single residential lot. The cost of a cistern can range from $160 for a 165 gallon polyethylene tank to $10,000 for a 5,000 gallon fiberglass/steel composite tank (LIDC, 2007).

Vegetated roofs are an effective LID technique that provides storm water runoff control, air quality improvement, increased energy efficiency, urban heat island reduction, and improved aesthetics. A vegetated roof system uses foliage and a light weight soil mixture to absorb, filter, and detain rainfall. Installation of a vegetated roof cost between $10-16 per square foot (US EPA, 2000).

Permeable pavement design consists of a porous surface with an underlying stone reservoir to temporarily hold surface water runoff before it enters the subsoil. This increases groundwater infiltration and decreases storm water runoff into surrounding waterbodies. The strength of this LID techniques lies within its ability to balance both increased runoff infiltration and uses such as walking and/or driving. Porous concrete can range from $2 to $6 per square foot and various pavers can range from $1 to $10 per square foot, with grass and gravel pavers making up the lower range and concrete and stone pavers making up the higher range (PATH, 2008). Because of differences in surface texture and the importance for flow path through the surface, maintenance of permeable pavements is critical to their effectiveness. Cleaning by vacuum sweeping and pressure washing is generally recommended several times a year, depending on usage and traffic. With more traffic, the maintenance must increase (PATH, 2008).

Cost Comparison
Table 3-4 summarizes the estimated total costs as results of implementing this TMDL. The overall project costs arising from lagoon restoration activities and pollutant loading reduction in storm water could be in a range of $116.2 million to $185.2 million. With consideration of the maintenance cost to structural BMPs such as vegetated swales and extended detention basins, this overall cost may amortized, at an interest rate of 6 percent, to become as low as $9.91 million per year during implementation of this TMDL.

Table 3-4. Cost Summary for storm water treatment implementation alternatives

Implementation Alternatives	**Lagoon restoration and vegetative swales**	**Lagoon restoration and 1 acre-foot basins**	**Lagoon restoration and 100 acre-foot basins**

Total Project Cost	$116.2 million	$185.2 million	$121.6 million
Amortized Annual Cost	$9.91 million	$15.43 million	$10.29 million

3.9 Reasonable Alternatives to the Proposed Activity

The environmental analysis must include an analysis of reasonable alternatives to the proposed activity.[50] The proposed activity is a Basin Plan amendment to incorporate a sediment TMDL for Los Peñasquitos Lagoon. The purpose of this analysis is to determine if there is an alternative that would feasibly attain the basic objective of the rule or regulation (the proposed activity), but would lessen, avoid, or eliminate any identified impacts. The alternatives are discussed in the subsections below.

3.9.1 Alternative 1 – San Diego Water Board TMDL

This program alternative is based on the TMDL that is presently proposed for San Diego Water Board consideration. The proposed TMDL focuses on the reduction of sediment loads to the natural background loading rate in the Los Peñasquitos Watershed. The WLAs and LAs, as well as compliance schedules, are established through the Basin Plan amendment. The WLAs and the implementation schedule, once incorporated into the Basin Plan, will be considered by NPDES permit writers when developing permit limits that are adopted in separate actions by the San Diego and State Water Boards.

Foreseeable environmental impacts from methods of compliance, as discussed in Section 3.6, are well known and explored throughout the contents of this document. Potential adverse impacts to the environment stem principally from the installation, operation, and maintenance of structural BMPs. This document analyzes these impacts and concludes that installation of implementation projects are relatively short duration and small scale construction and maintenance activities that will result in less than significant environmental impacts. It also concludes that the benefits of the program outweigh any less than significant adverse environmental effects.

3.9.2 Alternative 2 – US EPA TMDL

This program alternative is based on a TMDL that would be established by the US Environmental Protection Agency (US EPA) if the San Diego Water Board fails to adopt a sediment TMDL for the Lagoon, pursuant to the Clean Water Act section 303(d). Because the technical analysis by US EPA will be very similar to the San Diego Water Board analysis, and because the same laws and regulations would apply, it is assumed that the technical portions, WLAs, and LAs of this TMDL program alternative will be essentially the same as program Alternative 1. However, such a TMDL is not implemented through a Basin Plan amendment. Therefore, the WLAs will be implemented through NPDES permit limits without consideration of a compliance schedule. Because NPDES permits are renewed every five years, all responsible parties would be required to be in full compliance immediately following the TMDL adoption by US EPA, or within five years.

[50] 23 CCR section 3777

Absent US EPA completion of an alternative TMDL, it would be speculative to evaluate whether or not reasonable foreseeable actions needed to achieve the alternative TMDL would reduce or increase environmental impacts (as compared to Alternative 1). Nevertheless, it is anticipated that this alternative would achieve compliance through the same foreseeable compliance projects listed in Table 3-1 analyzed for Alternative 1.

3.9.1 No Action Alternative

This program alternative assumes that neither the US EPA nor the San Diego Water Board implements a sediment TMDL for the Lagoon. While responsible parties could implement BMPs on a discretionary basis, this CEQA analysis is based on the assumption that no additional sediment reduction BMPs would be implemented in addition to those that are presently in place. However, Alternative 3 is contrary to federal and state law. While impacts to the environment from construction or maintenance of structural BMPs would be avoided in this alternative, failure to implement a TMDL would not restore beneficial uses in the Lagoon due to sediment impairment. In comparison, either Alternative 1 or 2 will restore beneficial uses and attain water quality standards by reducing sediment loads, thus representing a benefit to the environment, while Alternative 3 will result in a continued sediment impairment of the Lagoon.

3.9.2 Preferred Alternative

This environmental analysis finds that Alternative 1 is the most environmentally advantageous alternative.

Alternative 3 is not feasible because there is a legal requirement under the Clean Water Act to address the section 303(d) impairment listing. This alternative is not assumed to implement BMP projects to reduce sediment loads and restore beneficial uses in the Lagoon in a timely fashion, if at all. While Alternative 3 will avoid potential impacts due to discrete installation project, the waterbody impairment will continue.

Both Program Alternatives 1 and 2 will comply with the law and reduce sediment loads and restore beneficial uses in the Lagoon at a comparatively small environmental cost through completion of the foreseeable compliance projects listed in Table 3-1 of section 3.6. The key difference between these two program alternatives is the establishment of an implementation schedule. While the same LAs and WLAs will need to be met and the same technological choices will be available by both alternatives, Alternative 1 will allow a measured implementation plan, resulting in full compliance in 20 years. Alternative 2, in contrast, will require compliance at the time of TMDL adoption or permit renewal, which in all NPDES permit cases, is at most 5 years. The environmental impacts due to Alternative 2 may be of greater severity as the intensity of implementation actions will be greater to comply with the shorter time frame. The longer schedule of Alternative 1 allows for prioritization and planning, more thoroughly mitigated impacts, more appropriately designed, sited and sized structural devices and, therefore, less environmental impact in general. In addition, prioritization and planning will likely result in more efficient use of funds and lower overall costs.

3.10 Other Environmental Considerations

This section evaluates several other environmental considerations of reasonably foreseeable methods of complying with the Sediment TMDL, specifically:

3.10.1 Cumulative Impacts of the Program Alternatives (as required by CEQA Guidelines section 15130);

3.10.2 Potential Growth-Inducing Effects of the Program Alternatives (as required by CEQA Guidelines section 15126); and

3.10.3 Unavoidable Significant Impacts (as required by CEQA Guidelines section 15126.2).

3.10.1 Cumulative Impacts

Cumulative impacts, defined in Section 15355 of the CEQA Guidelines, refer to two or more individual effects, that when considered together, are considerable or that increase other environmental impacts. Cumulative impact assessment must consider not only the impacts of the proposed TMDL, but also the impacts from other municipal and private past, present, and future projects, which would occur in the watershed.

As discussed in the checklist, this SED concludes that reasonably foreseeable methods of compliance may result in potentially significant impacts to historical, archaeological, and paleontological resources (see explanation above for Cultural Resources). In examining the potential for cumulatively considerable effects, impacts to these historical, archaeological, and paleontological resources together with the effects of other known projects in or near the Los Peñasquitos watershed were considered that also involve minor construction and earthmoving. The following past, present, and future projects were considered:

- I-805 HOV Extension/Carroll Canyon Road Extension
- Carmel Valley Neighborhood 10
- Peñasquitos Glens Unit Number 4 of the Almazon Residences Project
- Los Peñasquitos Lagoon Basin
- Sorrento-Miramar Curve Realignment and Second Main Track Project
- Sorrento Pointe Development
- Sprint Nextel Black Mountain Middle School
- Bridge Replacement Project

None of the above listed projects identified significant impacts on historical, archaeological, or paleontological resources; however, several projects mitigated impacts to less than significant levels. The contribution of the proposed Basin Plan amendment could be relatively major due to the wide-distribution of reasonably foreseeable methods of compliance throughout the watershed. However, as discussed in the checklist, these impacts could be fully offset if adequately mitigated on the project level by the lead agency.

3.10.2 Growth-Inducing Impacts

This section presents the following:

1) An overview of the CEQA Guidelines relevant to evaluating growth inducement,

2) A discussion of the types of growth that can occur in the Los Peñasquitos watershed,

3) A discussion of obstacles to growth in the watershed, and

4) An evaluation of the potential for the TMDL Program Alternatives to induce growth.

<u>CEQA Growth-Inducing Guidelines</u>

Growth-inducing impacts are defined by the State CEQA Guidelines as (CEQA Guidelines, Section 15126.2(d)):

> The ways in which a proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are impacts which would remove obstacles to population growth. Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects... [In addition,] the characteristics of some projects… may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It is not assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

Growth inducement indirectly could result in adverse environmental effects if the induced growth is not consistent with or accommodated by the land use plans and growth management plans and policies. Local land use plans provide for land use development patterns and growth policies that encourage orderly urban development supported by adequate public services, such as water supply, roadway infrastructure, sewer services, and solid waste disposal services.

Public works projects that are developed to address future unplanned needs (i.e., that would not accommodate planned growth) could result in removing obstacles to population growth. Direct growth inducement would result if, for example, a project involved the construction of new wastewater treatment facilities to accommodate populations in excess of those projected by local or regional planning agencies. Indirect growth inducement would result if a project accommodated unplanned growth and indirectly established substantial new permanent employment opportunities (for example, new commercial, industrial, or governmental enterprises) or if a project involved a construction effort with substantial short-term employment opportunities that indirectly would stimulate the need for additional housing and services. Growth inducement also could occur if the project would affect the timing or location of either population or land use growth, or create a surplus in infrastructure capacity.

Types of Growth

The primary types of growth that occur within the Sediment TMDL area are:

1) Development of land, and

2) Population growth (Economic growth, such as the creation of additional job opportunities, also could occur; however, such growth generally would lead to population growth and, therefore, is included indirectly in population growth.)

Growth in Land Development
Growth in land development is the physical development of residential, commercial, and industrial structures in the Sediment TMDL area. Land use growth is subject to general plans, community plans, parcel zoning, and applicable entitlements and is dependent on adequate infrastructure to support development.

Population Growth
Population growth is growth in the number of persons that live and work in the Sediment TMDL area and other jurisdictions within the boundaries of the area. Population growth occurs from natural causes (births minus deaths) and net emigration to or immigration from other geographical areas. Emigration or immigration can occur in response to economic opportunities, life style choices, or for personal reasons.

Although land use growth and population growth are interrelated, land use and population growth could occur independently from each other. This has occurred in the past where the housing growth is minimal, but population within the area continues to increase. Such a situation results in increasing population densities with a corresponding demand for services, despite minimal land use growth.

Overall development in the County of San Diego and Cities of San Diego, Del Mar, and Poway is governed by their General Plans, which are intended to direct land use development in an orderly manner. The General Plan is the framework under which development occurs, and, within this framework, other land use entitlements (such as variances and conditional use permits) can be obtained. Because the General Plan guides land use development and allows for entitlements, it does not represent an obstacle to land use growth. The cities within the Sediment TMDL area also have plans which direct land use development.

Existing Obstacles to Growth

Obstacles to growth could include such things as inadequate infrastructure, such as an inadequate water supply that results in rationing, or inadequate wastewater treatment capacity that results in restrictions in land use development. Policies that discourage either natural population growth or immigration also are considered to be obstacles to growth.

Potential for Compliance with the Proposed TMDL to Induce Growth

Direct Growth Inducement
Because the reasonably foreseeable methods of compliance with the proposed Sediment TMDL focus on structural BMPs, non-structural BMPs and improvements to the storm drain system which are located throughout the urbanized portion of this TMDL area, this TMDL would not result in the construction of new housing and, therefore, would not directly induce growth.

Indirect Growth Inducement
Two areas of potential indirect growth inducement are relevant to a discussion of the proposed TMDL: (1) the potential for compliance with the TMDL to generate economic opportunities that could lead to additional immigration, and (2) the potential for the proposed TMDL to remove an obstacle to land use or population growth.

Installation and/or construction of structural BMPs to comply with the proposed TMDL would occur over a 20-year time period. Installation and maintenance spending for compliance would generate jobs throughout the region and elsewhere where goods and services are purchased or used to install structural BMPs. Based on the above annual construction cost estimates, the alternatives would result in direct jobs and indirect jobs. The creation of jobs in the region is considered a benefit.

Although the construction activities associated with the Sediment TMDL would increase the economic opportunities in the area and region, this construction is not expected to result in or induce substantial or significant population or land use development growth because the majority of the new jobs that would be created by this construction are expected to be filled the existing surplus of unemployed persons in the area and region.

The second area of potential indirect growth inducement is through the removal of obstacles to growth. As discussed above, no obstacles exist to land use or to population growth in the watershed.

3.10.3 Unavoidable Significant Adverse Impacts

Section 15126.2(a)(b) of the CEQA Guidelines requires a discussion of the significant environmental effects and the significant environmental effects which cannot be avoided if the proposed project is implemented. Reasonable foreseeable methods of compliance with the Basin Plan Amendment may have adverse significant impacts to historical, archaeological, and paleontological resources. Proposed projects that would occur as a result of the Basin Plan amendment that would have potentially significant impacts on historical, archaeological, and paleontological resources would be untaken at the discretion of lead agencies under their respective local and state regulatory framework. Project specific impacts and mitigation measures will be evaluated in environmental reviews specific to those projects. While potential significant impacts to historical, archaeological, and paleontological resources may be mitigated through this discretionary environmental review, specific mitigation measures for said projects is not available at the programmatic level, since specific projects are unknown at this time. Therefore, although likely avoidable and mitigate able, potential impacts to historical, archaeological, and paleontological resources are significant and unavoidable.

Section 15126.2(c) of the CEQA Guidelines requires a discussion of potential significant, irreversible environmental changes that could result from a proposed project. Examples of such changes include commitment of future generations to similar uses, irreversible damage that may result from accidents associated with a project, or irretrievable commitments of resources. Resources (materials, labor, and energy) to implement TMDL-related projects do not represent a substantial irreversible commitment.

Furthermore, implementation of the Sediment TMDL is both necessary and beneficial. To the extent that the alternatives, mitigation measures, or both, that are examined in this SED are not deemed feasible by the municipalities and agencies complying with the TMDL, the necessity of implementing the federally required TMDL and removing the significant environmental effects from sediment impairment in the Lagoon (an action required to achieve the express, national policy of the Clean Water Act) remains. In addition, implementation of the TMDL will have substantial benefits to water quality and will enhance beneficial uses. Enhancement of the recreational, estuarine, and areas of biological significance beneficial uses will have positive social and economic effects by improving saltmarsh and non-tidal saltmarsh habitat for both aesthetic enjoyment and biological utility.

3.11 Statement of Overriding Considerations and Findings

The proposed Basin Plan amendment would result in potentially significant impacts to historical, archaeological, and paleontological resources through reasonably anticipated methods of compliance. Although it is likely that potential impacts will be avoided and/or mitigated, specific mitigation measures cannot be identified as specific projects are not identified. Therefore the potentially significant impacts may occur and must be considered, for this programmatic evaluation, significant and unavoidable.

The San Diego Water Board staff has balanced the economic, legal, social, technological, and other benefits of this proposed Sediment TMDL against the unavoidable environmental risks in determining whether to recommend that the San Diego Water Board approves this project. Upon review of the environmental information generated for this project and in view of the entire record supporting the TMDL, staff has determined that the specific economic, legal, social, technological, and other benefits of this proposed Sediment TMDL outweigh the unavoidable adverse environmental effects, and that such adverse environmental effects are acceptable under the circumstances.

The implementation of this Basin Plan amendment will result in improved water quality in the waters of the region and will have significant positive impacts to the environment (including restoration and enhancement of beneficial uses) and the economy over the long term. The implementation of the Basin Plan amendment will restore and protect the Lagoon for use and enjoyment by the people of the state. Enhancement of the recreational, estuarine, and areas of biological significance beneficial uses will have positive social and economic effects by improving saltmarsh and non-tidal saltmarsh habitat for both aesthetic enjoyment and biological utility.

This TMDL is required by law under section 303(d) of the federal Clean Water Act (CWA), and if this San Diego Water Board does not establish this TMDL, the US EPA will be required to develop a TMDL. The CWA requires states to establish a priority ranking for waters on the 303(d) list of impaired waters and to develop and implement TMDLs for these waters.[51] The impacts associated with US EPA's establishment of the TMDL would be significantly more severe, as discussed herein, because US EPA will not provide a compliance schedule and the final waste load allocations, pursuant to federal regulations, would need to be complied with upon incorporation into the relevant stormwater permits.[52] Since compliance would not be authorized over a period of years, all of the impacts associated with complying would be truncated into a short time frame, thus exacerbating the magnitude of the cumulative effect of performing all projects relatively simultaneously throughout the region.

Reasonable foreseeable methods of compliance may have adverse significant impacts to historical, archaeological, and paleontological resources. However, mitigation measures are available for each resource to reduce environmental impacts to less than significant levels. Reasonable foreseeable methods of compliance will be implemented by responsible jurisdictions and would therefore be subject to a separate, project-level environmental review. The lead agencies for the reasonable foreseeable methods of compliance projects have the ability to mitigate project impacts, can and should mitigate project impacts, and are required under CEQA to mitigate any environmental impacts they identify, unless they have reason not to do so. Notably, in almost all circumstances, where unavoidable or immitigable impacts would present unacceptable hardship upon nearby receptors or venues, the local agencies have a variety of alternative implementation measures available instead.

Implementation of the TMDL is both necessary and beneficial. To the extent that the alternatives, mitigation measures, or both, that are examined in this analysis are not deemed feasible by responsible agencies, the necessity of implementing the federally required TMDL and removing the sediment impairment from the Lagoon (an action required to achieve the express, national policy of the Clean Water Act) remains.

[51] 40 CFR 130.7
[52] 40 CFR 122.44(d)(1)(vii)(B).)

To the extent that future projects do not avoid or fully mitigate potential impacts, and the implemental of the Basin Plan amendment and this decision does not fully mitigate the adverse effects of those reasonably foreseeable projects, as discussed in greater detail above, the San Diego Water Board finds that overriding considerations of the greater public interest requires this action. Implementation of the Basin Plan amendment is in the greater public interest. The environmental, economic, and social benefits of implementing the Basin Plan amendment outweigh the potential adverse environmental effects that are not avoided or fully mitigated.

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Attachment 4
Response to Peer Review Comments

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Response to Dr. Rockwell Geyer Comments on
Review of Los Peñasquitos Lagoon Sedimentation/Siltation TMDL

Reviewer information:
Dr. Rockwell Geyer
Woods Hole Oceanographic Institute

Comment submittal date:
April 7, 2011

Comment ID	Comment	Water Board Response
1	This report provides a detailed analysis of the factors contributing to the impairment of Los Peñasquitos Lagoon and a quantitative analysis of the appropriate rate of sediment input that would support a "healthy" ecosystem. The report provides results of field studies as well as two coupled modeling studies, one of the watershed and one of the surface water flow within the Lagoon. The report is well written, and it appears that the underlying modeling and field conform to acceptable professional standards. I do not have any major objections with the methods of the details of the model implementation.	Comment noted.
2	My main objection to the report is that there is very little description (actually none that I could find) about the actual model runs the produced the numbers for the TMDL-i.e. the numbers in Tables ES-1 and ES-2. (Note that these are different runs than the model calibration runs, for which there was adequate detail).	Restoration of the Lagoon is a high priority for the San Diego Water Board. Acknowledging the environmental and political complexities, the uncertainties in sediment sampling, sediment load modeling, and quantification, as well as the time and the financial resources needed to restore a coastal lagoon, and recognizing the urgency to proceed with regulatory actions, the Board will implement a strategy of phased approaches to immediately address sediment impairment in Los Peñasquitos Lagoon and restore its designated beneficial uses. Unfortunately, these data could not be compiled from the model results and provided due to funding limitations. Also see responses to comments 3 and 4, below.

<table>
<tr><th>Comment ID</th><th>Comment</th><th>Water Board Response</th></tr>
<tr><td>3</td><td>A detailed description of the input variables and results for the “Current Load” condition and the “Historic Load” condition. This would include tabular and/or graphical summaries for each case of:

• Precipitation,
• Maximum and “wet season” integrated river discharges (of each subwatershed),
• Mean and maximum sediment concentrations for each subwatershed,
• Sediment loadings from each subwatershed and the ocean boundary for each of the runs,
• Patterns and amounts of sediment deposition in the lagoon following wet weather events for the two cases.

…I expect this information has been generated by the modelers. It should be included in the report. In fact, it really represents the essence of the modeling effort. It is hard to make an informed judgment about the appropriateness of the TMDLs without the information [above].</td><td>Subwatershed estimates were not provided because a policy decision was made to use the total load transported to the lagoon from the watershed to calculated allocations. Regarding the 5th bullet, time-series TSS calibration results for the lagoon are provided in the Lagoon Model Calibration section of the Modeling Report. These data show the lagoon responses during wet and dry weather periods. Sediment load results are typically not provided, except as needed for the TMDL calculations.

Unfortunately, these data could not be compiled from the model results and provided due to funding limitations.</td></tr>
</table>

Comment ID	Comment	Water Board Response
4	Sensitivity studies for the TMDLs so as to arrive at error estimates. These should mainly involve varying the estimated sediment loading relationship for each subwatershed, as this is where most of the error comes from. The biggest source of uncertainty in the TMDL calculation is the estimation of an appropriate sediment loading curve for the Los Peñasquitos Creek, because of the vast discrepancy between the USGS data and the more recent data. Because this is the dominant contributor (from a water volume standpoint) to the receiving waters, the order-of-magnitude uncertainty in this loading translates into an order-of-magnitude uncertainty in the TMDL. There may be other parameters of model quantities that the modelers believe should be varied as well, for example the geometry of the inlet as influenced by the 101 bridge, in order to determine the sensitivity of the results to these uncertainties. …[T]his approach is more appropriate for the "margin of error" requirement than the more informal approach that was described in the report. I believe that the modelers should have reasonable information about the sensitivity of their results to the uncertainties of the inputs. Thus it should not be difficult to produce meaningful ranges of uncertainty of the worst-case and historical cases.	The Margin of Safety accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality (CWA § 303(d)(1)(C), 40 CFR 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. The MOS for this TMDL was changed from implicit to explicit as a result of peer review and US EPA comments. The explicit MOS of 5 percent was applied to account for the difficulty in collecting water samples that accurately compute sediment transport and the lack of available bank erosion and bedload transport data. Key model parameters include the geometry of the ocean inlet (held static for the model runs) and other factors to calibrate the models based on available data. There were some discrepancies and uncertainties in the observed data, as described in the reports. Various sensitivity analyses were run to determine the final model configuration and to calibrate the models. Some of this information is included. For example, streambank erosion sensitivity analyses are discussed on page 46 of the Technical Support Document. Additional information on model sensitivity can be provided at a later date, due to time constraints.

Comment ID	Comment	Water Board Response
5	In the report, they say that considerable historical analyses were performed to determine that the 1970's represent the appropriate level of loading for the TMDL. I think it would be appropriate to include more of the historical analysis in the report. For example, what evidence is there for the quality of the wetlands in the 1970's or before? The reason I bring this up is to raise the possibility that factors other than land use-for example changes in the geometry of the flow within the lagoon due to the railroad and the 101 may have contributed to siltation even before there was major development of the watershed.	The Technical Support Document, Section 3, discusses in great detail historical information. Any information not found here is located in the references. The Background section of the Staff Report was modified to include more of the historical information, including figures that illustrate wetland extent. The comment has a valid point that factors other than land use may have contributed to siltation even before there was major development in the watershed. These other factors, mainly physical factors in the lagoon, do indeed affect water circulation and sedimentation processes, as described in the revised TMDL report. However, this TMDL focuses only on reduction of past, present, and future sediment sources from the watershed. The TMDL has been strengthened to include an adaptive management approach, which will allow responsible parties to address these, and other, factors that contribute to loss of salt marsh in the Lagoon in a holistic manner. The model can be further refined in the future to further examine changes in sediment loading and transport during implementation planning. Also see response to comment 2.

Comment ID	Comment	Water Board Response
6	Another issue that I expected to see addressed in the report is a discussion of the implications of reducing the loading to the TMDL that is established. What do the models say the sediment accumulation would be under those circumstances? What implications might there be to for remediation of the wetland?	A discussion of foreseeable methods to comply with the TMDL is discussed thoroughly in the California Environmental Quality Act (CEQA) Analysis, which was not available to the reviewers for peer review. The TMDL is written such that attainment of the numeric target will result in attainment of the sediment water quality standard for the Lagoon. Regardless of whether sediment load reductions will result in an increasing trend in saltmarsh habitat, the responsible parties have the burden to either rectify historic sediment discharges or demonstrate that they did not cause or contribute to the loss of saltmarsh. The modeled historical condition (which established the TMDL target) estimates the sediment contribution to the lagoon from the watershed and ocean inlet for the critical period. Sediment deposition and erosion events are dynamic, resulting in changing accumulation patterns. These questions can be studied further in the implementation stage of the TMDL using the models and additional field data collection. Also see response to comment 2.

Comment ID	Comment	Water Board Response
7	My overall reaction to this report is that the estimation of the TMDL is not limited by the models or their implementation but rather by inadequate data. The nature of the variability of precipitation in Southern California leads to an extremely difficult sampling problem with respect to watershed processes. Significant sediment transport only occurs during El Niño years, so it takes decades to obtain statistically significant data. Yet land uses and watershed management practices change on timescales comparable to the return interval of the major wet-weather periods, making it even more difficult to develop robust statistics about the sediment transport rates in the system. The vast differences between the USGS data and the subsequent estimates of sediment concentrations are probably not methodological-the indicate the system is highly non-stationary. I have two suggestions in the face of the uncertainty associated with the limited data base.	Comment noted.

Comment ID	Comment	Water Board Response
8	One is to use information about other watersheds in the southern California area that may have more extensive data sets to inform the determination of an appropriate TMDL. For instance, what are typical wet-weather suspended sediment concentrations in other similar watersheds with varying amounts of developed land? Obviously the lithology, soil types, relief and land use all factor in, watershed models can help normalize for these factors influencing sediment yield. My point is that more data are needed, and data from other watersheds are likely to help guide the determination of appropriate TMDLs.	Page 23 of the TMDL report states "Due to the unique characteristics of the Lagoon, it was determined that a historical analysis of the Lagoon and its watershed would provide the best information available for determining the conditions that support water quality standards". An effort was made to locate an appropriate reference lagoon, including discussions with local experts and the academic community. Lagoon environments throughout southern California (and throughout the state) have experienced significant degradation overtime, therefore, it was determined that modeling of the historical condition would provide the best measure of the sediment load reduction that would be needed for the TMDL. Also see response to comment id number 9, below.
9	My second suggestion in light of the uncertainty of the present sediment loading regime is to pursue an adaptive management approach, in which an effective monitoring system is put in place to obtain detailed sediment loading data while monitoring the response of the receiving waters. The TMDL that comes out of this study should be viewed as provisional, and it should be revised as the data allows a more accurate assessment of the actual loading rate and its impact on the receiving waters. Such a strategy does not preclude the pursuit of remediation efforts within the watershed and the receiving waters, but such efforts should be pursued with deliberation and cognizance of the uncertainty of the estimates of loading and it impact on the impairment of the receiving waters.	Changes have been made to the Staff Report and Basin Plan Amendment to further clarify the adaptive management approach that will be taken for this TMDL. The Implementation Plan section of the Staff Report will further elaborate on this approach. Also see response to comment 2.

Response to Dr. Kirk Barrett's Comments on Review of Los Peñasquitos Lagoon Sedimentation/Siltation TMDL

Reviewer information:
Dr. Kirk R. Barrett, PE, PWS
Director, Passaic River Institute
Montclair State University

Comment submittal date:
April 5, 2011

Comments to address Identified Scientific Issues

Comment ID	Comment	Water Board Response
Sediment Loading Calculation		
1.	The LSPC model is a scientifically tenable model for modeling watershed hydrology and sediment transport, although it might be computational overkill and excessive parameterization (ie, a simpler model might give results that are just as useful).	Comment noted.
2.	LSPC does not include specific provisions for modeling construction sites. Construction sites are known to have the potential to generate intense loadings of sediment – although these loadings are controlled (to varying degrees) by BMPs. Given the rapid development in this watershed, construction sites may be a large source of sediment, whose load would be underestimated by this modeling approach. This issue should be investigated.	The models were calibrated based on observed data; therefore, all sources are implicitly represented in the simulated results. Furthermore, the model can be updated in the future, as needed, to explicitly represent particular sources depending on available data. Based on the San Diego Association of Governments 2000 land use coverage, approximately 171 acres, or 0.3 percent, of the total land use area is identified as construction/transitional. While construction only accounts for a small percentage of land use in the watershed, it is correct that construction sites are known to generate large sediment loads. Construction sites are dual regulated under both local ordinances and statewide general permits, which requires these sites to develop and implement storm water pollution prevention plans.
3.	The mid-70s load is calculated using extremely wet (1993) conditions, but this seems inappropriate since the mid-1970s load did not occur under such	The purpose of the reference period (mid-1970s) is to estimate the loading for the critical period based on landuse conditions in the watershed that preceded recent development and other activities that have led to increased

Comment ID	Comment	Water Board Response
	extremely wet conditions (based on the flow rates presented in Att. 1 Figure 17). Using an extremely wet year to model 1970s load may well greatly overestimate the actual 1970 loads.	sedimentation in the lagoon. For TMDL development, the same weather conditions (the critical wet period in this case) were modeled to determine the relative difference in sediment loading between the current and historical condition. The difference in sediment load represents the % reduction required to achieve the TMDL target (historical condition). This is the usual approach for reference condition based TMDLs. Over estimation of loads is weighted when determining compliance with the TMDL.
4.	It seems inappropriate to use a very wet year as the basis to compute loads because sedimentation is a cumulative phenomenon that occurs over several to many years – which will not be represented by an extremely wet year. I believe it would be better to model using a range of rainfall amounts, then weight the results based on the frequency of occurrence of those amounts	TMDLs are calculated under critical conditions. The critical condition can be thought of as the “worst case” scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Sediment is primarily contributed during storm events, which is why the 1993 El Nino water year was selected as the critical time period for TMDL development. The goal of the TMDL is to reduce the majority of the sediment loading to the Lagoon which occurs during storm periods. It wouldn’t be reasonable to require sediment loading from storm periods to be equal or less than the total sediment load that’s contributed during dry periods. The assumption is that if the watershed loading to the Lagoon under critical conditions is reduced to be equal to the historical condition then WQOs for sediment should be achieved. Because sediment loading is greatest during large storm events, loads are calculated under the wettest conditions, appropriately identified as the critical period (1993 conditions).
5.	Document says "Existing loads were estimated based on modeling of current land use conditions (from the SANDAG 2000 land use	The SANDAG 2000 land use coverage was the most recent landuse dataset that covers the entire watershed and is consistent with other TMDLs in the region. The model can be

Comment ID	Comment	Water Board Response
	coverage)", so the "current" land use is actually from 2000, now more than 10 years past. Figure 12 in Att. 1 (p 29) indicates a ~20% growth in population from 2000 to 2010. It seems inappropriate to use 10 year-old land use to calculate current loading.	updated in the future if needed to more accurately simulate current sediment loading.
6.	It is quite difficult to collect water samples to accurately compute sediment transport. A typical method of collecting a single grab sample is likely to be insufficient to characterize lateral and vertical variability in suspended solids concentrations. Details are needed regarding sample collection procedures and analysis and any QA/QC procedures to verify that representative samples were collected.	This comment has valid point, and we recognize the uncertainties and limitations in sampling suspended sediment concentrations. Sample collection procedures are detailed in Los Peñasquitos TMDL monitoring study (City of San Diego, 2009).
7.	The report indicates that streambank erosion is significant in Carroll Canyon Creek (CCC) and Carmel Creek (CC), but not in Los Peñasquitos Creek (LPC). This doesn't seem tenable since I expect that the geomorphic conditions are similar in each canyon. What physical explanation supports the differences in streambank erosion?	Carroll Canyon Creek is primarily responsible for the amount of sediment loading into the Lagoon due to various factors such as land cover/land use, slopes, development intrusion into riparian areas, hydrology, etc. This is supported by long-term observations of sediment loading by California State Parks, the Los Peñasquitos Lagoon Foundation, City of San Diego stormwater personnel, and other accounts. In addition, it should be noted that LPC runs through the Los Peñasquitos Canyon Preserve whereas urbanization occurs directly on the banks of CCC and CC. .
8.	Model parameters for streambank deposition and scour critical shear stresses varied by reach, as indicated in Appendix B. This doesn't seem tenable since I doubt the geologic material change significantly. What is the physical explanation that supports varying these parameters?	There are various differences in stream and watershed characteristics among different areas. Differences can be found in land cover/land use, slopes, development intrusion into riparian areas, hydrology, etc. Streambank erosion rates were based on available monitoring data and differences in modeled land loads. Additional monitoring data are currently being collected by the City of San Diego to further quantify streambank erosion characteristics in different areas for further calibration of the model.
9.	Figure 38 and 39 show poor	These discrepancies are addressed in the

Comment ID	Comment	Water Board Response
	agreement between measured and modeled flow rates for all 3 storms at all 3 sites, with the model greatly exceeding (often >50%) measured in all cases. Especially for the Carroll Canyon Creek and Carmel Creek subbasins, I can find little basis for trusting the model results are acceptably accurate.	Modeling Report (Attachment 2). The following statement is included on Page 46 of Attachment 2: *Note that flow calibration discrepancies shown in Figures 37 through 39 are likely due to possible problems with the flow rating tables and resulting streamflow estimates for these stations, as discussed in the previous section.* The previous section referenced above can be found on and Page 41 of Attachment 2: *Flows typically increase further downstream barring withdrawals and/or infiltration; however, storm volumes during the monitoring period at the downstream station were significantly lower than reported at the upstream USGS gaging station. This may indicate that the flow rating table for the downstream station may not characterize higher flows well, especially since the model calibrated well to the upstream USGS gaging station. As a result, significant adjustments were not made to the model in order to match the measured flows at the MLS.* Best available data were used, and the model was calibrated considering the limitations in the observed data.
10.	The text states "The average difference between modeled and measured EMCs for CC, LPC, and CCC was 83%, 51%, and 65%, respectively." These differences seem significantly large when compared with the percent reduction in sediment load required by the TMDL (67%).	Table 15 is comparing the fractionation of the sediment into sand/silt/clay between observed and modeled values. The 83%, 51%, and 65% refers to the EMC which is a comparison of the flow weighted average concentrations. <u>Generally applicable response</u> This comment has a valid point, and we recognize the uncertainties and limitations in developing the sediment TMDL. We will take into account this and other applicable comments in future improvement of the TMDL, consistent with the following overall strategy: Restoration of the Lagoon is a high priority for the San Diego Water Board. Acknowledging the environmental and political complexities, the uncertainties in sediment sampling, sediment load modeling, and quantification, as well as the time and the financial resources needed to restore a coastal lagoon, and recognizing the

Comment ID	Comment	Water Board Response
		urgency to proceed with regulatory actions, the Board will implement a strategy of phased approaches to immediately address sediment impairment in Los Peñasquitos Lagoon and restore its designated beneficial uses. The Implementation Section of the report has been revised, a Lagoon numeric target has been incorporated, and an explicit margin of safety has been calculated to provide additional assurances of water quality standard attainment.
11.	Note that goal of the simulation is not simulate only TSS concentrations but also TSS loads, which is the product of flow and concentration. Modeled and measured loads should be compared.	The models were used to estimate total sediment loading to the lagoon and the complex/varying nature of sediment processes within the lagoon. Available TSS data were used to help calibrate the LSPC model, but the total sediment load output was used for TMDL development. Bedload movement is generally not captured in the TSS results, therefore, differences between observed and modeled data are expected. Sediment loads were not measured in the field; therefore, the model results can only be compared to observed concentration data. This information can be obtained in the future and would help with implementation efforts. The models and TMDL were developed based on best available information.
12.	The document says "Sediment transported via diffusive bed load processes also has the potential to be a significant source of sediment loadings; however, this source was neither characterized in the LSPC modeling or would be with traditional TSS sampling" and "bed flow has the potential to be the dominate sediment transport pathway and could add significant sediment to the lagoon." It seems, therefore, unlikely that the TMDL can be accurately calculated without accounting for bed load.	The Technical Support Document (Attachment 1) includes a description of the LSPC modeling framework and cites references for additional information (Pages 24 & 25). This section states that scouring of the stream bottom and transport processes are included in the model algorithms. This captures the movement of bed material that is deposited and available for scouring and transport downstream, depending on stream velocities and other processes. Bed load contributions were considered in the LSPC watershed model. The model can be updated in the future to include sediment transport data collected as part of TMDL compliance monitoring.
13.	Regarding simulation of oceanic	The San Diego Water Board agrees with this

Comment ID	Comment	Water Board Response
	loading to the lagoon, the fact that the model cannot simulate the changing cross section at mouth of the lagoon seems like a serious limitation. The widening and narrowing of the mouth has major affect on tidal flushing and sediment dynamics in the lagoon.	comment that the lagoon mouth cross-section is constantly changing, but the ERDC model only represents a fixed rectangular cross-section configuration. Furthermore, the ERDC model cannot model beach erosion processes with the existing model configuration which lacks wave, wave-breaking, and wave-current interaction components. While the mouth's impact on Lagoon processes is important, the focus of this TMDL is to reduce discharges of sediment from the watershed to Lagoon. Also see response to comment 10 on San Diego Water Board's overall strategy.
14.	The omission of bed load modeling in the lagoon also seems like a serious limitation; bed load is likely a significant component of sediment transport.	See response to comment 12.
15.	Figures 46-71 show large disagreement between modeled and observed TSS concentrations and those of specific size-classes at the mouth and, even more so, at the lagoon segment. It appears to me that the lagoon modeling results are not really tenable for use in computing the required sediment reduction.	See responses to comments 10, 11, and 13.
16.	I would like to see an explicit explanation of how and why the modeled net sediment loading from the ocean showed a 39% decrease from the historical/target condition (9,780 tons) in the 1970s to 5,944 tons currently. How is this explained?	This explanation is contained in section 9.3 of the Technical Support Document (Attachment 1), which states: *The Lagoon model shows that a reduction in watershed sediment loading affects the amount of sediment that can deposit throughout the lagoon from oceanic inputs (considering a constant input of sediment from the ocean boundary under current and historical conditions). The model analysis for historical conditions indicates that a greater proportion of sediment that deposits in the Lagoon originates from tidal inputs during lower watershed loading periods, therefore, the TMDL results show that a net [de]crease (original typo) in oceanic loads occurs during the critical wet period under*

Comment ID	Comment	Water Board Response
		historical landuse conditions…Tidal input from the ocean boundary represents natural background loads, therefore, no reduction is required for this source category.
17.	In any case, it is not clear to me how the oceanic input is incorporated into the TMDL. I assume that calculation of the historical/target and current oceanic input had no effect on calculation of the historical/target and current watershed loadings or the resulting required reduction. In that case, I'm not sure why lagoon modeling was necessary or even useful. It seems to me that one only need compute the sediment load off the watershed to determine the TMDL. Is this correct?	It is correct that the oceanic load will not be considered for reduction, because it is a nonpoint background source, and the San Diego Water Board's authority lies in regulating point sources only. However, TMDL development requires the analysis of all potential sources (point and nonpoint), including the oceanic inputs. A Lagoon modeling was therefore necessary to develop a load allocation for the oceanic inputs.
18.	The approach of setting the target condition as a historical loading that produced no impairment in the lagoon seems tenable. Besides, the alternative approach of determining an allowable sedimentation rate in the lagoon and back-calculating the sediment load apparently isn't feasible (based on the large disagreements between measured and modeled results found in this study) given the serious modeling challenges.	Comment noted.
19.	Regarding irrigation, I don't think it matters much whether it is modeled accurately because the "critical period" which was modeled was based on climatic conditions from 10/1/92 – 4/30/93, which was 1) in the fall and winter when irrigation needs are small and 2) a very wet period which further reduces irrigation.	Comment noted.
20.	Regarding soil characteristics, using the Soil Survey Geographic Database seems a tenable choice. I don't understand the decision to modify the particle size distribution, but I don't think it has much of an	Comment noted.

Comment ID	Comment	Water Board Response
	effect on the TMDL since it was done for both the current and historical/target runs.	
21.	I have commented on bank erosion and bed load in #1 above.	See response to comment ids 7, 8, and 12.
22.	I don't think some of the assumptions are really conservative since they were applied to both the current and target conditions -- the "conservativeness" cancels out.	The San Diego Water Board agrees. The implicit margin of safety was replaced with an explicit margin of safety.
23.	As mentioned under #1, the choice of a very wet year is not conservative regarding historical conditions.	See responses to comments 3 and 4.
24.	I think the main problem with the implicit MOS is that I don't know how you can assess the magnitude of the MOS. That is a policy issue, though, not a scientific issue.	It is true that one cannot easily assess the magnitude of implicit Margin of Safety (MOS). The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between effluent limitations and water quality (CWA § 303(d)(1)(C), 40 CFR 130.7(c)(1)). EPA guidance explains that the MOS may be implicit through conservative assumptions in the analysis that must be described.
25.	No comments	Comment noted.
26.	The scientists and engineers that worked on this project did about as good as they could within the constraints they were working. Nonetheless, in my opinion, there are aspects of the study whose scientific soundness is not adequately defended, particularly regarding bank erosion and bed load transport. This opinion, coupled with the significant disagreement between modeled and measured values that reveals uncertainty on a scale similar to the required reduction in sediment load, leads me to the opinion that I believe it is not scientifically sound to confidently conclude that the required reduction is either necessary or sufficient to correct the impairments in the Lagoon.	Please see response to comment 10. This adaptive management approach will allow the pursuit of remediation efforts within the watershed and the receiving waters to proceed with an understanding of the uncertainty of the loading estimates and Lagoon impacts.

Additional Detailed Comments

Comment ID	Page	Comment	Water Board Response
Draft Staff Report			
27.	6	Problem statement is needs more support-it does not contain any real data about the cumulative amount or rates of sedimentation across the marsh, nor about the effects of sedimentation. Perhaps this data is contained in the referenced documents by California State Parks. If so, it should be at least summarized here. I expected to see actual data on sediment accumulation in the marsh via LIDAR, ground survey data, surface elevation tables, horizon markers and/or sediment traps. The modeling report references a 2008 bathymetric survey -- is that really all there is? The modeling report also references "the 2006 Los Peñasquitos Lagoon Foundation monitoring report" which "includes monitored elevation profiles in the lagoon" (Hany et al, 2007). Why are the results not presented here? Are there more of these reports? I also expected to see maps of the hydroperiod of the marsh (eg, average hours of flooding per day) and how it has changed over the years due to sedimention. Is it not possible to construct such maps? Moreover, there should be some real data about the effects of the vegetation, eg. ground-level surveys showing change from wetland vegetation to upland vegetation.	Lines of evidence of sediment impairment for Los Peñasquitos Lagoon are contained in the California's 303(d) Listing (the 303(d)/305(b) Integrated Report). The purpose of this study is to identify the overall sediment load reduction that is needed to help meet the lagoon's beneficial uses. The problem statement serves to further define the Lagoon impairment Lagoon, while the TMDL Staff Report is reserved to present the requested information. Please also see response to comment 10. Due to funding constraints, maps of the hydroperiod of the marsh were not incorporated into the reports.
28.	10	This section needs a close-up figure of the hydrography of the lagoon (include berms, culverts and trestles). I can't tell from the existing figures where/how water enters and	Comment noted. Additional photos and descriptions were added to the Staff Report.

Comment ID	Page	Comment	Water Board Response
		moves through the marsh.	
29.	23	Document says "Note that the Highway 101 bridge abutments were recently replaced and have resulted in improved tidal exchange through the area." Increasing tidal flow could induce profound positive changes on the lagoon. Changes, if any, which have been observed in sedimentation rates and/or vegetation since the Highway 101 bridge was replaced in 2005 should be discussed. This could have large implications regarding the amount of reduction in sediment load that is required.	Modeling of current and historic conditions utilized the existing mouth (ocean inlet) geometry. Cross-section data were collected after replacement of the Highway 101 abutments, therefore, the model represents current conditions with respect to the bridge abutments. Examination of the effects of the previous abutments (as affects the ocean inlet geometry) was not required for TMDL development.
30.	23	Document says "This historic land use distribution (Figure 3) was used to calculate the numeric target …" but Figure 3 is actually the 2000 land use, not the 1970s land use (although the 1970s land use is depicted in a figure in Attachment 1).	The reference has been corrected.
31.	23	A USGS quad map is not a very good tool for determining land use, particularly in distinguishing agriculture from "open" land. How was this distinguished? Particularly, was ranching an important land use in the 1970s? Ranching could have an elevated sediment load relative to open land.	An extensive effort was made to locate the best available data to develop a spatial landuse coverage for the historical condition in the watershed. USGS topomaps provided the best information available. The SANDAG 2000 landuse coverage does not break out lands used for ranching versus traditional open space lands, assuming these areas were grouped under that category. Future updates to the model can include a more detailed landuse representation to estimate the loads from these areas.
32.	33	The mid-70s load is calculated using extremely wet (1993) conditions, but this seems inappropriate since the mid-1970s load did not occur under such extremely wet conditions (based on the flow rates presented in Att. 1 Figure 17). Using an extremely wet year to model 1970s	See response to comment 3.

Comment ID	Page	Comment	Water Board Response
		load may well greatly overestimate the actual 1970 loads.	
33.	33	It seems in appropriate to use a very wet year as the basis to compute loads because sedimentation is a cumulative phenomenon that occurs over several to many years – which will not be represented by an extremely wet year. I believe it would be better to model using a range of rainfall amounts, then weight the results based on the frequency of occurrence of those amounts	See response to comment 4.
34.	35	Document says "Existing loads were estimated based on modeling of current land use conditions (from the SANDAG 2000 land use coverage)", so the "current" land use is actually from 2000, now more than 10 years past. Figure 12 in Att. 1 (p 29) indicates a ~20% growth in population from 2000 to 2010. Justify why it is appropriate to use 10 year-old land use to calculate current loading.	See response to comment 5.
35.	1	This needs to be labeled as "Attachment 1: Technical Support Document"	Reference corrected.
36.	32-33	Figures 13 and 14 indicate an *expansion* of wetlands in the lagoon from 2000 to 2009, including near the outlets of Carmel Creek (CC) and LPC – the very place sedimentation should be more severe. Perhaps this is an artifact of the mapping/classification techniques; if so, this should be explained. If it is not such an artifact, it calls in to question the presumption that the sedimentation is impairing wetlands in the lagoon. This issue should be discussed. (The figures do show a change from salt marsh to fresh marsh, but it should be explained why this	The wetland surveys depicted in these maps show a coarse representation of wetland areas and types in the lagoon. Also, the report mentions that different survey techniques were used in different years and studies. The purpose of the maps is to show the expansion of freshwater and riparian wetlands in recent years. Sections 4.1.5 and 3.4 state that California State Parks has indicated the sediment is a cause of the impairment and habitat conversion.

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		change can be attributed to sedimentation.)	
37.	35	The document states a "four percent increase in runoff since 1972"; I think that is a mistake – the increase should be much greater than 4%.	The reference has been corrected to state a "four percent increase in runoff per year since 1972."
38.	40	Document says "Event mean concentrations (EMCs) from storm water and dry weather runoff were collected at the MLS on Los Peñasquitos Creek (LPC) ***near*** the confluence with Carroll Canyon Creek (CCC)." Use of "near" is confusing – is it upstream or downstream of the confluence? It makes a big difference.	The statement has been corrected to clarify that the MLS is located "immediately upstream of the confluence with Carroll Canyon Creek."
39.	41	Document says "… presence of the El Cuervo Norte wetland diverting flows from Los Peñasquitos Creek". This is the first time this diversion has been mentioned. It needs more explanation.	A description of the El Cuervo Norte wetland has been included in section 3, Los Peñasquitos Watershed Description, as follows: *The 27-acre El Cuervo Norte wetlands restoration project is located in the Peñasquitos Canyon Preserve and will provide over 24 acres of southern willow scrub, oak-sycamore woodland and freshwater marsh habitat. The project consists of approximately 9 acres of wetland creation, 14.3 acres of wetlands enhancement, 2 acres of upland native buffer, and 1.3 acres of park access road and a San Diego Gas & Electric power pole maintenance area.*
40.	41	I think Sec 5 Data Inventory and Analysis, even as a summary, needs to be expanded to include more details on how much data was collected and when**. It should also address data collected at the ocean inlet and in the lagoon itself.**	Comment noted. This information can be located in the modeling report and references provided.
41.	8	I don't understand how the Surface Soil Runoff Fractionation was calculated. Please explain more clearly.	The calculation of these values is explained on Pages 6&7: "To account for these differences, soils transported by surface runoff were assumed to be composed of 5 percent sand, twice as

Comment ID	Page	Comment	Water Board Response
			much clay as the percentage of clay within each hydrologic soil group, and the remainder assigned to the silt fraction (Table 2)”
42.	11	If you were using area-velocity meters, I don't understand why you have to use Manning's equation to calculate flow rate. The area-velocity meter measures average velocity over the entire water column, so it need only be multiplied by cross sectional area (derived from water depth and the stage-area relationship) to compute flow rate.	The Technical Support Document (Attachment 1) includes a description of the LSPC modeling framework and cites references for additional information (Pages 24 & 25). Model development requires Manning’s equation inputs.
43.	15	It is quite difficult to collect water samples to accurately compute sediment transport. (see "Improved protocol for Classification and analysis of Stormwater-borne solids" By Larry A. Roesner et al, Colorado State University, 2007). A typical method of collecting a single grab sample is likely to be insufficient to characterize lateral and vertical variability in suspended solids concentrations. Details are needed regarding sample collection procedures and analysis and any QA/QC procedures to verify that representative samples were collected.	See response to comment 6.
44.	15	CC is missing from the list of stations monitored. 12/7/07 is missing from the list of storms monitored.	Stations TWAS-1 and TWAS-2 were only monitored on 11/30/07 and 2/3/08. This is correct in the text and Table 6.
45.	15 and 16	The text on page 15 says Figure 14 presents the "relationship between rainfall and flow", but Figure 14 is labeled with TSS -- not flow. Which is correct? I don't believe a TSS vs. rain plot is meaningful. A plot of TSS vs. flow would be more useful.	Text will be corrected to state: rainfall and TSS.
46.	15-21	In Tables 5-9, include MLS or TWAS- in the station identifier for clarification.	The stations are identified correctly in the text.
47.	17	Flow rate should be added to Table	Comment noted; however, due to

Comment ID	Page	Comment	Water Board Response
		6. Rain column should indicate rain over what period relative to when the TSS measurement was made, and should specify the location of the rainfall measurement.	funding constraints, no changes were made at this time.
48.	19-21	Show TSS pollutographs in graphical form, with the flow hydrograph superimposed on the same graph (ie, one axis for flow, another axis for TSS). This will aid in understanding the relationship between flow and TSS.	Comment noted; however, due to funding constraints, no changes were made at this time.
49.	21 and 22	The USGS often collects "suspended sediment concentration" data rather than "total suspended solids" data. Although identical in concept, they are analyzed differently. The USGS has reported that the two results are often not identical nor comparable ("Collection and Use of Total Suspended Solids Data" by John R. Gray and G. Doug Glysson). Please verify that the USGS data is really TSS and, if it is instead SSC, discuss if it is acceptable to compare with TSS data.	The USGS data are suspended sediment concentrations (SSC). It is not readily known if the pollutograph samples collected were TSS or SSC. Updates to the text will be made based on available information, but may require further investigation in the future to verify the reported parameter.
50.	21	The fact that " TSS concentrations recorded at the MLS on LPC since 2001 were more than five times lower than the data collected by the USGS at both stations" in 1982 to 1986 (including the station that is very near the MLS) seems to contradict the assertion that sediment loadings have increased over time. What explains this contradiction?	Several factors may be attributing to this observation including differing station locations and/or sampling time relative to storms. Due to the difficulties in quantifying sediment loads based off TSS data, these data should not be used solely to compare sediment loadings over time.
51.	22	I don't understand why TWAS-1 and TWAS-2 are included on this graph since I thought they were synonymous with MLS/LPC and CCC respectively.	TWAS-1 and TWAS-2 are different than the MLS and pollutograph stations. Refer to Figures 6 & 7.
52.	22	The EMCs measured by the different methods differ significantly. Which value one uses has large implications on calculation of sediment transport. Is one method	Different methods may have been used in different time periods and at different stations. Best available data from different stations and time periods were used to help develop

Comment ID	Page	Comment	Water Board Response
		considered more reliable than the other and why?	and calibrate the LSPC model. It is not readily known if one method is considered more reliable than another.
53.	23	Present the data in Figures 16 and 17 in a table listing percent (by mass) clay, sand and silt	Comment noted; however, due to funding constraints, no changes were made at this time.
54.	26	Text says "Detailed cross section information did not exist for the watershed, therefore, mean stream depth and channel width were estimated using regression curves that relate upstream drainage area to stream dimensions available in the LSPC model setup spreadsheet …"." Drainage area-to-stream dimensions relationships can vary significant from one region to another. Are these relationships specific to this region? If not, how do you know they are applicable to this region?	The LSPC model was developed based on available data to represent the stream channel cross-sections. These data are not specific to southern California. The LSPC model has been successfully applied in multiple watersheds throughout southern California using these assumptions.
55.	26	Text says "Manning's n values ranging from 0.03 to 0.2 reflected very different stream types, including streams with concrete channels to heavily vegetated channels." How was the amount of vegetation in the channels determined?	Amounts of vegetation within channels were determined through visual observations and discussions with monitoring staff.
56.	27	Regarding irrigation, I don't understand how this procedure is appropriate to estimate the amount of irrigation water actually applied. It computes the irrigation demand, but where is the evidence that the amount of irrigation water applied is closely correlated with demand? If these areas are on public water supplies, it may be more accurate to compute irrigation from water use records. With that being said, I expect that very little irrigation takes place in the winter months (when the flows and sediment transport are high) and so it probably doesn't matter. Moreover, the "critical	Representation of the entire hydrologic cycle and water balance components was important for model development, even though the critical period was used to define the TMDL. Water use correlates with irrigation demand. Assumptions used are described on Page 27. Irrigation was assumed to occur year-round.

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		period" which was modeled to compute current and target loads ran from 10/1/92 – 4/30/93, which was 1) in the fall and winter when irrigation needs are minimal and 2) a very wet period which further reduces irrigation. So, please discuss irrigation rates in winter.	
57.	28	I am unsure about the applicability of watershed delivery ratios present in a 1975 textbook on sedimentation engineering (Vannoni, 1975). What other estimates of delivery ratios are there? Why have you chosen to used those published by Vannoni? How do you know they are valid in this watershed and climate?	These literature values were used to set the initial parameter values in the model. However, model calibration was used to make necessary adjustments to initial values.
58.	28	How do you know that "Two catchments in the upper watershed (1408 and 1409) had increased rainfall due to higher elevation which was greater than observed at the Alert gage"? I thought there was no gage in those watersheds.	Available rainfall data was scaled based on elevation to account for the difference in the upper watershed. These regional differences were recognized to increase modeling accuracy. Scaling is discussed on Page 28.
59.	34	Regarding oceanic input of sediment, the report says "The concentrations of sand, silt, and clay fractions were set to constant values initially and then adjusted during calibration." When I read this, I took it to mean that there was no independent estimate of oceanic concentrations. But later I saw that Figures 46-58 present observed TSS values at the ocean inlet (although the "Data inventory" section of the report has no discussion about how these data were collected). Why weren't these values used as boundary conditions? Without such a boundary condition, model calibration becomes an exercise of adjusting the input concentrations to match the model results -- without regard to whether the input concentrations match reality.	No data were available on the particle size distribution of oceanic sand input. These initial values were adjusted during calibration based on TSS data collected at the ocean inlet. The TSS data presented in Figures 46-58 were collected at the ocean inlet (lagoon mouth), which is governed by ocean input, watershed input, and local sediment deposition and resuspension. This is different than the oceanic input, which is represented as the ocean open boundary (open ocean far away from the beach). Data were not available to characterize this input.

Comment ID	Page	Comment	Water Board Response
60.	40	Why are there missing numbers in the "observed flow" column? Why were the time periods 1995-1999 and 2000-2004 for selected for comparison? (I expected the calibration and validation periods to be compared.)	The report was updated with the missing numbers. Regarding the calibration and validation time periods, the modeling period was divided into two timeframes for calibration/validation. Modeled and observed values are compared within each time period.
61.	39 - 40	Figures 29 and 30 are a good way to compare observed and model results and model results look good, tracking observed cumulative volume. The results in Table 14 look good where it counts – ie, in the 10% highest flows and in the winter flow.	Comment noted.
62.	42-44	I don't understand Figs 33-35. I see only one line on each graph, which I assume corresponding to the same colored line in the legend. There is also black line in each legend, but there are no black lines on the graphs. I'm guessing you plotted observed flow, but omitted modeled flow. Add the modeled flow and include a table of summary statistics (eg, total and peak flow from each event and percent difference).	The Modeling Report has been updated with the correct figures.
63.	44	The report indicates that streambank erosion is significant in CCC and CC, but not in LPC. This doesn't seem tenable since I expect that the geomorphic conditions are similar in each canyon. What would explain the differences in streambank erosion?	See response to comment 3.
64.	44	Model parameters for streambank deposition and scour critical shear stresses varied by reach, as indicated in Appendix B. This doesn't seem tenable since I doubt the geologic material change significantly. What is the physical explanation that supports varying these parameters?	See response to comment 8.
65.	45	The log scale in Fig. 36 confounds comparison of measured vs.	Comment noted. No change needed.

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		modeled. In addition to the Fig, present these results in a table and compute percent error. I expect that several of them will exceed 50%.	
66.	46-47	Figure 38 and 39 show poor agreement between measured and modeled flow rates for all 3 storms at all 3 sites, with the model greatly (often >50%) exceeding measured in all cases. (The timing is off too, with the model peaking earlier than measured hydrographs – but errors in timing are not critical for computing sediment loading). The text attributes this disagreement to problems with the rating curves at the sites. This explanation has some credibility in the LPC subbasin because the model-measured flow agreement was good at the USGS station on LPC (over the whole period of record anyway – measured vs. modeled results for these 3 storms at the USGS gage are not presented). For the CCC and CC subbasins, I can find little basis for believing the model results are acceptably accurate.	See response to comment 9. Best available data were used, and the model was calibrated considering the limitations in the observed data. The model can be updated in the future to refine sediment loading numbers with new data such as bedload, flow, grain size, and suspended sediment data.
67.	46-47	Figures 38-39 also show significant disagreement between modeled and measured TSS concentrations. However, interpretation of this disagreement in confounded by 1) the disagreement in the timing of the model hydrograph with the measured hydrograph, coupled with 2) the likely (I have asked to see the plot) relationship between TSS and flow. Therefore, I don't think these plots are very useful for assessing the accuracy of TSS predictions. I suggest rescaling the time axis to a non-dimensional "fraction of time to peak flow". I also suggest constructing cumulative TSS mass graphs showing measured and modeled calculations. Given the above mentioned disagreement in	Overall, there is a good agreement between modeled and observed TSS concentrations, as shown in these figures. Measured TSS concentrations are highly variable; therefore perfect agreement is not expected. These results are consistent with the performance of similar modeling studies. See response to comment 9 for modeled hydrograph.

Comment ID	Page	Comment	Water Board Response
		flow, I expect there to be large disagreements in these cumulative mass plots.	
68.	48	The text states "The average difference between modeled and measured EMCs for CC, LPC, and CCC was 83%, 51%, and 65%, respectively." These differences seem significantly large; note that these percent differences (which one could interpret as an indicator of uncertainty in the results) are similar to the percent reduction in sediment load required by the TMDL (67%).	See response to comment 10.
69.	49	The report says "suspended sediment simulations reasonably predicted the observed stormwater TSS concentrations in the Los Peñasquitos watershed." The term "reasonably" is ambiguous and subjective and therefore not very useful in judging the appropriateness of the results. Moreover, the goal of the simulation is not only simulate TSS concentrations but to simulate TSS loads. As mentioned above, modeled and measured loads should be compared.	Comment noted. See response to comment 11.
70.	49	The document says " Sediment transported via diffusive bed load processes also has the potential to be a significant source of sediment loadings; however, this source was neither characterized in the LSPC modeling or would be with traditional TSS sampling" and "Because of the length of those periods without TSS at low levels, bed flow has the potential to be the dominate sediment transport pathway and could add significant sediment to the lagoon." It seems, therefore, unlikely that the TMDL can be accurately calculated without accounting for bed load.	See response to comment id number 12.
71.	52-56	The data is too densely compressed	Comment noted; however, due to

Comment ID	Page	Comment	Water Board Response
		on Figures 43-45 to allow interpretation regarding the agreement of modeled and measured values. This data needs to be presented in an additional or alternative way, for example, as a table with error statistics or scattered plots of modeled vs. measured data.	funding constraints, no changes were made at this time.
72.	54	The fact that the model cannot simulate the changing cross section at mouth of the lagoon seems like a serious limitation. The widening and narrowing of the mouth has major affect on tidal flushing and sediment dynamics in the lagoon.	See response to comment 13.
73.	56	The omission of bed load modeling in the lagoon also seems like a serious limitation; bed load is likely a significant component of sediment transport.	See responses to comments 12 and 14.
74.	58-64	Figures 46-58 present observed TSS values at the ocean inlet, but the "Data inventory" section of the report has no discussion about how these data were collected.	Monitoring is described in the report and references.
75.	58-71	Figures 46-71 show large disagreement between modeled and observed TSS concentrations and those of specific size-classes at the mouth and, even more so, at the lagoon segment. It is not possible, based on these figures alone, to quantify the size of this disagreement nor its implication on the uncertainty of predicted effects of sediment load reductions. Suffice it to say that it appears to me that the lagoon modeling results are not really tenable for use in computing the required sediment reduction.	Sediment modeling is highly complex and a significant amount of information is provided to compare the modeled vs. observed results. Detailed discussion of the sediment modeling results is provided in the Sediment Calibration section that begins on page 57 of the Technical Support Document (Attachment 1). The TMDL accounts for uncertainty through inclusion of an explicit margin of safety. Please also see response to comment id 10.
76.	71	I would like to see an explicit explanation of how and why the modeled net sediment loading from the ocean showed a 39% decrease	See response to comment 16.

Comment ID	Page	Comment	Water Board Response
		from the historical/target condition (9,780 tons) in the 1970s to 5,944 tons currently. How is this tenable?	
77.	71	Given that the choice of the target condition was a historical watershed sediment loading, I'm not sure why lagoon modeling is even necessary. It seems to me that one only need compute the sediment load off the watershed. (However, if other ways of reducing sedimentation in the lagoon will be considered such as more railroad trestles, digging more creeks or dredging the mouth more often, then the model could be useful.)	See response to comment 17.
78.	71	I expected the lagoon model results to include sedimentation rates within the lagoon. Ideally, there should be measured sedimentation rates with which to compare the modeled rates. This would be the real "acid test" of the modeling system – can it reproduce sediment accumulation rates in the lagoon?	Observed measurements of sediment loading in the lagoon are not available. This comparison can be made in the future, depending on the availability of information.
79.	71	This report needs an additional section discussing the application of the model to the critical period, under historical/target and current conditions.	Application of the model to the critical period under each condition is discussed in Sections 8 .6 and 9.3 of the Technical Support Document.

Attachment 5

Public Comments on April 22, 2011 Draft

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Attachment 5: Public Comments on April 22, 2011 Draft

On April 22, 2011, the San Diego Water Board provided tentative Resolution No. R9-2011-0021 and supporting documents for public comment. This document contains the public comments received from interested parties in response to tentative Resolution No. R9-2011-0021. The comment period ranged from April 22, 2010 to June 8, 2011. In response to public comments, the tentative Resolution and supporting documents were revised and then made available as tentative Resolution No. R9-2012-0033.

List of Commenters

Commenter ID Number	Company/Agency	Representative
1	City of San Diego	Kris McFadden
2	Hanson Aggregates	Steve Zacks
3	U.S. Environmental Protection Agency	Cindy Lin
4	County of San Diego	Cid Tesoro
5	Caltrans	Scott McGowen
6	California State Parks	Darren Scott Smith
7	City of Del Mar	Mikhail Ogawa
8	City of Poway	Malik Tamimi
9	Los Peñasquitos Lagoon Foundation	Mike Hastings
10	Cal CIMA	Adam Harper
11	Industrial Environmental Association	Patti Krebs

May 20, 2011

Electronic Delivery to: chenning@waterboards.ca.gov

Cathryn Henning, Water Resource Control Engineer
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, California 92123

Subject: Comments on Tentative Resolution No. R9-2011-0021, to Amend the Water Quality Control Plan for the San Diego Basin (9) to Incorporate the Total Maximum Daily Load for Sedimentation in Los Peñasquitos Lagoon

Dear Ms. Henning:

The City of San Diego (City) Transportation and Storm Water Department is pleased to provide the San Diego Regional Water Quality Control Board (Regional Board) with comments regarding Tentative Resolution No. R9-2011-0021 (Resolution) to amend the San Diego Basin Plan to incorporate the Total Maximum Daily Load (TMDL) for Sedimentation in Los Peñasquitos Lagoon (Lagoon).

At the request of the Regional Board, the City led the third party development of the TMDL. The reason for this collaborative effort was to allow the dischargers to help develop the TMDL, and stay on schedule. It has been a two-year collaborative effort funded by the City of San Diego, with input from the other Responsible Parties, and guidance from the Regional Board, US Environmental Protection Agency, and other stakeholders. We facilitated monthly coordination stakeholder meetings, used consultant services to perform modeling and reporting, and assigned tasks to ensure the project stayed on schedule. The City has been integral in the development of the TMDL; consequently, we have a more thorough knowledge of the required process procedures.

The City believes that this Resolution goes beyond the scope of the sedimentation TMDL. A TMDL is a calculation of the maximum loading capacity of the impaired waterbody for each impairing pollutant, which is sediment in this case. On February 3, 2010, the Responsible Parties were directed by the Regional Board to focus on sediment only, and not surrogate measures in the lagoon.

Our general comments are presented below, as well as specific comments included in the attached table.

- The goal of the TMDL is to address sediment and not all of the potential pollutants of the lagoon. Step 2 Long-term Goal and Step 3 Final Goal of the Three-Step Waterbody Goal, in the Resolution attachment, is beyond the scope of this sedimentation TMDL.
- Load Reduction Plan requirements call for scheduled Best Management Plan (BMP) implementation with a construction schedule, adjustments to staff scheduling and resources. As a governmental agency, our resources and staffing are based upon city council approval. It is difficult to schedule in advance when and if BMPs will be constructed, and when staff and resources will be secured. Information regarding a construction schedule, staff time, positions, and job descriptions should not be required in the TMDL Load Reduction Plan.
- The City does not believe that the Required Special Study on Lagoon Stressors should be included as a requirement in the Resolution, because this TMDL addresses sedimentation impairments. Specials studies can be addressed by the Responsible Parties in the Load Reduction Plan.
- The Adaptive Management Schedule has management decisions being made as a result of the Special Studies on Lagoon Stressors within a 6 year timeframe. If the TMDL has a Comprehensive Load Reduction Plan, we are required to be at 20% reduction at 5 years. It is unknown how long it will take before we see improvement in the lagoon but since we are only required to be at 20% reduction in 5 years, it is not clear as to whether the Regional Board will move to Steps 2 and 3 based on the Special Study results in the 6 year timeframe.
- The environmental analysis and checklist addresses bacteria issues and not entirely on sediment.
- The SED should provide the level a detail as required in an EIR.
- Cumulative impacts are not addressed in the environmental analysis.
- The project has an inadequate impact analysis because there are less than significant impacts with mitigations not properly addressed and analyzed, such as cultural resources and land use.
- Provide findings as described in State CEQA Guidelines section 15091 for significant environmental effects identified in an environmental impact report, and if the project as adopted will result in the occurrence of significant effects that are not avoided or substantially lessened, provide the specific reasons to support its action based on the final EIR and/or other information in the record described in State CEQA Guidelines section 15093 for similar significant effects identified in an environmental impact report.
- The Statement of Overriding Considerations does not explain how the project benefits outweigh the environmental effects.

- The above mentioned following require significant changes and recirculation of the Substitute Environmental Documentation.
- We are requesting that facilities that qualify as Phase II MS4 permittees, be included in this TMDL. Additionally, Industrial General Permit facilities and Construction General Permit sites are point sources of sediment to the lagoon and should be identified in the TMDL as contributors. In this watershed, there gravel mines that discharge directly into the receiving waters and the jurisdictions have no authority to regulate them.

The City appreciates the opportunity to lead the TMDL development effort. We feel that we have a better understanding of the TMDL development process. We request that the TMDL be confined to the 303(d) listed pollutant.

If you have any questions, please contact Ruth Kolb at (858) 541-4328.

Sincerely,

Kris McFadden
Deputy Director

KM/rk

Attachment: City of San Diego Comments Table on the Los Peñasquitos Sediment TMDL

cc: Almis Udrys, Office of the Mayor
Garth K. Sturdevan, Director
Ruth Kolb, Program Manager
File

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
1	Staff Report	6	Compliance Schedule Full implementation of the TMDL for sediment shall be completed within 10 years from the effective date of the Basin Plan amendment. As an incentive to take a more comprehensive pollution reduction approach, an alternative 20-year schedule is provided which requires responsible parties to plan for, and demonstrate required load reductions of bacteria and other pollutants, in addition to the sediment load reductions required by this project	Development of a comprehensive approach will include an analysis of additional pollutants that can be addressed in the load reduction strategy, depending on feasibility. Recommended edit: "… demonstrate required load reductions of bacteria and other pollutants (as feasible), in addition to the sediment load reductions required by this project"
2	Staff Report	10	The Sediment TMDL for Los Peñasquitos Lagoon should (1) result in reduction in the current watershed sediment loading rate to the early-1970s watershed sediment loading rate, and (2) initiate long-term Lagoon monitoring to assess Lagoon's response to decreasing sediment loads and overall health	(2) focuses on lagoon monitoring. The TMDL addresses watershed reductions that are needed to reduce sediment loads long-term. Compliance monitoring requirements for sediment will be specified in the upcoming CLRP. Special studies that address the overall health of the lagoon are needed but are outside the scope of this sediment TMDL. The CLRP can include recommendations for special studies of the lagoon, with the understanding that required compliance monitoring will focus on assessing sediment load reductions from the watershed.
3	Staff Report	31	General Statewide Storm Water Permits	We agree that it is important to include reference to the General Storm Water Permits in the TMDL. Data were not available during TMDL development to explicitly estimate the sediment load contribution from these facilities. Additional effort is needed in the future to quantify the loads and impacts from these facilities.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
4	Staff Report	42	Critical location (included in TMDL Technical Report)	This implicit margin of safety assumption should be included in the staff report
5	Staff Report	44	Section 8 - Implementation Plan 3-Step Waterbody Goal	We support the ultimate goal of restoring the lagoon and an adaptive management approach. As noted in Section 2 – Problem Statement, the lagoon was placed on the 303(d) list for sediment/siltation (also noted in the heading for Step 1). The TMDL only addresses sediment reductions based on this listing and discussion with the San Diego Regional Board during TMDL development. As a result, achieving the required sediment reduction is the focus of the TMDL. Steps 2 and 3 may be needed in the future if it's determined that additional actions are needed to restore the lagoon. These actions and related lagoon monitoring studies are, however, outside the scope of this TMDL. Lagoon monitoring should be referenced as follow-up special studies that may be needed to better understand existing conditions in the lagoon and to determine if additional actions are needed in the future. The 3-Step Goal statement is appropriate, however, the above clarification is needed.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
6	Staff Report	45	Section 8.1.2 – Responsible Party Identification	The 3rd paragraph under this section notes that the Phase 1 MS4 copermittees are the ultimate point source of sediment to the lagoon. It should be noted there are several General Storm Water Permit facilities (e.g. mining operations) that discharge directly to surface waters in the watershed and not to storm water conveyances maintained by the Phase 1 MS4 copermittees. The San Diego Water Board is responsible for enforcing these permits, as noted in the 4th paragraph. The TMDL notes that the sediment contribution from these facilities is likely significant and will need to be quantified to determine the impacts from these facilities.
7	Staff Report	46	SLRP/CLRP submittal	Approval of the SLRP or CLRP by the San Diego Water Board will be required in order to commit the necessary resources needed to implement the recommended actions. A timeline for the approval process should be specified
8	Staff Report	47	SLRP/CLRP requirements – 1)D	Staffing and other resource needs will be determined during development of the SLRP or CLRP. A general requirement that adequate staffing and oversight of implementation efforts is acceptable. Specific language requiring a schedule for staff time, etc. should be deleted.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
9	Staff Report	47	SLRP Requirements – 2) and 3)	Refer to Comment #5. Lagoon monitoring references should be edited as appropriate based on the recommended changes to Section 8.5.1. Lagoon monitoring should not be required as this TMDL addresses the sediment/siltation impairment of the lagoon.
10	Staff Report	47	SLRP Requirements – 4)	Clarify that the comparison to historic conditions (early 1970s) will focus on achieving the sediment load reduction required specified in the TMDL. Several of the lines of evidence specified in Section 8.3.1 do not provide a direct measure of sediment loading. This section should be edited to focus on monitoring efforts that provide direct feedback on sediment/siltation improvements that may result from reductions in watershed loading
11	Staff Report	48	CLRP Requirements – 2)D	Recommended edit: "Periodically assess the water quality of all water body/pollutant combinations within the Penasquitos watershed ***that are included*** in the CLRP to identify all water quality problems."
12	Staff Report	49	Section 8.1.4	Refer to Comment #7
13	Staff Report	50	Section 8.2	Refer to Comment #7

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
14	Staff Report	51	Section 8.3.1 – Weight of Evidence Approach	The Lagoon Condition lines of evidence do not provide a direct measure of sediment load reduction which is the focus of this TMDL. Several Creek Condition lines of evidence also may not have a direct linkage with sediment improvements. As noted in previous comments and elsewhere in Section 8, this TMDL specifically addresses the sediment/siltation impairment of the lagoon. Special studies would need to be developed to assess lagoon and creek conditions that may be affected by other pollutants and physical disturbances
15	Staff Report	53	Section 8.5.1	Refer to Comments #2, #5, and #9. Lagoon monitoring should not be required as this TMDL addresses the sediment/siltation impairment of the lagoon. Lagoon monitoring should be referenced as follow-up special studies that may be needed to better understand existing conditions in the lagoon and to determine if additional actions are needed in the future. Specific requirements for conducting lagoon monitoring and special studies should be deleted.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
16	Staff Report	53 & 54	Section 8.5.1	Regarding the possible need to move to Steps 2&3 of the waterbody goals – improvements in lagoon condition in response to sediment reductions will be a slow, incremental process. Adequate time will be needed to demonstrate improvements in the lagoon resulting from BMP implementation. In addition, a well-designed compliance monitoring strategy must be developed and included in the SLRP or CLRP to document these improvements and link them back to reductions in sediment loading. Special studies of the lagoon must take into account the time that will be required to measure changes in lagoon condition over time. The need for additional regulatory or restorative actions (and resources) will be dependent on an accurate measure of the lagoon's response to BMP implementation.
17	Staff Report	54	Section 8.5.2	The Regional Board listed sediment/siltation as the 303(d) impairment cause for the lagoon. A comprehensive study of lagoon stressors, if needed, should be led and funded by the Regional Board, as this TMDL was developed to specifically address sedimentation impacts from the watershed. The SLRP or CLRP, therefore, will focus on identifying the BMP actions that are needed to reduce sediment loading to the lagoon and a compliance monitoring program to assess these changes over time.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
18	Staff Report	55	Section 8.5.3	Refer to Comment #16. The Adaptive Management Schedule does not allow sufficient time to show marked changes in lagoon condition from future BMP implementation activities. According to this schedule, special studies will be completed within 4 years of OAL approval. The Alternative Compliance Schedule (page 52) requires a 20% reduction in sediment loading within this time frame. Cost-effective management decisions cannot be made unless adequate time is allowed to measure and demonstrate changes in lagoon condition as a result of BMP implementation. A longer schedule is needed to be consistent with the Alternative Compliance Schedule and the time that will be needed for the lagoon to begin to show improvements. Refer to Comment #18 regarding the need for special studies of the lagoon and the responsible entity
19	Resolution No. R9-2011-0021	5	15. TMDL Implementation, Monitoring, and Compliance	Include the following: … implement a Sediment Load Reduction Plan (SLRP) <u>or Comprehensive Load Reduction Plan (CLRP)</u>. Include the following: … Final compliance with this TMDL must be achieved, as soon as possible, but no later than ten years <u>for the SLRP or no later than twenty years for the CLRP</u> from the effective date of the Basin Plan Amendment.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
20	Resolution No. R9-2011-0021	5	16. TMDL Project Objective and Waterbody Goal	The Resolution is for Sedimentation/Siltation TMDL. Delete the following: TMDL Project Objective ~~and Waterbody Goal~~: The objective of this TMDL project to attain the sediment water quality objective in the Los Penasquitos Lagoon. ~~This is considered an essential first step towards achievement of the ultimate waterbody goal. The final goal for the Los Penasquitos Lagoon is full attainment of all water quality objectives, protection of all beneficial uses, and restoration to a functional healthy estuarine ecosystem.~~
21	Resolution No. R9-2011-0021	6	18. California Environmental Quality Act Requirements:	Delete the following: For CEQA purposes, the "project" is both the adoption of a Basin Plan amendment establishing a TMDL for sediment in the Lagoon ~~and all of the implementation activities undertaken by the responsible parties to comply with the TMDL.~~

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
22	Resolution No. R9-2011-0021 Attachment A	A-2 & A-3	Restoring Los Penasquitos Lagoon: Three-Step Waterbody Goal	1. Revise title to Reducing Sedimentation and Siltation Load to the Los Penasquitos Lagoon. 2. Delete three-step Waterbody Goal. 3. Strike out and keep the following: ~~Step 1 Intermediate-term Goal:~~ Attain water quality objective for sediment in Los Penasquitos Lagoon and address current Clean Water Act section 303(d) sediment impairment. Overall Strategy Reduce current watershed sediment load to early 1970s watershed sediment load. Delete: ~~Initiate long-term Lagoon monitoring~~ and replace with: Compliance monitoring to assess Lagoon's response to decreasing sediment ~~and overall health~~. Strike out the entire title and paragraph of Step 2 Long-term Goal. Delete the entire title and paragraph of Step 3 Final Goal.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
23	Resolution No. R9-2011-0021 Attachment A	A-3	Step 1: Sediment Total Maximum Daily Load for Los Penasquitos	Delete "Step 1" from Title.
24	Resolution No. R9-2011-0021 Attachment A	A-10	Implementation Plan SLRP Requirements	Revise "The SLRP shall contain…" to "The SLRP is recommended to contain…"
25	Resolution No. R9-2011-0021 Attachment A	A-11	SLRP components, item numbers 1A through 1C	Keep only the main headings & delete details: A) Initial BMP Analysis B) Scheduled BMP Implementation C) Scheduled Periodic BMP Assessment and Optimizing Adjustments
26	Resolution No. R9-2011-0021 Attachment A	A-11	SLRP component, item number 1D	Delete "D. Continuous Budget and Funding Efforts-Securing budget and funding for BMP staffing and equipment should be scheduled early and continue until the sediment TMDL is met. The SLRP should include a schedule for staff time, including position and job description, authorized for securing funding for non-structural BMP implementation and maintenance."

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
27	Resolution No. R9-2011-0021 Attachment A	A-11	SLRP component, item number 2	Delete "2) … and the Lagoon monitoring requirements."
28	Resolution No. R9-2011-0021 Attachment A	A-11	SLRP component, item number 3	Delete "3) Details of the required special studies, including delivery dates for those studies."
29	Resolution No. R9-2011-0021 Attachment A	A-12	CLRP requirements	Revise "The CLRP shall contain…" to "The CLRP is recommended to contain…"
30	Resolution No. R9-2011-0021 Attachment A	A-12	CLRP requirements, item number 2B	Delete item 2B and replace with the following: Develop watershed-based, land use planning policies and approaches each jurisdiction can review and select for use in their planning processes.
31	Resolution No. R9-2011-0021 Attachment A	A-18 & A-19	Adaptive Management	Delete Required Lagoon Monitoring section.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
32	Resolution No. R9-2011-0021 Attachment A	A-19	Adaptive Management	Delete Required Special Study on Lagoon Stressors section.
33	Resolution No. R9-2011-0021 Attachment A	A-19	Adaptive Management	Delete Adaptive Management Schedule section.
34	Staff Report	Pg 1	Executive Summary, fourth paragraph	Delete "initiate long-term Lagoon monitoring" and replace with "compliance monitoring." Delete "and overall health."
35	Staff Report	Pg 44	Implementation Plan	Delete three-step Waterbody Goal.
36	Staff Report	Pg 44	Implementation Plan	Delete the following: Accordingly, this Implementation Plan describes both the program of implementation and the adaptive management approach ~~necessary for achieving step 1, the Intermediate-term goal~~.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
37	Staff Report	Pg 44	Implementation Plan	Strike out and keep the following: ~~Step 1 Intermediate-term Goal:~~ Attain water quality objective for sediment in Los Penasquitos Lagoon and address current Clean Water Act section 303(d) sediment impairment. Overall Strategy Reduce current watershed sediment load to early 1970s watershed sediment load. Delete: ~~Initiate long-term Lagoon monitoring~~ and replace with: Compliance monitoring to assess Lagoon's response to decreasing sediment ~~and overall health~~.
38	Staff Report	Pg 44	Implementation Plan	Delete Step 2: Long-term Goal Section and Step 3: Final Goal Section
39	Staff Report	Pg 45	8.1.1 San Diego Water Board Actions	Revise …to comply with the total wasteload allocation to reduce 'collective watershed sources' to the following: …to comply with the total wasteload allocation of this TMDL sedimentation.
40	Staff Report	Pg 46	SLRP Requirements	Revise "The SLRP shall contain…" to "The SLRP is recommended to contain…"

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
41	Staff Report	Pg 47	SLRP Requirements, item numbers 1A through 1C	Keep only the main headings and delete details: A) Initial BMP Analysis B) Scheduled BMP Implementation C) Scheduled Periodic BMP Assessment and Optimizing Adjustments
42	Staff Report	Pg 47	SLRP Requirements, item 1D	Delete "D. Continuous Budget and Funding Efforts- Securing budget and funding for BMP staffing and equipment should be scheduled early and continue until the sediment TMDL is met. The SLRP should include a schedule for staff time, including position and job description, authorized for securing funding for non-structural BMP implementation and maintenance."
43	Staff Report	Pg 47	SLRP Requirements, item 2	Delete "… and the Lagoon monitoring requirements."
44	Staff Report	Pg 47	SLRP Requirements, item 3	Delete "3) Details of the required special studies, including delivery dates for those studies."
45	Staff Report	Pg 48	CLRP Requirements	Revise "The CLRP shall contain…" to "The CLRP is recommended to contain…"
46	Staff Report	Pg 48	CLRP Requirements, item 2B	Delete item 2B and replace with the following: Develop watershed-based, and use planning policies and approaches each jurisdiction can review and select for use in their planning processes.
47	Staff Report	Pg 53-54	8.5.1 Required Lagoon Monitoring	Delete section 8.5.1 Required Lagoon Monitoring

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
48	Staff Report	Pg 54	8.5.2 Required Special Study on Lagoon Stressors	Delete section 8.5.2 Required Special Study on Lagoon Stressors.
49	Staff Report	Pg 55	8.5.3 Adaptive Management Schedule	Delete section 8.5.3 Adaptive Management Schedule and Table 7.
50	Staff Report	Pg 56-60	Section 9: Environmental Analysis, Environmental Checklist, and Economic Factors	Staff report lists Attachment 5 for the Environmental Analysis and Checklist. However, this document is labeled Attachment 3. Correct inconsistency.
51	Environmental Analysis and Checklist		(General Comment)	The environmental analysis and checklist addresses bacteria issues and not entirely on sediment.
52	Environmental Analysis and Checklist		(General Comment)	The SED should provide the level of detail as required in an EIR.
53	Environmental Analysis and Checklist	3-42	Environmental Checklist and Analysis	Cumulative impacts are not addressed in the environmental analysis.
54	Environmental Analysis and Checklist		Environmental Checklist and Analysis	The project has an inadequate impact analysis because there are less than significant impacts with mitigations not properly addressed and analyzed, such as cultural resources and land use.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
55	Environmental Analysis and Checklist	3-51 Through 3-53	Environmental Analysis and Findings	Provide findings as described in State CEQA Guidelines section 15091 for significant environmental effects identified in an environmental impact report, and if the project as adopted will result in the occurrence of significant effects that are not avoided or substantially lessened, provide the specific reasons to support its action based on the final EIR and/or other information in the record described in State CEQA Guidelines section 15093 for similar significant effects identified in an environmental impact report.
56	Environmental Analysis and Checklist		Environmental Analysis and Findings	The Statement of Overriding Considerations does not explain how the project benefits outweigh the environmental effects.
57	Environmental Analysis and Checklist		(General Comment)	The above mentioned following require significant changes and recirculation of the Substitute Environmental Documentation.

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Ms. Cathryn Henning
California Regional Water Quality Control Board,
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340.

Subject: Comments on Los Peñasquitos Lagoon Sedimentation TMDL

Dear Ms. Henning:

Below are comments/ questions on the proposed TMDL.

1. Finding #`9 on page 4 of Tentative Resolution No. R9-2011-0021 (attached) states:

> Non-point sources: In this project, the "collective watershed sources" also include all the *non-point sources located in the watershed* such as agriculture (1 percent of current land use area) and open space (43 percent of current land use area). This is the case because virtually the entire Los Peñasquitos watershed is drained through the Phase I MS4 collection systems and therefore these sources, although nonpoint in origin, are considered by the San Diego Water Board to be "controllable" point sources. For this reason the Phase I MS4s can be thought of as the primary and ultimate point sources of sediment to the Lagoon.

Hanson Aggregates operates an aggregate and concrete operation know as Carroll Canyon. Stormwater from this operation flows direcly into Carroll Canyon Creek withour first entering a public storm drain. Does Finding #9 mean our site's discharge could be part of the collective watershed TMDL allocation of 2,580 tons/year described in Finding # 12 of the Tentative Resolution? If no, how would a sediment load be assigned to our site?

We request that sediment load allocations be discussed with dischargers such as Hanson Aggregates before they are finalzied. These discussions would include review of the feasiblity of the load allocation.

2. A primary concern is what are the RWQCB's expectations when there are extraordinary rain events such as a 100-year storm? These events could generate the most significant sediment loading to the lagoon, but it may be infeasible to adequately control the waste load. The draft Industrial Stormwater Permit expects BMP's to be designed to a compliance storm event. RWQCB staff stated at a workshop that if the compliance storm event is exceeded, then the discharger is not expected to comply with the NAL's and NEL's. Would there be similar provisions with the TMDL?

3. If our sites are assigned an effluent limit/ allocation in response to the TMDL, then how will run-on from offsite properties be accounted for? For example, assume a creek that drains a large (e.g. 10 square miles) upgradient watershed cannot handle a storm event, overflows onto our parcel, and then causes excessive sedimentation. Does this sediment apply towards our effluent limit/ allocation?

Regards,

Steve Zacks

Steve Zacks
Environmental Manager

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

May 23, 2011

David Gibson
Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

Dear Mr. Gibson,

Thank you for the opportunity to comment on the Los Peñasquitos Lagoon Sedimentation TMDL Staff Report and Draft Basin Plan Amendment (BPA), dated April 22, 2011. We have reviewed both documents in accordance with Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130 which describe the statutory and regulatory requirements for approvable TMDLs. EPA finds serious concerns with several TMDL elements in the draft documents which may result in our disapproval of the TMDL. Below we describe the sections which require modification and addition of the appropriate technical support and regulatory language.

Numeric Target & Linkage Analysis

The TMDL must identify appropriate numeric water quality targets that provide a quantitative measure to show attainment with applicable water quality standard(s) in Los Peñasquitos Lagoon. Specifically, the TMDL is interpreting a narrative water quality objective and therefore it is essential to establish numeric measures that will define the narrative condition for protecting the beneficial uses. According to EPA's guidelines for reviewing TMDLs under existing regulations, the TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources.

The staff report clearly described the beneficial uses and impact of sedimentation to the Lagoon:

"The beneficial use that is most sensitive to increased sedimentation is estuarine habitat. Estuarine uses may include preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (such as marine mammals or shorebirds).......Impacts associated with increased and rapid sedimentation include: reduced tidal mixing within Lagoon channels, degraded and (in some cases) net loss of riparian and salt marsh vegetation, increased vulnerability to flooding for surrounding urban and industrial developments, increased turbidity associated with siltation in Lagoon channels, and constricted wildlife corridors." (p. 9 of Staff Report & p14 of Attachment 1)

As such, the focus of the TMDL should identify the physical, chemical and biological factors influencing the estuarine habitat caused by sedimentation and siltation. Since the applicable water quality objective is a narrative objective for sediment, the TMDL should identify numeric targets that will provide the basis for evaluating if the water quality objectives and beneficial uses have been attained in Los Peñasquitos Lagoon. In similar sediment TMDLs adopted within the State, multiple targets for the water column and habitat have been included to provide a clear evaluation to determine if water quality objectives and beneficial uses are attained (e.g., tidal prism volume, turbidity, %fines, % gravel, % salt marsh habitat, etc.). In this TMDL, sedimentation has presumably caused estuarine habitat loss which is critical for the protection of rare, threatened and endangered species and spawning habitat. Specifically, sedimentation within the Lagoon restricts the tidal prism, or exchange between the ocean and the Lagoon, and degrades critical salt marsh habitats through various processes. This important information should be used to define the appropriate numeric targets. For example, Attachment 1 of the staff report carefully identified that 180 acres of 510 habitat acres have been directly impacted by sedimentation. And yet, this information was not utilized in the definition of the numeric targets or in other sections of the TMDL staff report.

Instead, this TMDL defined a single numeric target based on historical conditions and calculated a historic sediment load of 12, 360 tons per critical wet period. The numeric target is appropriate in providing the load reduction required by the point sources; however, it does not provide a measure to evaluate whether the Lagoon itself has attained the water quality objectives and protection of the beneficial uses. We require the inclusion of other numeric targets that directly assess the condition of the Lagoon to ensure a clear linkage between allocations, numeric targets and the restoration goal of the TMDL.

Source Assessment

In our review, we did not find a complete analysis of all possible sources in the BPA and staff report. Attachment 1 of the Staff report (p37) discussed impacts of railroad-related construction activities and the railroad berm as causing sedimentation in the Lagoon. However, this source was not identified in the TMDL staff report or the BPA as a potential source to be addressed. The TMDL should identify all point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day.

This TMDL document identified wave action from the ocean as a Load Allocation. Since the ocean is defined as a "non-controllable" background source, please appropriately identify this as a background source and not a Load Allocation. Clear sources that are due to natural background tidal exchange processes should be noted and evaluated as part of the background sources portion of the TMDL budget. If human activities are leading to increasing wave action or disrupting the sedimentation rate, a wasteload allocation should be considered.

Margin of Safety

The CWA statute and corresponding federal regulations require that a TMDL include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)). In our view, this TMDL includes huge uncertainties in the calculation of the loading capacity, including the linkage between the WLA and the numeric targets and the water quality objectives. The implicit MOS does not adequately provide a sufficient measure of protection in accounting for the large level of uncertainties. In addition, the conservative assumptions in the analysis and calculation of the wasteload allocation should be clearly defined and included to better evaluate the level of implicit or explicit MOS. We strongly recommend the TMDL include an explicit MOS unless greater clarity is provided in detailing out the assumptions and areas of conservative measures.

Implementation Plan

This TMDL outlines a three step process to restore Los Peñasquitos Lagoon. A phased approach outlining the implementation plan for achieving the TMDL's final wasteload allocations and numeric targets is appropriate. However, this TMDL does not clearly outline the framework nor the detail actions required for each step to show with reasonable assurance that the wasteload allocations and numeric targets to support protection of beneficial uses will be achieved. The current three step goals only describes the overall strategy and regulatory actions; the content of the strategy and actions are limited in scope and do not provide the detailed actions, measures and milestones to define how the TMDL and its goals will be achieved.

Overall, EPA finds these TMDL and BPA documents, as presented, do not provide reasonable and sufficient technical information and therefore do not appear to meet regulatory requirements for addressing excessive sedimentation in the Los Peñasquitos lagoon. More importantly, the TMDL must include clear quantitative measures that will result in direct evaluation of the Lagoon to show water quality improvements and restoration of the impaired beneficial uses.

We recommend the appropriate information be included in the TMDL documents to fulfill the statute and regulatory requirements of an approvable TMDL. If you have any questions, please contact me at (213) 244-1803.

Sincerely yours,

Cindy Lin
TMDL Liaison, Water Division

County of San Diego

DEPARTMENT OF PUBLIC WORKS

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May 23, 2011

Dave Gibson, Executive Officer
San Diego Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

SEDIMENT TMDL FOR LOS PENASQUITOS LAGOON

Dear Mr. Gibson:

Thank you for the opportunity to comment on the *Sediment TMDL for Los Penasquitos Lagoon*. We have provided extensive comments on the Tentative Resolution (including Attachment A – the proposed Basin Plan Amendment) as well as the Draft Staff Report and Attachment 3 (Environmental Analysis and Checklist) in the enclosed table.

If you have questions please contact Todd Snyder, Watershed Planning Manager, at (858) 694-3482 or by e-mail at todd.snyder@sdcounty.ca.gov.

Sincerely,

CID TESORO
LUEG Program Manager

CT:ti

Enclosure

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
1	Tentative Resolution	5	Item 15. Final Compliance within 10 years.	Please add after Basin Plan Amendment, "or within 20 years if a Comprehensive Load Reduction Plan (LRP) is developed for the watershed." The compliance timelines identified in the Resolution should be consistent with those identified in the Attachment (see A-10). We agree that the option for an extended compliance timeline is appropriate for a LRP that addresses multiple pollutants. This will also ensure consistency with the recently adopted Bacteria TMDL for Beaches and Creeks, which also impacts the Los Penasquitos Watershed.
2	Tentative Resolution	5	Item 16. TMDL Project Objective and Waterbody Goal	Please delete the last sentence. This TMDL is for sediment and should remain focused on sediment. "Full attainment of all water quality objectives ... and restoration to functional healthy estuarine ecosystem" is beyond the scope of this TMDL.
3	Tentative Resolution	5	Item 17. Scientific Peer Review.	Several responses (>17%) to the peer review questions state that "due to time constraints, no changes were made at this time." Additional time should be devoted to making all changes to the TMDL that are appropriate based on peer review.
4	Tentative Resolution	6	Item 18. "For CEQA Purposes, the 'project' is both the adoption of the Basin Plan Amendment and all of the implementation activities…"	The CEQA analysis does not address any of the implementation actions that will result from this TMDL. If it did, more specific mitigation and alternatives would need to be included in the Staff Report.
5	Tentative Resolution	6	Item 19 second paragraph. "The San Diego Water Board only considers the reasonably foreseeable feasible environmental impacts of those methods of compliance, and the reasonably foreseeable mitigation measures which would avoid or eliminate the identified impacts."	The substitute environmental documents do not identify the reasonably forseeable mitigation measures which would avoid, reduce, or eliminate impacts identified as "significant".
6	Tentative Resolution	6-7	Item 20. "Possible alternatives and mitigation are described in the CEQA environmental analysis, specifically the Staff Report and the environmental checklist."	There is little to no specific mitigation identified or alternatives proposed that would mitigate the "project". The supporting documents currently identify that most if not all impacts from the project are the responsibility of other agencies. The Staff Report and the Environmental Analysis include three alternatives, none of which specifically identify which, if any, potential environmental impacts that the alternative address.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
7	Tentative Resolution	7	Item 22. Economic Analysis	The Water Boards' economic analysis generally discusses the range of costs involved with construction of a few types of compliance measures. However, it does not provide an analysis of the costs required to operate and maintain these measures, the cumulative number of BMPs expected to be necessary over the life of the project, nor does it analyze the requirement for the responsible parties to identify additional staffing in the LRP. Without this information, there is no way to make a direct comparison between the anticipated economic impacts of implementing the TMDL and the environmental benefits to be achieved. Therefore, it is unclear how the Water Board has reached the conclusion that anticipated economic impacts are acceptable. These comments apply equally to Page 59, Section 9.6 in the Draft Staff Report.
8	Attachment A	A-9, A-10	Attachment A, page A-9, states it is the responsibility of the Phase I MS4s (County of San Diego and Cities of San Diego, Del Mar, and Poway) to assume the lead role in coordinating and carrying out the responsible party actions, compliance monitoring, and adaptive management required under this TMDL project.	Each of the listed responsible parties (Phase I MS4s, Phase II MS4s, Caltrans, and the General Construction/Industrial Stormwater Permittees) should have equal responsibility for developing, implementing, and complying with the TMDL.
9	Attachment A	A-10	Develop and Submit a Load Reduction Plan	Last paragraph replace "and" with "or" in first sentence.
10	Attachment A	A-10, A-11	SLRP Requirements	It is not feasible to identify a detailed schedule for construction of BMPs and additional staffing within the timeline allowed for submittal of the SLRP. Realistically, it can take several years once a candidate project is identified to confirm implementation feasibility. Some of the issues that need to be resolved before a BMP can be constructed include: identifying funding, analyzing environmental impacts, and (in some cases) acquiring land. In general, there is too much specificity required in the SLRP.
11	Attachment A	A-12	Item 6. "Parties should review and modify their jurisdictional ordinances…"	This statement contradicts findings made in the Initial Study (see page 3-34 Land Use), which states that the project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project.
12	Attachment A	A-13	Implement Load Reduction Plan	Does the language here imply that the CLRP is acceptable to the Water Board if no comments are provided on the content of the Plan?

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
13	Attachment A	A-13	Reasonablely Foreseeable Methods of Compliance by RPs	It would be better to make this section more general since there are likely other foreseeable methods of compliance not included on the list provided.
14	Attachment A	A-15	Compliance Determination – Weight of Evidence	This section contains contradictory language. It first says "Attainment of the 1970s loading rate will be demonstrated by measuring and reporting on *any combination of* the following individual lines of evidence …". It then says "*Each line of evidence* must establish the early 1970s condition and the existing condition in the SLRP or CLRP, such that progress can be quantified as a percent." It is more appropriate to some, but not all, lines of evidence to be used because it will be difficult or impossible to determine progress on many of the potential lines of evidence listed. For example, IBI and CRAM were either not completed or were not available in the 1970's and require in field measurements that cannot be recreated. Also, while vegetation maps may be available for portions of the lagoon and the watershed, there is no complete vegetation coverage available for the entire watershed with specific detail for the vegetation types listed.
15	Attachment A	A-16, A-17	Compliance Schedule	It is problematic to establish load reduction targets (both interim and final) that assess sediment loading on an annual basis. Sediment loading can be highly variable across years due to changes in rainfall amounts, intensities, etc. over the course of a year. It may be more appropriate to use a 10-year running average to factor out years have abnormally high loading due to hydrologic variability. Responsible parties should be given the opportunity to propose an alternative compliance schedule that is subject to review and acceptance by the Water Board. Currently, responsible parties are only allowed to propose "additional" interim milestones and final compliance schedules.
16	Attachment A	A-18, A-19	Required Lagoon Monitoring/ Required Special Studies	While the stated objective of the TMDL is to reduce sediment loads, it appears that much of these two programs will take us immediately into Step 2 and 3. Monitoring required by the TMDL should be limited to assessing the goal of Step 1 – sediment load reduction. The last sentence under required Lagoon Monitoring starting with "One of the SD Water Board …" should be deleted from this section. It might fit into the Staff Report but does not belong in the Resolution or the Basin Plan Amendment.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
17	Attachment A	A-19	Adaptive Management Schedule	Special studies are required to be carried out within 4 years of OAL approval. The compliance timeline requires 30% of the total load reduction to be achieved by this time. If the conclusion of the special studies is that sediment is a minor factor affecting Lagoon health, the TMDL proposes that the project shift focus to other more important factors controlling lagoon health. It would be more effective from an economic perspective to conduct the special studies first, then define the appropriate regulatory approach based on the results. There is much opportunity for wasted time and money in the approach proposed by the TMDL. These comments apply equally to Section 8.5.2 and 8.5.3 in the Draft Staff Report.
18	Draft Staff Report - April 2011	2, 13	Sources and Responsible Parties	Staff Report should clearly state that the land use coverage used is not the "current" or "existing" state of the watershed and should indicate why the 2000 LU coverage was selected to define existing conditions.
19	Draft Staff Report - April 2011	5	Implementation of TMDL	Language in this section indicates that Phase II MS4s and General Industrial and Construction Permit holders "may" be required to develop SLRPs. It is unclear from the staff report whether existing requirements for Phase II MS4s and Construction/Industrial Storm Water Permit holders are sufficient to support achievement of the load reductions required in this TMDL. The Water Board should specify the criteria that will be used to assess whether these parties will have to implement SLRPs. There are properties in the watershed, such as sand mining operations, that discharge directly to the creek or other receiving water that do not first enter an MS4 controlled by a Phase I MS4 permittee.
20	Draft Staff Report - April 2011	10	According to California State Parks, the lagoon consists of approximately 510 acres of wetland habitats… remaining 180 acres of salt marsh and brackish marsh vegetation are impaired by excessive sedimentation.	180 acres of impaired habitats is significantly less than the original estimate under the 1996 listing of 469 acres. There is a lack of discussion regarding the severity of the effect of sediment on the Estuarine Beneficial Use and the 1996 TMDL listing. Delisting should be included as a feasible alternative for portions of the Lagoon.
21	Draft Staff Report - April 2011	15	First Paragraph states " Currently the lagoon mouth is open throughout most of the year …Mechanical dredging is used only when needed"	This is contradictory to statements in the Initial Study Attachment 3 page 3-4 which states "a permanent mouth opening to ocean cannot be naturally maintained… therefore channel is "often" dredged to alleviate danger…"
22	Draft Staff Report - April 2011	19	First paragraph states "These sediment deposits have gradually built-up over the years.."	This is contradictory to the findings that sedimentation is the leading cause in the "rapid loss" of salt marsh habitat as stated on page 10 and 19 of the Staff Report. Furthermore, Section 4.1 page 21 states "Gradual Sediment accumulation in the lagoon has created areas of higher elevation." Findings in these documents should be consistent.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
23	Draft Staff Report - April 2011	30	Phase II MS4 discussion	The Resolution and accompanying documents indentify that Phase II MS4 are responsible parties to this TMDL. Page 30 of the Staff Report indicates that there are no Phase II MS4 entities enrolled under Order No. 2003-0005-DWQ in this watershed. This section should identify the potential Phase II entities within the watershed that are subject to future enrollment.
24	Draft Staff Report - April 2011	56	Section 9	This section should cite all the relevant sections of CEQA that are appropriate.
25	Draft Staff Report - April 2011	56	Attachment 5 citation	Attachment 3 – Environmental Analysis and Checklist (Incorrectly cited as Attachment 5)
26	Draft Staff Report - April 2011	60	Section 9.7 Reasonable Alternatives to the proposed activity	Section 9.7 only identifies 2 of 3 alternatives discussed in the Initial Study 3-47 through 3-49. Per Section 15126.6 of CEQA, it should identify the basic objectives of the Sediment TMDL and then provide a reasonable range of alternatives that would achieve some or all objectives of the proposed project. These should be based on a goal to reduce some or all of the potentially significant environmental effects of the project. One such alternative would be the delisting of the lagoon for sediment (if appropriate). Another would be to conduct special studies first to identify the primary cause(s) of degraded lagoon health, then to pursue the regulatory approach that most efficiently addresses the impairment.
27	Attachment 3 Environmental Analysis and Checklist	3-3	Title	Page 3-3 identifies this as Attachment 5. This should be changed to Attachment 3. This analysis and checklist should list appropriate sections of CEQA as necessary.
28	Attachment 3 Environmental Analysis and Checklist	3-3	Project Description	The project description lacks sufficient detail to provide a basis for the responses in the environmental checklist.
29	Attachment 3 Environmental Analysis and Checklist	3-3 through 3-5	Environmental Setting	This section does not include any information on habitats (types, acres, location, etc) found within the watershed or the lagoon upon which to base conclusions reached in the checklist.
30	Attachment 3 Environmental Analysis and Checklist	3-4	Third Paragraph last sentence.	Add “in part” after the word “due”. The TMDL documents clearly state that while sediment and siltation are a problem for the loss of beneficial uses in the lagoon, they may not be the only reason for the loss of the estuarine beneficial use.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
31	Attachment 3 Environmental Analysis and Checklist	3-4 through 3-5	Sensitive Species	This list should include sensitive species of plants and animals associated with the lagoon/estuary. Most of these species are riparian and upland species. This discussion should also cite references used to determine the list of species.
32	Attachment 3 Environmental Analysis and Checklist	3-5, 3-6	Section 1.2 Existing Local, Specific, and Regional Plans, and Habitat Conservation Plans	While it is not clear as to the extent of what types of plans should be included in this section, there should be at least some discussion of the MSCP and the appropriate approved Subarea Plans for this watershed. Further, there should be some discussion on specific stormwater related ordinances that each of the Responsible Parties have adopted to control stormwater problems.
33	Attachment 3 Environmental Analysis and Checklist	3-6	Project Clean Water	Project Clean Water is not a program. It is a website that provides a forum for sharing information regarding water quality and watersheds in the County. It is not appropriate to reference Project Clean Water in this section.
34	Attachment 3 Environmental Analysis and Checklist	3-10	Section 4 Reasonably Foreseeable Methods of Compliance.	This section would better support the discussions, conclusions, and findings in later sections and the Checklist if the section focused on different general methods for sediment control and runoff (for example structural vs. non-structural; site design vs. source control vs. treatment control; and/or short term (construction related) vs. long term (permanent) BMPs). Specific types of BMPs discussions i.e. sediment basins, silt fences and energy dissipaters should be listed under each of the site specific (land use) sections. See section specific comments below. As it is presented in Section 4 on page 3-10, the BMP list is not really reflected in the separate site specific discussions. For example, rain barrels are discussed on page 3-16 but are not listed on page 3-10.
35	Attachment 3 Environmental Analysis and Checklist	3-11	Section 4-1 Reasonably Foreseeable Methods of Compliance at Specific Sites	Much of this section appears to refer to the Bacteria TMDL for Beaches and Creeks, which is entirely inappropriate and leads one to question the appropriateness of the conclusions reached in sections 4.2 through 4.6 and the specific impact analysis in the Environmental Checklist Section 5.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
36	Attachment 3 Environmental Analysis and Checklist	3-12	Section 4.2 BMP's For Construction Sites	This section provides one of the more informative discussions regarding site specific BMPs and their potential impacts. Each of the following sections would benefit from a similar analysis. It should be noted that regardless of land use (commercial, industrial, and residential), construction BMPs on raw land (undeveloped) may be more intensive than that for developed land, which may present additional constraints on types used. This discussion should also note the temporal aspects of many of these BMPs in that they are used only during the construction phase of the development (i.e. silt fences, fiber rolls and temporary detention basis). Whereas the longer term (permanent type BMP's) should be designed to control flow, intensity and volume of runoff. However, discussions of the specific types would logically fit under the specific land use discussed in later sections. This analysis should also discuss that disturbance of the land (grading and brushing) has the potential to result in the greatest direct impacts related to sediment generation in excess of natural background. After construction (discussed in other sections) sediment generation is an indirect impact as a result of increased intensity and volume of runoff.
37	Attachment 3 Environmental Analysis and Checklist	3-13	Section 4.3 Potential BMP's for Residential Areas.	This section incorrectly correlates high density to sediment generation. Sediment generation is mostly the result of land disturbance (discussed above) not the particular land use or density. High density, regardless of specific land use, can be associated with increased imperviousness leading to increase volume, intensity, and duration of runoff. However, many studies actually show that higher densities when coupled with appropriate site design and open space protection actually reduces the overall imperviousness at a watershed level.
38	Attachment 3 Environmental Analysis and Checklist	3-15	Section 4.4 BMP's for Park and Recreation Areas	According to the SANDAG 2000 Land Use data, these two land uses comprised approximately 3.3 percent of the watershed. There is little support that these parks or recreation areas are located in areas that would support the type of BMPs discussed in this section or would be located to effectively reduce sediment or runoff. A more important feature of this watershed is the large percentage of the watershed that was defined as Open (43%). Much of this area will remain as open space as it is designated as part of the MSCP preserve area, which includes most of the 3 major canyons as well as the lagoon and estuary. Construction and other development would be precluded in much of these areas which would limit the type and amount of BMPs that could be utilized.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
39	Attachment 3 Environmental Analysis and Checklist	3-16, 3-17	Section 4.5 Potential BMPs for Commercial/Institutional Areas Section 4.6 Potential BMPs for Industrial and Transportation Areas	As stated above for Residential, it is not clear from these discussions why population densities have any direct effect on sediment generation rates. This assumption, if true, should be supported by evidence.
40	Attachment 3 Environmental Analysis and Checklist	3-17	Section 5 Environmental Checklist	Appendix G of CEQA provides a list of 9 factors that should be used when evaluating impacts associated with projects. Of particular concern in this checklist is evaluation factor 9, it is apparent from the list that the Regional Board has not clearly established thresholds in which to measure the level of significance, furthermore there is a lack of connection with many of the mitigations listed with the specific impact identified.
41	Attachment 3 Environmental Analysis and Checklist	Applies to all	Section 5 Environmental Checklist	Page 6 of the Tentative Resolution states "For CEQA purposes, the "project" is both the adoption of a Basin Plan Amendment establishing a TMDL for sediment, in the Lagoon and all (emphasis added) of the implementation activities undertaken by the responsible parties to comply with the TMDL." This appears to conflict with the project descriptions found elsewhere which generally state "Adoption of the Basin Plan Amendment". Furthermore, discussions of BMP's (structural or non-structural) are not specific to type of BMP but rather general in nature and therefore provide little support for conclusions reached in the checklist.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
42	Attachment 3 Environmental Analysis and Checklist	Multiple	I. Aesthetics: a), c) II. Agriculture and Forest Resources: a) III. Air Quality: a) through d) IV. Biological Resources: a) through f) V. Cultural Resource: VI. Geology and Soil: b) VII. Greenhouse Gas Emissions: a) VIII. Hazards and Hazardous Material IX. Hydrology and Water Quality: b), e) X. Land Use and Planning XI. Mineral Resources XII. Noise XIII. Population and Housing XIV. Public Services XV. Recreation XVI. Transportation/Traffic XVII. Utilities and Service Systems XVIII. Mandatory Findings of Significance: a)	References and resources used to determine the level of impact should be cited in the discussions and included in a reference section used for the environmental checklist. While references and resources are important for each of the resources listed they are most important for those resources where a determination of "Potentially Significant" or "Less Than Significant with Mitigation" has been made. These references and resources should be used to identify the level of significance and to determine appropriate and feasible mitigation. Furthermore, they should provide the basis for making a determination whether the impact will remain significant after mitigation occurs that would require specific overriding considerations by the approving body. Additionally, even though the SED has identified that mitigation would be the responsibility of others, this does not obviate the requirement for the Checklist to identify the appropriate mitigation necessary to reduce significant impacts to a level of less than significance.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
43	Attachment 3 Environmental Analysis and Checklist	3-17	I. Aesthetics: a) c)	These two evaluations identify one reference, the City of San Diego General Plan, to determine that Mira Mesa is a Public Vantage Point for the Los Peñasquitos Canyon. The discussion also identifies LP Lagoon as a scenic resource but there is no specific reference as to why this is included. Are scenic resources in the watershed limited to these two areas? The main purpose of this section should focus on whether or not implementation of the project will have any direct/indirect impact on the identified Aesthetic resources. Aesthetic impacts from the project itself should be considered in section c). The two mitigation measures that are referenced in this section, screening and undergrounding, do not appear to be feasible when considering the list of Potential Compliance Methods listed in Section 4. Mitigation provided should have the ability to mitigate impacts associated with these types of compliance methods. Finally, consideration should be given to existing protections that would preclude the placing of structural BMPs within existing aesthetic resource areas. Staff should review these existing protections: the City of San Diego General Plan and MSCP and include specific discussion how these could reduce impacts.
44	Attachment 3 Environmental Analysis and Checklist	3-17	I. Aesthetics: b)	There are four state highways that occur in the project area, Interstate 5, Interstate 805, Interstate 15 and State Route 56. Please reference the resources used to determine that these four highways are not considered "scenic".
45	Attachment 3 Environmental Analysis and Checklist	3-19	II. Agricultural And Forest Resources a) through e)	The Checklist includes specific references that could be used to determine whether the project will have an impact on these resources. It does not appear that any of these resources were utilized to assess the level of impact.
46	Attachment 3 Environmental Analysis and Checklist	3-20	III. Air Quality	The level of impact should not be determined simply because the SDAPCP states the County of San Diego is not compliant. There needs to be additional determination as to whether impacts associated with implementing BMP's structural and non-structural will conflict or obstruct implementation of the plan. What is the connection between non structural BMPs and increased traffic? Would this traffic be in addition to planned traffic levels within the watershed? Would implementation of structural BMPs or other types of BMPs have a similar affect on traffic?
47	Attachment 3 Environmental Analysis and Checklist	3-21	III. Air Quality b), c), d)	Please cite specific reasons why these are considered as potentially significant. Also, if these are potentially significant, what mechanisms does the SDAPCP require to reduce the impacts to acceptable levels?

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
48	Attachment 3 Environmental Analysis and Checklist	3-22	IV. Biological Resources	Please cite the references used to determine the presence of habitat for and/or presence of Special Status Species found in the watershed. What thresholds were used to determine level of significance of the actions proposed? This section seems to shift focus from BMP impact analysis to the Basin Plan Amendment. Specific impacts to resources would occur at the BMP implementation portion of the project versus the Basin Plan Amendment portion. Discussions should be modified to reflect that the Water Board has considered the whole of the action involved in the project.
49	Attachment 3 Environmental Analysis and Checklist	3-22	IV. Biological Resources	a) The finding is that the project impact is potentially significant; however, the discussion indicates that all of the local, state, and federal agencies involved with species and habitat protection would need to review and approve (or deny) any project that could impact sensitive species. In all cases, projects would be denied if impacts remained significant after mitigation. Discussion should list potential mitigation required from these agencies and should include a discussion of the local MSCP. This program provides “take” authorization for the 85 species covered by the program.
50	Attachment 3 Environmental Analysis and Checklist	3-22	IV. Biological Resources	The discussion under Biological Resources states that the Regional Board would have authority to review and approve any project that impacts waters of the state including habitat and species associated with these projects. Therefore, since the Regional Board has this regulatory authority, specific mitigation required by the Regional Board should be identified here. Furthermore, there needs to be a clear finding regarding the level of impact after implementation of these mitigation measures.
51	Attachment 3 Environmental Analysis and Checklist	3-22	IV. Biological Resources	e) No level of significance is identified.
52	Attachment 3 Environmental Analysis and Checklist	3-22	IV. Biological Resources	f) This section has two impact levels listed. In the discussion on page 3-25, the Regional Board “asserts” that agencies listed would require effective mitigation as appropriate. If this is the case, the Regional Board should identify the specific mitigation that would reduce impacts. Also, if this is a factual conclusion, it would appear that the finding should be “Less than significant with mitigation”.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
53	Attachment 3 Environmental Analysis and Checklist	3-25	V. Cultural Resources	This section indicates that there is a "less than significant impact" to all cultural, historical and/or paleontological resources in the watershed as a result of this project. However, it also states that each of these resources are reasonably expected to occur in the watershed and that earth moving may, in fact, impact each of these resources. Neither the EA nor the Checklist provides adequate information upon which to make this finding. Any impact to these resources would require mitigation either through complete avoidance, grading monitoring, data recovery, and/or curation.
54	Attachment 3 Environmental Analysis and Checklist	3-26	VI. Geology and Soils b), c)	It is not clear what resources were used to make the determination regarding the level of significance related to these resources. Were highly erosive soils or unstable geologic units or soils identified in the watershed?
55	Attachment 3 Environmental Analysis and Checklist	3-29	VII. Greenhouse Gas Emissions a)	Staff should review pertinent sections of CEQA to determine the appropriate level of impact and potential mitigation for Greenhouse Gas Emissions as a result of the project. Specific sections of CEQA that provide guidance are: § 21083.05, § 21097, § 21155, §15064(h)(3), §15064.4, §15125(d), §15126.4(c), §15130 (B)(d), §15150 (e)(4), §15183(g)(8), §15183.5, §15364.5
56	Attachment 3 Environmental Analysis and Checklist	3-30	VIII. Hazards and Hazardous Materials e), f)	While the statement that there are no airports (public or private) within the watershed is accurate, it should be noted that the watershed is in the Airport influence zone of the Miramar Military Airport. It should also be noted that there are several private heliports in the watershed.
57	Attachment 3 Environmental Analysis and Checklist	3-34	X. Land Use Planning	This section seems to focus on the Basin Plan amendment, which does not include all of the subsequent implementation actions. Staff should analyze the different compliance measures and determine the level of impact. There are at least 3 cities and the County of San Diego that have General Plans, Zoning Ordinances, regulations and Habitat Conservation Plans that should be referenced when making the determinations in this section.
58	Attachment 3 Environmental Analysis and Checklist	3-35	XI. Mineral Resources	No references are cited. Are there any known valuable mineral resources in the watershed? What effect would implementation of this TMDL have on the ability to mine those resources? The land use in the watershed includes the mining of sand and rock. At a minimum, this section should recognize that the use exists and that the sediment TMDL might have an impact on these operations.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
59	Attachment 3 Environmental Analysis and Checklist	3-35	XII. Noise	As noted above, there is no discussion regarding resources used to determine the level of significance. Furthermore, if there are regulations and other mitigation available for impacts considered to be significant, they should be listed, regardless of whether another agency has the responsibility to implement.
60	Attachment 3 Environmental Analysis and Checklist	3-37	XIII. Population and Housing	The discussion for b) and c) should be expanded to explain why some housing may need to be displaced to install BMPs and why this would not result in displacement of a substantial number of people or create the need for replacement housing.
61	Attachment 3 Environmental Analysis and Checklist	3-39	XVI. Transportation/Traffic	a) Should reevaluate what the question is asking. b) Reference included is the county congestion management agency, who exactly are you referring to? d) Would the project substantially increase the number of large slow construction vehicles on local streets?
62	Attachment 3 Environmental Analysis and Checklist	3-40	XVII. Utilities and Service Systems	As stated in many of the previous sections, if these impacts are considered significant, specific mitigation needs to be listed that addresses the impact regardless of the agency responsible for carrying out the mitigation.
63	Attachment 3 Environmental Analysis and Checklist	3-41	XVIII. Mandatory Findings of Significance	a) The discussion in this section is not consistent with the finding of "Potentially Significant". This section should not be treated lightly as it is the basis for determining whether or not an EIR, Mitigated ND, or ND would be required. Based on these findings, it should be expected that the SED would provide the review and analysis that would normally be found in an EIR, including resource specific technical reports to identify resources and to detail the impacts and to provide specific mitigation for any significant direct and indirect impacts.
64	Attachment 3 Environmental Analysis and Checklist	3-41	XVIII. Mandatory Findings of Significance	b) The discussion is not consistent with the finding of "less than significant impact". There has not been any Cumulative Impact Analysis for any of the affected resources listed in the Checklist. CEQA §15130 discusses the components of an adequate Cumulative Review. The SED should be revised to include such a discussion.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
65	Attachment 3 Environmental Analysis and Checklist	3-42	Section 6 Economic Factors	The section appears to contradict the responsibility of the Regional Board to prepare an economic analysis of its actions. The citations provided include Water Code §13241 and §13141 it is not clear that either of these sections of the water code apply to the whole of this project. However, CEQA §15124(c) requires the project description to include a general description of the project's technical, economic, and environmental characteristics. Other sections of CEQA that may apply include §15131 Economic and Social Effects, which provides guidance on what this may include. §15187 (d) The environmental analysis shall take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites.
66	Attachment 3 Environmental Analysis and Checklist	3-44	Section 6.2 TMDL Implementation Costs	Sections references bacteria reduction. Section should be revised as appropriate to evaluate sediment/runoff reduction.
67	Attachment 3 Environmental Analysis and Checklist	3-44	Section 6.3 Cost Estimates of Typical Controls for Urban Runoff Discharges	Discussions are mostly limited to initial costs for construction of a typical BMP. Other cost factors that should be considered would be the overall cost, the cost of acquiring land, environmental review required for specific projects, the cost involved with the operation and maintenance of BMPs, and staffing required for the 10-20 year life of the TMDL.
68	Attachment 3 Environmental Analysis and Checklist	3-45	Stream and Lagoon Restoration	Delete discussions regarding the Wind River. It would be more appropriate to discuss projects that have occurred in Southern California.
69	Attachment 3 Environmental Analysis and Checklist	3-46	Sand Filters	Delete discussion. Sand Filters would not be considered as a reasonable or feasible BMP for the removal, reduction or treatment of sediment.
70	Attachment 3 Environmental Analysis and Checklist	3-47	Section 7 Reasonable Alternatives to the Proposed Activities	Introductory paragraph cites the Bacteria TMDL. Revise as necessary for Sediment.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
71	Attachment 3 Environmental Analysis and Checklist	3-47	Section 7 Reasonable Alternatives to the Proposed Activities	CEQA §21002 states that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects, and that the procedures required by this division are intended to assist public agencies in systematically identifying both the significant effects of proposed projects and the feasible alternatives or feasible mitigation measures which will avoid or substantially lessen such significant effects. The project description should be the factual basis for determining a reasonable range of alternatives. Feasible alternatives should at least meet some of the goals and objects of the project and or reduce some or all of the significant impacts associated with the projects. Section 7.4 of the EA states "the previous three alternatives … are not expected to attain the basic objective of the project". This statement attests to the lack of a reasonable range of alternatives.
72	Attachment 3 Environmental Analysis and Checklist	3-49	Section 8.1 Statement of Overriding Considerations	CEQA §15093 requires the decision-making agency to balance, as applicable, the economic, legal, social, technological, or other benefits, including region-wide or statewide environmental benefits, of a proposed project against its unavoidable environmental risks when determining whether to approve the project. If the specific economic, legal, social, technological, or other benefits, including region-wide or statewide environmental benefits, of a proposed project outweigh the unavoidable adverse environmental effects, the adverse environmental effects may be considered "acceptable." The EA should identify the specific impacts that cannot be mitigated or that will remain significant after mitigation. For each of these, there should be a statement that identifies the economic, legal social… benefits that outweigh the unavoidable environmental risks.

#	Document	Page(s)	Excerpt/Topic	Comments/Proposed Changes
73	Attachment 3 Environmental Analysis and Checklist	3-51	Section 8.2 Findings	CEQA §15091 requires findings for each significant impact. According to the Checklist, there are significant impacts to 8 Resources (several of which have multiple findings of significance). Section 8.2 only covers 5. These findings must be based on substantial evidence in the record. Since there are relatively few resources provided upon which to substantiate the conclusions reached in the Checklist, it cannot be shown that findings were based on substantial evidence in the record. Findings that such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding are not adequate. The EA does not provide any discussion of what mitigation is available or could be implemented by that agency; therefore, these conclusions are not supported by evidence in the record. Since there is a Statement of Overriding Consideration provided in Section 8.1, findings pursuant to 15091(a)(c) need to be included here.

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May 23, 2011

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The California Department of Transportation (Caltrans) appreciates the opportunity to comment on the proposed amendment to the Water Quality Control Plan for the San Diego Region (Basin Plan) to incorporate a Total Maximum Daily Load (TMDL) for Sediment in the Los Peñasquitos Lagoon. Caltrans supports the Regional Board's efforts to protect human health and achieve the highest standard of water quality possible. The Caltrans statewide National Pollutant Discharge Elimination System (NPDES) permit is currently going through the process of being renewed (Tentative Order No. 2011-XX-DWQ; NPDES No. CAS000003). The Tentative Order and the State Construction General Permit (CGP) are the mechanisms for Caltrans to implement consistent sediment controls statewide. Caltrans has a stringent program in place to control sediment and to comply with the permit requirements. Caltrans has reviewed the TMDL and Basin Plan Amendment (BPA) and has concerns in the following areas.

1. TMDL Project Objective and Waterbody Goal

Beginning on page A-2 of the TMDL Resolution, three steps are described that are envisioned by the Regional Board to completely restore the Los Peñasquitos Lagoon. The TMDL documents released by the Regional Board focus on Step 1 of the waterbody goal for restoring the Los Peñasquitos Lagoon. This step is to attain the water quality objective for sediment in the Lagoon and the analysis included in this TMDL focuses on the impacts of sediment loads.

The current version of the TMDL requires the responsible parties to develop and submit either a Sediment Load Reduction Plan (SLRP) for sediment or a Comprehensive Load Reductions Plan (CLRP) for all pollutants causing impairment to the Lagoon. The plan must be submitted within 18 months of the effective date of the TMDL. The TMDL does not include the necessary analysis to understand the impacts of the other pollutants of concern that would play a critical role in the development of the CLRP. These include the evaluation of sources and the linkage analysis to evaluate how the discharges from these sources impact the water body.

Without these elements, the development of the CLRP to ensure the final goals of attainment of all water quality objectives, protection of beneficial uses, and restoration of the Lagoon to a functional healthy estuarine ecosystem may be difficult. All requirements in the TMDL under the SLRP option should specifically address sediment, as this is the only pollutant that the Regional Board has evaluated for this TMDL. If the necessary analyses are made available to understand the impacts of the other pollutants of concern, then these elements could be incorporated into a comprehensive plan at that time.

Caltrans requests that the TMDL allow stakeholders the option to submit an SLRP to meet the initial TMDL deadlines, and, if the necessary analyses are made available to understand the impacts of the other pollutants of concern, then the responsible parties should be allowed the option to transition from the SLRP to a CLRP.

2. ***Individual or Group Compliance***

The TMDL Resolution places collective responsibility for compliance with the TMDL on all of the named responsible parties. The TMDL also requires the Phase I MS4 owners and Caltrans to "jointly prepare and submit" the SLRP or CLRP to the Regional Board (page A-10). Caltrans impervious facilities in the watershed account for less than one percent of the total watershed area.

Caltrans specifically requests that the Resolution allow Caltrans the option to act individually to comply with the TMDL and develop and submit TMDL deliverables or to act collectively with the other stormwater permittees.

3. ***Required Lagoon Monitoring and Restoration***

The TMDL Resolution requires that the named responsible parties conduct Lagoon monitoring. Lagoon monitoring is beyond the scope of the TMDL. During the meeting that was held on February 3, 2010, Regional Board staff informed the responsible parties that this would not be a requirement of the TMDL. Page A-18 of Attachment A to the TMDL resolution states "The specific purpose of the Lagoon monitoring results will be to serve as a "trigger" to indicate the need for, and timing of, further follow-up regulatory actions by the San Diego Water Board and further restorative actions by the responsible parties." This statement as well as this section implies that any monitoring conducted would determine the need for additional requirements outside the scope of this sediment TMDL. All requirements in this TMDL under the SLRP option should specifically address sediment, since the necessary analyses have not been performed to understand the impacts of other pollutants of concern. Any restorative actions outside of this TMDL would require separate analyses and compliance and should be clearly described in the TMDL Resolution.

Caltrans requests that the TMDL requirement for Lagoon monitoring be removed. In addition, Caltrans requests that the TMDL language include a clear description of any actions that would be required as a result of either the SLRP or CLRP monitoring approach. Any actions taken should also include a clear and quantifiable link toward compliance with the waste load allocations (WLAs).

4. ***Comparison of Historic Conditions***

Page A-11 of Attachment A to the TMDL resolution requires that the responsible parties include in the SLRP "Data sufficient to complete the side-by-side comparison of historic conditions (early 1970s) and current conditions (2000-current) to inform the lines of evidence necessary to determine compliance." Due to the limited information available about conditions in the early 1970s, any comparison to historic conditions would likely need to be performed using the watershed and lake models developed for this TMDL. However, we have serious concerns with the accuracy of the model:

a) The deposition and resuspension from bed sediments does not appear to have been evaluated by the model. This limits the ability to evaluate and account for the interaction between watershed-associated sediments and salt-pan silts in the Lagoon.

b) The modeled volumes and flows were higher in general than those observed in the watershed (as shown in Table 14 and Figure 30 of the modeling report). This concern was corroborated by Dr. Kirk Barrett in his peer review comments (comment no. 9 from Peer Review Comments and Responses, dated April 22, 2011).

c) The average difference between the modeled and measured event mean concentrations (EMCs) are significant. These are reported for CC, LPC, and CCC, to be 83%, 51%, and 65%, respectively. In addition, the modeled event mean concentrations (with the exception of one) that are shown in figure 36 of the modeling report are higher than observed concentrations. Our concern was also corroborated by Dr. Kirk Barrett (comment no. 10 from Peer Review Comments and Responses, dated April 22, 2011).

In addition, Dr. Rockwell Geyer expressed significant concerns with the model results and the exclusion of important data from the TMDL documents in the peer review comment letter. The commenter notes that "the TMDL that comes out of this study should be viewed as provisional, and it should be revised as the data allows a more accurate assessment of the actual loading rate and its impact on the receiving waters" (from Peer Review Comments and Responses, dated April 22, 2011). This statement causes serious concern, and additional evaluation of the model is necessary. The Regional Board staff often cites limited time as the reason that additional verification for model and TMDL WLA assumptions was not included in the TMDL documents. This is not a satisfactory response, as it is critical to the responsible parties that the TMDL be as accurate as possible. Otherwise funds could be spent on actions that may not be effective or could even be counterproductive. Although Caltrans supports the incorporation of an adaptive management approach into the TMDL, this does not provide a satisfactory response to address our concerns.

The WLAs are based on the model sediment load estimates for 1972. However, the watershed model hydrology was calibrated for 1993 to 2008. There is a twenty year gap between the period that the model was calibrated for and the period for which the WLAs were estimated. There is no validation described in the TMDL modeling report that proves that the model load estimates are accurate for 1972.

Caltrans requests that, if the model is to be used to estimate the WLAs or required to perform the side-by-side comparison, the model should undergo a full review and these concerns must be addressed. Additional support should then be provided to demonstrate the accuracy of the model. Alternatively, the Regional Board could consider development of other methods to be used by the responsible parties.

5. ***Scheduled Continuous Budget and Funding Efforts***

Part D of the SLRP Requirements in Attachment A to the TMDL Resolution requires that the responsible parties secure "budget and funding for BMP staffing and equipment" early and until the sediment TMDL is met (page A-11). Furthermore, it states that "the SLRP should include a schedule for staff time, including position and job description, authorized for securing funding for non-structural BMP implementation and maintenance. " Due to the current California state budget deficit, Caltrans is facing a lack of resources to address the TMDL outside of the funding allocated to applicable highway projects, and Caltrans does not have the authority to impose user or utility fees to pay for the TMDL implementation.

Caltrans requests that this requirement be removed from the TMDL and that language be added to allow for flexibility in implementation during times of funding challenges.

6. ***Implement Load Reduction Plan***

The TMDL Resolution requires that the SLRP or CLRP "must be implemented immediately upon receipt of Water Board comments and recommendation, but in any event, no later than 60 days after submittal to the San Diego Water Board". The responsible parties to the TMDL would likely need time to adjust to any significant comments or recommendations from the Regional Board. This requirement does not allow any time for this.

Caltrans requests revising to allow the responsible parties to have 90 days after the receipt of comments and recommendations from the Regional Board to implement the plan.

7. ***Special Study***

Page A-19 of Attachment A to the TMDL resolution, states

> "Because sediment is not the only stressor to Lagoon health, and this TMDL is likely only a first step toward achieving the Three-Step Waterbody Goal, the responsible parties are required to quantify the magnitude and extent of impacts caused by all stressors to Lagoon health."

In addition, Attachment A states

> "The study should be developed in coordination with other monitoring programs. Any monitoring program developed as part of this study must include the same elements identified in Compliance Monitoring."

This special study requirement requires monitoring of all stressors (water quality objectives) on the Lagoon. The SLRP option in the TMDL should only require assessment of the impacts to the Lagoon due to sediment, not all water quality objectives.

Caltrans requests that the requirement to evaluate the impacts to the Lagoon of other pollutants be removed from this TMDL.

We hope these comments are helpful. If you have any questions or concerns, please contact Keith Jones at (916) 653-4947.

Joyce Brenner for Scott McGowen

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DEPARTMENT OF PARKS AND RECREATION
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May 23, 2011

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RE: Basin Plan Amendment to Incorporate Sediment Total Maximum Daily Load for Los Peñasquitos Lagoon

Dear Ms. Henning,

Thank you for the opportunity to comment on the Draft Staff Report (March 3, 2011) regarding the Basin Plan Amendment to Incorporate Sediment Total Maximum Daily Load (TMDL) for Los Peñasquitos Lagoon. California State Parks (CSP) is the owner of most of the estuary as part of Torrey Pines State Natural Reserve (Reserve). CSP appreciates the work the Stakeholder Group and Regional Water Quality Control Board (Board) has expended in producing the TMDL and associated processes. Reducing the effects of hydromodification and associated sedimentation within and above the Los Peñasquitos estuary is a complex task. To date the TMDL's greatest accomplishment is that it has given the various stakeholders a process to begin making improvements to the estuary. CSP is anxious to further develop this partnership by implementing projects to improve the health and sustainability of the Los Peñasquitos estuary.

Several items within the Staff Report (and Technical Report) need to be corrected or further developed: misleading or unclear statements regarding losses to riparian habitat, clarification regarding the definitions of impaired and unimpaired with the respect to historical changes in vegetation communities, and a lack of specificity regarding monitoring parameters.

Throughout the document (for example, page 1, pp. 4; page 8, pp. 4; page 17, pp. 1; page 18, pp.1) there are references to "losses of riparian habitat" or "unimpaired" freshwater habitats. While there is much evidence showing losses to tidal and alkali habitats there is little evidence of losses to riparian or other freshwater habitats. Prior to urbanization of the watershed (circa 1972) there was very little freshwater or riparian vegetation within the Los Penasquitos estuary. Since then, much of the area that formerly supported saltmarsh, saltflat, and alkali marsh has been converted to freshwater habitats. These habitats support dense native vegetation and when compared to non-estuarine riparian systems and do not appear to be impaired. They are, however, a symptom of the impairment or destruction of the tidal and alkali habitats that preceded them. The tidal and alkali systems are rarer and of higher value in southern California than freshwater riparian wetlands and are a priority for habitat restoration within the estuary.

CSP support's the historic analysis approach to the sediment load modeling and the TMDL development, and is looking forward to the efforts to reduce the sediment deposition within the estuary to pre-urbanization levels. An important element of this effort is to monitor the reduction in sediment loads and to objectively assess the effects upon the estuarine habitats. This assessment should focus on measuring the accumulation of sediments within wetland habitats (particularly vegetated habitats, saltflat and mudflat), measuring the changes in the spatial extent of habitats, and measuring their species composition. The amount and velocity of freshwater flows (and potentially soil salinity) should also be carefully monitored to provide a control for the relative contribution of freshwater flows when sediment control measures are implemented.

The Los Peñasquitos Lagoon Foundation, State Coastal Conservancy, the Southwest Wetlands Interpretive Association, and CSP are currently working on an enhancement plan for the Los Peñasquitos estuary. Part of this process will include monitoring important environmental parameters including detailed habitat and sensitive species maps, and vegetation sampling). Additionally, this plan will develop a framework for enhancement projects to repair the estuary. This is an opportunity for the Stakeholders, Board, CSP, and others to consolidate a partnership to share resources and expertise to begin effecting large-scale improvement on the function and sustainability of the Los Peñasquitos estuary.

Thank you for the opportunity to comment on the *TMDL* Documents. Please feel free to contact Darren Smith (619-952-3895) for further discussion of our concerns.

Sincerely,

Darren Scott Smith

Darren Scott Smith, Natural Resources Program Manager, San Diego Coast District

Cc Clay Phillips, Acting San Diego Coast District Superintendent
William Mennell, District Specialist Manager
Brian Ketterer, North Sector Superintendent
Reading File

City of Del Mar

May 23, 2011
Via e-mail

Ms. Cathryn Henning, Water Resource Control Engineer
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

City of Del Mar Comments on Tentative Resolution No. R9-2011-0021, to Amend the Water Quality Control Plan for the San Diego Basin (9) to Incorporate the Total Maximum Daily Load for Sedimentation in Los Peñasquitos Lagoon

Dear Ms. Henning:

The City of Del Mar (City) appreciates the opportunity to provide comments on the Tentative Resolution No. R9-2011-0021 (Resolution) to amend the San Diego Basin Plan to incorporate the Total Maximum Daily Loads (TMDL) for Sedimentation in Los Peñasquitos Lagoon (Lagoon) being considered by the San Diego Regional Water Quality Control Board (Regional Board) on June 8, 2011. The City understands the importance of this TMDL, and is especially cognizant of the importance of water quality protections.

The City has participated in the two-year collaborative third party effort to develop the TMDL. At the request of the Regional Board, the City of San Diego led and funded the effort, with input from other Responsible Parties, and guidance from the Regional Board, US Environmental Protection Agency, and other stakeholders. The Responsible Parties (City of San Diego, County of San Diego, City of Poway, Caltrans, and the City of Del Mar) dedicated staff time to the development of the TMDL by preparing and reviewing documents and attending frequent meetings. However, the City has specific concerns about approaches taken in the proposed TMDL. As such, the City is submitting the following comments for consideration by the Regional Board and its staff. The strikethrough text represents recommended deletions and the underline text represents recommended additions.

1) The Los Peñasquitos Lagoon is designated as an impaired water body for sedimentation pursuant to Clean Water Act section 303(d); however, the Lagoon is not listed for any other pollutants at this time (303(d) list dated 1/27/2010). The objective of this TMDL is to attain the sediment water quality objective in the Los Peñasquitos Lagoon, not all of the potential pollutants and issues of the lagoon. The City believes that the "Restoring Los Peñasquitos Lagoon: Three Step Waterbody Goal" approach presented in this TMDL, goes beyond the scope of this sedimentation TMDL for the lagoon. For example, it is stated on page A-2 of the TMDL "Although a return to pristine conditions is not expected, a holistic watershed restoration effort is expected to eventually result in the attainment of all applicable water quality standards in Los Peñasquitos Lagoon as well as in each of its three tributary creeks". Furthermore, Step 3 Final Goal of this TMDL is to attain all water quality objectives and protect all beneficial uses – restore lagoon to functional healthy estuarine ecosystem.

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While the City agrees that attaining water quality objectives and protection of all beneficial uses is of great importance, the Sedimentation TMDL is not the appropriate mechanism to address all beneficial uses in the Lagoon.

Therefore, the City recommends that the language on page 5 of the Resolution Item 16 be revised to state the following:

> ***16. TMDL Project Objective*** ~~***and Waterbody Goal:***~~ *The objective of this TMDL project is to attain the sediment water quality objective in the Los Peñasquitos Lagoon.* ~~*This is considered an essential first step towards achievement of the ultimate waterbody goal. The final goal for the Los Peñasquitos Lagoon is full attainment of all water quality objectives, protection of all beneficial uses, and restoration to a functional healthy estuarine ecosystem.*~~

The City also recommends the following language changes on page A-2 of the Resolution:

> ***Restoring Los Peñasquitos Lagoon*** ~~***: Three Step Waterbody Goal***~~
>
> *Los Peñasquitos Lagoon is one of the few remaining and irreplaceable coastal lagoons in Southern California providing valuable estuarine habitat as well as numerous other important beneficial uses. Over the course of the 20th century, the lagoon has incurred a number of important anthropogenic disturbances which, cumulatively, have resulted in excessive sedimentation and the gradual degradation and loss of estuarine habitat.*
>
> *Restoration of the Lagoon is a high priority for the San Diego Water Board. Acknowledging the environmental and political complexities, as well as the time and financial resources needed to restore a coastal lagoon, the San Diego Water Board has established this Sediment TMDL for the Los Peñasquitos Lagoon as the first step in addressing the impairment and beneficial uses of the lagoon. The overall strategy is to reduce the current watershed sediment load to early 1970s watershed sediment load and determine if there is a response to the salt marsh habitat of the Lagoon.* ~~*a three-step Waterbody Goal for Los Peñasquitos Lagoon. Although a return to pristine conditions is not expected, a holistic watershed restoration effort is expected to eventually result in the attainment of all applicable water quality standards in Los Peñasquitos Lagoon as well as in each of its three tributary creeks.*~~ ~~***Accordingly, the Sediment TMDL for Los Peñasquitos Lagoon, see section {insert section #}, addresses Step 1, Intermediate-term Goal.***~~
>
> ~~***Step 1 Intermediate Goal:***~~
>
> ~~***Attain water quality objective for sediment in Los Peñasquitos Lagoon and address current Clean Water Act section 303(d) sediment impairment***~~
>
> > ~~Overall Strategy~~
> >
> > ~~Reduce current watershed sediment load to early 1970s watershed sediment load. Initiate long-term Lagoon monitoring to assess Lagoon's response to decreasing sediment loads and overall health.~~
> >
> > ~~Regulatory Action~~
> >
> > ~~Adopt and implement sediment TMDL~~
>
> ~~***Step 2 Long-term Goal***~~
>
> ~~***Stop degradation and loss of Los Peñasquitos Lagoon's salt marsh habitat. Restore to condition of early 1970s salt marsh in terms of extent and quality.***~~

~~Overall Strategy~~
~~To monitor, assess, and implement appropriate regulatory mechanism.~~
~~Regulatory Action~~
~~To be determined based on results of Lagoon monitoring.~~

~~***Step 3 Final Goal:***~~
~~***Attain all water quality objectives and protect all beneficial uses. Restore Lagoon to functional healthy estuarine ecosystem.***~~

~~Overall Strategy~~
~~To monitor, assess, and implement appropriate regulatory mechanism.~~
~~Regulatory Action~~
~~To be determined based on results of Lagoon monitoring.~~

~~Step 1:~~ Sediment Total Maximum Daily Load for Los Peñasquitos Lagoon

2) Required Lagoon Monitoring and Required Special Study on Lagoon Stressors
   a. The City does not believe the lagoon monitoring and special studies should be requirements in this Resolution. These would be more appropriately addressed by the Responsible Parties in the Load Reduction Plan.

   b. The Adaptive Management Schedule has inappropriate timing and should not be included. As stated on page A-18 of the TMDL, "The Long-Term Lagoon monitoring is required to measure and assess the Lagoon's response to the sediment load reductions required under this TMDL over time. The specific purpose of the Lagoon monitoring results will be to serve as a 'trigger' to indicate the need for, and timing of, further follow-up regulatory actions by the San Diego Water Board and further restorative actions by the responsible parties".

   The Adaptive Management Schedule included for this special study has prescribed management decisions triggered as a result of the Special Studies on Lagoon Stressors within a six-year timeframe. If the TMDL has a Comprehensive Load Reduction Plan, the responsible parties are required to meet a 20% reduction within five-years. However, Waterbody Goals 2 and 3 have the potential to be required as a result of the Special Study within six years. The timeline does not provide the responsible parties the opportunity to meet the TMDL compliance timelines prior to significant activities being required by the TMDL.

   The City requests that the Required Special Studies and Adaptive Management Schedule included on pages A-18 and A-19 of this TMDL be removed, and the following language be inserted on page A-10 under "Develop and Submit a Load Reduction Plan" after the second paragraph:

   "The responsible parties need to develop special studies including a monitoring program to measure and assess the Lagoon's response to the sediment load reductions over time as part of their Load Reduction Plans."

3) The City also requests that the following language from Resolution No. R9-2010-0001 (Bacteria TMDL) be added to this TMDL on page A-9 after the third full paragraph under the "Responsible Parties Identification" heading:
"The municipal MS4s may demonstrate that their discharges are not causing the exceedances in lagoon by providing data from their discharge points to the lagoon, by providing data collected at jurisdictional boundaries, and/or by using other methods accepted by the San Diego Water Board".

4) Additionally, the City requests that the following language similar to Resolution No. R9-2010-0001 (Bacteria TMDL) be included in this TMDL on page A-17 in the Adaptive Management Section:
"As the implementation of these TMDLs progress, the San Diego Water Board recognized that revisions to the Basin Plan may be necessary in the future. The San Diego Water Board will initiate a Basin Plan amendment project to revise the requirements and/or provisions for implementing these TMDLs within 8 years from the effective date of this Basin Plan amendment or earlier if all of the following conditions are met:
   - *Sufficient data are collected to provide the basis for the Basin Plan amendment.*
   - *A report is submitted to the San Diego Water Board documenting the findings from the collected data*
   - *A request is submitted to the San Diego Water Board with specific revisions proposed to the Basin Plan, and the documentation supporting such revisions.*

   The San Diego Water Board will work with project proponents to ensure that the data and documentation will be adequate for the initiation of the Basin Plan amendment. The San Diego Water Board will be responsible for taking the Basin Plan amendment project through the administrative and regulatory process for adoption by the San Diego Water Board, and approval by the State Water Board, OAL, and USEPA.

   If no Basin Plan amendment has been initiated within 8 years of the effective date of this TMDL Basin Plan Amendment, and the Executive Officer determines, with Regional Board concurrence, that insufficient data exist to support the initiation of a Basin Plan amendment, a subsequent Basin Plan amendment to revise the requirements and/or provisions for the implementation of these TMDLs, will not be initiated until the Executive Officer determines the conditions specified above are met."

5) SLRP and CLRP Requirements – The City requests that the requirements are revised to match the language in Resolution No. R9-2010-0001, Bacteria TMDL. The Bacteria TMDL lists recommended SLRP and CLRP components rather than explicitly requiring them. This requested change is important for consistency amongst potential CLRP documents. Additionally, Load Reduction Plan requirements call for scheduled Best Management Plan (BMP) implementation with a construction schedule, adjustments to staff scheduling and resources. As a governmental agency, our resources and staffing are based upon City Council approval. Only tentative schedules can be developed for such long-term plans as the CLRP.

The City recommends the following changes to the SLRP and CLRP requirements:

a. Page A-10:
SLRP Recommended Components ~~Requirements~~
The SLRP ~~shall~~ should contain~~, at a minimum~~ the following components:

b. Page A-12:
CLRP Recommended Components ~~Requirements~~
The CLRP should ~~shall~~ contain~~, at a minimum,~~ the following components:

6) The City requests the following changes be made to the TMDL:

a. Page A-13, under the "Implement Load Reduction Plan" heading:
"The SLRP or CLRP must be implemented immediately upon receipt of Water Board ~~comments and recommendation~~ comments, recommendation and supporting justification for any recommended program/activity changes, but in any event, no later than 60 days after submittal to the San Diego Water Board".

b. Page A-15 under the "Weight of Evidence Approach" heading:
"Each line of evidence must establish the early 1970s or equivalent condition derived as applicable and the existing condition in the SLRP and CLRP, such that progress can be quantified as a percent. In addition, all lines of evidence must be weighted".

c. Page 5 – Item 15:
"Final compliance with this TMDL must be achieved, as soon as possible, but no later than ten years if the SLRP is chosen or 20 years if the CLRP is chosen from the effective date of the Basin Plan Amendment".

7) The City requests that Section 4.1, Reasonably Foreseeable Methods of Compliance at Specific Sites, of Attachment 3, Environmental Analysis and Checklist, be revised. This section is addressing bacteria rather than sediment.

If you should have any questions regarding these comments please contact me directly at (619) 994-7074, or by email at cleanwater@delmar.ca.us.

Sincerely,

Mikhail Ogawa
Clean Water Manager
City of Del Mar

KB:MO

0 Attachment(s)
cc:
File

CITY OF POWAY

May 23, 2011

Electronic Delivery to: chenning@waterboards.ca.gov

Cathryn Henning, Water Resource Control Engineer
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, California 92123

Subject: Comments on Tentative Resolution No. R9-2011-0021, to Amend the Water Quality Control Plan for the San Diego Basin (9) to Incorporate the Total Maximum Daily Load for Sedimentation in Los Peñasquitos Lagoon

Dear Ms. Henning:

The City of Poway would like to thank the San Diego Regional Water Quality Control Board (Regional Board) for the opportunity to comment on the Tentative Resolution No. R9-2011-0021 (Resolution) to amend the San Diego Basin Plan to incorporate the Total Maximum Daily Load (TMDL) for Sedimentation in Los Peñasquitos Lagoon (Lagoon).

During the past two years, the City of Poway has been an active participant in the third party development of the TMDL. The City and Responsible Parties spent countless hours working closely with the Regional Board and other stakeholders to develop this TMDL. Numerous options and various perspectives were discussed by all parties regarding the development of the TMDL. It was a collaborative effort up until the tentative resolution was released to the Public for review. Significant changes were observed and directives to measure and address additional items other than sediment loading have been made. The Regional Board gave direction to the City of Poway and other Responsible Parties to concentrate on sediment and not surrogate measures in the Lagoon.

The City of Poway is concerned that the directive goes above and beyond a sedimentation TMDL. In addition to addressing sedimentation, the TMDL is requiring other potential pollutants to be addressed as part of the proposed second and third step waterbody goal.

Furthermore, introduction of a second and third step water body goal is a new concept to the Responsible Parties. This is the first time this information has been presented to the City of Poway and other Responsible Parties. It is not very clear how these steps/goals tie into the compliance schedule.

Moreover, prescriptive language requiring special study on lagoon stressors in the resolution should be left to the dischargers to develop as part of their load reduction plans.

Lastly, the load reduction plan requirements included BMP implementation schedules, staffing and resources. These requirements should not be a requirement of the Load Reduction Plan as municipalities such as Poway cannot easily provide this information without council approval.

The City appreciates the opportunity to provide general comments on the Tentative Resolution. It is our understanding that additional comments will be accepted up until the public hearing on June 8, 2011. Again, the City would like to request that the TMDL is focused on sediment only and not all of the potential pollutants of the lagoon. Should you have any questions, please feel free to contact me at (858) 668-4653.

Sincerely,

Malik Tamimi

Malik Tamimi
Stormwater Program Administrator

cc: Bob Manis, Director of Development Services
Steve Crosby, City Engineer
File

June 13, 2012
Item No. 12
Supporting Document No. 3

Commenter ID 9

May 23, 2011

Cathryn Henning
Water Resource Control Engineer
Monitoring, Assessment & Research Unit
San Diego Water Board
9174 Sky Park Ct #100
San Diego, CA 92123-4353

Subject: Comment Letter – Draft Sediment TMDL for Los Peñasquitos Lagoon

Dear Ms. Henning,

On behalf of the Los Peñasquitos Lagoon Foundation, I am submitting my comments regarding the proposed Sediment TMDL for Los Peñasquitos Lagoon (LPL). Overall, I believe the TMDL was presented in fair and logical way to achieve both compliance with the Clean Water Act and protection of the lagoon's beneficial uses. However, given the last minute changes to the approach for achieving compliance and protection, the date for TMDL adoption by the State Water Board should be delayed to allow the discharges adequate time to submit comments and have these comments adequately addressed by Water Board staff. With that being said, I am also aware that this delay will most likely not be granted before the June date set for this decision as the State must comply with federal timelines for certifying and implementing TMDLs. Below are my comments related to the documents circulated for review.

1. **The Sediment TMDL for LPL and pending amendment to the Basin Plan needs to include focus on bed load sediment, the processes that affect it (e.g. sediment transport) and it's contribution to impacts related to sedimentation both in and around lagoon channels, as well as associated lagoon uplands.**
    a. The water quality objective for sediment in the Basin Plan states, "The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses." This water quality objective should also reference bed load sediment, as "suspended sediment load" tends to focus only on silts and clays. Bed load sediment can, at times of elevated sediment transport, produce more significant impacts to the lagoon's beneficial uses by burying habitat and/or raising elevations within the lagoon and the lagoon/watershed interface. Even

slight changes in elevation in coastal salt marshes can have significant impacts as it can dramatically reduce exposure to or negate tidal mixing, especially in the eastern portion of the lagoon.

b. Bed load sediment needs to be monitored in order to calibrate the watershed model. According to State Water Board staff responses to peer review, the LSPC watershed model does account for bed load sediment and its transport based on established algorithms inherent in the model. However, there has not been adequate monitoring of bed load transport or downstream accretion of bed load sediment to calibrate the model. Give the discrepancies between modeled and observed results in the model for other factors (e.g. TSS, water levels) it can only be assumed that such discrepancies would exist for the modeled results for bed load sediment. Perhaps a solution would be to include both survey transects and grain size analysis at select locations within the lagoon AND the lagoon/watershed interface, where much of this sediment is deposited as flow rates quickly decrease due to both “natural structures” (i.e. vegetation) and anthropogenic structures (e.g. railway berm). Surveys along lagoon channels should also be used to account for the inability for the lagoon model to account for bank erosion within lagoon channels, which occur after large storm events or series of events as witnessed over the last 10 years.

2. **Preservation of Biological Habitats of Special Significance (BIOL) should be elevated to the same status or higher than Estuarine (EST) with regard to prioritizing beneficial uses to be protected in LPL and the focus of the Sediment TMDL.** LPL is a dedicated Salt Marsh Preserve by the State of California with the staff report and associated literature citing the need to protect this vanishing habitat type. While the Estuarine beneficial use is an extremely important beneficial use afforded by LPL, it tends to ignore the fact that the lagoon has lost (and is still losing) coastal salt marsh habitat to conversion to brackish and riparian habitats. Unfortunately, all three of these habitat types fit under the definition of estuarine habitat resulting in the potential further loss of coastal salt marsh due to increases in brackish and riparian habitats in the lagoon and associated uplands, even with apparent TMDL compliance. Both brackish (e.g. cattails) and riparian (e.g. willows) vegetation types can act as temporary or permanent sediment sinks that could mask the true impacts of sedimentation on the beneficial uses of LPL as well as inaccurately display success in load reductions.

June 13, 2012
Item No. 12
Supporting Document No. 3

Commenter ID 9

a. Compliance/success criteria, as well as associated monitoring needs to focus on habitat type and conversion rates over time, as they related to sedimentation. This measure was presented by the State Water Board as a means to assess "weight of evidence" and should be used to show compliance to the TMDL and protection/future restoration of LPL's beneficial uses. Currently the Los Peñasquitos Lagoon Foundation plans on using this method in updating their lagoon enhancement plan, following a phased approach of protecting existing coastal salt marsh (short-term), restoring recently converted habitat back to coastal salt marsh (mid-term) and expanding coastal salt marsh to areas historically having this habitat type (long-term).

3. **Monitoring needs to account for more than TSS within the surface water and use precipitation rates from localized sources (not Lindbergh Field)**

   a. Total Suspended Solids does not accurately portray sedimentation trends and impacts within the watershed and lagoon, as it can be highly inaccurate (e.g. included organic matter within the sample) and does not measure bed load sediment.

   b. Topographical surveys should be included as a necessary component to water quality surveys in surface waters. Much of the indirect impacts to water quality are caused by sediment deposition in the lagoon/watershed interface. Unfortunately, the linkages between the two models does not seem to accurately describe what is occurring in this area, located mostly in the western reaches of the LSPC model.

   c. Precipitation levels within the watershed need to be accurate as this is a highly influential variable for determining sediment loading from the watershed. Precipitation during storm events in San Diego can vary widely by location with some nearby areas experiencing intense, prolonged rainfall while other nearby locations have little to no measurable precipitation. Therefore, weather stations within the watershed should be used rather than taking rainfall amounts from more established locations like Lindbergh Field.

4. **Monitoring should be conducted in conjunction with established monitoring programs in LPL.** Biological monitoring has been conducted for the past 26 years at LPL and channel surveys since 1995. This information should be used to assess

success of the sediment TMDL. Too often monitoring programs conducted by municipalities or agencies (e.g. Caltrans) do not capture the real processes occurring in the lagoon and watershed and consultants are given too short of a timeframe to collect data and extrapolate trends for these narrow data sets. Monitoring at LPL is currently being conducted by the Southwest Wetland Interpretive Association. This monitoring team, led by Dr. Jeff Crooks, is often consulted by both the State Water Board and the Southern California Coastal Water Research Project (SCCWRP) with regard to lagoon processes and impacts caused by urbanization at LPL and other coastal lagoons in Southern California. It is therefore, logical to consult Dr. Crooks with regards to any monitoring program created to characterize lagoon health and impacts from anthropogenic sources and structures.

5. **How will the monitoring programs include climate change variables?** The monitoring and modeling aspects of the TMDL should look at climate change as it affects both intensity and duration of storm events, instead of assuming the most significant sediment loading will occur during El Niño years. The recent storm events in late December 2010 that lead to, by some expert speculation, to a 100-year flood event occurred during a winter that was characterized as being a La Niña.

Thank you for all of your hard work in pushing the Sediment TMDL forward. LPLF looks forward to working with the State Water Board and all of the other stakeholders in the next phase of the process. If you have any questions, please contact me at (760) 271-0574.

Sincerely,

Mike Hastings

Mike Hastings, Executive Director
Los Peñasquitos Lagoon Foundation

California Construction and
Industrial Materials Association

Friday, May 20, 2011

Ms. Cathryn Henning
California Regional Water Quality Control Board,
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

Re: Comment Letter – Clarification Los Pensaquitos TMDL.

Dear Ms. Henning:

These comments are offered on behalf of the California Construction and Industrial Materials Association (CalCIMA). CalCIMA is a statewide trade association representing the construction aggregate, ready mix concrete and industrial minerals industries in California. Our members operate over 500 facilities statewide providing the raw materials to fuel California's infrastructure needs as well as the needs of the construction, manufacturing and industrial sectors. Several of our members are Industrial Stormwater Permit holders within the Los Penasquitos watershed. We appreciate this opportunity to comment on the proposed TMDL as well as the time your staff took to talk with us over our questions regarding the action.

We believe many of our questions were answered by staff as we had some initial confusion over the two versions of the tentative resolution on the Boards website. The draft that was set for peer review did not include industrial permit holders as responsible parties within the waste load allocation and was of concern to us as it seemed to preclude industrial permit holders from discharging. We appreciate the clarifications which were added to the tentative resolution in the 4-22-11 release version which clearly includes both construction and industrial permit holders as responsible parties under the overall waste load allocation. We believe it was important to recognize our members facilities were not precluded from discharging within the watershed.

In order to ensure we properly understand our obligations under the plan we are seeking clarification on a few issues. Under item 15 of the tentative resolution it notes that responsible parties are required to develop and implement a Sediment Load Reduction Plan (SLRP). Our review of the Implementation Plan indicates that this requirement was scheduled to apply as in Section 8.1.3;

> The Phase I MS4 owners (City of San Diego, City of Del Mar, City of Poway, and County of San Diego) and Caltrans are required to **jointly** prepare and submit for San Diego Water

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Board review, comment, and revision, a Sediment Load Reduction Plan (SLRP) that demonstrates how they will comply with the required wasteload reductions in this TMDL. If the Phase I MS4s and Caltrans choose to address impairments due to loads from multiple pollutants, in addition to sediment, then they will be required to jointly prepare and submit a Comprehensive Load Reduction Plan in lieu of a SLRP.

The implementation plan in the staff report seems to define the SLRP is a "joint" document while item 15 of the interim resolution could be read to require each responsible party to submit a SLRP. Likewise, page 5 notes "Industrial and construction storm water permittees will also be required to comply with existing requirements under their respective permits. In addition, Phase II MS4s and Construction and Industrial Storm Water Permit holders may be required to submit Sediment Load Reduction Plans outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDL in the Lagoon."

We would appreciate clarification of this issue. Is there one SLRP submitted jointly, one by the phase 1 MS4's and Caltrans with the possibility of permit holders and phase II MS4's also needing to submit one? We believe the intent is one overarching SLRP and would note that it is important that industrial permit holders be included as stakeholders in discussions of such a SLRP. We certainly are willing to work with the Board and the MS4's as such plans are developed to help ensure the accuracy and feasibility of considered actions and timeframes.

From our discussions we realize this action is the start of a multi year process where multiple components from monitoring to BMP development will occur to create a phased reduction towards meeting the assigned WLA. We recognize the importance of maintaining the beneficial uses of water of the Los Penasquitos Lagoon and want to be participants within those processes.

Respectfully,

Adam Harper
Director of Policy Analysis

INDUSTRIAL ENVIRONMENTAL ASSOCIATION
Leaders of Environmental Responsibility

June 8, 2011

Ms. Cathryn Henning
California Regional Water Quality Control Board,
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

Re: Tentative Resolution No. R9-2011-0021: A Resolution Amending the Water Quality Control Plan for the San Diego Basin (9) to Incorporate the Total Maximum Daily Load for Sedimentation in Los Peñasquitos Lagoon

Dear Chairman Destache and Board Members:

The Industrial Environmental Association is an organization representing manufacturing, technology and research and development companies throughout San Diego County. Thank you for the opportunity to comment on this draft Total Maximum Daily Load (TMDL) for Sedimentation in Los Peñasquitos Lagoon (the "Draft TMDL"). We believe the following issues need to be clarified in the Draft TMDL.

- **The term "Responsible Parties" is used with different meanings throughout the document and needs to be clarified:**

The term "Responsible Parties" is used throughout the document but is given different meanings in different sections, leading to confusion. This needs to be corrected.

Finding 11 (Responsible Parties Identification) on pg. 4 defines Responsible Parties as "…the owners and operators of the collective watershed sources" and includes the Phase I copermittees (cities of San Diego, Poway, Del Mar, and the County of San Diego), Phase II MS4 permittees, Caltrans, and the General Construction and General Industrial Storm Water Permittees.

In contrast, on pg. A-10 (Develop and Submit a Load Reduction Plan) it identifies a subset of the "Responsible Parties" (i.e., the Phase I MS4 owners and Caltrans) that are required to jointly prepare and submit the Sediment Load Reduction Plan (or "SLRP") to the Regional Board as opposed to all of the responsible parties.

Another distinction on the role of the various "Responsible Parties is made on pg. A-9 of Attachment A where it states it is the "…expectation and responsibility of the Phase I MS4 copermittees to assume the lead role in coordinating and carrying out the responsible party actions, compliance monitoring, and adaptive management required under this TMDL project".

Other references to "Responsible Parties" in the Appendix (e.g., SLRP Requirements, Compliance Monitoring, Compliance Determination, Weight of Evidence Approach, Required Lagoon Monitoring, Required Special Study on Lagoon Stressors, Adaptive Management Schedule) should clarify whether they are referring to all the "Responsible Parties" (Finding 11), the subset of "Responsible Parties" identified in pg. A-10 or the Phase I MS4 copermittees identified on pg. A-9. Most of these tasks appear to be more appropriately the responsibility of the Phase I MS4 copermittees, not the other "Responsible Parties", and this should be clarified in the Draft TMDL.

- **The Load Allocation for Construction Projects Subject to the SWRCB's Storm Water Construction General Permit (CGP) Should be Compliance with the CGP:**

Construction projects are dissimilar from facilities and operations with long-term discharges in that their discharges are intermittent and occur over relatively short durations. Additionally, construction projects typically do not have a baseline to which they can compare sediment loadings which means that assigning load reductions would be problematic. The assessment of overall load reductions (which would include construction projects) can be accomplished by the studies the MS4s conduct. Therefore, the Draft TMDL should specify that adherence to a SWPPP that meets the requirements of the CGP will be consistent with the approved TMDL.

- **The Draft TMDL Should Specify that the Phase I MS4 Copermittees Need to Provide the Draft Plans Required by the Draft TMDL to All Responsible Parties for Input:**

The proposed plans (e.g., SLRP) required by the Draft TMDL should be provided to all of the "Responsible Parties" for input and they should be allowed to participate in the development process of the plans.

Thank you for your consideration of our comments.

Sincerely,

Patti Krebs

Patti Krebs
Executive Director