California Environmental Protection Agency

Central Coast Regional Water Quality Control Board

Total Maximum Daily Loads for Nitrate, Dissolved Oxygen, Sodium, and Chloride in San Simeon Watershed in San Luis Obispo County, California

Draft Project Report

March, 2015

Adopted by the
Central Coast Regional Water Quality Control Board
Resolution No. R3-20xx-xxxx
on ______________, 2015

Approved by the
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on ________________, 2015

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Documents also are available at:
http://www.waterboards.ca.gov/centralcoast/water_issues/programs/tmdl/303d_and_tmdl_projects.shtml

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Stakeholders, including agencies, organizations, and individuals who have a special interest in the San Simeon Watershed

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AGR	Agricultural Supply
Basin Plan	Water Quality Control Plan for the Central Coastal Basin (June 2011)
BIOL	Preservation of Biological Habitats of Special Significance
CCAMP	Central Coast Ambient Monitoring Program
Cambria CSD	Cambria Community Services District
CFS	Cubic Feet Per Second
Cl	Chloride
CMP	Cooperative Monitoring Program
Cm	Centimeter
COLD	Cold Fresh Water Habitat
CWA	Clean Water Act
DO	Dissolved Oxygen
GIS	Geographic Information System
GPM	Gallons Per Minute
GPD	Gallons Per Day
GWR	Ground Water Recharge
MCLs	Maximum Contaminant Levels
MGD	Million Gallons Per Day
MRP	Monitoring and Reporting Program
MUN	Municipal and Domestic Supply
N	Nitrogen
Na	Sodium
NNE	Nutrient Numeric Endpoint
NO_3	Nitrate
NO_3 as NO_3	Nitrate as nitrate
NO_3 as N	Nitrate as nitrogen
OEHHA	California Office of Environmental Health Hazard Assessment
P	Phosphorus
PO_4	Orthophosphate
RARE	Rare, Threatened, or Endangered Species
REC-1	Water Contact Recreation
SPWN	Spawning, Reproduction, and/or Early Development
STEPL	USEPA Spreadsheet Tool for Estimating Pollutant Load
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
USEPA	United States Environmental Protection Agency
WARM	Warm Fresh Water Habitat
WDR	Waste Discharge Requirements
WILD	Wildlife Habitat
ºC	Degrees Centigrade
ºF	Degrees Fahrenheit
mg/L	Milligram per liter

µg/L	Micrograms per liter
310SSC	Lower San Simeon Creek CCAMP sampling station
310SSU	Upper San Simeon Creek CCAMP sampling station

EXECUTIVE SUMMARY

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for CWA Section 303(d) listed waterbodies. San Simeon Creek has been included on the CWA Section 303(d) list as impaired for nitrate (NO_3), dissolved oxygen (DO), sodium (Na), and chloride (Cl). This project addresses waterbody impairments due to nitrate, low dissolved oxygen, sodium, and chloride.

This TMDL report for San Simeon Creek evaluates total nitrogen (TN), nitrate, total phosphorus (TP), orthophosphate (PO_4), sodium, and chloride loading and assigns a TMDL for total nitrogen, total phosphorus, sodium, and chloride loading to San Simeon Creek in San Luis Obispo County. The causes of impairment for low dissolved oxygen levels (e.g. biostimulatory substances, total nitrogen and total phosphorus) are the result of complex physical and chemical relationships occurring in riparian and aquatic systems. Therefore, although there are numeric targets for dissolved oxygen, no load is assigned. By addressing the nutrient impairments, the low dissolved oxygen impairment will be rectified. Information for the San Simeon Creek TMDL for Nitrate, Dissolved Oxygen, Sodium, and Chloride is summarized below in Table 1.

Table 1 - Summary Information, San Simeon Creek TMDL for Nitrate, Dissolved Oxygen, Sodium, and Chloride

San Simeon TMDL For Nitrate, Dissolved Oxygen, Sodium, and Chloride – Summary Central Coast Regional Water Quality Control Board		
Waterbody Identification	San Simeon Creek Watershed	
Location	San Luis Obispo County, California Hydrologic Unit Code # 180600060404	
Area	20,571 acres	
TMDL Pollutants of Concern	Total Nitrogen, Nitrate, Total Phosphorus, Orthophosphate, Sodium, Chloride	
Pollutant Sources	Land application of treated wastewater through spray irrigation/percolation ponds adjacent to San Simeon Creek.	
Beneficial Uses Impaired	• Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply • Cold Fresh Water Habitat (COLD) - Uses of water that support cold water ecosystems • Warm Fresh Water Habitat (WARM) - Uses of water that support warm water ecosystems • Agricultural Supply (AGR)- Uses of water for farming, horticulture, or ranching • Spawning, Reproduction, and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.	
Numeric Targets	Receiving water column	Nitrate must not exceed 10 mg/L NO_3 as N (MUN)
		Total Nitrogen must not exceed 1.3 mg/L N during July through

<table>
<tr><td rowspan="8"></td><td rowspan="8"></td><td>December (NNE)</td></tr>
<tr><td>Total Phosphorus must not exceed 0.05 mg/L P during July through December (NNE)</td></tr>
<tr><td>Sodium must not exceed 69 mg/l Na (AGR)</td></tr>
<tr><td>Chloride must not exceed 106 mg/l Cl (AGR)</td></tr>
<tr><td>Dissolved oxygen must remain greater than or equal to 7.0 mg/L (COLD)</td></tr>
<tr><td>Dissolved oxygen Median must remain greater than 85% saturation (General objective)</td></tr>
<tr><td>Dissolved oxygen should not exceed 13 mg/L (CCAMP guideline)</td></tr>
<tr><td>Chlorophyll-a should not exceed 15 µg/L (CCAMP guideline)</td></tr>
<tr><td rowspan="3">Waste Load Allocations (receiving water column)</td><td>Cambria Community Services District National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges with Low Threat to Water Quality (NPDES Order No. R3-2011-0223)</td><td rowspan="3">Total Nitrogen ≤ 1.3 mg/L as N
Seasonal July through December

Total Phosphorus ≤ 0.05 mg/L P
Seasonal July through December

Nitrate 10 mg/L as N
All Year

Sodium ≤ 69 mg/l Na
All Year

Chloride: ≤ 106 mg/l Cl
All Year</td></tr>
<tr><td>Industrial stormwater general permit (storm drain discharges from industrial facilities)
NPDES No. CAS000001</td></tr>
<tr><td>Construction stormwater general permit (storm drain discharges from construction operations)
NPDES No. CAS000002</td></tr>
<tr><td rowspan="3">Load Allocations (receiving water column)</td><td>Cambria Community Services District (Wastewater discharges to percolation ponds)
WDR No. 01-100</td><td rowspan="3">Total Nitrogen ≤ 1.3 mg/L as N
Seasonal July through December

Total Phosphorus ≤ 0.05 mg/L P
Seasonal July through December

Nitrate 10 mg/L as N
All Year

Sodium ≤ 69 mg/l Na
All Year</td></tr>
<tr><td>Owners/operators of irrigated agricultural lands (Discharges from irrigated lands)</td></tr>
<tr><td>Owners/operators of land used for/containing domestic animals/livestock</td></tr>
</table>

	No responsible party (Natural sources)	Chloride: $\leq$ 106 mg/l Cl All Year
Implementation Strategy (Proposed Actions to Correct CWA Section 303(d) -Listed Impairments):	Revise WDR Order No. 01-100 and replace NPDES Order No. R3-2011-0223 for Cambria Community Services District, San Luis Obispo County	

Total Maximum Daily Load
This TMDL report presents a TMDL to address impairment due to nitrate, dissolved oxygen (DO), sodium (Na), and chloride (Cl) in the San Simeon Watershed. TMDL is a term used to describe the maximum amount of pollutants; in this case, total nitrogen, total phosphorus, sodium, and chloride that a stream can receive and still meet water quality standards. A TMDL identifies the probable sources of pollution, establishes the maximum amount of pollution a stream can receive and still meet water quality standards, and allocates that amount to all probable contributing sources. By "allocating" an amount to a contributing source, we are assigning responsibility to someone, an agency, group, or individuals, to reduce their contribution to meet water quality standards.

The federal Clean Water Act requires every state to evaluate its waterbodies and maintain a list of waters (CWA Section 303(d) List) that are considered "impaired" either because the water exceeds water quality standards or does not achieve its designated use. For each stream on the Central Coast's CWA Section 303(d) List, the Central Coast Regional Water Quality Control Board (Central Coast Water Board) must develop and implement a plan to reduce pollutants so that the stream is no longer impaired and can be de-listed.

Impaired Waterbody
The geographic scope of this project includes the San Simeon Creek Watershed, which encompasses approximately 20,571[1] acres in San Luis Obispo County (Figure 1). San Simeon Creek is located 2 1/2 miles north of Cambria, California. This creek drains to the Pacific Ocean with the headwaters in the Santa Lucia Mountain Range. The main stem of San Simeon Creek is 6.7 miles (10.8 km) in length and branches into two forks. The North Fork of San Simeon Creeks is approximately 4.2 miles in length and the South Fork is approximately 4.8 miles in length. There are two significant tributaries, Van Gordon and Steiner Creeks, 5.6 and 10.6 miles in length respectively.

[1] Area calculated using the National Hydrography Dataset Plus catchment data (United States Geological Survey data set).

Figure 1 - Location of the San Simeon Creek Watershed

Numeric Targets, TMDLs and Allocations
Numeric targets are water quality targets developed to ascertain when and where water quality objectives are achieved, and hence, when beneficial uses are protected. The numeric targets for this TMDL include Central Coast Water Quality Control Plan (Basin Plan) numeric water quality objectives for nitrate, dissolved oxygen, sodium, and chloride and are protective of beneficial uses. The numeric targets for this TMDL also include Nutrient Numeric Endpoint (NNE) values (75^{th} percentile for reference streams) for total nitrogen and total phosphorus, and recommended thresholds for chlorophyll-a and maximum dissolved oxygen.

Land discharge of wastewater effluent from the Cambria Community Services District (Cambria CSD) containing concentrations of nitrogen, phosphorus, sodium, and chloride is impacting groundwater. That groundwater is flowing sub-surface into San Simeon Creek causing exceedances of the water quality objectives protective of municipal and domestic supply (MUN), agricultural supply (AGR), and Cold Freshwater Habitat (COLD) beneficial uses. The Cambria CSD is assigned waste load and load allocations for total nitrogen, total phosphorus, sodium, and chloride to achieve the TMDL that is equal to the numeric targets as presented in the Table 2 below. This TMDL is a concentration-based TMDL equal to the numeric targets and water quality objectives.

Table 2 - Numeric Targets, TMDL, and Load Allocations for San Simeon Watershed

Numeric Targets, TMDL, and Waste Load Allocations		
Waterbodies Assigned TMDLs	**Responsible Party Assigned Allocation (Source)**	**Receiving Water Numeric Targets, TMDLs, and Load Allocations**
San Simeon Creek	Cambria Community Services District (Land discharge of treated domestic wastewater and surface water discharge of treated groundwater)	Nitrate $\leq$ 10 mg/L NO_3 as N
		Total Nitrogen $\leq$ 1.3 mg/L N (July - December)
		Total Phosphorus $\leq$ 0.05 mg/L P (July - December)
		Sodium $\leq$ 69 mg/L Na
		Chloride: $\leq$ 106 mg/L Cl
		Receiving Water Numeric Targets
		Dissolved oxygen must remain greater than 7.0 mg/L
		Dissolved oxygen Median must remain greater than 85% saturation
		Dissolved oxygen should not exceed 13 mg/L
		Chlorophyll-a should not exceed 15 µg/L

TMDL Implementation, Monitoring, and TMDL Timeline

This TMDL is being implemented by Cambria CSD Waste Discharge Requirements (WDRs) for Discharges, Order No. R3-2001-100[2] and NPDES Order No. R3-2011-0223. Staff has concluded that revision of the current Cambria CSD Orders is necessary to implement this

[2] Order and MRP, Order No. 01-100 adopted by the Central Coast Water Board, on November 14, 2014. d NPDES Order No. R3-2011-0223 was permitted on December 8, 2014.

TMDL. New requirements will be described in the revised Orders to reduce loading of total nitrogen, nitrate, total phosphorus, orthophosphate, sodium, and chloride in San Simeon Creek, thereby addressing the impairments for these pollutants.

The Cambria CSD is required to comply with the Orders and MRPs described in this TMDL, Section 7, which includes an implementation strategy to achieve TMDLs for total nitrogen, total phosphorus, sodium, and chloride. The target date to achieve the allocations, numeric targets, and TMDL in San Simeon Creek is January 1, 2025.

1 INTRODUCTION

1.1 Clean Water Act Section 303(d)

Section CWA Section 303(d) of the federal Clean Water Act requires every state to evaluate its waterbodies and maintain a list of waters that are considered "impaired" either because the water exceeds water quality standards or does not achieve its designated use. For each waterbody on the Central Coast's CWA Section 303(d) list the Central Coast Regional Water Control Board (Central Coast Water Board) must develop and implement a plan to reduce pollutants so that the waterbody is no longer impaired and can be de-listed. Section 303(d) of the Clean Water Act states:

Each State shall establish for the waters identified in paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those pollutants which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

The State complies with this requirement by periodically assessing the conditions of the rivers, lakes, and bays and identifying them as "impaired" if they do not meet water quality standards. These waters, and the pollutant or condition causing the impairment, are placed on the CWA Section 303(d) list. In addition to creating this list of waterbodies not meeting water quality standards, the Clean Water Act mandates each state develop Total Maximum Daily Loads (TMDLs) for each waterbody listed. The Central Coast Water Board is the agency responsible for protecting water quality consistent with the Central Coast Water Quality Control Plan (Basin Plan), including developing TMDLs for waterbodies identified as not meeting water quality objectives.

1.2 Project Area

The geographic scope of this TMDL (the project area) includes the San Simeon Creek Watershed (Hydrologic Unit Code # 180600060404), which encompasses approximately 20,571 acres in San Luis Obispo County (Figure 2). San Simeon Creek is located 2 1/2 miles north of Cambria, California.

1.3 Pollutants Addressed

This project addresses waterbody impairments due to nitrate, low dissolved oxygen, sodium, and chloride.

1.4 Watershed Description

San Simeon Creek San Simeon Creek drains to the Pacific Ocean with the headwaters in the Santa Lucia Mountain Range. The main stem of San Simeon Creek is 6.7 miles (10.8 km) in length and branches into two forks. The North Fork of San Simeon Creek is approximately 4.2 miles in length and the South Fork is approximately 4.8 miles in length. There are two significant tributaries, Van Gordon and Steiner Creeks, 5.6 and 10.6 miles in length respectively.

As shown in Figure 2, the flows from the North Fork of San Simeon Creek, the South Fork of San Simeon Creek, and Steiner Creek all drain to Central Coast Ambient Monitoring Program (CCAMP) sampling station 310SSU. The upper watershed flows join flows from the lower portion of San Simeon Creek and Van Gordon Creek and this combined flow drains through CCAMP sampling station 310SSC.

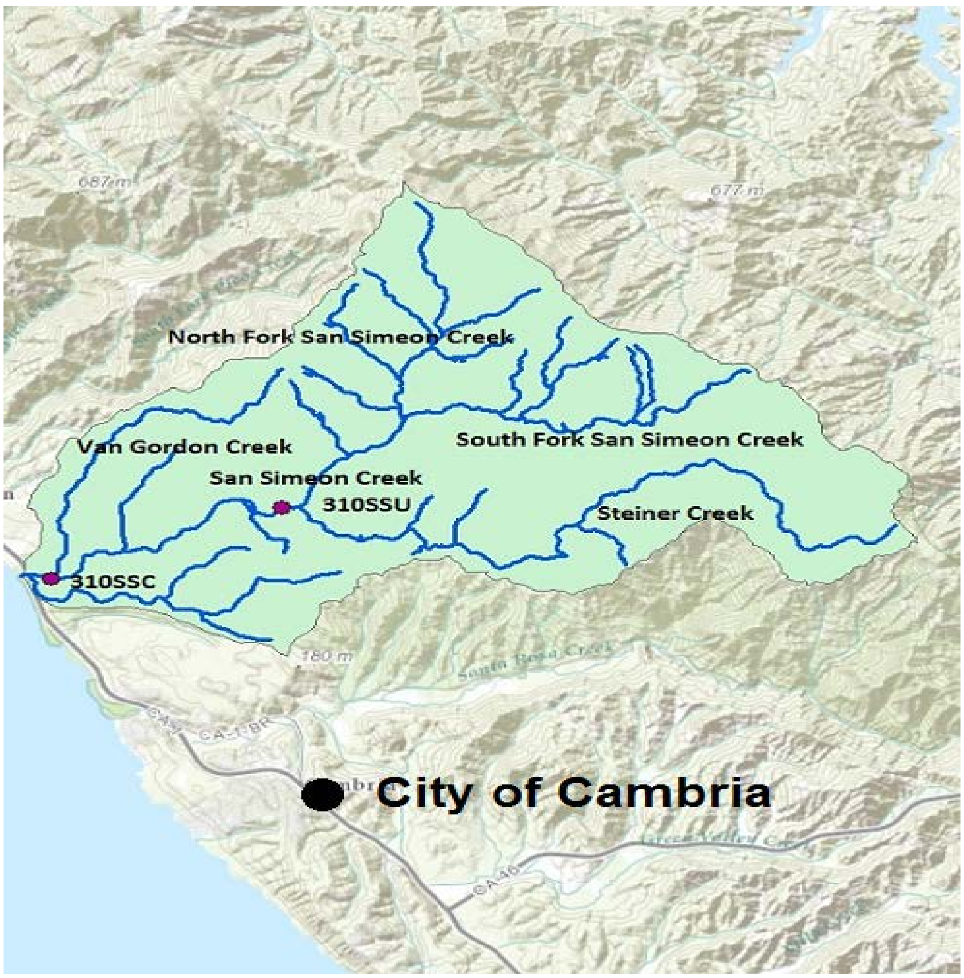

Figure 2 - The San Simeon Creek Watershed

The watershed flows from the southern face of the Santa Lucia Mountains to the Pacific Ocean just northwest of Cambria. The lower watershed consists of a willow riparian zone turning to mixed hardwood forests with increasing elevation. Grass and oak woodlands are observed in some of the highest elevations (Bein 1991). The creek sustains high quality habitat for a variety of aquatic and terrestrial species and terminates into a lagoon that supports both the endangered Tidewater Goby as well as the threatened South-Central Coast Steelhead. In addition, the riparian corridor provides habitat for the threatened Red-Legged Frog and the Southwestern

Pond Turtle. San Simeon Creek has about one-mile of perennial habitat area in its upper reaches that contributes to the survival of juvenile and smolt-sized steelhead during the summer (D.W. Alley 1997).

State Parks owns approximately 1500 acres in the lower portion of watershed and it is managed as a recreation and preservation area. The remainder of the watershed is privately owned with varying land use practices. Private land use practices include a gravel mining operation, wastewater disposal, row crop agriculture operations, vineyards, orchards, and cattle grazing.

The Cambria CSD owns and operates a wastewater collection, treatment and disposal system which provides service to the unincorporated community of Cambria. The treatment facilities, located in the Santa Rosa Creek Watershed, consist of activated sludge processes with a total design capacity of 1.0 million gallons per day (MGD). Treated wastewater, approximately 0.5 to 0.75 million gallons per day, is pumped to a 22 acre land disposal facility up gradient of CCAMP sampling station 310SSC in the San Simeon Creek Watershed (Figure 3) and applied to the land through four percolation ponds (Figure 3 and Figure 22). The percolation ponds are located on District property at 990 San Simeon-Monterey Creek Road. Prior to construction of the percolation ponds in 1999, the 22 acres were spray irrigated with wastewater effluent. The land disposal facility is located approximately 2 1/2 miles north of Cambria and is adjacent to the confluence of San Simeon and Van Gordon Creeks.

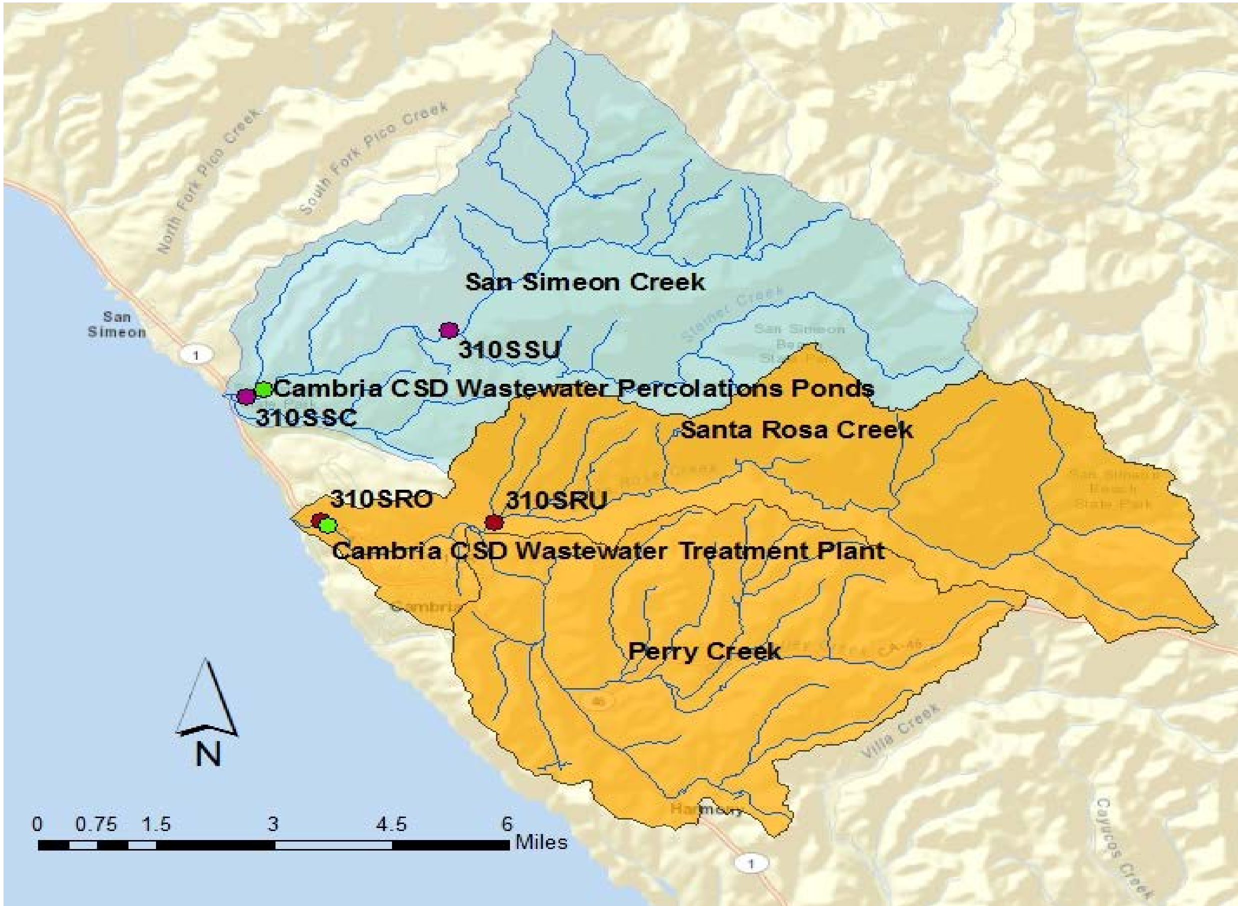

Figure 3 - Location of the CCAMP Monitoring Stations (San Simeon and Santa Rosa Creeks), Cambria CSD Wastewater Treatment Plant in Santa Rosa Creek Watershed and Cambria CSD Percolation Ponds in San Simeon Creek Watershed

The Cambria CSD also owns and operates an Advanced Water Treatment Plant (AWTP) that supplies drinking water to the community of Cambria. The AWTP is located on District property in the San Simeon Creek watershed, adjacent to the 22-acre land disposal facility. The AWTP pumps and treats up to 1.0 mgd of groundwater, producing two product waters of different quality (membrane filtrate and reverse osmosis) and two wastewater discharges (membrane filter backwash and reverse osmosis concentrate and cleaning solutions).

The membrane filtrate water (144,000 gpd) is discharged to San Simeon Creek to maintain creek levels and associated habitat. The reverse osmosis product water (700,000 gpd) is injected into the ground for indirect potable reuse. The membrane filter backwash water (90,000 gpd) is discharged to the existing percolation ponds. The reverse osmosis concentrate and cleaning solutions water (65,000 gpd) is discharged to an impervious evaporation impoundment.

In addition to the State Park lands and the Cambria CSD wastewater percolation ponds, there are five irrigated agriculture operations (operations enrolled under the Water Board agriculture regulatory program) in the watershed totaling 202 acres (FMMP 2008). About 135 acres are farmed adjacent to Van Gordon Creek. There are 12 acres of irrigated row crops (peas using reclaimed wastewater), 60 acres of orchard using micro-irrigation, and 63 acres of vineyard using micro-irrigation. The other two agriculture operations in the watershed are 45 acres of avocados and a 22 acre vineyard adjacent to San Simeon Creek.

The remainder of the watershed is 17,156 acres (about 83 percent of the watershed) designated grazing land. However, the actual number of acres being grazed and the number of animals grazing varies from year to year. For the designated grazing areas, aerial photography (Google Maps, Imagery 2013/2014) shows mixed land cover of grasslands, shrubs, and forest.

Table 3 shows the approximate percentage of each land use type within the watershed. The land uses shown on this table are derived from the Farmland Mapping and Monitoring Program (FMMP 2008) and are displayed in Figure 4. The active agricultural land use (row crop, vineyards, and orchards) in the San Simeon Creek watershed is approximately 1.3 percent of the total watershed area.

Table 3 - San Simeon Creek Watershed Land Use (FMMP, 2008)

Land cover	Percent of the watershed	Area in acres
Urban and Built-Up Land	0.3	67[A]
Prime Farmland	0.7	148
Farmland of Statewide Importance	0.1	17
Unique Farmland	0.5	105
Fallow Farmland	3.0	618[3]
Grazing Land	83.4	17156
Other Land (Forested, mined, and government lands)	12.0	2460
Total	100%	20,571

[A] The Cambria Community Services District's 22 acre land disposal facility is located on lands designated Urban and Built-Up Land

[3] Field observations (March 2014) of fallow farmland identified an additional row crop operation (approximately 12 acres) and five areas of dry farming (oat hay, approximately 92 acres) adjacent to San Simeon Creek upstream of 310SSC and downstream of 310SSU.

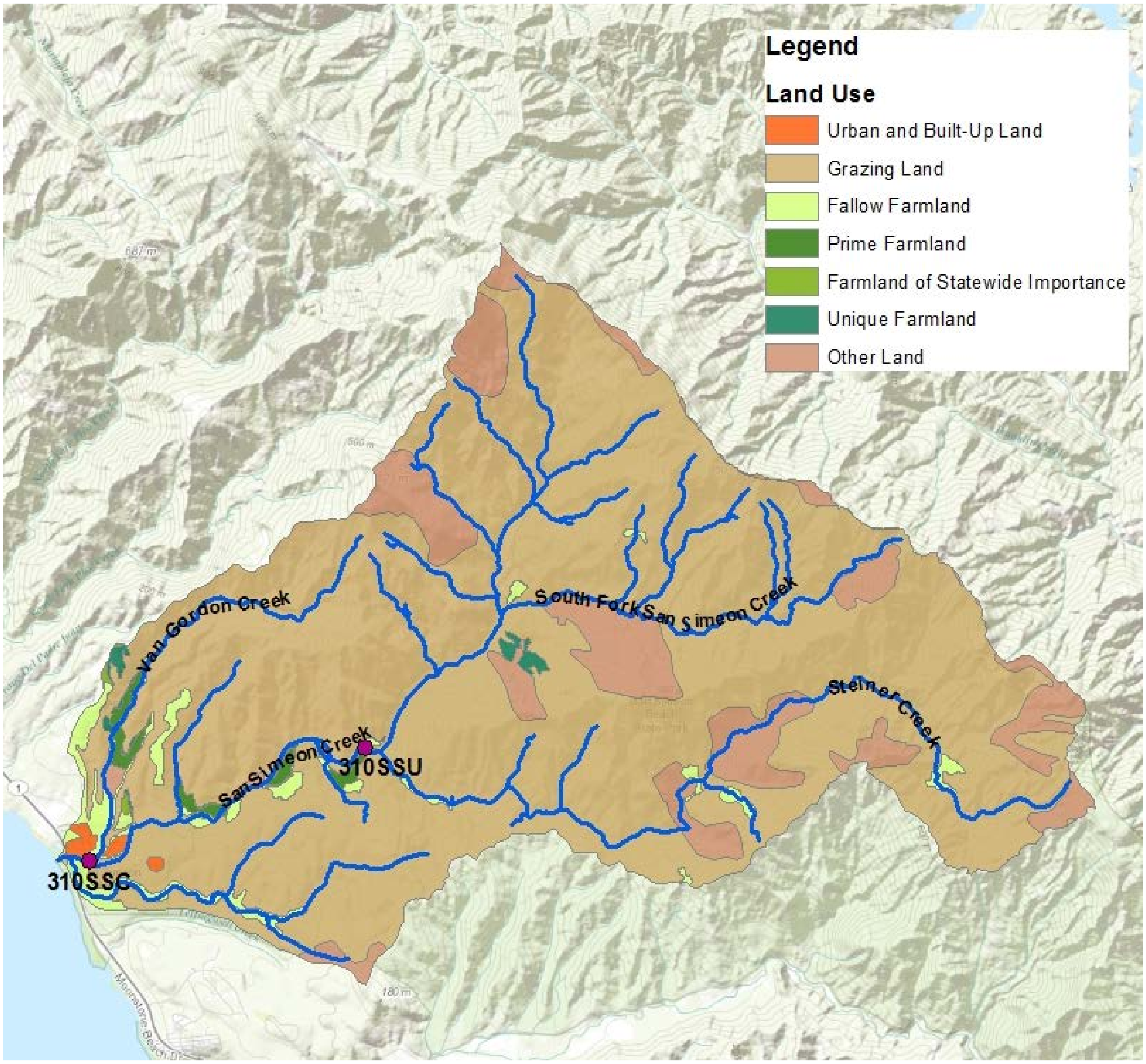

Figure 4 - Land use in the San Simeon Creek Watershed

Rainfall in the San Simeon Creek watershed varies across the watershed from 20 inches at the coast to more than 40 inches at the headwaters of San Simeon Creek (Yates and Van Konyenburg 1998). In the winter months, temperatures range between approximately 32 and 68 degrees Fahrenheit (ºF) and in summer, between 49 and 92 degrees ºF. During the summer months, the creek generally dries up except for flow supported by a spring that keeps the creek wet from the lagoon upstream approximately 1,000 feet (San Luis Obispo County, 2010).

2 PROBLEM IDENTIFICATION

2.1 Water Quality Standards

TMDLs are requirements pursuant to the federal Clean Water Act. The broad objective of the federal Clean Water Act (USEPA, 2014) is to “restore and maintain the chemical, physical and biological integrity of the Nation's waters." Water quality standards are provisions of state and federal law intended to implement the federal Clean Water Act. In accordance with state and federal law, California's water quality standards consist of:

- Beneficial uses, which refer to legally-designated uses of waters of the state that may be protected against water quality degradation (e.g., drinking water supply, recreation, aquatic habitat, agricultural supply, etc.)
- Water quality objectives, which refer to limits or levels (numeric or narrative) of water quality constituents or characteristics that provide for the reasonable protection of beneficial uses of waters of the state.
- Anti-degradation policies, which are implemented to maintain and protect existing water quality, and high quality waters.

Therefore, beneficial uses, water quality objectives, and anti-degradation policies collectively constitute water quality standards. Beneficial uses, relevant water quality objectives, and anti-degradation requirements that pertain to this TMDL are presented below in Section 2.2, Section 2.3, and Section 2.4, respectively.

2.2 Beneficial Uses

The designated beneficial uses identified in the Basin Plan for the San Simeon are shown in Table 4.

Table 4 - Basin Plan Designated Beneficial Uses

Waterbody Name	MUN	AGR	PRO	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRESH	COMM	SHELL
San Simeon	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X	

Beneficial uses are regarded as existing whether the waterbody is perennial or ephemeral or the flow is intermittent or continuous.

Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. According to State Board Resolution No. 88-63, "Sources of Drinking Water Policy" all surface waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

- TDS exceeds 3000 mg/l (5000 uS/cm electrical conductivity);
- Contamination exists, that cannot reasonably be treated for domestic use;
- The source is not sufficient to supply an average sustained yield of 200 gallons per day;
- The water is in collection or treatment systems of municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff; and
- The water is in systems for conveying or holding agricultural drainage waters.

Agricultural Supply (AGR) - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Service Supply (IND) - Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. Ground water recharge includes recharge of surface water underflow.

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Wildlife Habitat (WILD) - 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.

Cold Freshwater Habitat (COLD) - Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Warm Freshwater Habitat (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Migration of Aquatic Organisms (MIGR) - Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning, Reproduction, and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Preservation of Biological Habitats of Special Significance (BIOL) - Uses of water that support designated areas 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.

Rare, Threatened, or Endangered Species (RARE) - 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.

Freshwater Replenishment (FRESH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity) which includes a waterbody that supplies water to a different type of waterbody, such as, streams that supply reservoirs and lakes, or estuaries; or reservoirs and lakes that supply streams. This includes only immediate upstream waterbodies and not their tributaries.

Commercial and Sport Fishing (COMM) - Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

2.3 Water Quality Objectives

The Basin Plan contains specific water quality objectives that apply to nutrients and nutrient-related parameters. In addition, Central Coast Water Board staff uses established, scientifically-defensible numeric criteria to implement narrative water quality objectives, and for use in Clean Water Act Section 303(d) Listing assessments. These water quality objectives and criteria are established to protect beneficial uses and are compiled in Table 5.

Table 5 - Compilation of Basin Plan (2011) Water Quality Objectives

Constituent Parameter	Source of Water Quality Objective	Numeric Target	Primary Use Protected
Biostimulatory Substances **(Nitrogen, Total; Phosphorus, Total)**	Basin Plan narrative objective[A]	see report Section 4.2	General Objective for all Inland Surface Waters, Enclosed Bays, and Estuaries (biostimulatory substances objective) -- (e.g., WARM, COLD, REC-1, WILD)
Chloride	Basin Plan guideline[B] California Agricultural Extension Service guidelines	106 mg/L	AGR - severe problems may occur when chloride exceeds 106 mg/L in irrigation supply water
Chlorophyll *a*	Basin Plan narrative objective[A] North Carolina Administrative Code, Title 151, Subchapter 2B, Rule 0211	40 µg/L[C]	Numeric listing criteria to implement the Basin Plan biostimulatory substances objective for purposes of Clean Water Act Section 303(d) Listing assessments.
Dissolved Oxygen	General Inland Surface Waters numeric objective	Dissolved Oxygen shall not be depressed below 5.0 mg/L Median values should not fall below 85% saturation.	General Objective for all Inland Surface Waters, Enclosed Bays, and Estuaries.
	Basin Plan numeric objective	Dissolved Oxygen shall not be depressed below 7.0 mg/L	COLD, SPWN
	Basin Plan numeric objective	Dissolved Oxygen shall not be depressed below 5.0 mg/L	WARM
	Basin Plan numeric objective	Dissolved Oxygen shall not be depressed below 2.0 mg/L	AGR
Nitrate as N	Basin Plan numeric objective	10 mg/L	MUN, GWR
Nitrate as N	Basin Plan numeric criteria (Table 3-3 in Basin Plan) California Agricultural Extension Service guidelines	5 – 30 mg/L	AGR “Severe” problems for sensitive crops at greater than 30 mg/L “Increasing problems” for sensitive crops at 5 to 30 mg/L
Sodium	Basin Plan guideline[B] California Agricultural Extension Service guidelines	69 mg/L	AGR (Agricultural Supply) - severe problems may occur when sodium exceeds 69 mg/L in irrigation supply water

[A] The Basin Plan biostimulatory substances narrative objective states: *“Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.”* (Biostimulatory Substances Objective, Basin Plan, Chapter 3)

[B] The Basin Plan Table 3-3, guidelines for Interpretation of Quality of Water for Irrigation
[C] Central Coast Water Board staff has used 40 ug/L as stand-alone evidence to support chlorophyll-a listing recommendations for the CWA Section 303(d) list. However, we are using 15 ug/L as supporting evidence of nutrient over-enrichment, based on a review of existing and recommended limits used elsewhere (Worcester, K.R., D. M. Paradies, and M. Adams. 2010).

2.3.1 Basin Plan Water Quality Objectives for Toxicity

The Basin Plan states that for toxicity, “All waters shall be maintained free of nitrate substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.

Survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality conditions, shall not be less than that for the same waterbody in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in Standard Methods for the Examination of Water and Wastewater, latest edition. As a minimum, compliance with this objective shall be evaluated with a 96-hour bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances is encouraged.”

2.3.2 OEHHA Public Health Goals for Drinking Water

The California Office of Environmental Health Hazard Assessment (OEHHA) developed Public Health Goals of 45 mg/L for nitrate (equivalent to 10 mg/L nitrate as nitrogen), 1 mg/L for nitrite as nitrogen, and 10 mg/L for joint nitrate/nitrite (expressed as nitrogen) in drinking water (OEHHA, 1997). The calculation of these Public Health Goals is based on the protection of infants from the occurrence of methemoglobinemia, the principal toxic effect observed in humans exposed to nitrate or nitrite. The Public Health Goals are equivalent to California’s current drinking water standards for nitrate (45 mg/L nitrate as nitrate), nitrite (1 mg/L nitrite as nitrogen), and 10 mg/L (joint nitrate/nitrite expressed as nitrogen) which were adopted by the California Department of Health Services in 1994 from the U.S. Environmental Protection Agency’s Maximum Contaminant Levels (MCLs) promulgated in 1991.

2.4 Anti-degradation Policy

In accordance with Section II.A of the Basin Plan, wherever the existing quality of water is better than the quality of water established in the Basin Plan as objectives, such existing quality shall be maintained unless otherwise provided by provisions of the state anti-degradation policy.

2.5 Pollutants Addressed

San Simeon Creek is listed on the 2010 Clean Water Act Section 303(d) list for nitrate, low dissolved oxygen, sodium, and chloride in accordance with the State Water Resources Control Board Water Quality Control Policy for Developing California’s Clean Water Act Section 303(d) list, September 2004 (SWRCB, 2004a). Table 3.2 of the Listing Policy specifies the minimum number of measured exceedances needed to place a water segment on the section 303(d) list for conventional pollutants. Based on results from CCAMP monitoring from San Simeon Creek (monitoring site 310SSC) for 4/24/2001 through 11/15/2006, water quality exceeds:

- The Basin Plan chloride water quality guideline, Table 3-3, for the AGR beneficial use in 22 of 46 samples analyzed from San Simeon Creek.
- The Basin Plan dissolved oxygen water quality objective for the COLD beneficial use in 12 of 52 samples analyzed from San Simeon Creek.
- The Basin Plan nitrate water quality objective for the MUN beneficial use in 7 of 53 samples.
- The Basin Plan sodium water quality guideline, Table 3-3, for the AGR beneficial use in 24 of 46 samples analyzed from San Simeon Creek.

In each case the exceedances meet the minimum number of measured exceedances needed to place San Simeon Creek on the CWA Section 303(d) list.

3 DATA ANALYSIS

3.1 Water Quality

This section provides information pertaining to data sources and the results of water quality data used to assess water quality conditions and impairment. Water quality data is also contained in Appendix A – Water Quality Data.

Staff used Central Coast Ambient Monitoring Program (CCAMP) data and Cambria CSD data for the development of these TMDLs. CCAMP sites include:

- Arroyo De La Cruz Creek, 310ADC (Watershed north of San Simeon Creek)
- Pico Creek, 310PCO (Watershed north of San Simeon Creek)
- San Simeon Creek, sites 310SSC and 310SSU
- Santa Rosa Creek, sites 310SRO and 310SRU (Watershed south of San Simeon Creek)
- Villa Creek, 310VIA (Watershed south of San Simeon Creek)
- Cayucos Creek, 310CAY (Watershed south of San Simeon Creek)

Location of the monitoring sites for Arroyo De La Cruz Creek, Pico Creek, San Simeon Creek, Santa Rosa Creek, Villa Creek, and Cayucos Creek are shown below in Figure 5.

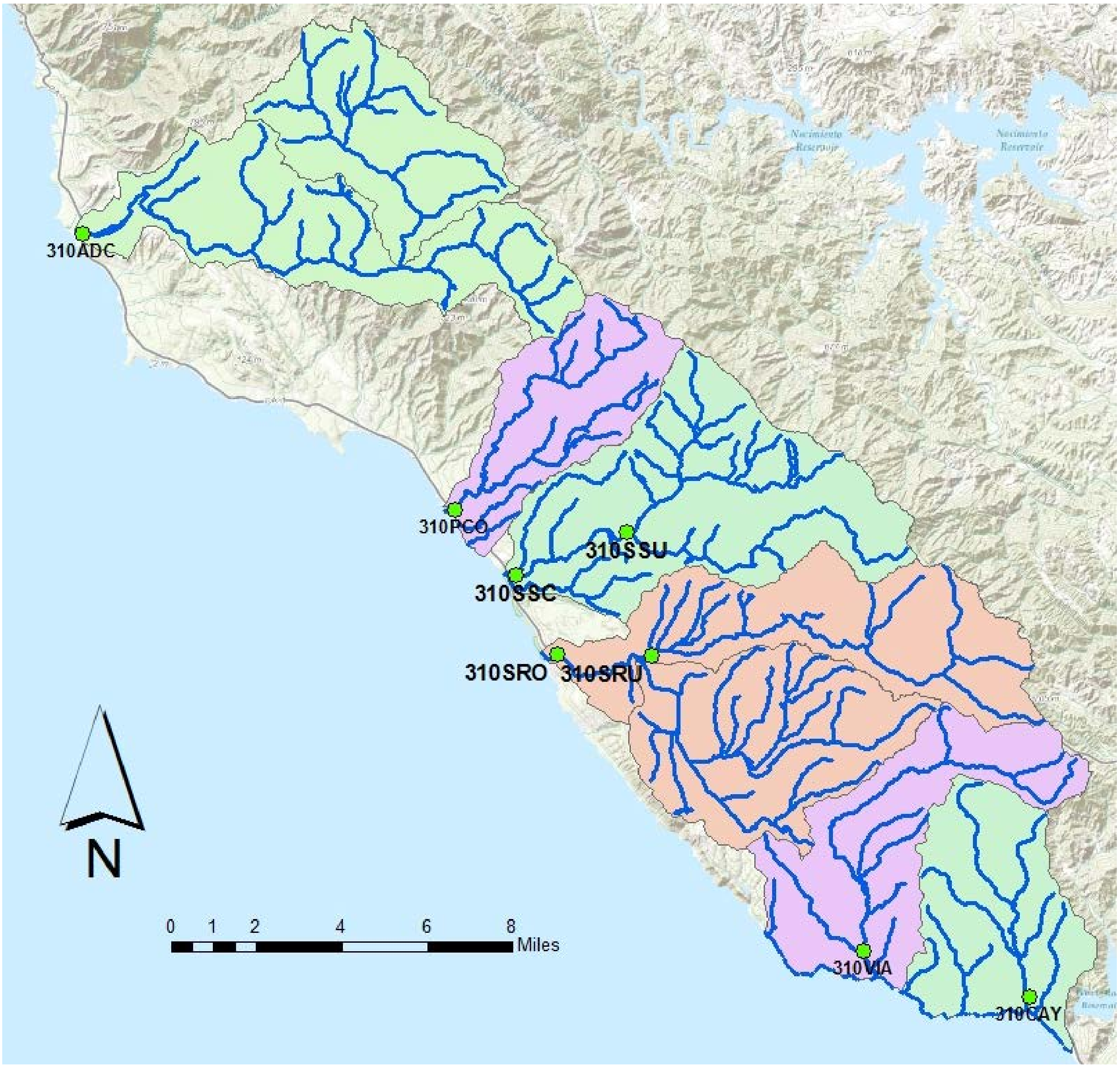

Figure 5 - CCAMP Monitoring Sites for Arroyo De La Cruz Creek (310ADC), Pico Creek, (310PCO), San Simeon Creek (310SSU, 310SSC), Santa Rosa Creek (310SRO, 310SRU), Villa Creek (310VIA), and Cayucos Creek (310CAY)

It is important to note that CCAMP does not collect surface water samples at a sampling station when diminishing flow conditions exist. Flows at a sampling station are considered “diminishing” when water is not continuous for a minimum of 100 feet, there are non-flowing-pools disconnected by dry ground, and/or there is no water. All five surface watersheds sampled by CCAMP experience diminishing flow conditions at some stations during the dry season (typically July through December).

Cambria CSD sites sampled include effluent discharged at the Cambria CSD wastewater percolation ponds (collected at the wastewater treatment plant prior to discharge) and groundwater samples from three different wells adjacent, above, and below the wastewater percolation ponds in the San Simeon Creek watershed. The groundwater sampling locations are:

- SS No.3 (Domestic Water Well)
- 9P7
- 16D1

The Cambria CSD groundwater sites are shown below in Figure 6.

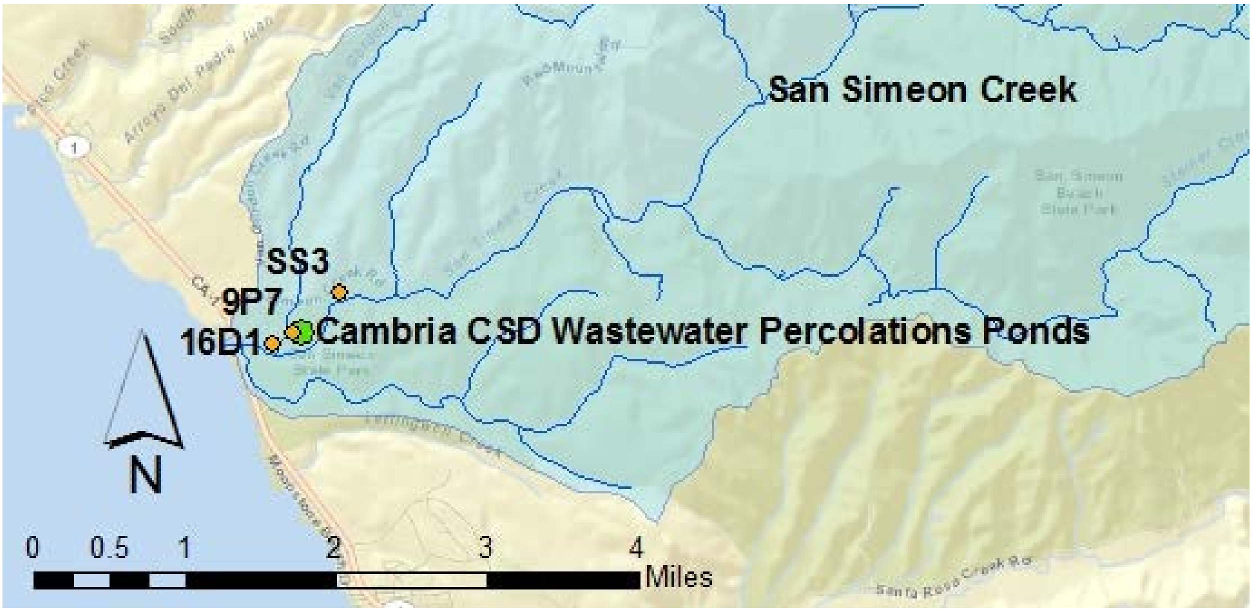

Figure 6 - Location of Cambria CSD Well Sites SS3, 9P7 and 16D1

3.1.1 Neighboring Watersheds Analysis

CCAMP collected water samples from two sites (310SSC and 310SSU) in the San Simeon watershed, two sites in the Santa Rosa Creek Watershed (310SRO and 310SRU), and one site in the Arroyo De La Cruz Creek Watershed (310ADC) at the sites as shown in Figure 5[4]. The CCAMP monitoring site 310SSC is located on San Simeon Creek at the State Park footbridge in the lower portion of the watershed and monitoring site 310SSU is located on San Simeon Creek in the middle portion of the watershed. The CCAMP monitoring site 310SRO is located on Santa Rosa Creek at Moonstone Drive in the lower portion of the watershed and monitoring site 310SRU is located on Santa Rosa Creek at Ferrasci Road in the middle portion of the watershed. The CCAMP monitoring site 310ADC is located on Arroyo De La Cruz Creek at State Highway One in the lower portion of the watershed.

Central Coast Water Board staff evaluated water quality in watersheds neighboring San Simeon Creek to determine if water quality conditions observed were specific to San Simeon Creek or specific to coastal watersheds. Staff evaluated data collected:

- For 2001 through 2013 in the San Simeon Creek Watershed CCAMP site 310SSC and for the years 2002, 2003, and 2009 for site 310SSU;
- For 2001 through 2012 in the Santa Rosa Creek Watershed CCAMP site 310SRO and for the years 2002, 2003, and 2009 for site 310SRU; and

[4] Staff also evaluated total nitrogen and total phosphorus data from Pico, Villa, and Cayucos creeks (310 PCO, 310VIA, and 310CAY respectively). The data in these three watersheds were combined with data from Santa Rosa and the Arroyo De La Cruz Creeks and is discussed in Appendix C.

- For 2001 through 2012 in the Arroyo De La Cruz Creek Watershed CCAMP site 310ADC.

The mean total nitrogen concentrations for 310SRO, 310SRU, and 310ADC (0.35, 0.44, and 0.18 mg/L (N) respectively) are similar to the concentration of 0.43 mg/L measured at San Simeon Creek station 310SSU (above the Cambria CSD discharge ponds). In contrast, total nitrogen concentrations measured at San Simeon Creek (CCAMP site 310SSC), below the Cambria CSD discharge ponds, had a mean concentration of 7.82 mg/L, with a range of 0.298 – 28.4 mg/L (N).

Like total nitrogen, mean nitrate concentrations measured at 310SRO, 310SRU, 310ADC, and 310SSU were low when compared to the downstream site in San Simeon Creek (310SSC). Mean nitrate concentrations for Santa Rosa Creek, Arroyo De La Cruz Creek, and upper San Simeon Creek ranged between 0.11 and 0.19 mg/L (NO_3 as N). In contrast, nitrate levels in San Simeon Creek measured below the Cambria CSD discharge ponds at 310SSC had a mean concentration of 7.45 mg/L (NO_3 as N).

Total phosphorus mean concentrations at 310SRO, 310SRU, and 310ADC were 0.07, 0.028, and 0.028 mg/L (P) respectively. The mean total phosphorus concentrations for 310SRO, 310SRU, and 310ADC are similar to the concentration of 0.05 mg/L that was measured at upper San Simeon Creek station 310SSU. In contrast, total phosphorus concentrations measured at San Simeon Creek (310SSC), below the Cambria CSD discharge ponds, had a mean concentration of 0.68 mg/L, with a range of 0.016 – 1.9 mg/L (P). Table 6 below summarizes the data for five CCAMP sampling sites.

Like total phosphorus concentrations, mean orthophosphate concentrations measured at 310SRO, 310SRU, 310ADC, and 310SSU were low when compared to the downstream site in San Simeon Creek (310SSC). Mean orthophosphate concentrations for Santa Rosa Creek, Arroyo De La Cruz Creek, and upper San Simeon Creek ranged between 0.01 and 0.031 mg/L (P). In contrast, orthophosphate concentrations measured at San Simeon Creek (310SSC), below the Cambria CSD discharge ponds, had a mean concentration of 0.63 mg/L (PO_4 as P).

Similarly sodium and chloride concentrations measured at 310SRU (26 and 19 mg/l respectively) and 310ADC (19 and 23 mg/l respectively) were comparable to what was measured at San Simeon Creek site 310SSU (16 and 12 mg/l respectively). Santa Rosa Creek 310SRO sodium and chloride concentrations (44 and 51 mg/l respectively) were elevated when compared to 310SSU, 310SRU, and 310ADC, but lower than values documented at 310SSC (99 and 123 mg/l respectively).

Table 6 - Summary Data for CCAMP Sampling Sites (Arroyo De La Cruz, San Simeon and Santa Rosa Creeks)

Constituents in mg/L	Surface Water Sites				
	310SSC	310SSU	310ADC	310SRO	310SRU
Chloride	123 [A]	11.7 [C1]	26 [BG]	51 [BG]	19 [GF]
Chlorophyll-a	3.82 [B]	3.96 [C]	2.24 [BG]	2.3 [BG]	2.66 [GF]
Chlorophyll *a*(Range)	0 – 46.5 [E]	0.04 - 43.87 [F]	0 – 40.3 [BG]	0-53.47 [BG]	0-55.95 [GF]
Dissolved Oxygen (Range for all years)	1.5 - 14.1 [B2]	8.7 - 12.0 [F]	2.3 -10.7 [BG]	2.8 - 14.4 [BG]	7.7 – 14.4 [GF]
Nitrate as N	7.45 [A]	0.11 [C]	0.093 [BG]	0.15 [B]	0.19 [GF]
Nitrate as N (Range)	0.021 – 28 [D]	0.01 - 0.88 [F]	0.02 - 0.49 [BG]	0.02 – 1.37 [B]	0.02 – 1.46 [GF]
Total Nitrogen as N	7.82 [A]	0.43 [C]	0.18 [BG]	0.35 [BG]	0.44 [GF]
Total Nitrogen as N – (Range)	0.298 – 28.4	0.076 – 3.91	0.078 – 1.15	0.078 – 9.92	0.10 – 3.9 [GF]
Orthophosphate	0.63 [A]	0.01 [C]	0.01 [BG]	0.028 [BG]	0.032 [GF]
Orthophosphate – (Range)	0.01 – 1.7	0.01 – 0.034	0.003 – 0.026	0.008 - 0.75	0.005 – 0.27 [GF]
Total Phosphorus	0.68 [A]	0.05 [C]	0.028 [BG]	0.070 [BG]	0.407 [GF]
Total Phosphorus – (Range)	0.016 – 1.9	0.012 – 0.39	0.012 – 0.12	0.012 - 6.5	0.012 – 7.60 [GF]
Salinity (ppt)	0.56 [B]	0.24 [C]	0.30 [BG]	0.45 [B]	0.4 [G]
Sodium	99 [A]	16 [C1]	19 [BG]	44 [B]	26 [GF]
Total Nitrogen/Total Phosphorus Ratio	11.5	8.6	6.43	5	1.08 [GF]

A = Mean for all years (2001-2013);
B = Mean for all years (2001-2012 through August);
C = Mean for years (2002, 2003, 2009);
D = years 2001-2013;
E = years 2001-2012 through August;
F = years 2002, 2003, 2009;
G = CCAMP webpage data;
1 = no data for 2003;
2 = 2012 complete year

From this preliminary analysis it is clear that total nitrogen, nitrate, total phosphorus, orthophosphate, sodium, and chloride measured at site 310SSC are elevated when compared to neighboring watersheds.

3.1.2 San Simeon Creek Analysis

3.1.2.1 <u>Total Nitrogen</u>

CCAMP collected 132 samples at 310SSC between April 2001 and December 2013. CCAMP collected nine samples at 310SSU in 2002/2003 and seven samples in 2009. CCAMP analyzed those samples for total nitrogen[5]. Figure 7 below shows the location of both 310SSC and 310SSU and Appendix A contains a data summary for both sites.

[5] Nitrogen is a nutrient that supports growth of aquatic plants and analysis of total nitrogen is important to determine its roll in aquatic growth. Total nitrogen is the combination of ammonia, nitrite, nitrate, and organic nitrogen.

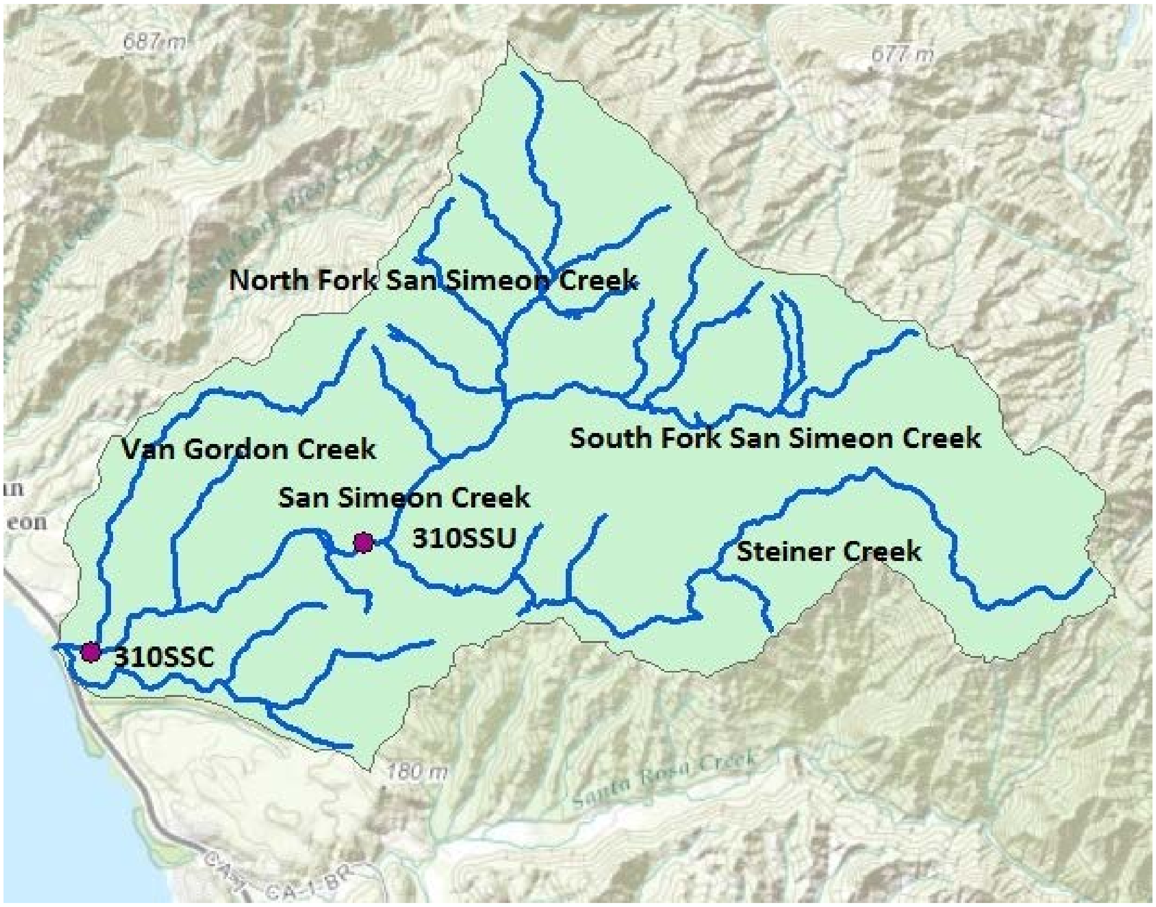

Figure 7 - Location of CCAMP Sites 310SSC and 310SSU

Figure 8 shows total nitrogen concentrations increase from January through December. USEPA's Ambient Water Quality Criteria Recommendations (December 2000) for subecoregion III-6 (San Simeon Creek is in subecoregion III-6) contains criteria for total nitrogen of 0.5 mg/L as N. The concentrations observed in San Simeon Creek (310SSC) exceed this recommendation with an annual average of 7.82 mg/L as N and a range of 0.3 – 28.4 mg/L as N (data review for 2001 through 2013). The dry season (July - December) total nitrogen annual average for this same period is 12.1 mg/L as N.

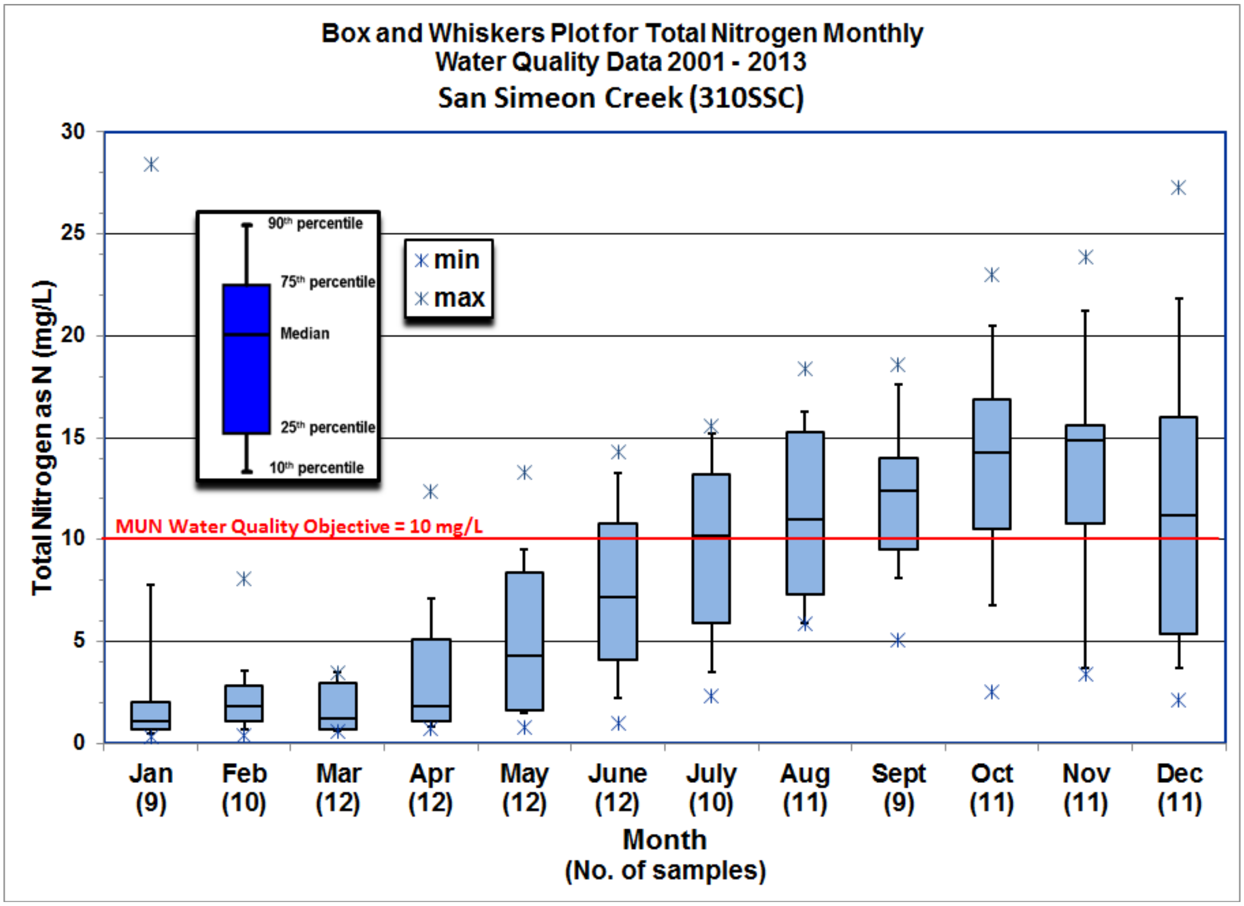

Figure 8 - Total Nitrogen as N (mg/L) for CCAMP Site 310SSC (2001/2013)

3.1.2.2 Nitrate

CCAMP collected 132 samples at 310SSC between April 2001 and December 2013 and analyzed those samples for nitrate. CCAMP collected nine samples at 310SSU in 2002/2003 and seven samples in 2009. The samples were analyzed for nitrate. Figure 9 shows 7 of 53 samples exceeded the MUN water quality objective for nitrate between 2001 and 2006. Over the next seven years (2007-2013), 36 of 79 samples exceeded the MUN water quality objective. This is approximately a 500 percent increase in the number of exceedances for a similar seven year period. For the period 2001-2012, 43 of 132 samples (33%) exceeded the MUN objective for nitrate (10 mg/L NO_3 as N). Table 7 is a summary of nitrate data for 310SSC.

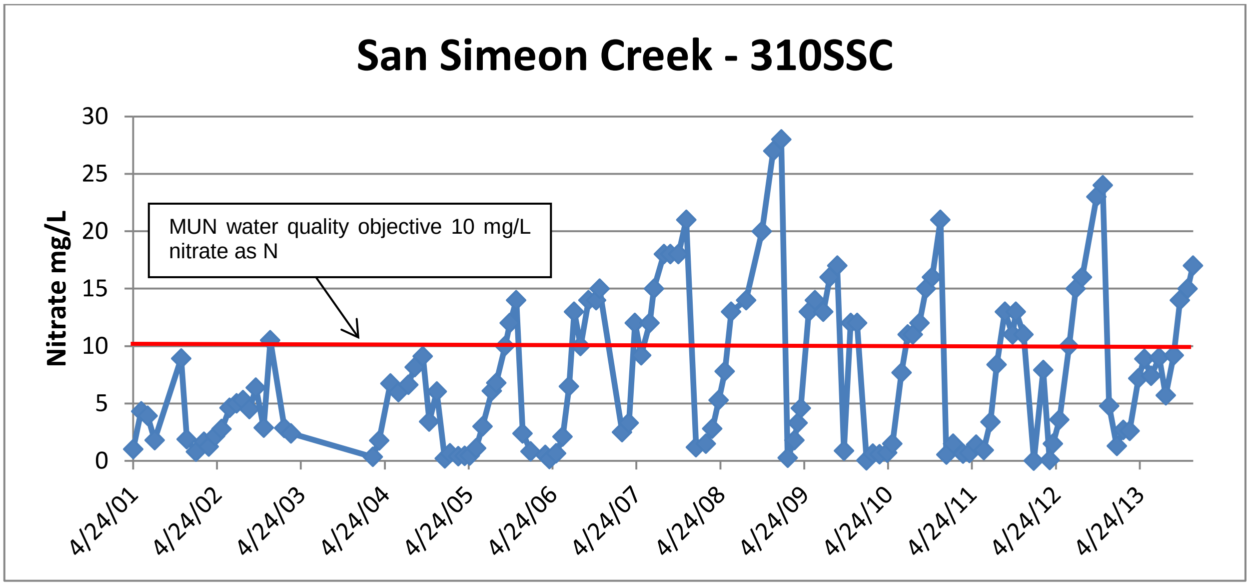

Figure 9 - Nitrate as N (mg/L) for CCAMP Site 310SSC (2001/2013)

For this same period (2001-2013), the annual average nitrate concentrations for 310SSC ranged between 2.63 and 12.90 mg/L nitrate as nitrogen (Table 7). Dry season (July-December) average nitrate concentrations for 310SSC ranged between 4.21 and 20.3 mg/L nitrate as nitrogen. The wet season (January-June) average nitrate concentrations for 310SSC ranged between 0.85 and 9.3 mg/L nitrate as nitrogen.

Table 7 - Summary of Nitrate as N (mg/L) data for 310SSC

	Nitrate (mg/L)							
	Annual Ave[A]	**July-Dec Ave (Dry)**	**Jan-June Ave (Wet)**	**Range**	**Sample Size**	**Number of Exceedances Per Season[B]**		**% exceed**
						Dry	**Wet**	
2013	8.33	11.7	5.0	1.3-17	12	3	0	25
2012	9.63	16.6	3.8	0.021 - 24	11	4	0	36
2011	5.46	10.0	1.0	0.55 - 13	12	4	0	33
2010	8.10	14.3	1.9	0.046 - 21	12	6	0	50
2009	10.45	11.8	9.3	0.26 - 28	13	5	3	62
2008	10.29	20.3	5.3	1.2 - 27	9	3	1	44
2007	12.90	18.00	7.8	2.5 - 21	10	5	2	70
2006	6.98	12.08	0.85	0.16 - 15	11	4	0	36
2005	4.43	8.55	0.90	0.22 - 14	13	2	0	15
2004	5.36	6.67	3.71	0.35 - 9.1	9	0	0	0
2003	2.63	No Data	2.63	2.39 - 2.9	2	0	0	0
2002	3.98	5.76	2.21	0.79 - 10.5	12	1	0	8
2001	3.65	4.21	3.09	1.02 - 8.9	6	0	0	0
Totals =	**7.45**	**11.7**	**3.7**		**132**	**37**	**6**	

A – On average nitrate makes up approximately 95 percent of the total nitrogen load
B – Exceedance = NO3 > 10 mg/L nitrate as N

For 310SSU, the monitoring site upstream of the Cambria CSD discharger, CCAMP collected and analyzed 9 samples in 2002/2003 and 7 samples in 2009. No samples exceeded the 10 mg/L nitrate as nitrogen water quality standard (Figure 10). In 2002/2003, the nitrate concentrations at this site ranged between 0.011 and 0.31 mg/L nitrate as nitrogen and for 2009 nitrate concentrations ranged between 0.026 and 0.88 mg/L nitrate as nitrogen. Across all three years, dry weather (July-December) average nitrate concentrations ranged between 0.16 and 0.32 mg/L nitrate as nitrogen. The wet weather (January-June) average nitrate concentrations ranged between 0.02 and 0.07 mg/L nitrate as nitrogen. Appendix A contains a summary of nitrate data for 310SSU.

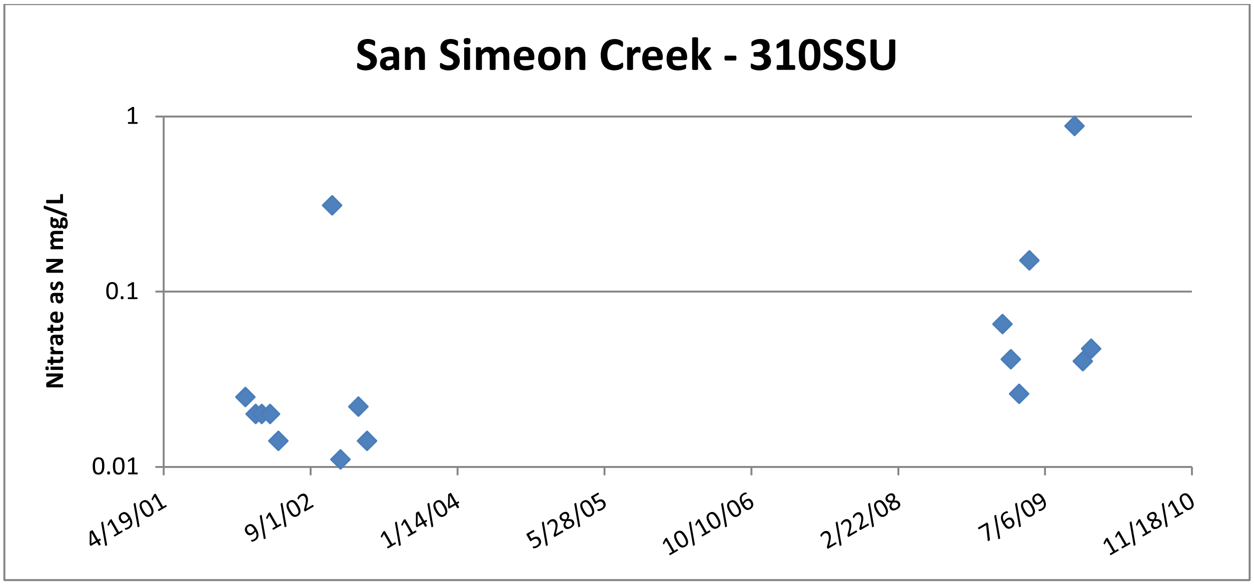

Figure 10 - Nitrate as N (mg/L) for CCAMP Site 310SSU (2001, 2002, and 2009)

3.1.2.3 <u>Total Phosphorus</u>

CCAMP collected 128 samples at 310SSC between April 2001 and December 2013. CCAMP collected nine samples at 310SSU in 2002/2003 and seven samples in 2009. The samples were analyzed for total phosphorus. Data shows, that similar to total nitrogen, total phosphorus concentrations increase from January through December.

USEPA's Ambient Water Quality Criteria Recommendations (December 2000) for subecoregion III-6 contains criteria for total phosphorus of 0.03 mg/L as P. The concentrations observed in San Simeon Creek (310SSC) exceed this recommendation with an annual average concentration of 0.68[6] mg/L as P and a range of 0.017 – 1.9 mg/L as P (data review for 2001 through 2013). The dry season (July - December) total phosphorus annual average concentration for this same period is 0.97 mg/L as P.

[6] On average orthophosphate makes up approximately 95 percent of the total phosphorus load. For orthophosphate the annual average concentration is 0.63 mg/L as P and a range of 0.01 – 1.7 mg/L as P (data review for 2001 through 2013). The dry season (July - December) orthophosphate annual average concentration for this same period is 0.94 mg/L as P.

3.1.2.4 Dissolved Oxygen (Concentration)

Between April 2001 and August 2012, CCAMP collected 132 in stream Dissolved Oxygen measurements at 310SSC. At 310SSU, CCAMP collected nine in stream dissolved oxygen measurements in 2002/2003 and seven in stream dissolved oxygen measurements in 2009 (Appendix A).

For the period 2001-2012, a total of 52 of 132 measurements (39% exceedance) at 310SSC did not meet the Cold Freshwater Habitat (COLD) dissolved oxygen water quality objective of ≥ 7.0 mg/L (Figure 11). Forty six of the violations occurred in the drier months of July through December. Appendix A contains a summary of dissolved oxygen data for 310SSC.

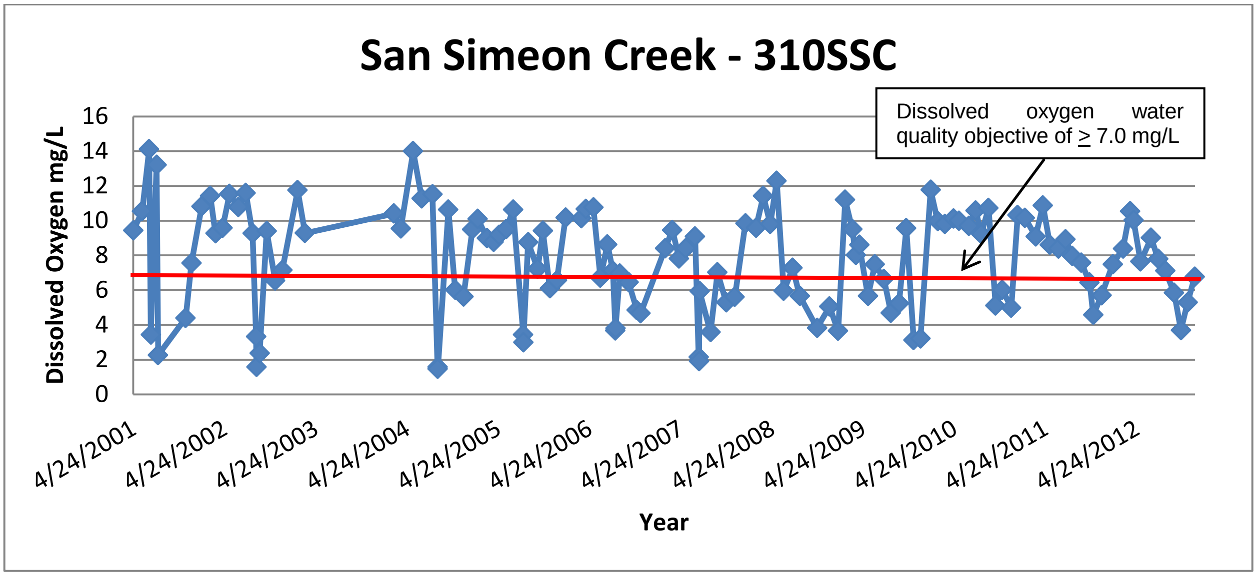

Figure 11 - In stream Dissolved Oxygen Measurements, 310SSC 2001-2012

In 2002, 2004, 2005, 2006, and 2007, CCAMP also collected 24-hour dissolved oxygen measurements at 310SSC. For July 6-7, 2007, Figure 12 shows the dissolved oxygen concentration below the water quality objective of ≥ 7.0 mg/L for more than sixteen hours during the 24-hour period and a diel swing of more than 8 mg/L over the 24-hour period. Similar depressed dissolved oxygen levels were measured in 2002, 2004, 2005, and 2006 (see additional graphs Appendix A).

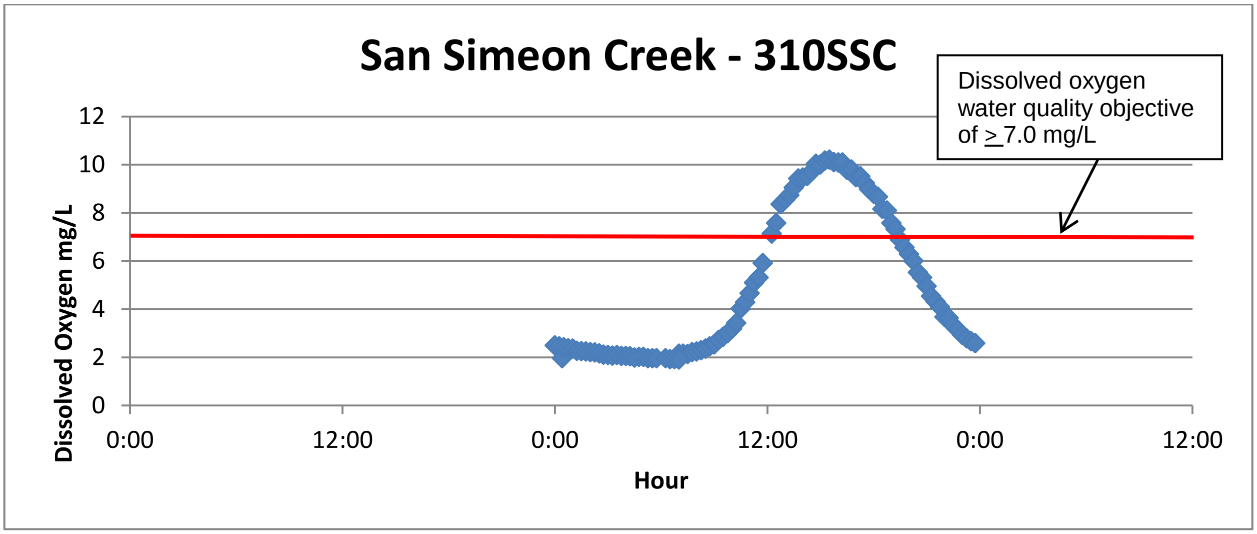

Figure 12 - 24-hour In Stream Dissolved Oxygen Measurements, July 6-7 2007

For 310SSU, the monitoring site above the Cambria CSD discharge, all measurements were above the dissolved oxygen water quality objective of 7.0 mg/L. Note 310SSU went dry in June 2002 and June 2009. In 2002 and 2009, flow resumed in November and October respectively.

3.1.2.5 Dissolved Oxygen (Percent Saturation)

Between April 2001 and August 2012, CCAMP collected 132 in stream dissolved oxygen percent saturation measurements at 310SSC. At 310SSU, CCAMP collected nine in stream dissolved oxygen percent saturation measurements in 2002/2003 and seven in stream dissolved oxygen percent saturation measurements in 2009.

For the period 2001-2012, a total of 65 of 132 measurements (49% exceedance) at 310SSC did not meet the Cold Freshwater Habitat (COLD) dissolved oxygen water quality objective of ≥ 85 percent saturation (Figure 13). Fifty-three of the violations occurred in the months of July through December. Of the 12 violations that occurred in the months of January through June, six occurred in 2009. All 16 samples evaluated at 310SSU met the water quality objective of greater than 85 percent saturation. Appendix A contains a summary of dissolved oxygen data for 310SSC and 310SSU.

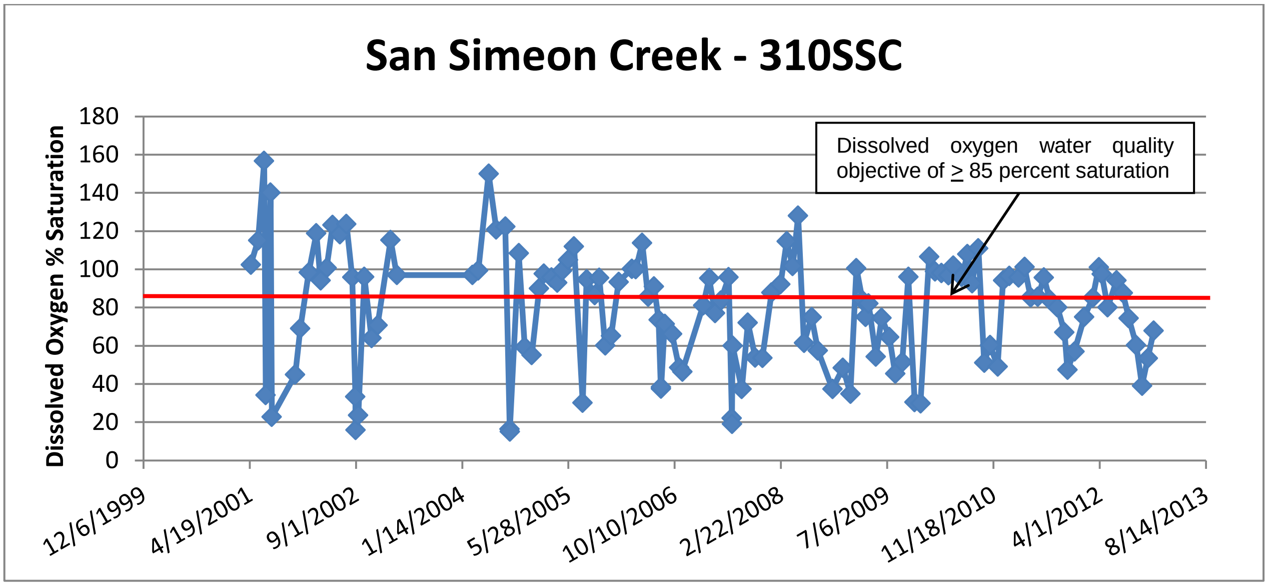

Figure 13 - In Stream Dissolved Oxygen Measurements, Percent Saturation, 2001-2012

3.1.2.6 Chlorophyll-a

Between April 2001 and August 2012, CCAMP collected 118 in stream chlorophyll-a measurements at 310SSC. At 310SSU, CCAMP collected nine in stream chlorophyll-a measurements in 2002/2003 and seven in stream chlorophyll *a* measurements in 2009 (Appendix A).

For chlorophyll-a in the water column, 15 ug/L and 40 ug/L are guideline values adapted from cold and warm water standards used in North Carolina and Oregon respectively. The Central Coast Water Board, when developing CWA Section 303(d) listed waterbodies, uses the 40 ug/L guideline value[7].

For the 2001 through 2012 period, 113 out of 114 chlorophyll-a measurements at 310SSC are below 40 ug/L, and therefore meet the guideline. Similarly for 310SSU, 15 out of 16 measurements in 2002/2003 and 2009 are below 40 ug/L for chlorophyll-a.

3.1.2.7 Algal Mats

Between January 2006 and August 2012 CCAMP conducted 79 stream observations for floating algal mats at 310SSC. Four of the 79 observations recorded aerial coverage greater than 25 percent and one of the 4 observations documented was greater than 50 percent aerial coverage (Figure 14). Site 310SSC also had 24 observations that documented coverage between 1 and 25 percent. In comparison, at the upstream station (310SSU), only two out of 7 observations in 2009 documented coverage between 1 and 25 percent. Of the two observations recorded, the coverage was one percent in November and five percent December. The other observations at 310SSU had no algal cover.

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[7] For the 2006 CWA Section 303(d) listing cycle, Central Coast Water Board staff used 40 ug/L as the guideline to determine impairment. Subsequent to the listing cycle, CCAMP identified a reference subset of the initial set of sites that showed no other signs of eutrophication, such as oxygen levels over 13 mg/L, water column chlorophyll-a exceeding 15 micrograms per liter (ug/L) or observed floating algal cover exceeding 50%. (Worcester et al. 2010). The numeric target is set at 15 ug/L.

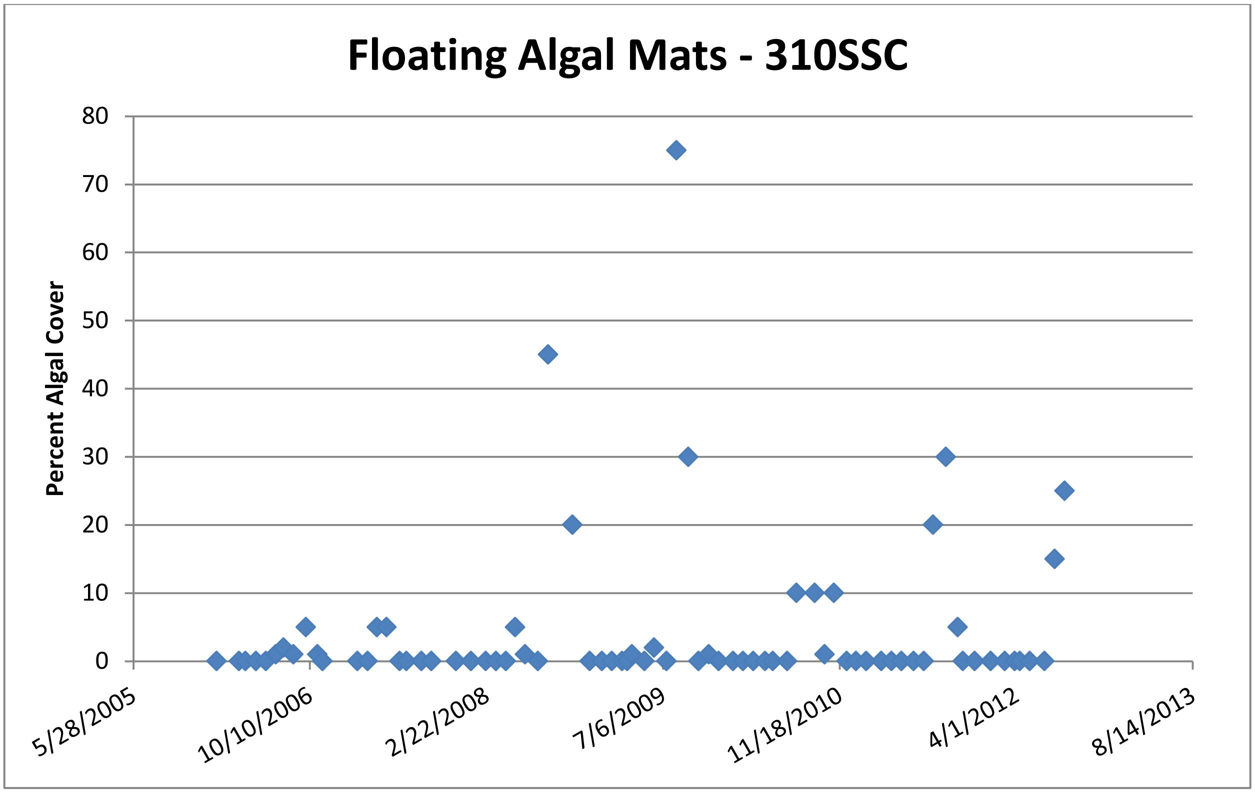

Figure 14 - Floating algal mats percent cover

It should be noted that CCAMP did not collect samples as a result of diminishing flow conditions for 310SSC in January 2006, June 2009, and August 2012. Similarly, for 310SSU, CCAMP did not collect samples during periods of diminished flow. CCAMP photos below show 310SSU as it goes dry (Figures 15 and 16). At this station, continuous flow stops as early as May and San Simeon Creek becomes a series of rapidly desiccating pools.


Figure 15 - Flow Conditions at 310SSU June 2009


Figure 16 - Flow Conditions at 310SSU July 2009

The CCAMP team also photographs monthly at 310SSC. Below are a series of photographs that document algal mat growth indicative of eutrophic[8] conditions (Figure 17).

Floating Algal Mat 310SSC_2002-Sept

Floating Algal Mat 310SSC_2005-June

Floating Algal Mat 310SSC_2006-Sept

Floating Algal Mat 310SSC_2008-Aug

[8] Eutrophication: the process by which a body of water becomes enriched in dissolved nutrients (such as nitrogen and phosphorus) that stimulate the growth of aquatic plant life, often resulting in the depletion of dissolved oxygen.

Floating Algal Mat 310SSC_2009_Sept Floating Algal Mat 310SSC_2010-Aug

Floating Algal Mat 310SSC_2011-Sept Floating Algal Mat 310SSC_2012-Aug

Figure 17 - Floating Algal Mat Photos 310SSC, 2002 through 2012

3.1.2.8 Sodium and Chloride

Staff also evaluated sodium and chloride concentrations at both 310SSC and 310SSU. Although there are no site specific water quality objectives for San Simeon Creek, the Basin Plan Table 3-3 guidelines for interpretation of Quality of Water for Irrigation states that severe problems may occur when sodium exceeds 69 mg/L and chloride exceeds 106 mg/L in irrigation supply water.

For sodium (2001-2013), 74 of 124 measurements at 310SSC did not meet the 69 mg/L guideline. During that same period, 70 out of 124 measurements did not meet the chloride guideline value of 106 mg/L.

An engineering report developed prior to Cambria CSD's discharge (Boyle Engineering Corporation, January 1977) documented a chloride concentration of 9.0 mg/L in San Simeon Creek (Data from the Department of Water Resources Memorandum Report 282.31). No sodium data was included in the Boyle (1977) report. The chloride value cited in 1977 is within the range of chloride concentrations measured at 310SSU in 2002, 2003, and 2009 (4.8 to 18 mg/L. Similarly, the sodium concentrations at 310SSU were low and ranged between 5.6 and 20 mg/L.

All sodium and chloride concentrations measured at 310SSU were well below the Basin Plan Table 3-3 guidelines.

In contrast, sodium and chloride samples collected at 310SSC from 2001 through 2012 had concentrations much higher than concentrations measured in 1977 and are consistently five to nine times higher than concentrations observed at 310SSU. Table 8 summarizes sodium and chloride concentrations measured at 310SSC from 2001 through 2013. Appendix A summarizes sodium and chloride concentrations measured at 310SSU.

Table 8 - 310SSC Sodium and Chloride Annual Average Concentrations (mg/L)

Year	Average	
	Sodium	**Chloride**
2013	112	120.1
2012	219.6	378.3
2011	59.0	81.9
2010	65.8	77.1
2009	98.5	133.1
2008	82.4	109.0
2007	95.9	121.1
2006	62.2	71.0
2005	128.5	86.7
2004	86.2	96.0
2003	No Data	No Data
2002	67.7	77.7
2001	86.2	114.3
Average all years	**98.9**	**123.4**

3.1.3 Cambria Community Services District (Cambria CSD) Point Source Discharge

The Cambria CSD discharges approximately 0.5 million gallons per day of treated wastewater to a 22 acre land disposal facility (percolation ponds) in the San Simeon Creek Watershed. The Cambria CSD collects an effluent water quality sample prior to discharge and groundwater samples from groundwater wells (named SS3, 9P7, and 16D1) adjacent to the land disposal percolation ponds (Figure 18).

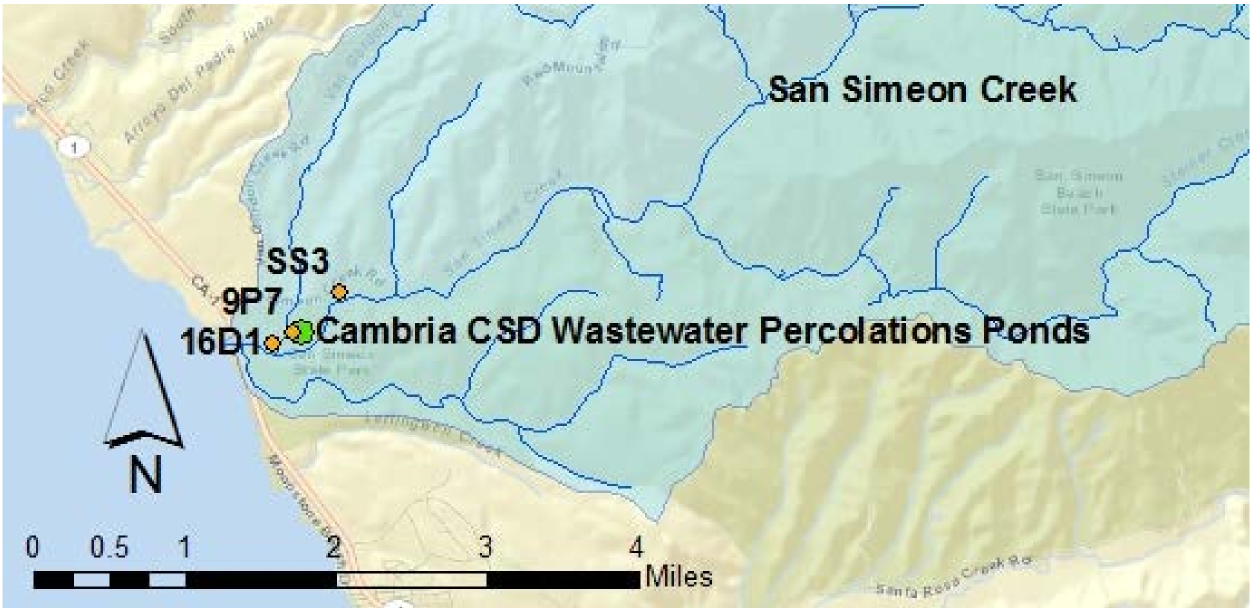

Figure 18 - Location of Cambria CSD Effluent Discharge Percolation Ponds and Groundwater Monitoring Wells in the San Simeon Creek Watershed

Cambria CSD collected 52 effluent samples between 2002 and 2012 (Appendix A). For the 2002 through 2012 period, effluent annual average nitrate concentrations ranged between 15.6 and 36.3 mg/L nitrate as nitrogen and effluent annual average sodium concentrations ranged between 131 and 203 mg/L. Effluent samples were not analyzed for chloride.

For the 2002 through 2012 period, each groundwater well was typically sampled twice annually. Samples from the City of Cambria water supply well SS3, in close proximity to San Simeon Creek and upstream of the Cambria CSD effluent discharge, had sodium and chloride in the same range as water quality observed at 310SSU. For SS3, sodium concentrations ranged between 18 and 23 mg/L and for 310SSU sodium concentrations ranged between 5.6 and 20 mg/L. Similarly, for well SS3, chloride concentrations ranged between 17 and 26 mg/L and for 310SSU chloride concentrations ranged between 4.8 and 18 mg/L. Nitrate concentrations at SS3 were slightly elevated when compared to 310SSU, but still very low with an average for all years (2001 – 2012) of 0.8 mg/L (nitrate as N) and a range 0.4 and 1.3 mg/L (Table 9).

Groundwater well 9P7 is located adjacent to the Cambria CSD 22 acre spray field/percolation ponds used for effluent disposal. Nitrate, sodium, and chloride concentrations measured at well 9P7, were elevated when compared to water quality observed at 310SSU, but lower than those observed at the down gradient well 16D1. For 9P7, nitrate concentrations ranged between 0.3 and 19.3 mg/L (nitrate as N), sodium concentrations ranged between 20 and 156 mg/L, and chloride concentrations ranged between 27 and 200 mg/L

Groundwater well 16D1 is located down gradient of the Cambria CSD effluent discharge. Samples analyzed from this well showed nitrate, sodium, and chloride concentrations were significantly elevated when compared to water quality observed at 310SSU and groundwater wells 9P7 and SS3. For 16D1, nitrate concentrations ranged between 3.4 and 24.5 mg/L (nitrate as N), sodium concentrations ranged between 32 and 142 mg/L, and chloride concentrations ranged between 110 and 210 mg/L. Table 9 below summarizes surface water, effluent, and groundwater data for select years.

Table 9 - San Simeon Watershed Surface and Ground Water

Annual Average (mg/L)	Surface Water			Effluent	Groundwater		
	Year	310SSC	310SSU	WWTP	SS3	9P7	16D1
Nitrate as N	**2012**	9.63	No Data	30.7	0.5	1.5	13.5
	2009	10.45	0.18	35.2	0.4	2.6	20.5
	2003	2.63	0.02[A]	34.5	0.9	10.3	14.2
	2002	3.98	0.06	17.6	0.8	7.1	6.8
Sodium	**2012**	220	No Data	182	19	24.5	139
	2009	99	15.2	158	19	45	129
	2003	No Data	No Data	155	18.6	56	134
	2002	68	17.6	203	18.7	68.5	115
Chloride	**2012**	378	No Data	No Data	20	31	194
	2009	133	12.2	No Data	19	64	170
	2003	No Data	No Data	No Data	19	88.5	197
	2002	78	10.9	No Data	20	118	140
Dissolved Oxygen	**2012**	7.47	No Data	3.9	NA	NA	NA
	2009	6.66	10.65	3.6	NA	NA	NA
	2003	10.52	10.19[A]	6.0	NA	NA	NA
	2002	8.18	10.33	7.4	NA	NA	NA

[A] Two data points

In Figures 19 and 20, water quality data shows that concentrations of nitrate, sodium, and chloride in both surface and ground water increase below the Cambria CSD discharge.

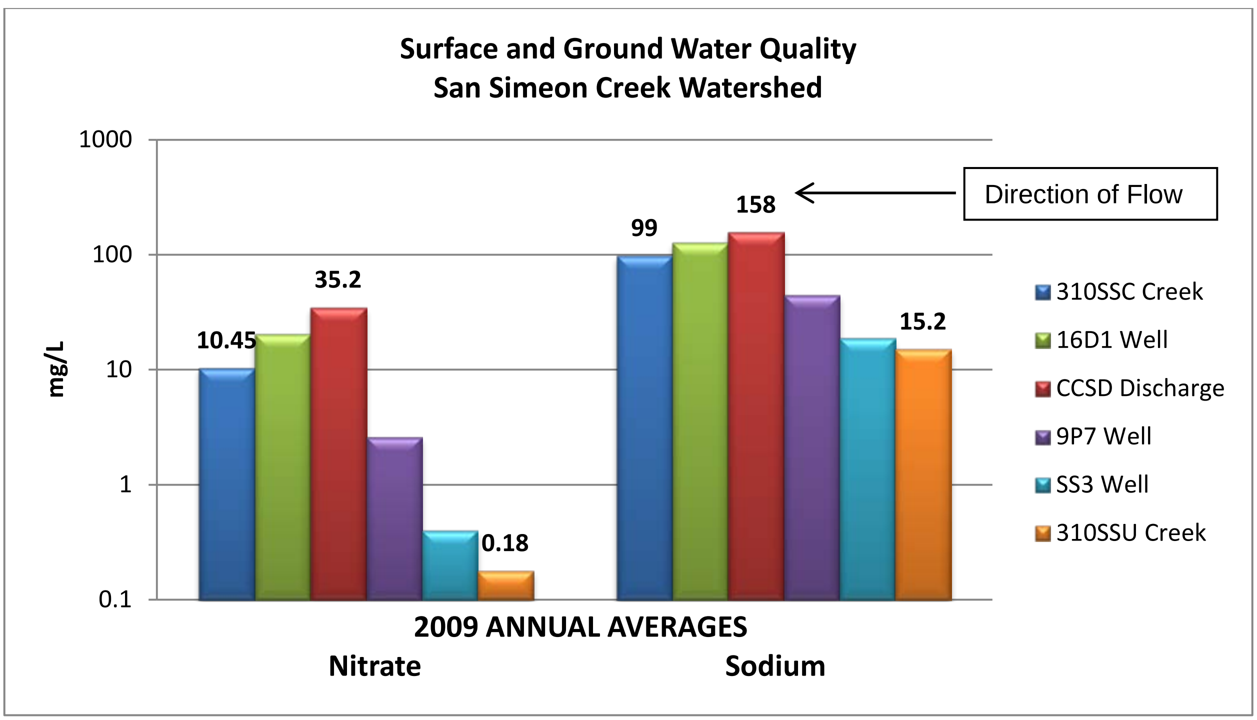

Figure 19 - Nitrate (NO_3) and Sodium (Na) in Surface and Ground Water in the San Simeon Creek Watershed

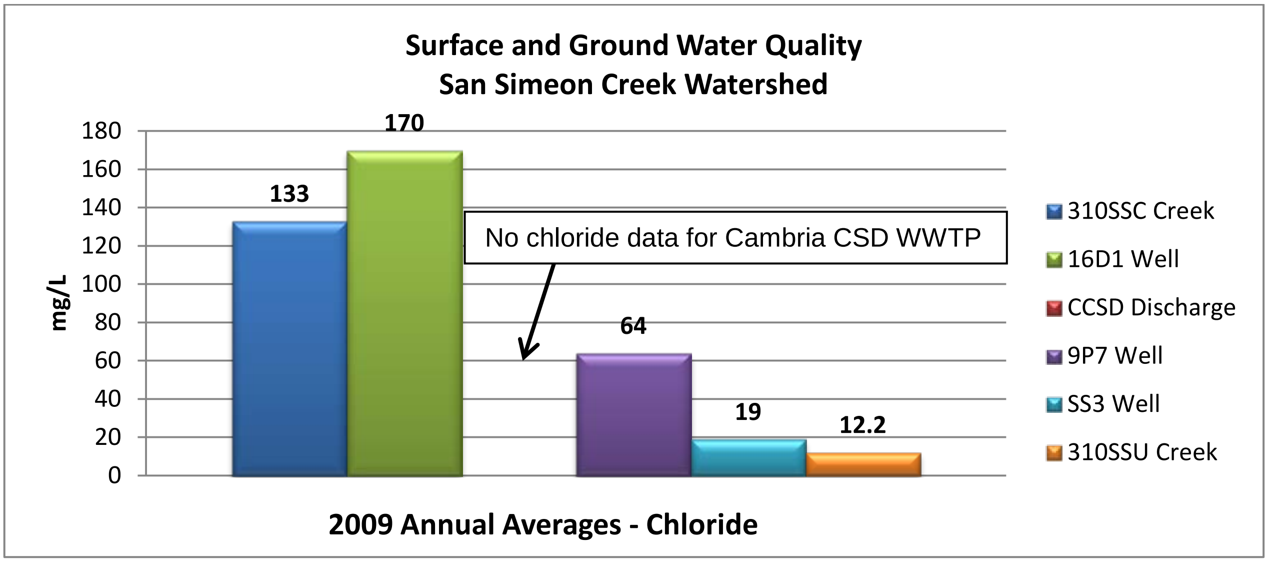

Figure 20 - Chloride in Surface and Ground Water in the San Simeon Creek Watershed

3.2 Biostimulation

Excessive nutrient concentrations in stream systems stimulate algal growth, which can create nuisance conditions for several beneficial uses including irrigation, industrial supply and recreational use. Additionally, excessive algae can remove oxygen from water, creating conditions unsuitable for many aquatic life forms. This condition is called “eutrophication”. Some algal blooms are also toxic to aquatic life, wildlife, and even humans. Waters that contain excessive algal growth are characterized by wide swings in dissolved oxygen concentrations, typically dropping below concentrations set to protect for aquatic life at night, and often rising above fully saturated levels during daytime (USEPA, 2000b). Low oxygen conditions can result in fish kills and harm to other aquatic life. Some species, such as trout, are particularly sensitive to low oxygen conditions, which is why more rigorous standards are set to support cold water fish habitat (Worcester et al., 2010).

Nitrogen and phosphorus, when not available in sufficient quantities, may limit plant growth. The ratio of nitrogen to phosphorus in the water column is considered a line of evidence of which nutrient is limiting, or could potentially limit algal growth in a waterbody (USEPA, 2000b). Published literature indicates that total nitrogen, total phosphorus (TN:TP) ratios above about 20:1 (ratio of 20) typically imply that phosphorus is the limiting nutrient; TN:TP ratios below about 10:1 (ratio of 10) can indicate that nitrogen in the limiting nutrient; and TN:TP ranges between about 10:1 and 20:1 indicate a transitional range where N and P can be co-limiting (Pete Osmolovsky, 2013). Data indicates that San Simeon Creek tends to be either nitrogen-limited or in the transitional range (Table 10).

Table 10 - 310SSC Total Nitrogen, Total Phosphorus Ratio

Year	Total Nitrogen : Total Phosphorous Ratio
2013	8
2012	14
2011	10
2010	11
2009	13
2008	15
2007	14
2006	13
2005	9
2004	10
2003	22
2002	12
2001	15

In addition to nutrient concentrations, solar radiation and flow can influence aquatic plant growth leading to conditions unsuitable for many aquatic life forms. Research indicates that when nutrients are high, sunlight availability is probably what actually limits aquatic plan growth. Accordingly, light availability is a response variable that should be considered in developing nutrient water column targets for biostimulatory impairments (Pete Osmolovsky, 2013).

Similarly, for San Simeon Creek, flows decrease and solar radiation increases, typically beginning in June. The upper portion of San Simeon Creek (310SSU) ceases to have continuous flow most years (June through September) and the lower lagoon portion (310SSC) of the creek is sustained by sub-surface flows.

To confirm that biostimulation is a significant issue in San Simeon Creek, a linkage between elevated nutrients and actual impairment of beneficial uses must be demonstrated (e.g. dissolved oxygen and/or pH imbalances and other water quality-aquatic habitat indicators). As shown above in Section 3, during periods of low flow, high solar radiation, and elevated nutrient concentrations (e.g. the dry season for July through December), San Simeon Creek experiences depressed oxygen concentrations that do not support the COLD beneficial use. Coincident with depressed oxygen concentrations, increased algal mat growth is consistently observed during the dry season. Depressed oxygen concentrations and increased algal mat growth are both conditions associated with biostimulation in San Simeon Creek.

3.3 Problem Statement

The Cambria CSD land discharge of treated domestic wastewater is percolating into San Simeon Creek at levels which are impairing beneficial uses and significantly impacting water quality.

The lower portion of San Simeon Creek (approximately four miles from the Creek mouth to the first San Simeon Creek Road crossing) is impaired due to exceedance of the water quality objective for nitrate of 10.0 mg/L (NO_3 as N) protecting the domestic or municipal supply (MUN) beneficial use. Central Coast Water Board staff assessed CCAMP data (monitoring site 310SSC for 4/24/2001 through 11/15/2006) for San Simeon Creek to determine beneficial use support and found 7 of 53 samples exceed the criterion for nitrate (mg/L). Since 2006 (2007-2013) an additional 36 of 79 samples exceeded the nitrate water quality standard.

The lower portion of the San Simeon Creek, approximately 5.6 miles, is also impaired[9] due to exceedance of the water quality objective for dissolved oxygen protecting Cold Freshwater Habitat (COLD) and Warm Freshwater Habitat (WARM) beneficial uses. Elevated nutrients and aquatic plant growth are two conditions contributing to low dissolved oxygen concentrations.

For the COLD beneficial use, the Basin Plan specifies dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time and dissolved oxygen saturation median values should not fall below 85% saturation as a result of controllable water quality conditions. Central Coast Water Board staff assessed CCAMP data (monitoring site 310SSC, 2001 - 2006) for San Simeon Creek and found 12 of 52 samples exceed the criterion for dissolved oxygen (mg/L) and 14 of 52 samples exceed the criterion for dissolved oxygen saturation (Percent Saturation). Since 2006 (2007-2012), an additional 40 of 80 samples exceeded the dissolved oxygen (mg/L) water quality standard and 51 of 80 samples exceeded the dissolved oxygen saturation (percent saturation) water quality standard.

For WARM, dissolved the oxygen concentration shall not be reduced below 5.0 mg/L at any time and dissolved oxygen saturation median values should not fall below 85% saturation as a result of controllable water quality conditions. Central Coast Water Board staff assessed CCAMP (monitoring site 310SSC, 2001 - 2006) data for San Simeon Creek to determine beneficial use support and found four of 52 samples exceed the criterion for dissolved oxygen and 14 of 52 samples exceed the criterion for dissolved oxygen saturation. Since 2006 (2007-2012), an additional 11 of 80 samples exceeded the dissolved oxygen (mg/L) water quality standard and 51 of 80 samples exceeded the dissolved oxygen saturation (mg/L) water quality standard.

The lower portion of the San Simeon Creek, approximately 4.0 miles, is also impaired due to exceedance of the guideline for chloride protecting the Agricultural Supply (AGR) beneficial use (Basin Plan Table 3-2 water quality objectives). Central Coast Water Board staff assessed CCAMP (monitoring site 310SSC, 2001 - 2006) data for San Simeon Creek to determine beneficial use support and 22 of 46 samples exceed the guideline for chloride. Since 2006 (2007-2013), an additional 48 of 78 samples exceeded the guideline for chloride.

The lower portion of the San Simeon Creek, approximately 4.0 miles, is also impaired due to exceedance of the guideline for sodium protecting the Agricultural Supply (AGR) beneficial use. Central Coast Water Board staff assessed CCAMP (monitoring site 310SSC, 2001 - 2006) data for San Simeon Creek to determine beneficial use support and 24 of 46 samples exceed the guideline for sodium. Since 2006 (2007-2013), an additional 50 of 78 samples exceeded the guideline for sodium.

As a result of these conditions, beneficial uses are not being protected. By developing TMDLs for the aforementioned pollutants, the water quality standards violations being addressed include:

- Violations of the drinking water standard for nitrate;

[9] The upper lagoon portion of San Simeon Creek (in the vicinity of 310SSC) experienced a fish kill in October 1995 (Alley 1997). At that time a combination of factors (elevated water temperatures, algal bloom, minimal stream inflow, etc.) produced low dissolved oxygen levels that resulted in the death of hundreds of juvenile steelhead.

- Violations of the Basin Plan narrative general objective for biostimulatory substances in inland surface waters and estuaries (as expressed by excessive nutrients, chlorophyll *a*, algal biomass, and low dissolved oxygen); and
- Violations of the guidelines for sodium and chloride protecting the Agricultural Supply (AGR) beneficial use.

The pollutants addressed in this TMDL are nitrate, sodium, chloride, and total phosphorus. Total phosphorus is included as a pollutant due to biostimulatory impairments of surface waters. Reducing nutrients will address the dissolved oxygen impairments in San Simeon Creek.

The proposed TMDLs will protect and restore the municipal and domestic water supply beneficial use (MUN), aquatic habitat beneficial uses (COLD, SPWN), and beneficial uses of the agricultural water supply beneficial use (AGR).

This project identifies the causes of impairment and describes solutions to achieve water quality objectives, guidelines, and protection of beneficial uses.

4 NUMERIC TARGETS

This section describes the numeric targets used to develop the TMDL. Numeric targets are water quality targets developed to ascertain when and where water quality objectives are achieved and when beneficial uses are protected.

4.1 Target for Nitrate (MUN Standard)

The purpose of this target is to meet the water quality objective for nitrate in municipal and domestic drinking water sources (MUN: Municipal/Domestic Supply; GWR: Groundwater Recharge). The Basin Plan numeric water quality objective for nitrate is 10 mg/L NO_3 as nitrogen, therefore the nitrate target is set at the Basin Plan water quality objective as follows:

- *For protection of MUN beneficial use - Receiving water column nitrate must not exceed 10 mg/L-N.*

4.2 Targets for Biostimulatory Substances (Total Nitrogen and Total Phosphorous

This section provides a summary of the information contained in Appendix C – San Simeon Creek Nutrient Numeric Target Development (see Appendix C for details). The Basin Plan contains the following narrative water quality objectives for biostimulatory substances:

- *Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.*

Under most circumstances, compliance with all applicable water quality objectives, including narrative objectives is required (SWRCB, 2011a). Further, according to USEPA guidance, TMDLs and associated wasteload allocations and load allocations must be set at levels necessary to result in attainment of all applicable water quality standards, including narrative water quality objectives (USEPA, 2000a). A narrative objective may be interpreted with respect to a specific pollutant or parameter by selecting an appropriate numeric threshold that meets the conditions of the narrative objective (SWRCB, 2011a). Therefore, to implement the Basin Plan's narrative objective for biostimulatory substances the Central Coast Water Board is required to develop technically defensible numeric water quality criteria to assess attainment or non-attainment of the narrative water quality objective.

To implement this narrative objective, staff evaluated available data, studies, established methodologies, technical guidance, peer-reviewed numeric criterion, and other information to estimate the levels of nitrogen and phosphorus that can be present without causing violations of the objective. It is important to recognize that definitive and unequivocal scientific certainty is not necessary in a TMDL process with regard to development of nutrient water quality targets protective against biostimulation. Numeric targets should be scientifically defensible, but are not required to be definitive. Eutrophication is an ongoing and active area of research. If the water quality objectives for biostimulatory substances are changed in the future, then any TMDLs and allocations that are potentially adopted for biostimulatory substances pursuant to this project may sunset and be superseded by revised water quality objectives.

Recent biostimulation research of inland surface waters in the California central coast region indicates that the existing nutrient numeric water quality objective to protect drinking water standards found in the Basin Plan (i.e., the 10 mg/L nitrate-nitrogen MUN objective) is unlikely to reduce benthic algal growth below even the highest benchmarks for water quality[10] (UCSC 2010). This is because aquatic organisms respond to nutrients at lower concentrations (UCSC 2010, Rollins et al. 2012). Therefore, the 10 mg/L nitrate-nitrogen objective is not protective against biostimulatory impairments. Consequently, it is necessary to set biostimulatory numeric water quality targets at more stringent levels than the existing numeric objectives found for nitrate in the Basin Plan (i.e., the 10 mg/L MUN objective).

Numeric targets for biostimulatory substances are presented in Table 11. Appendix C contains the data, assessments, and information used to derive numeric targets for biostimulatory substances. Staff followed USEPA guidance in developing draft targets with the goal being to account for physical and hydrologic variation within the San Simeon Creek watershed (see Nutrient Criteria Technical Guidance Manual, River and Streams – USEPA, July 2000b). The USEPA nutrient criteria guidance manual recommends that nutrient criteria be developed to account for natural variation existing at the regional and basin level-scale.

Table 11 - Dry Season Receiving Water Numeric Targets for Biostimulatory Substances

Allowable Total Nitrogen-N (mg/L)	**Allowable Total Phosphorus-P (mg/L)**	**Methodology for Developing Numeric Target**
1.3 mg/L	*0.05 mg/L*	Statistical Analysis (USEPA percentile-based approaches) CA NNE approach (NNE benthic biomass model tool) USEPA Nutrient Criteria Technical Guidance Manual, Rivers and Streams (USEPA, 2000b)

Dry Season = July through December

[10] USEPA guidance documents and assessment data were examined to produce a set of possible expected benchmarks for algal abundance and biostimulatory substances (University of California, Santa Cruz 2010).

Numeric target development in this TMDL is consistent with policy recommendations outlined in the draft State Water Resources Control Board's Statewide Nutrient Policy (SWRCB, 2011b). The draft Statewide Nutrient Policy recognizes both the California Nutrient Numeric Endpoints (CA NNE) approach and the USEPA percentile approach as the two alternatives under consideration for a statewide policy for nutrient policy. One additional line of evidence for establishing nutrient water quality targets is the application and/or modification of established nutrient/algal thresholds (e.g., nutrient concentration thresholds or algal limits from published literature) (USEPA, 2000a). Staff evaluated and utilized three lines of evidence in development of numeric targets.

4.3 Targets for Nutrient-Response Indicators (Dissolved Oxygen and Chlorophyll-a)

Low dissolved oxygen and chlorophyll-a are nutrient-response indicators and represent a primary biological response to excessive nutrient loading in waterbodies which exhibit biostimulatory conditions. The current CWA Section 303(d) listed dissolved oxygen impairment in the San Simeon Creek watershed is not directly addressed in the TMDL implementation plan in terms of calculating loads (TMDLs) or setting wasteload or load allocations for dissolved oxygen. However, reductions in nutrient loading are anticipated to be beneficial in attainment of water quality standards for dissolved oxygen and restoring the waterbodies to a desired condition. Note that this approach regarding nutrient pollution and dissolved oxygen has similarly been used in previous USEPA approved TMDLs (Wabash River Nutrient and Pathogen TMDL, 2006). Therefore, the current CWA Section 303(d) listing for dissolved oxygen that is associated with identified biostimulatory problems (refer to Section 3.1.2) is addressed by the TMDLs established herein. It is important to reiterate that nutrient concentrations by themselves constitute indirect indicators of biostimulatory conditions and there is an interrelationship between high nutrient loads, excessive algal growth, and the subsequent impacts of excessive algae on dissolved oxygen and aquatic habitat. Accordingly, staff is also proposing dissolved oxygen and chlorophyll-a numeric targets to ensure that streams do not show evidence of biostimulatory conditions. Additionally, numeric targets identified for dissolved oxygen and chlorophyll-a in this TMDL will be used as indicator metrics to assess primary biological response to future nutrient water column concentration reductions and compliance with the Basin Plan's biostimulatory substances objective.

4.3.1 Dissolved Oxygen

The Basin Plan contains the following water quality objectives for dissolved oxygen:

- *For warm beneficial uses and for waters not mentioned by a specific beneficial use, dissolved oxygen concentrations shall not be reduced below 5.0 mg/L at any time.*
- *For cold and spawning beneficial uses, dissolved oxygen concentrations shall not be reduced below 7.0 mg/L at any time.*
- *Median values for dissolved oxygen should not fall below 85% saturation as a result of controllable conditions.*

In addition, due to the nature of algal respiration and photosynthesis and since daytime monitoring programs are unlikely to capture most low dissolved oxygen crashes, it is prudent to identify a numeric guideline that can measure daytime biostimulatory problems on the basis of dissolved oxygen supersaturation. Peer-reviewed research in California's central coast region (Worcester et al., 2010) has established an upper limit of 13 mg/L for dissolved oxygen to screen for excessive dissolved oxygen. Of monitoring sites evaluated in the central coast region that are supporting designated aquatic habitat beneficial uses and do not show signs of biostimulation, dissolved oxygen concentrations rarely exceed 13 mg/L at any time. The 13 mg/L dissolved oxygen target is not a regulatory standard, but can be used as a TMDL nutrient-response indicator target to assess primary biological response to nutrient pollution reduction. Accordingly, staff proposes the numeric target for dissolved oxygen supersaturation indicative of biostimulatory conditions as follows:

- *Dissolved oxygen concentrations not to exceed 13 mg/L.*

This TMDL is addressing biostimulatory impairments that are credibly linked to biostimulation problems that include elevated algal biomass, wide diel swings in dissolved oxygen, and elevated nutrients.

4.3.2 Chlorophyll-a

Chlorophyll-a is an algal biomass indicator. The Basin Plan does not include numeric water quality objectives or criteria for chlorophyll-a. Staff considered a range of published numeric criteria. The State of Oregon uses an average chlorophyll-a concentration of > 15 µg/L as a criterion for nuisance phytoplankton growth in lakes and rivers (OAR 2000). The state of North Carolina has set a maximum acceptable chlorophyll-a standard of 15 µg/L for cold water (lakes, reservoir, and other waters subject to growths of macroscopic or microscopic vegetation designated as trout waters), and 40 µg/L for warm water (lakes, reservoir, and other waters subject to growths of macroscopic or microscopic vegetation not designated as trout waters) (North Carolina Administrative Code, 2003). A chlorophyll-a concentration of 8 µg/L is recommended as a threshold of eutrophy for plankton in EPA's Nutrient Criteria Technical Guidance Manual for Rivers and Streams (USEPA, 2000b). The Central Coast Region has used 40 µg/L as stand-alone evidence to support chlorophyll-a listing recommendations for the CWA Section 303(d) list.

A recent peer-reviewed study conducted by CCAMP reports that in the California central coast region inland streams that do not show evidence of eutrophication all remained below the chlorophyll-a threshold of 15 µg/L (Worcester et al., 2010). As this value is consistent with several values reported in published literature and regulations shown above, and as the CCAMP study by Worcester et al. is central coast-specific, staff proposes the numeric target for chlorophyll-a indicating biostimulatory conditions as follows:

- *Water column chlorophyll-a concentrations not to exceed 15 µg/L.*

4.4 Targets for Sodium

The Basin Plan numeric water quality guideline used in the 2010 CWA Section 303(d) assessment for sodium in irrigation water is 69 mg/L. This value is based on University of California Agricultural Extension Service general guideline value for sodium in irrigation water. According to USEPA (USEPA, 2007), the TMDL for San Simeon Creek should be calculated on the basis of this CWA Section 303(d) assessment criteria (69 mg/L), pending the approval of revised water quality guidelines or site specific objectives. This is because TMDLs must be consistent with current water quality criteria found in the Basin Plan.

The TMDL numeric target for sodium, which demonstrates if the AGR designated beneficial use for irrigation supply is being supported, is as follows:

- *The controllable discharge of wastes shall not cause concentrations of sodium to exceed 69 mg/l in receiving waters.*

4.5 Targets for Chloride

The Basin Plan numeric water quality guideline used in the 2010 CWA Section 303(d) assessment for chloride in irrigation water is 106 mg/L. This value is based on University of California Agricultural Extension Service general guideline value for chloride in irrigation water.

4.5.1 Criteria for Protection of MUN and GWR

The purpose of this target is to implement the Basin Plan's narrative taste and odor general water quality objective for drinking water supply. USEPA and the California Department of Public Health have established a recommended secondary maximum contaminant level (secondary MCL) for chloride in drinking water as 250 mg/L.

Therefore, the numeric target for chloride which demonstrates whether or not the MUN (drinking water supply) and GWR (groundwater recharge) designated beneficial uses are being supported is as follows:

- *The controllable discharge of wastes shall not cause concentrations of chloride to exceed 250 mg/l in receiving waters.*

Based on available water quality data, chloride concentrations in San Simeon Creek are achieving this numeric target under all flow and seasonal conditions and therefore MUN and GWR designated beneficial uses of the creek are being supported for chloride. It should be noted that State and Federal anti-degradation policies require that existing chloride water quality which is currently supporting MUN and GWR be maintained, and that future lowering of existing water quality is not allowed unless consistent with provisions of the State and Federal anti-degradation policies[11].

4.5.2 Criteria for Protection of Aquatic Habitat (WARM, SPWN)

The purpose of this target is to implement the Basin Plan's narrative toxicity general water quality objective and to ensure support of designated aquatic habitat beneficial uses in San Simeon Creek. The USEPA has established a national recommended acute toxicity threshold for chloride in ambient waters as 860 mg/L, which is protective of freshwater aquatic organisms (USEPA, 1988).

Therefore, the proposed numeric target for chloride, which demonstrates whether or not the WARM and SPWN designated beneficial uses are being supported, is as follows:

- *The controllable discharge of wastes shall not cause concentrations of chloride to exceed 860 mg/l in receiving waters.*

Based on available water quality data, chloride concentrations in San Simeon Creek are achieving this numeric target under all flow and seasonal conditions and therefore aquatic habitat designated beneficial uses of the creek are being supported for chloride. It should be noted that

[11] The State Water Resources Control Board and appellate court decisions indicate that water can be considered high quality for purposes of the anti-degradation policy on a constituent by constituent basis. Therefore, water can be of high quality under the anti-degradation policy for some constituents or beneficial uses, but not for others (see Court of Appeal of the State of California, Third Appellate District, Appeal Case C066410, Acociacion de Gente Unida, etc. et al. v. Central Valley Regional Water Quality Control Board).

State and Federal anti-degradation policies require that existing chloride water quality which is currently supporting aquatic habitat be maintained, and that future lowering of existing water quality is not allowed unless consistent with provisions of the State and Federal anti-degradation policies.

4.5.3 Criteria for Protection of Agricultural Supply (AGR)

The Basin Plan numeric water quality guideline used in the 2010 CWA Section 303(d) assessment for chloride in irrigation water is 106 mg/L chloride. This value is based on University of California Agricultural Extension Service general guideline value for chloride in irrigation water. According to USEPA (USEPA, 2007), the TMDL for San Simeon Creek should be calculated on the basis of this CWA Section 303(d) assessment criteria (106 mg/L), pending the approval of revised water quality guidelines or site specific objectives. This is because TMDLs must be consistent with current water quality criteria found in the Basin Plan.

Therefore, the TMDL numeric target for chloride, which demonstrates whether or not the AGR designated beneficial use for irrigation supply is being supported, is as follows:

- *The controllable discharge of wastes shall not cause concentrations of chloride to exceed 106 mg/l in receiving waters.*

The Basin Plan Table 3-3, guidelines for sodium and chloride are appropriate as the concentrations of sodium and chloride measured at 310SSU were well below the guideline values.

4.6 Summary of Numeric Targets

Table 12 - Summary Table of Numeric Targets

Constituent	Beneficial Use	Water Quality Objective	Target
Chloride	MUN GWR	*California Department of Public Health have established a recommended secondary maximum contaminant level (secondary MCL) for chloride in drinking water as 250 mg/L*	***≤ 250 mg/l***
	WARM SPWN	*USEPA has established a national recommended acute toxicity threshold for chloride in ambient waters as 860 mg/L*	***≤ 860 mg/L***
	AGR	*Basin Plan numeric water quality guideline = 106 mg/L*	***≤ 106 mg/l***
Chlorophyll-a	COLD WARM SPWN RARE BIOL	*Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.*	***≤ 15 µg/L***
Dissolved Oxygen	WARM	*For warm beneficial uses and for waters not mentioned by a specific beneficial use, dissolved oxygen concentrations shall not be reduced*	***≥ 5.0 mg/L***

		below 5.0 mg/L at any time.	
	COLD SPWN	*For cold and spawning beneficial uses, dissolved oxygen concentrations shall not be reduced below 7.0 mg/L at any time.*	***≥ 7.0 mg/L***
	COLD WARM RARE BIOL	*Median values for dissolved oxygen should not fall below 85% saturation as a result of controllable conditions.*	***Median ≥ 85% saturation***
	COLD SPWN	*None*	***≤ 13 mg/L***
Nitrate	MUN	*10 mg/L-N*	***≤ 10 mg/L-N***
Nitrogen, Total	COLD WARM REC-1 RARE BIOL	*Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.*	***1.3 mg/L-N during July through December***
Phosphorus, Total	COLD WARM REC-1 RARE BIOL	*Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.*	***0.05 mg/L-* P during July through December**
Sodium	AGR	*Basin Plan numeric water quality guideline = 69 mg/L*	***≤ 69 mg/l***

5 SOURCE ANALYSIS

5.1 Point Source Assessment (Waste Load Assessment)

The Cambria CSD owns and operates an Advanced Water Treatment Plant (AWTP) that supplies drinking water to the community of Cambria. Operation of the AWTP has potential to impact San Simeon Creek lagoon water levels by utilizing groundwater that would otherwise contribute to water flows in San Simeon Creek. To mitigate potential effects, the AWTP discharges 100 gpm (approximately 144,000 gpd) of treated groundwater to maintain lagoon water levels (Figure 21). Discharge of the treated groundwater is regulated through National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges with Low Threat to Water Quality (NPDES Order No. R3-2011-0223). This discharge was permitted on December 8, 2014.

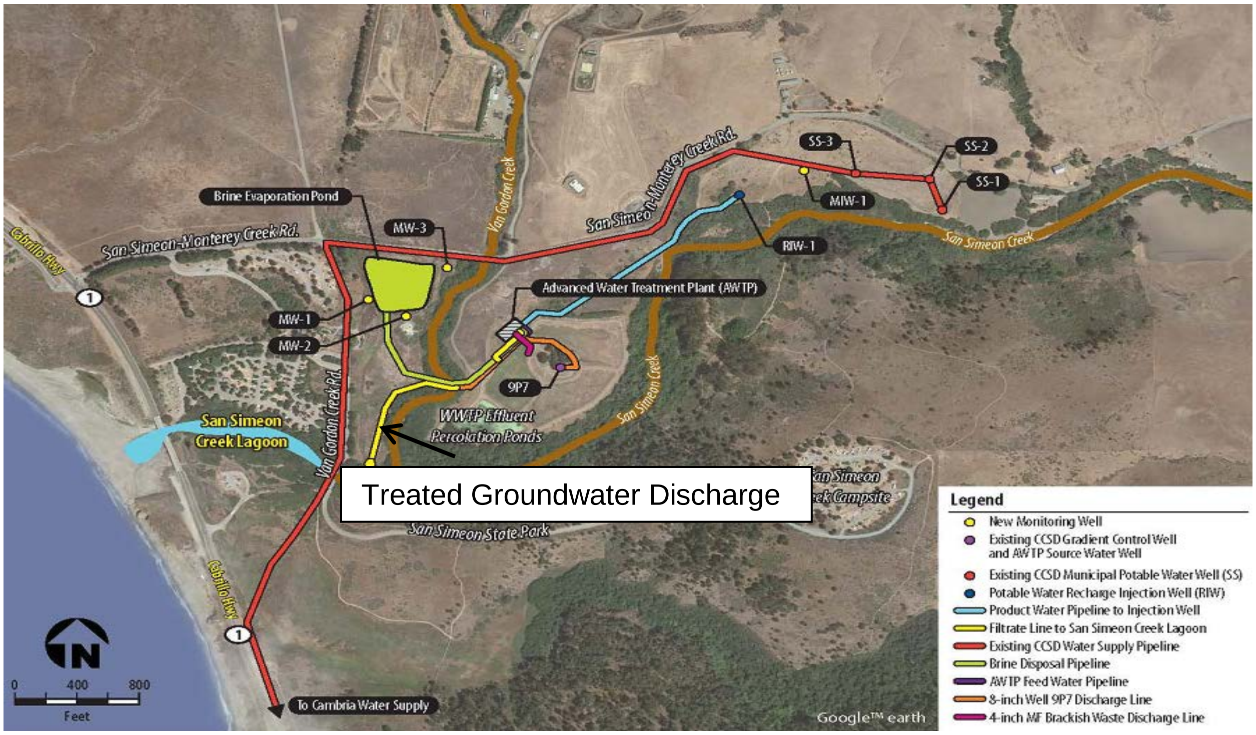

Figure 21- Treated Groundwater Discharge to San Simeon Creek (Source CDM Smith)

Table 13 documents water quality of the NPDES discharge. Data in Table 13 represents data from a single sample collected February 9, 2015. Additional data should be available March 1, 2015. Current levels of nitrate, sodium, and chloride meet water quality objectives.

Table 13 - Water Quality of Cambria CSD Discharge to Van Gordon Creek

Cambria CSD Discharge to Van Gordon Creek (Water) Sampled:02/09/15 16:45		
Analyte	**Result**	**Units**
Ammonia as N	0.038	mg/L
Chloride	16	mg/L
Chlorine Residual	0.61	mg/L
Nitrate as N	0.59	mg/L
Total Dissolved Solids	260	mg/L
Sodium	30	mg/L

The Cambria CSD also owns and operates a wastewater collection, treatment and disposal system which provides service to the unincorporated community of Cambria. Treated wastewater (on average 0.5 to 0.75 million gallons per day) is pumped 2 1/2 miles north to a 22 acre land disposal facility in the San Simeon Creek Watershed and applied to the land through percolation ponds. Figure 22 shows the location of the Cambria CSD wastewater treatment plant (WWTP) and percolation ponds. Figure 23 shows the current layout of the ponds.

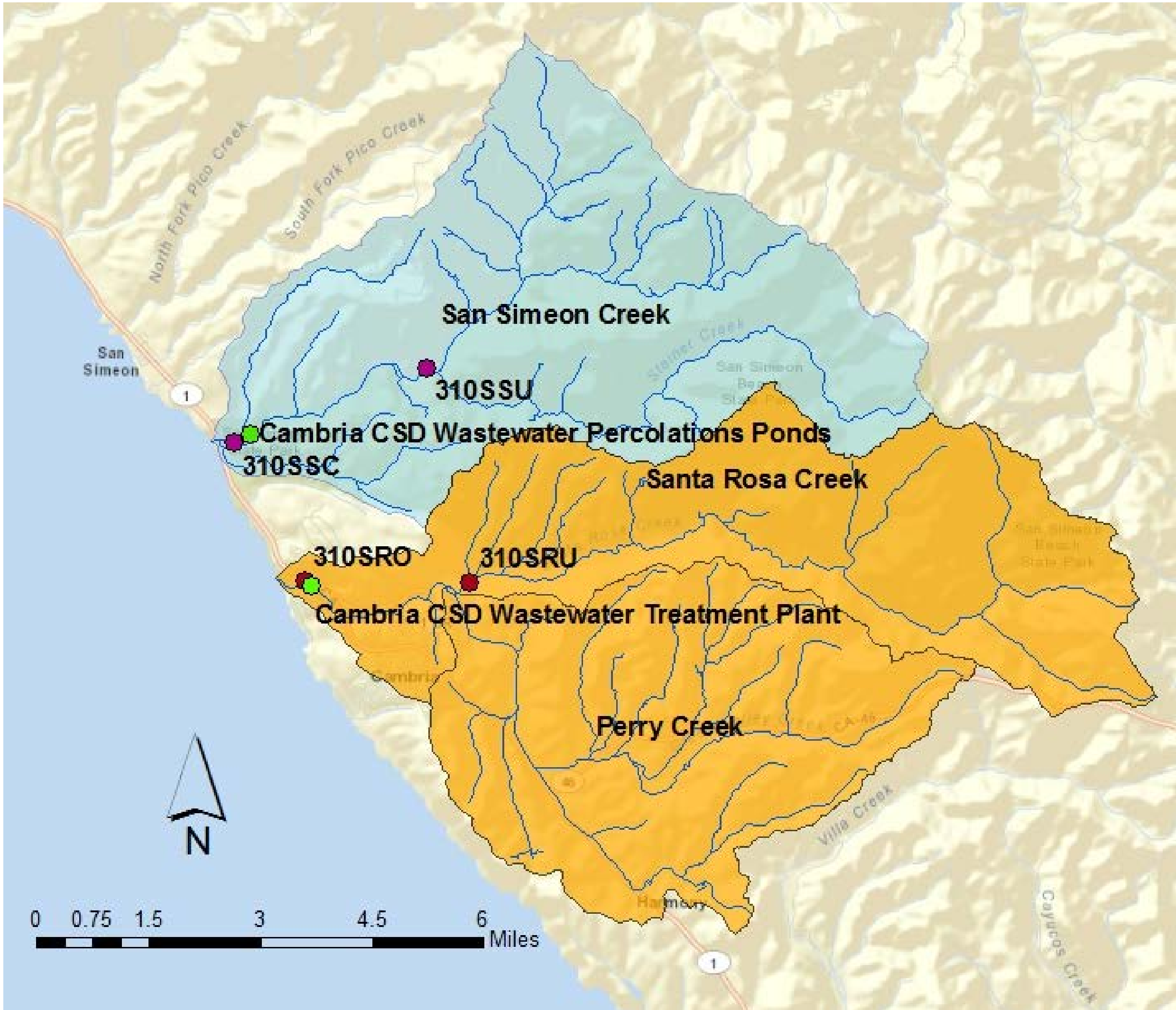

Figure 22 - Location of the CCAMP Monitoring Stations (San Simeon and Santa Rosa Creeks), Cambria CSD Wastewater Treatment Plant in Santa Rosa Creek Watershed and Cambria CSD Percolation Ponds in San Simeon Creek Watershed

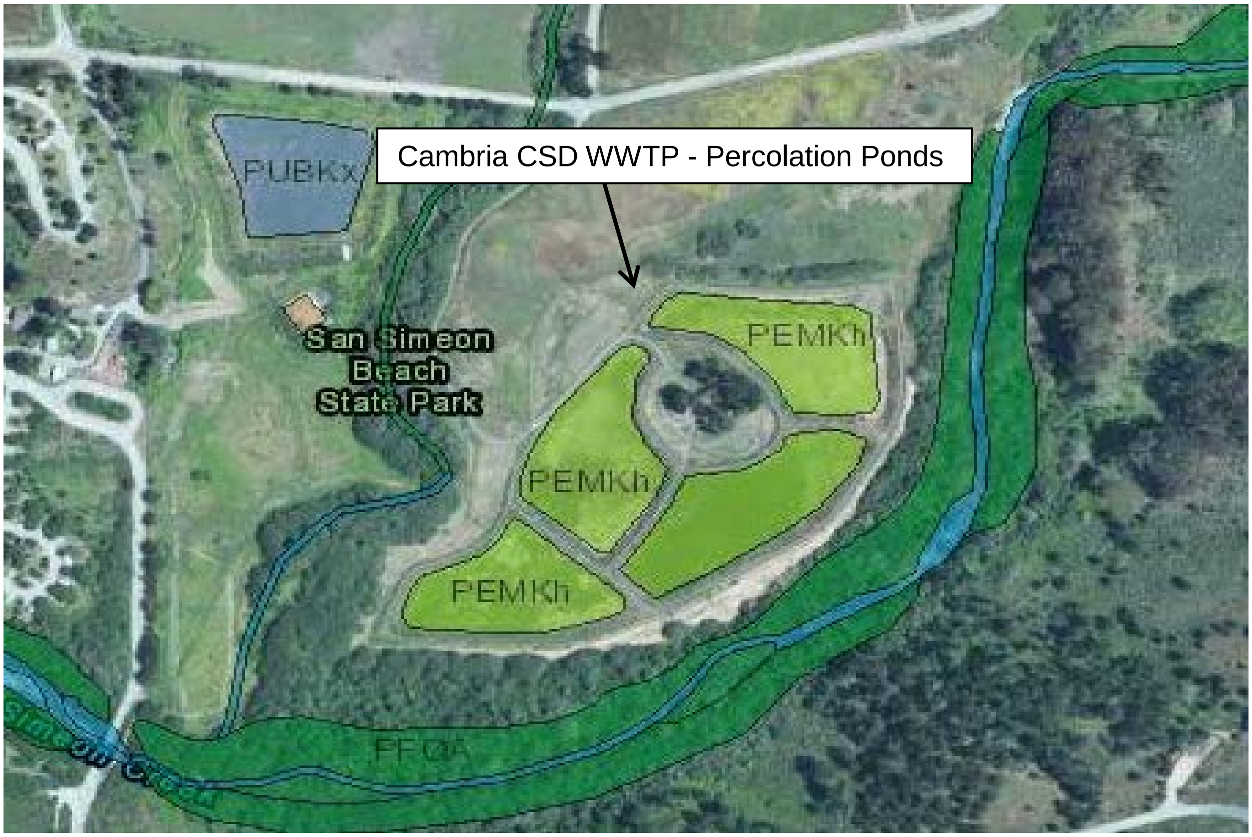

Figure 23 - Cambria CSD Percolation Ponds (source: National Wetlands Inventory)

Prior to the early 1980's, the Cambria CSD did not discharge treated wastewater into the San Simeon Creek watershed. Data from San Simeon Creek prior to 1980 are shown in Table 14 below (Boyle 1977). This data shows total dissolved solids, nitrates, sodium, and chloride consistent with surface water quality concentrations measured at 310SSU. Water quality at 310SSU supports beneficial uses and the data implies that surface water in lower San Simeon Creek was supportive of beneficial uses prior to wastewater being discharge into the lower watershed.

Table 14 - Quality of Surface Water in San Simeon Creek pre-1980

Parameter	**Concentration (mg/L**[A]	**Concentration (mg/L)**[B]
TDS	259	286
Phosphate	Not Tested	No Data
Total Phosphorus	Not Tested	No Data
Nitrate Nitrogen	0.49 (nitrate as nitrogen)	<0.01
Total Nitrogen	0.5	No Data
Chlorides	9	13
Sulfates	33	42.3
Sodium	No Data	15.8

[A] *Concentrations are averages based on Department of Water Resources (Memorandum 282.31, 1969) test results* (12 samples per well).
[B] *Concentrations are averages based on United States Geological Survey (Report 98-4061) test results (two stations upgradient of Cambria CSD treated wastewater discharge, but below 310SSU, total of four data points 1988-1989).*

Simlarly, groundwater quality data prior to discharge are shown below in Table 15 (Boyle 1977). This data shows total dissolved solids, sodium, and chloride concentrations consistent with groundwater water quality concentrations measured at Cambria CSD water supply well SS3. The nitrate data in the table below is elevated when compared against nitrate concentrations observed in Cambria CSD water supply well SS3 and there are reports of agriculture activities on the Bonomi Ranch prior to the discharge of wastewater. However, the data for total dissolved solids, sodium, and chloride implies that overall, groundwater in lower San Simeon Creek was supportive of beneficial uses prior to wastewater being discharged into the lower watershed. It should be noted that the nitrate concentrations in the Bonomi Ranch groundwater had a an average concentration of 5.4 mg/L nitrate as N prior to 1969. This concentration is similar to the average annual concentration for the period 2001-2012 of 4.8 mg/L from well 9P7[12].

Table 15 - Groundwater Quality in San Simeon Creek Watershed pre-1980

Parameter	Bonomi Ranch[A] Irrigation Well 1975 (mg/L)	Average[B] of Analyses Prior to 1969 Concentration (mg/L)		
		Average	Maximum	Minimum
Calcium	34	46.8	58	26
Magnesium	29	36.3	40	33
Sodium	21	17.6	21	14
Potassium	0.8	1.25	4	1
Bicarbonate	220	277	307	203
Sulfate	44	40.2	47	35
Carbonate	0	1.3	14	0
Chloride	20	22.3	53	16
Nitrate	10	5.4	30	1.8
Flourine	0.1	0.25	0.9	0.1
Boron	0.33	0.18	0.22	0.13
Iron	0.10	No Data	No Data	No Data
Manganese	Less than 0.01	No Data	No Data	No Data
Total Dissolved Solids	350	323	396	260
Total Hardness	269	266	297	209

[A] Bonomi Ranch is now Cambria CSD's wastewater disposal sprayfileds/percolation ponds (State of California, 1977). Data here appears to be a single sample (not specified in source report).
[B] Concentrations are averages based on Department of Water Resources (Memorandum 282.31, 1969) test results (12 samples per well).

One way to assess the significance of the Cambria CSD treated wastewater discharge is to consider loads contributed by the discharge. For the period 2001-2012, the average wastewater effluent discharged is 0.59 million gallons per day (MGD). Over that same period the average annual effluent nitrate concentration was 27.3 mg/L nitrate as nitrogen. For the Cambria CSD discharge, using the average flow and the average nitrate concentration for the 2001-2012 period, a mass loading calculation shows that the effluent discharged to the percolation ponds delivers an average nitrate nitrogen load of 134 pounds per day. This equates to an average annual load contributed to the San Simeon Creek watershed of approximately 48,874 pounds nitrate as nitrogen.

Daily load = average concentration X average flow

[12] Well 9P7 is located on the former Bonomi Ranch property.

Daily load = 27.3 mg/L * 3.78 L/gal * 1gm/1000 mg*1Kg/1000gm*2.2lb/kg* 590,000 gal/day

= 133.9 lb/day or 48,874 lb/year

Similar calculations can be made for sodium and chloride. Table 16 below summarizes the results for nitrate, sodium, and chloride.

Table 16 - Cambria CSD Wastewater Effluent Calculated Nitrate, Sodium, and Chloride Loads to Percolation Ponds

Constituent	Average		
	Annual Concentration (mg/L)	**Daily Load lb/day**	**Annual Load lb/year**
Nitrate	27.3	134	48,874
Sodium	163	800	291,909
Chloride	170[A]	834	304,445

[A] The Cambria CSD does not currently analyze effluent for chloride. This is the average annual concentration from well 16D1, which is downgradient of the effluent discharge. This value is consistent with effluent chloride levels reported in 1989 (Cambria CSD 1989)

For context, one acre of strawberries uses approximately 30 to 60 pounds of nitrogen per acre. Assuming 60 pounds of nitrogen per acre, the Cambria CSD annual loading of 48,874 lb/year equates to one farm of approximately 815 acres growing one crop of strawberries per year or a farm of approximately 272 acres growing three crops of strawberries per year.

Surface water and groundwater quality are discussed in Section 3 above. The data shows that both surface water and groundwater quality are degraded as a result of the Cambria CSD point source discharge. Table 17 below summarizes the water quality data:

Table 17 - Pre and Post Discharge Surface and Ground Water Quality

Constituent	Surface Water (310SSC)		Groundwater	
	Pre-1980[1]	**Current**	**Pre-1980[2]**	**Current[3]**
Total Dissolved Solids	259 - 286	659 [A]	323	768.8
Phosphate	Not Tested	0.63 [A]	No Data	No Data
Total Phosphorus	Not Tested	0.68 [A]	No Data	No Data
Nitrate Nitrogen (N)	<0.01 - 0.49	7.45 [A]	5.4	12.1
Total Nitrogen	0.5	7.82 [A]	No Data	No Data
Chlorides	9 - 13	123 [A]	22.3	170.2
Sulfates	33 - 42.3	No Data	40.2	84.8
Sodium	15.8	99 [A]	17.6	123.0
Boron	No Data	No Data	0.18	0.3

1 - Sample taken in the lower watershed
2 - Bonomi Ranch Irrigation Well prior to 1969 (location of current spray fields/percolation ponds)
3 - Well 16D1 down gradient of Cambria CSD wastewater discharge (2001-2012)
A = Mean for all years (2001-2013)

In the report "Second Supplemental Report for County of San Luis Obispo on Cambria Wastewater Disposal Facilities, San Luis Obispo County" (Boyle 1977), degradation of groundwater was a pre-determined impact. However in 1977, the Boyle report states that the buildup of nitrate concentration in the local groundwater should not be of concern because "this portion of the basin will not be used for domestic water supply." The Boyle 1977 report also states that the discharged wastewater will reach surface waters and that San Simeon Creek flows will "be available to dilute wastewater reaching the creek, either from Van Gordon Creek surface discharges or seepage from groundwater."

A report by Jones & Stokes (1991) confirms that groundwater impacted by the Cambria CSD discharge is seeping into surface waters adjacent to sprayfield operations. The Jones & Stokes report states "the lagoon is formed by seepage of groundwater into the creek, pricipally near the upstream end of the lagoon," which is adjacent to the wastewater disposal area. This same report goes on to state that locating the proposed percolation ponds[13] toward the downstream end of the sprayfields would maximize the opportunity for infiltrated pond water to seep into the creek and lagoon.

Finally in July 1999, the Cambria CSD submitted a Surface Water Monitoring Report (Cambria CSD 1999) to Central Coast Water Board staff. This report confirms "elevated levels of nitrate downstream of the effluent disposal ponds indicate water quality degradation in the surface water and in the groundwater at well 9P7." This report goes on to state there is a need to lower nitrate impacts associated with the Cambria CSD effluent and that the effluent discharge should use an average level of "5.0 mg/L nitrate as nitrogen."

In summary, surface water and groundwater quality are degraded as a result of the Cambria CSD treated wastewater point source discharge to percolation ponds. Three reports developed for the Cambria CSD confirm that the Cambria CSD treated wastewater discharge is seeping into surface waters and a 1999 report states that the Cambria CSD needs to lower nitrate impacts associated with wastewater discharge[14].

5.2 Nonpoint Source Assessment

5.2.1 Water Quality and Land use

Surface water quality samples collected and analyzed from 310SSU implies that water quality in the upper watershed is not degraded. Groundwater samples collected from well SS3 (up gradient of the Cambria CSD wastewater discharge) by Cambria CSD as part of their drinking water supply service, confirms that water quality in the upper alluvial groundwater basin is not degraded. Water quality in upper San Simeon Creek is similar to water quality data Central Coast Water Board staff analyzed from neighboring reference streams. Therefore, nonpoint source discharges do not appear to be degrading either surface or ground water quality in the upper watershed. Table 18 below summarizes surface and ground water quality. Figure 21 above shows the location of the CCAMP monitoring stations (San Simeon and Santa Rosa Creeks), Cambria CSD wastewater treatment plant in the Santa Rosa Creek watershed and Cambria CSD percolation ponds in the San Simeon Creek watershed (refer to Figure 5 for location of 310ADC and Figure 18 for location of the groundwater wells).

[13] Spray field converted to percolation ponds in approximately 2000.
[14] There is concern that in addition to the Cambria CSD wastewater discharge, two State Park ranch house septic systems that could be influencing both surface and ground water quality. However, both of these systems were connected to the Cambria CSD sewer system in 1998 (Cambria CSD letter in Central Coast Water Board file, December 1998).

Table 18 - Surface and Ground Water Quality San Simeon Creek and One Reference Stream

Annual Average (mg/L)	Surface Water			Groundwater
	310SSC	310SSU	310ADC	SS3
Nitrate as N	7.45 [A]	0.11 [C]	0.093 [BG]	0.8
Sodium	99 [A]	16 [C1]	19 [BG]	20
Chloride	123 [A]	11.7 [C1]	26 [BG]	21
Dissolved Oxygen	1.5 - 14.1 [B2]	8.7 - 12.0 [D]	2.3 -10.7 [BG]	No Data

A = Mean for all years (2001-2013);
B = Mean for all years (2001-2012 through August);
C = Mean for years (2002, 2003, 2009);
D = Years 2002, 2003, 2009;
G = CCAMP webpage data;
1 = no data for 2003

Surface water quality samples collected and analyzed from 310SSC confirms that water quality in the lower watershed is degraded. Similarly, ground water samples collected (by the Cambria CSD as part of their wastewater discharge monitoring program) from wells 9P7 and 16D1, confirms that water quality in the lower alluvial groundwater basin is degraded.

Although nonpoint pollutant sources (e.g. row crop agriculture, onsite wastewater disposal, etc.) can not be catagroically excluded as contributing to degraded water quality in the lower watershed, an analysis of land use activities shows similar land uses in both the upper and lower watersheds (Table 19). For example, rangeland and forested lands cover more than 85 percent of both the uppper and lower watersheds.

Table 19 - Land Use in San Simeon Creek Watershed

	Upper Watershed (310SSU)		Lower Watershed (310SSC)		Watershed
Land Use	**Percent of Upper Watershed**	**Acres**	**Percent of Lower Watershed**	**Acres**	**Total Acres**
Cropland	1	163	12	725	888
Pastureland	82	12,195	84	4,961	17,156
Forested lands	16	2,328	2	132	2460
Septic systems	0	NA	0	NA	NA
Urban area	0	0	1	67	67
Total acres		14,686		5,885	20571

Of the 888 acres designated as cropland, 618 of those acres are considered fallow. Of the remaining 270 acres of cropland, the Central Coast Water Board agriculture regulatory program shows there are five active irrigated agriculture operations in the watershed totaling 202 acres (FMMP 2008). In the lower watershed, three operations totaling about 135 acres are farmed adjacent to Van Gordon Creek (a tributary in the lower watershed). The 135 acres are 12 acres of irrigated row crops (peas using reclaimed wastewater), 60 acres of orchard using micro-irrigation, and 63 acres of vineyard using micro-irrigation (Figure 24). Staff also identified an additional row crop operation currently not enrolled in our agriculture regulatory program of approximately 12 acres adjacent to San Simeon upstream of 310SSC and downstream of 310SSU (this farm is not shown on Figure 24). This amounts to a total of 24 acres of row crops and 103 acres of orchard/vineyard, active agriculture operations, in the lower watershed.

Two other agriculture operations are in the upper San Simeon Creek watershed. These operations total 67 acres, with 45 acres of avocados and a 22 acre vineyard.

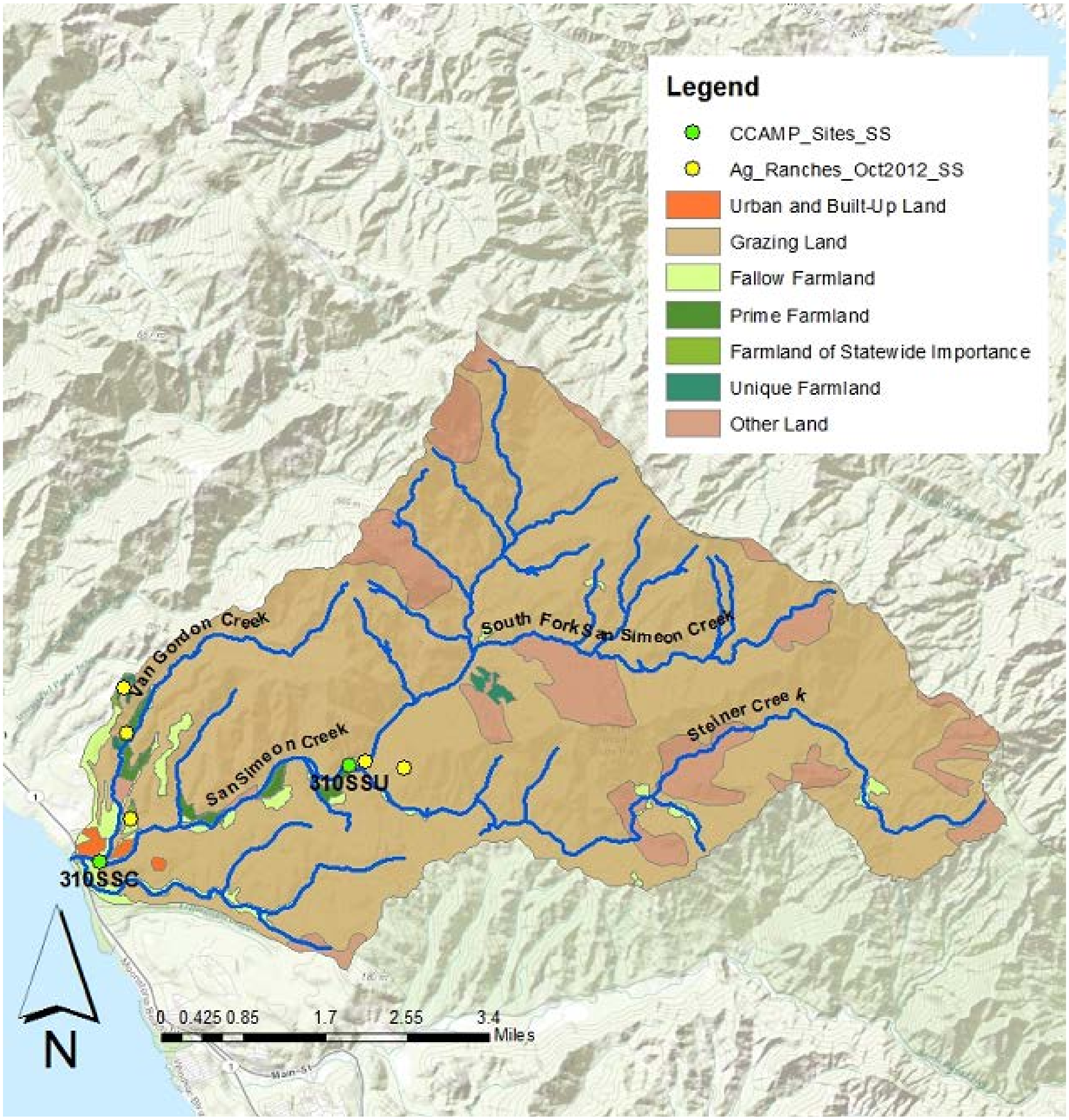

Figure 24 - Land use in the San Simeon Creek Watershed and Location of Agriculture Ranches in San Simeon Creek Watershed

It appears that with the exception of 24 acres of row crops in the lower watershed the land uses are similar throughout the watershed[15]. During a field visit to San Simeon Creek watershed on

[15] The area designated urban is primarily made up of the Cambria CSD 22 acre spray field (percolation ponds) and the State Park Campground.

September 29 and December 2, 2014, staff did not observe any tail water discharge from agricultural operations into San Simeon Creek between 310SSU and 310SSC.

The Cambria CSD discharge is equivalent to a full time 272 acre farm (estimated three crops per year) and the contribution of pollutants from the Cambria CSD discharge appear to be the sole source impacting water quality in the lower watershed. Any nonpoint source contribution from the 24 acres of row crops in the lower watershed appears to be negligible (annual average nitrate from water supply well SS3 (2001-2012) is 0.8 mg/L NO_3 as N; this supply well is adjacent to 12 of the 24 acres of row crops). However, once the water quality of the wastewater discharge is improved, Central Coast Water Board staff will re-evaluate nonpoint source contributions to confirm that water quality and beneficial uses are protected.

5.2.2 Nitrate Loading Using STEPL Model (Load Assessment)

Excessive levels of nitrogen may reach surface waters as a result of human activities (USEPA, 1999). In this TMDL project report, nutrient source loading estimates from nonpoint sources were accomplished using the US Environmental Protection Agency's Spreadsheet Tool for Estimating Pollutant Load (STEPL) model. STEPL allows the calculation of nutrient loads from different land uses and source categories. This model does not allow for the inclusion of point source discharges.

STEPL provides a Visual Basic interface to create a customized, spreadsheet-based model in Microsoft Excel. STEPL calculates watershed surface runoff and nutrient loads (including nitrogen and phosphorus) based on various land uses and watershed characteristics. STEPL has been used previously in USEPA approved TMDLs to estimate source loading (USEPA, 2010).

For source assessment purposes, STEPL was used to estimate nutrient loads at the San Simeon Creek watershed-scale. STEPL was also used to allow for subwatershed-scale loading estimates. The annual nutrient loading estimate in STEPL is calculated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as the land use distribution, precipitation data, soil characteristics, groundwater inputs, and management practices. Additional details on the model can be found at: http://it.tetratech-ffx.com/stepl/.

To estimate nitrate loads, STEPL requires area estimates for the following four land use classifications; urban, cropland, pastureland, and forest. Staff aggregated the Farmland Mapping and Monitoring Program (FMMP 2008) land use/land cover classification to derive land use acreage for the San Simeon Creek watershed required for STEPL as shown in Table 20.

Table 20 - San Simeon Creek Watershed, Aggregation of FMMP, 2008 land use/land cover classifications for STEPL

FMMP Name	Acres	STEPL Land Use Classification
Urban and Built-Up Land (D)	67	Urban
Grazing Land (G)	17,156	Pastureland
Fallow Farmland (LP)	618	Cropland
Prime Farmland (P)	148	Cropland
Farmland of Statewide Importance (S)	17	Cropland
Unique Farmland (U)	105	Cropland
Other Land (Forested, mined, government lands) (X)	2460	Forest
Aggregated STEPL Land Use Classification		
STEPL Land Use Classification	**Acres**	
Urban	67	
Cropland	888	
Pastureland	17,156	
Forest	2460	

Staff also aggregated the FMMP land use/land cover classification to derive land use acreage for the upper San Simeon Creek watershed required for STEPL as shown in Table 21.

Table 21 - Upper San Simeon Creek Watershed, Aggregation of FMMP, 2008 land use/land cover classifications for STEPL

FMMP Name	Acres	STEPL Land Use Classification
Urban and Built-Up Land (D)	0	Urban
Grazing Land (G)	12,195	Pastureland
Fallow Farmland (LP)	119	Cropland
Unique Farmland (U)	44	Cropland
Other Land (Forested, mined, government lands) (X)	2328	Forest
Aggregated STEPL Land Use Classification		
STEPL Land Use Classification	**Acres**	
Cropland	163	
Pastureland	12,195	
Forest	2328	

Input parameters used in this STEPL source assessment are shown in Table 22 and the spreadsheet results are presented in Appendix B – STEPL Spreadsheets. It should be emphasized that nutrient loads calculated by STEPL are estimates and subject to uncertainties. Actual loading at the local stream-reach scale can vary substantially due to numerous factors over various temporal and spatial scales.

Table 22 - STEPL Input Data

Input Category	Input Data	Sources of Data
Mean Annual Rainfall	15.85 inches/year	San Luis Obispo County as provided in STEPL
Mean Rain Days/Year	41.1 days/year	San Luis Obispo County as provided in STEPL
Weather Station (for rain correction factors)	0.865 Mean Annual Rainfall- 0.418 Mean Rain Days/Yr.	Santa Maria WSO Airport as provided in STEPL
Land Cover	FMMP	Aggregated FMMP land use/ land cover as represented in Tables 15 and 16
Urban Land Use Distributions (impervious surfaces categories)	STEPL default values	STEPL
Septic system discharge and failure rate data	53 Systems(Total Watershed) 25 Systems (Upper Watershed) 2.43 persons/system 8% failure rate	Estimated 53 systems based on 2013 review using Google Maps. Population per system = 2.43 persons/system (National Average contained in STEPL). Failure rate of 8% systems cited in 2003 Sanitary Survey of Santa Barbara County.
Hydrologic Soil Group (HSG)	HSG "D"	HSG based on SSURGO soil data for San Simeon Creek watershed
Soil N concentration (%)	N = 0.08%	• N (%) – estimated national median value from information in GWLF User's Manual, v. 2.0 (Cornell University, 1992 - http://www.avgwlf.psu.edu/Downloads/GWLF Manual.pdf).
NRCS reference runoff curve numbers	STEPL default values	NRCS default curve numbers provided in STEPL
Nutrient concentration in runoff (mg/L)	1.5 – 2.5 mg/L (urban) 11.4 mg/L (cropland) 0.25 mg/L (grazing land) 0.2 mg/L (forest)	• Urban lands – Used STEPL default values that contain a range of N runoff concentrations based on specific urban land use type (e.g., commercial, industrial, residential. Transportation, etc.). • N Concentration data for farmland from Southern California Coastal Water Research Project, Technical Report 335 (Nov. 2000) • Grazing lands mean N runoff concentration. from California Rangeland Watershed Laboratory rangeland presentation for stream water quality (average of the concentrations given for moderate grazing intensity and no grazing categories) http://rangelandwatersheds.ucdavis.edu/Recent%20Outreach/tate%20oakdale%20mar%202012.pdf

		• Forest N and P runoff concentration: used STEPL default values
Nutrient concentration in shallow groundwater (mg/L).	1.52[16] mg/L (ag and urban) 0.47 mg/L (grazing lands) 0.11 mg/L (forest)	• NO_3 as N (ag and urban) – mean value for San Simeon Creek watershed using USGS GWAVA model dataset. http://water.usgs.gov/GIS/metadata/usgswrd/XML/gwava-s_out.xml • Mean values using USGS GWAVA model dataset

Staff ran the STEPL model for both the San Simeon Creek watershed and the upper San Simeon Creek watershed. For the lower San Simeon Creek watershed, the nonpoint source load was calculated as the difference between the total watershed load, minus the load from the upper watershed. For the San Simeon Creek watershed, the total estimated nitrogen load from nonpoint sources is 56,972 lbs/year. Table 23 and Figure 25 summarize the San Simeon Creek watershed estimated nonpoint source loads of nitrogen.

Table 23 - Summary of Estimated Loads from Nonpoint Sources, San Simeon Creek Watershed

Sources	Nitrogen Load (lbs/yr)	Percent of Load
Urban	243	0.4
Cropland	11,920	21
Pastureland	41,599	73
Forest	815	1.4
Septic	132	0.23
Groundwater	2,263	3.97
Total	**56,972**	**100**

[16] The mean nitrate value for San Simeon Creek watershed excluding groundwater impacted by the Cambria CSD WWTP discharge

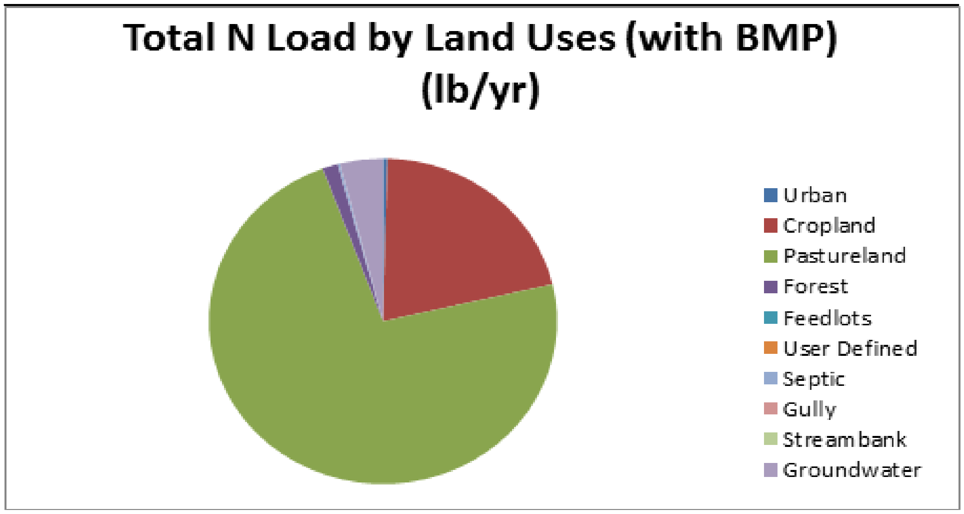

Figure 25 - Summary of Estimated Nitrogen Loads from Nonpoint Sources, San Simeon Creek Watershed.

5.2.2.1 Upper San Simeon Creek Watershed

The San Simeon Creek watershed is 20,571 acres and 14686 of those acres (71.4 percent) are located up stream of CCAMP sampling site 310SSU. Approximately 18 percent of the cropland, 71 percent of the pastureland, 95 percent of the forested lands, and 47 percent of the septic systems are located up stream of 310SSU. The nonpoint source load attributed to these land uses using STEPL is 36,619 lbs/year or approximately 64 percent of the estimated total nonpoint source nitrate load in the watershed (Appendix B).

Current water quality data shows nitrate concentrations at 310SSU (upper San Simeon Creek) consistently below 1.0 mg/L, with an annual average nitrate concentration of 0.11 mg/L nitrate as nitrogen (16 measurements in years 2002, 2003, 2009). The in stream nitrate concentrations imply that the nonpoint sources of nitrate are assimilated within the watershed and are not adversely impacting water quality.

5.2.2.2 Lower San Simeon Creek Watershed

The lower San Simeon Creek watershed is 5885 acres (28.6 percent of the watershed) located down stream of CCAMP sampling site 310SSU. Approximately 82 percent of the cropland, 29 percent of the pastureland, five percent of the forested lands, 53 percent of the septic systems, and 100 percent of the urban area are located in the lower portion of the watershed. The nonpoint source load attributed to these land uses using STEPL is 20,353 lbs/year or approximately 36 percent of the total nonpoint source nitrate load in the watershed.

Water quality data from 1977 (pre-wastewater discharges into the San Simeon Creek Watershed) shows nitrate concentrations of 0.5 mg/L in lower San Simeon Creek at 310SSC (Boyle 1977). Current water quality data shows annual nitrate concentrations at 310SSC ranging between 2.63 and 12.90 mg/L, with an annual average nitrate concentration of 7.45 mg/L nitrate as nitrogen (132 measurements across years 2001 - 2013).

Figure 26 below shows monthly nitrate concentrations at 310SSC. During wet months, periods of increased stream flow between January and June, average nitrate concentrations are measured at 3.7 mg/L nitrate as nitrogen. During dry months, periods of decreased stream flow between July and December, average nitrate concentrations are measured at 11.7mg/L nitrate as nitrogen.

During the wet months, the potential for non-point sources of nitrate to impact water quality is increased. However, the data shows that nitrate concentrations are lowest during these months.

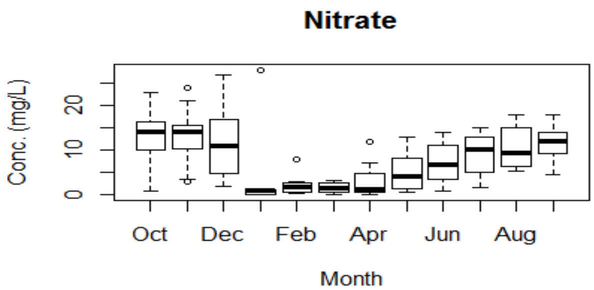

Figure 26 - Monthly Nitrate as Nitrogen Concentrations 310SSC

5.2.3 Loading of Sodium/Chloride associated with Livestock Grazing

The STEPL model is used for estimating loads for nitrogen, phosphorus, biochemical oxygen demand, and sediment. In addition to these parameters, in any given watershed, livestock operations could potentially cause excessive land disturbance and thereby contribute to elevated sedimentation and dissolved solids (e.g., dissolved minerals, salts) in a stream. However, based on available data there is no evidence of excessive land disturbance by livestock in the San Simeon Creek watershed that would contribute to elevated sedimentation or salts loads in the creek.

5.2.3.1 Upper San Simeon Creek Watershed

Water quality data shows the median turbidity value in upper San Simeon Creek (310SSU), which contains 71 percent of the livestock grazing lands is 2.1 NTU (2002, 2003, 2009), with an average of 36.9 NTU and a 75th percentile of 5.5 NTU. Water quality data for sodium shows the median value is 17 mg/L (average = 16.2 mg/L), with a 75th percentile of 19 mg/L. The median concentration for chloride is 11.5 mg/L (average = 11.7 mg/L), with a 75th percentile of 13.3 mg/L. These low turbidity, sodium, and chloride values comport reasonably well with a relatively undisturbed or reference background conditions in California streams[17].

5.2.3.2 Lower San Simeon Creek Watershed

Water quality data (2001-2012) shows the median turbidity value in lower San Simeon Creek (310SSC), which contains 29 percent of the livestock grazing lands, is 0.40 NTU (average = 38.1 NTUs), with a 75th percentile of 2.6 NTU. Water quality data (2001-2013) in lower San Simeon Creek (310SSC) for sodium shows the median value is 94.5 mg/L (average = 99 mg/L), with a 75th percentile of 112 mg/L. The median value for chloride is 110 mg/L (average = 123 mg/L), with a 75th percentile of 150 mg/L.

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[17] USEPA has estimated that reference or relatively undisturbed turbidity conditions in California streams range from 1.1 NTU to 5.5 NTU (USEPA, 2000a)

In Figures 27 and 28 below, data shows monthly sodium and chloride concentrations at 310SSC. During wet months, periods of increased stream flow between January and June, average sodium and chloride concentrations are measured at 50 and 58 mg/L respectively. During dry months, periods of decreased stream flow between July and December, average sodium and chloride concentrations are measured at 147 and 187 mg/L respectively.

During the wet months, the potential for non-point sources of sodium and chloride to impact water quality is increased. However, the data shows that sodium and chloride concentrations are lowest during these months.

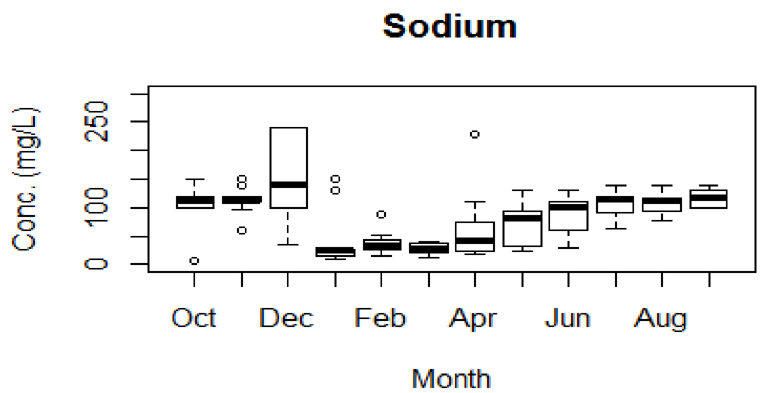

Figure 27- Monthly Sodium Concentrations 310SSC

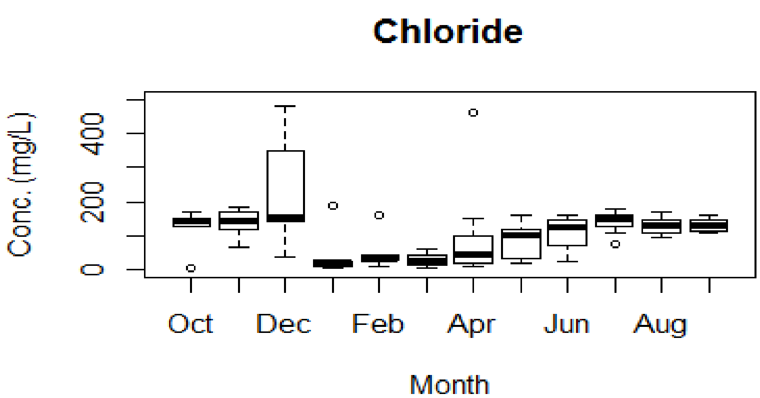

Figure 28 - Monthly Chloride Concentrations 310SSC

5.3 Conclusions from Source Analysis

There both point and nonpoint source discharges in the San Simeon Creek watershed. As discussed in Section 5.1 above, point sources contribute approximately 48,874 lb/year of nitrate as nitrogen into the lower San Simeon Creek Watershed as estimated using the annual average flow (CFS) of wastewater discharge and the annual average nitrate concentration in wastewater discharged to the percolation ponds. As discussed in Section 5.2 above, the STEPL model estimates that the average nonpoint source nitrate load for the total watershed is 56,972 lbs/year. For the upper watershed the estimated nonpoint source nitrate load is 36,619 lbs/year and the lower watershed is 20,353 lbs/year.

Based on water quality data (surface and ground water), water quality in the upper San Simeon Creek is not impacted. Overall, it appears that the upper San Simeon Creek watershed is capable of assimilating the nonpoint loads and there are no significant point source loads in the upper watershed.

For the lower watershed, surface and ground water quality data confirms that water quality is degraded. Groundwater below the Cambria CSD treated wastewater discharge (22 acre parcel) and down gradient of the discharge is degraded. Surface water adjacent to the Cambria CSD treated wastewater discharge is degraded. The impact of the Cambria CSD treated wastewater discharge to groundwater and surface water in lower San Simeon Creek is documented in two separate reports (Jones & Stokes, 1991 and Cambria CSD, 1999) and confirmed by Cambria CSD groundwater data and CCAMP surface water quality data.

Groundwater data pre-discharge collected at the current location of the Cambria CSD discharge (Table 15) did show average nitrate levels of 5.4 mg/L nitrate as nitrogen, but both sodium and chloride were not impacted (17.6 and 22.3 mg/L respectively). This elevated groundwater nitrate concentration indcates some localized impacts to water quality from the existing agriculture operation (circa 1975). However, that operation ceased once the property was purchased by the Cambria CSD and subsequently used for the discharge of treated wastewater.

Also, the in stream nitrate concentration pre-discharge was 0.49 mg/L nitrate as nitrogen (Table 14). Similarly, in stream sodium and chloride concentrations pre-discharge were consistent with water quality at 310SSU (Department of Water Resources, 1969, and Yates, E.B., and Van Konyenburg, K.M., 1998).

Analysis of land use across the watershed shows similar land uses in both the upper and lower watersheds. Currently, there are no confirmed agriculture related discharges in the lower watershed and it appears that the lower San Simeon Creek watershed is capable of assimilating the nonpoint loads within the lower watershed. Although nonpoint pollutant sources (e.g. row crop agriculture, onsite wastewater disposal, etc) can not be catagroically excluded as contributing to degraded water quality in the lower watershed, the Cambria CSD treated wastewater discharge is equivalent to a full time 272 acre farm (estimated three crops per year) and the contribution of pollutants from the Cambria CSD discharge appear to be the sole source impacting water quality in the lower watershed. Any nonpoint source contribution from the 24 acres of row crops in the lower watershed appears to be negligible (annual average nitrate from water supply well SS3 (2001-2012) is 0.8 mg/L nitrate as N; this supply well is adjacent to 12 of the 24 acres of row crops). However, once the water quality of the wastewater discharge is improved, Central Coast Water Board staff will re-evaluate nonpoint source contributions to confirm that water quality and beneficial uses are protected.

Finally, staff calculated the current dry season nitrate load to San Simeon Creek at 310SSC using the CCAMP measured mean dry season flow (CFS) and the CCAMP measured dry season average nitrate concentration (measured 2001-2012).

For the lower San Simeon Creek watershed, a comparison of the estimated in stream dry season load (STEPL) to the measured (CCAMP 310SSC) in stream dry season load[18] for nitrogen (Figure 29), suggests that the nonpoint source nitrogen loads calculated by STEPL approximate only 60 percent of the estimated loads derived using CCAMP data. This implies, assuming no assimilation of the non-point source nitrogen load, that a minimum of 40 percent of the observed load can be attributed to point source discharge. Similar assertions can be made for both sodium and chloride.

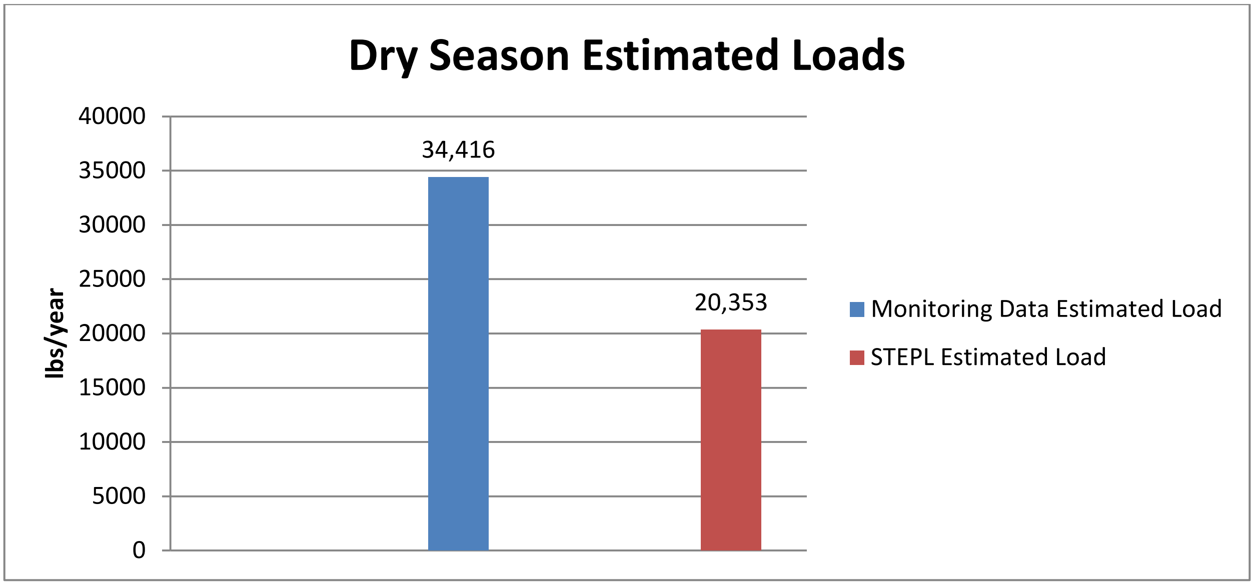

Figure 29 - Comparison of STEPL predicted nitrogen loads (lbs/yr) to 310SSC monitoring data loads, dry season.

These are estimates for the San Simeon Creek watershed. It is understood that there will be substantial variation due to temporal or local, site specific conditions. More information will be collected during TMDL implementation to assess controllable sources of nitrate, sodium, and chloride.

Central Coast Water Board staff considers the Cambria CSD treated wastewater discharge to be the sole source impacting surface and ground water quality in lower San Simeon Creek.

6 TOTAL MAXIMUM DAILY LOADS AND ALLOCATIONS

6.1 Introduction

The TMDL represents the loading capacity of a stream - the amount of a pollutant that the stream can assimilate and still support beneficial uses. The TMDL is the sum of allocations for nonpoint and point sources and any allocations for a margin of safety. TMDLs are often expressed as a

[18] Flow rate = 1.62 ft3/sec; Nitrate Concentration = 10.79 mg/L (Average dry weather concentration 2001-2013)Load = 1.62 ft^3/sec × 28.32 L/ft^3 × 10.79 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15×10^7) sec/yearLoad = 34,416 lbs/year

mass load of the pollutant but can also be expressed as a unit of concentration (40 CFR 130.2(i)).

The TMDLs for total nitrogen, nitrate, total phosphorus, sodium, and chloride for San Simeon Creek are set at a maximum concentrations (numeric targets) in receiving water. The TMDL allocations, which include background levels, are also equal to the numeric targets. Expressing the TMDL as a concentration equal to the water quality objectives and numeric targets provides a direct measure of the total nitrogen, nitrate, total phosphorous, sodium, and chloride levels in the watershed to compare with water quality objectives and provides a measurable target for sources to monitor and with which to comply. Requiring the responsible parties to reduce total nitrogen, nitrate, total phosphorus, sodium, and chloride discharges to the numeric water quality objectives and targets will establish a direct link between the TMDL target and sources.

Waste load and load allocations for total nitrogen, nitrate, total phosphorus, sodium, and chloride are assigned to each source, including background. These allocations will require a reduction of existing loads by the Cambria CSD.

6.2 Existing Loading and Loading Capacity

Existing mean annual loads were estimated for the lower San Simeon Creek Watershed using a simple averaging technique where the load is calculated as the average concentration of samples multiplied by the mean flow. Staff considered the following flow data, shown in Table 24, to estimate mean annual flows for streams within the San Simeon Creek watershed:

- USGS gage station data;
- Incidental data from Cambria Community Services District, 1988, Complaints Alleging Violation of Permit 17287, Application 25002 San Simeon Creek Underflow, State Water Resources Control Board, Order WR 88-14;
- Mean annual flow estimates from USGS's high resolution National Hydrography Dataset Plus (NHDPlus) [19]; and
- Instantaneous flow data from the Central Coast Ambient Monitoring Program (CCAMP) and Cooperative Monitoring Program (CMP). Flow data period varies, but generally from 2004 to 2011.

Table 24 - Summary of Estimated Mean Flows (cfs) for San Simeon Creek Watershed Streams

Site ID	CCAMP/CMP Flow Data (2004-2011) [A]		Palmer Flat's Gage Station[B]	NHDPlus [C]	USGS [D]
	Sample Count	**Mean annual Flow (cfs)**	**Mean Flow (cfs)**	**Mean Annual Flow (cfs)**	**Mean Annual Flow (cfs)**
310SSC	44	**7.53**	0.656 (1976)	9.69	4.85
			0.878 (1977)		
			10.2 (1984)		

[19] The NHDPlus Version 1.0 (2005) was created by the U.S. Environmental Protection Agency and the U.S. Geological Survey as an integrated suite of application-ready geospatial data sets that incorporate many of the features of the National Hydrography Dataset (NHD) and the National Elevation Dataset (NED). The NHDPlus includes a stream network (based on the 1:100,000-scale NHD), networking, naming, and "value-added attributes" (VAA's).

			9.4 (1985)		

Note: Values indicated in **bold** are used to estimate mean annual and mean dry season nitrate loads, loading capacities under TMDL conditions, and percent reduction goals as presented in this Section.
[A] Monitoring program instantaneous measurements (Central Coast Ambient Monitoring Program).
[B] Palmer Flat's is located just below the confluence of San Simeon Creek and Steiner Creek. Incidental data from Cambria Community Services District, 1988, Complaints Alleging Violation of Permit 17287, Application 25002 San Simeon Creek Underflow, State Water Resources Control Board, Order WR 88-14
[C] NHDPlus mean annual flow using Unit Runoff Method
[D] USGS gage data 1988

Staff used CCAMP water quality monitoring data and the flow data to calculate mean concentrations and derive the estimated nonpoint source loads for the lower San Simeon Creek Watershed. Table 25 presents a tabulation of estimated mean annual total nitrogen, total phosphorus, sodium, and chloride loads, loading capacity under TMDL conditions, and percent reduction goals for San Simeon Creek as measured at 310SSC.

Table 25 - Estimated Mean Annual Total Nitrogen, Total Phosphorus, Sodium, and Chloride Loads, Loading Capacities, and Percent Reduction goals for 310SSC

	Total Nitrogen-N	Total Phosphorus	Sodium	Chloride
Estimated Flow (cfs)	7.53	7.53	7.53	7.53
Measured Concentration (mg/L)	7.82	0.68	98.9	123.4
Estimated Existing Load (lbs)	115,806	10,070	1,466,284	1,829,519
Calculated Loading Capacity (lbs) [A]	17,327	667	920,690	1,414,393
Calculated Percent Reduction Goal	85%	93%	37%	23%
Numeric Target Used for Calculated Loading Capacity (mg/L)	1.3 mg/L TN-N	0.05 mg/L TP-P	69 mg/L	106 mg/L

[A] Includes a 10 percent margin of safety

The TMDLs are set equal to the loading capacity. The loading capacity for the San Simeon Creek watershed is the amount of total nitrogen, total phosphorus, sodium, and chloride that can be assimilated without exceeding the water quality objectives. The allowable water column concentrations for total nitrogen, total phosphorus, sodium, and chloride will achieve the water quality objectives for the beneficial uses and are equal to the numeric targets.

The loading capacity, or Total Maximum Daily Load, for total nitrogen, total phosphorus, sodium, and chloride are receiving water column concentration-based Total Maximum Daily Loads and are applicable as indicated in Table 26. Central Coast Water Board staff anticipates that implementation actions will result in the TMDLs achieving the targets associated with biostimulation (dissolved oxygen levels will improve).

Table 26 - San Simeon Creek Concentration-based TMDLs

Constituent	**Beneficial Use**	**Water Quality Objective**	**TMDL** Receiving water column concentration-based
Nitrate*	MUN	10 mg/L NO_3 as N	$\leq$ 10 mg/L NO_3 as N
Total Nitrogen	COLD WARM RARE	*Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such*	$\leq$ 1.3 mg/L as N

		growths cause nuisance or adversely affect beneficial uses.	
Total Phosphorus	COLD WARM RARE	*Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.*	≤ 0.05 mg/L OP as P
Sodium	AGR	*Basin Plan numeric water quality guideline = 69 mg/L*	≤ 69 mg/l Na
Chloride	AGR	*Basin Plan numeric water quality guideline = 106 mg/L*	≤ 106 mg/l Cl

*Nitrate TMDL is equal to the Basin Plan Water Quality Objective

6.3 Linkage Analysis

The goal of the linkage analysis is to establish a link between pollutant loads and desired water quality. This ensures that the loading capacity specified in the TMDLs will result in attaining the desired water quality. For these TMDLs, this link is established because the load allocations are equal to the numeric targets, which are the same as the TMDLs. Therefore, reductions in total nitrogen, total phosphorus, sodium, and chloride loading will result in achieving the water quality standards.

6.4 Allocations

States are to establish TMDLs at levels necessary to attain and retain numeric and narrative water quality standards (40 CFR 130.7(c)(1)). As will be discussed in the following section, discharge of treated wastewater and groundwater from the Cambria CSD is the source causing impairment of water quality standards established for the protection of beneficial uses. Table 27 shows waste load and load allocations assigned to responsible parties. The waste load allocations and load allocations are equal to the TMDLs and are receiving water allocations.

Table 27 – Waste Load Allocations and Load Allocations for San Simeon Watershed

WASTE LOAD ALLOCATIONS[AB]	
Responsible Party Assigned Allocation (Source)	**Receiving Water Allocations** (discharges shall not cause surface receiving waters to exceed the following)

Cambria Community Services District National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges with Low Threat to Water Quality (NPDES Order No. R3-2011-0223)	1.3 mg/L Total Nitrogen as N (Dry Season[C]) 10 mg/L Nitrate as N 0.05 mg/L Total Phosphorous (P) (Dry Season[C]) 69 mg/l Sodium (Na) 106 mg/l Chloride (Cl)
Industrial stormwater general permit (storm drain discharges from industrial facilities) NPDES No. CAS000001	1.3 mg/L Total Nitrogen as N (Dry Season[C]) 10 mg/L Nitrate as N 0.05 mg/L Total Phosphorous (P) (Dry Season[C]) 69 mg/l Sodium (Na) 106 mg/l Chloride (Cl)
Construction stormwater general permit (storm drain discharges from construction operations) NPDES No. CAS000002	
LOAD ALLOCATIONS[AB]	
Responsible Party Assigned Allocation (Source)	**Receiving Water Allocations** (discharges shall not cause surface receiving waters to exceed the following)
Cambria Community Services District (Wastewater discharges to percolation ponds) WDR No. 01-100	1.3 mg/L Total Nitrogen as N (Dry Season[C]) 10 mg/L Nitrate as N 0.05 mg/L Total Phosphorous (P) (Dry Season[C]) 69 mg/l Sodium (Na) 106 mg/l Chloride (Cl)
Owners/operators of irrigated agricultural lands (Discharges from irrigated lands)	
Owners/operators of land used for/containing domestic animals/livestock	
No responsible party (Natural sources)	

[A] Federal and state anti-degradation requirements apply to all waste load and load allocations.

[B] Achievement of final waste load and load allocations to be determined on the basis of the number of measured exceedances and/or other criteria set forth in Section 4 of the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (the "Listing Policy" – State Water Resources Control Board, Resolution No. 2004-0063, adopted September 2004) or as consistent with any relevant revisions of the Listing Policy promulgated in the future pursuant to Government Code section 11353.
[C] Dry season is July 1st – December 31st.

6.5 Margin of Safety

This TMDL incorporates an implicit margin of safety (10 percent). The water column total nitrogen and total phosphorus numeric targets are derived from promulgated USEPA protocols. The water column sodium and chloride numeric targets are consistent with the Basin Plan. Therefore the loading capacities have the same conservative assumptions used in these procedures.

6.6 Critical Conditions and Seasonal Variation

A critical condition is the combination of environmental factors resulting in the water quality standard being achieved by a narrow margin (i.e., that a slight change in one of the environmental factors could result in exceedance of the water quality standard). Such a phenomenon could be significant if the TMDL were expressed in terms of load, and the allowed load was determined on achieving the water quality standard by a narrow margin. These TMDLs are expressed as concentrations, which are equal to the desired water quality conditions. Critical conditions are typically observed in the months of July through December. The TMDL is applicable during the months of July through December.

7 IMPLEMENTATION AND MONITORING

7.1 Introduction

This TMDL is being implemented by Cambria CSD Waste Discharge Requirements (WDRs) for Discharges, Order No. R3-2001-100 and NPDES Order No. R3-2011-0223. Staff has concluded that revision of the current Cambria CSD Orders is necessary to implement this TMDL. New requirements will be described in the revised Orders to reduce loading of total nitrogen, nitrate, total phosphorus, orthophosphate, sodium, and chloride in San Simeon Creek, thereby addressing the impairments for these pollutants.

The implementation strategy and monitoring and reporting identified below are actions recommended for incorporation into the revised WDRs and NPDES Orders. The revised or new orders regulating discharge from the Cambria CSD will describe the actual requirements that will result in achieving the TMDLs in San Simeon Creek.

7.2 Implementation Strategy for Discharges from Cambria Community Services District

The implementation strategy for this TMDL is:

1. Revise or replace Order R3-2001-100. The new order could include requirements for the Cambria CSD to:
   - Submit a load allocation attainment plan to eliminate impacts to San Simeon Creek so the receiving water allocations and TMDLs described herein are achieved. The plan should include milestone deliverables and dates that inform progress.
   - Develop and implement a monitoring and reporting program that demonstrates the effectiveness of the load allocation attainment program.

2. Replace NPDES Order No. R3-2011-0223 with an individual NPDES permit to include effluent limits consistent with the TMDLs.

7.3 Timeline and Milestones

The current levels of nitrate, sodium, and chloride in the NPDES discharge to San Simeon Creek lagoon are not impacting water quality related to these parameters. The current levels of total nitrogen, nitrate, total phosphorus, orthophosphate, sodium, and chloride in the wastewater discharge to the percolation ponds are impacting water quality. As such, implementation should occur at an accelerated pace to achieve the allocations and TMDL in the shortest time-frame feasible.

The target date to achieve the allocations, numeric targets, and TMDL in San Simeon Creek is January 1, 2025. This date allows time for the Cambria CSD to develop, plan, implement, construct, and monitor any proposed changes to the wastewater treatment plant. Staff concludes that the TMDL is achievable by this date because the results of wastewater treatment plant upgrades will be realized quickly. Also, available information suggests that Cambria CSD discharge is the sole source contributing to the impairment.

The existing NPDES Order will be replaced with an individual NPDES permit to include effluent limits consistent with the TMDLs. This action should be in parallel with revision of Order No. 01-100.

Central Coast Water Board staff will reevaluate impairments caused by total nitrogen, nitrate, total phosphorus, orthophosphate, sodium, and chloride when monitoring data is submitted and during replacement, revision or renewal of the Cambria CSD Orders. Central Coast Water Board staff will modify the conditions of the Cambria CSD (WDRs and NPDES), if necessary, to address remaining impairments.

7.4 Existing Implementation Efforts

The existing Cambria CSD Orders do not contain the proposed numeric targets, load allocations, or waste load allocations. Therefore, the existing Orders do not contain sufficient management practices aimed at improving or protecting impaired waters. Staff has an ongoing effort with the Cambria CSD to update the existing Order.

8 PUBLIC PARTICIPATION

The technical project report and appendices were made available for a 45-day public comment commencing on March 12, 2015.

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10 APPENDIX A - WATER QUALITY DATA

Water Quality Data

Multiple Sites (CCAMP)

Constituents in mg/L	Surface Water Sites				
	310SSC	**310SSU**	**310ADC**	**310SRO**	**310SRU**
Chloride	123[A]	11.7[C1]	23[BG]	51[BG]	19[G]
Chlorophyll-a	3.82[B]	3.96[C]	2.24[BG]	2.3[BG]	2.66[G]
Chlorophyll-a (Range)	0 - 46.5[E]	0.04 - 43.87[F]	0 - 40.3[BG]	0 - 53.47[BG]	0 - 55.95[G]
Dissolved Oxygen (Range for all years)	1.5 - 14.1[B2]	8.7 - 12.0[F]	2.3 - 10.7[BG]	2.8 - 14.4[BG]	7.7 - 14.4[G]
Nitrogen (Total) – TN	7.82[A]	0.43[C]	0.18[BG]	0.35[BG]	0.44[G]
TN – (Range)	0.298 – 28.4	0.076 – 3.91	0.078 – 1.15	0.078 – 9.92	0.10 – 3.9[G]
Nitrate as N	7.45[A]	0.11[C]	0.093[BG]	0.15[B]	0.19[G]
Nitrate as N (Range)	0.021 - 28[D]	0.01 - 0.88[F]	0.02 - 0.49[BG]	0.02 - 1.37[B]	0.02 - 1.46[G]
Phosphorus (Total) – TP	0.68[A]	0.05[C]	0.028[BG]	0.070[BG]	0.028[G]
TP – (Range)	0.016 – 1.9	0.012 – 0.39	0.012 – 0.12	0.012 - 6.5	No Data
Orthophosphate	0.63[A]	0.01[C]	0.01[BG]	0.028[BG]	0.031[G]
Orthophosphate – (Range)	0.01 – 1.7	0.01 – 0.034	0.003 – 0.026	0.008 - 0.75	0.005 – 0.27[G]
Salinity (ppt)	0.56[B]	0.24[C]	0.30[BG]	0.45[B]	0.4[G]
Sodium	99[A]	16[C1]	19[BG]	44[B]	26[G]
TDS	659[A]	300[C]	296[BG]	553[B]	485[G]
Water Temperature	16.2[B]	14.0[C]	16.1[BG]	17.5[BG]	16.8[G]
Water Temperature (Range)	9.86 - 20.49[E]	8.9 - 21.3[F]	11.5 - 20[BG]	5.7 - 23.7[BG]	9.5 - 22.2[FG]
TN/TP Ratio	11.5	11.18	6.43	5	15.7
Turbidity	38.09[B]	36.89[C]	3.1[BG]	61.9[BG]	79.9[G]

A = Mean for all years (2001-2013); B = Mean for all years (2001-2012 through August); C = Mean for years (2002, 2003, 2009); D = years 2001-2013; E = years 2001-2012 through August; F = years 2002, 2003, 2009; 1 = no data for 2003; 2 = 2012 complete year; G = CCAMP webpage data

San Simeon Creek Surface and Ground Water Data

Annual Average (mg/L)	Surface Water			Effluent	Groundwater		
	Year	310SSC	310SSU	WWTP	SS3	9P7	16D1
Nitrate as N*	**2012**	9.63	No Data	30.7	0.5	1.5	13.5
	2009	10.45	0.18	35.2	0.4	2.6	20.5
	2003	2.63	0.02[A]	34.5	0.9	10.3	14.2
	2002	3.98	0.06	17.6	0.8	7.1	6.8
TDS	**2012**	1134	No Data	952	350	400	795
	2009	668	283	840	360	485	805
	2003	434	293[A]	905	357	565	845
	2002	609	319	860	363	605	780
Sodium	**2012**	220	No Data	182	19	24.5	139
	2009	99	15.2	158	19	45	129
	2003	No Data	No Data	155	18.6	56	134
	2002	68	17.6	203	18.7	68.5	115
Chloride	**2012**	378	No Data	No Data	20	31	194
	2009	133	12.2	No Data	19	64	170
	2003	No Data	No Data	No Data	19	88.5	197
	2002	78	10.9	No Data	20	118	140
Dissolved Oxygen	**2012**	7.47	No Data	3.9	NA	NA	NA
	2009	6.66	10.65	3.6	NA	NA	NA
	2003	10.52	10.19[A]	6.0	NA	NA	NA
	2002	8.18	10.33	7.4	NA	NA	NA

[A] Two data points

310SSC (CCAMP)

Total Nitrogen as N (mg/L)

	Total Nitrogen							
	Annual Ave[a]	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Range	Sample Size	TN above 10 mg/L Per Season[b]		Percent nitrate in total nitrogen (NO3/TN)
						Dry	Wet	
2013	8.65	11.8	5.5	2.0 – 17.2	12	3	0	96.3
2012	9.79	16.6	4.1	0.3 – 23.9	11	4	1	98.4
2011	5.70	10.3	1.1	0.7 – 14.0	12	4	0	95.8
2010	8.46	14.6	2.4	0.8 – 21.2	12	6	0	95.7
2009	10.71	12.3	9.5	0.4 – 28.4	13	5	3	95.6
2008	10.52	20.7	5.5	1.4 – 27.3	9	3	1	97.8
2007	13.28	18.5	8.2	2.6 – 21.2	10	5	2	97.1
2006	7.32	12.6	1.2	0.7 – 15.6	11	5	0	95.4
2005	4.94	9.4	1.2	0.6 – 14.9	13	3	0	89.7
2004	5.80	7.2	4.1	2.0 – 9.7	9	0	0	92.4
2003	2.89	ND	2.9	2.7 – 3.1	2	--	0	91.0
2002	4.41	6.3	2.5	1.0 – 11.1	12	1	0	90.2
2001	4.05	4.6	3.5	1.3 – 9.5	6	0	0	90.1
Totals =	**7.82**	**12.1**	**4.0**		**132**			

ND = no data

Nitrate as N (mg/L)

	Nitrate							
	Annual Ave[a]	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Range	Sample Size	Number of Exceedances Per Season[b]		% exceed
						Dry	Wet	
2013	8.33	11.7	5.0	1.3-17	12	3	0	25
2012	9.63	16.6	3.8	0.021 - 24	11	4	0	36
2011	5.46	10.0	1.0	0.55 - 13	12	4	0	33
2010	8.10	14.3	1.9	0.046 - 21	12	6	0	50
2009	10.45	11.8	9.3	0.26 - 28	13	5	3	62
2008	10.29	20.3	5.3	1.2 - 27	9	3	1	44
2007	12.90	18.00	7.8	2.5 - 21	10	5	2	70
2006	6.98	12.08	0.85	0.16 - 15	11	4	0	36
2005	4.43	8.55	0.90	0.22 - 14	13	2	0	15
2004	5.36	6.67	3.71	0.35 - 9.1	9	0	0	0
2003	2.63	No Data	2.63	2.39 - 2.9	2	0	0	0
2002	3.98	5.76	2.21	0.79 - 10.5	12	1	0	8
2001	3.65	4.21	3.09	1.02 - 8.9	6	0	0	0
Totals =	**7.45**	**11.7**	**3.7**		**132**	**37**	**6**	

a - For most years, nitrate makes up approximately 95 percent of the total nitrogen load
b - Exceedance = NO3 > 10 mg/L nitrate as N

Total Phosphorus as P

	Annual Ave	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Range	Sample Size	TN:TP Ratio
2013	1.15	1.58	0.71	0.081 - 1.9	12	7.52
2012	0.72	0.97	0.51	0.046 - 1.3	11	13.60
2011	0.55	0.99	0.10	0.016 - 1.2	12	10.36
2010	0.77	1.27	0.27	0.041 - 1.4	12	10.99
2009	0.82	1.05	0.62	0.017 - 1.3	13	13.06
2008	0.69	1.30	0.38	0.047 - 1.4	9	15.25
2007	0.92	1.18	0.66	0.17 - 1.3	10	14.43
2006	0.56	0.85	0.22	0.063 - 1.0	11	13.07
2005	0.55	0.97	0.19	0.11 - 1.1	13	8.98
2004	0.58	0.74	0.39	0.03 - 0.89	9	10.00
2003	0.13	No Data	0.13	0.11 - 0.14	2	22.23
2002	0.36	0.51	0.20	0.05 - 0.57	12	12.25
2001	0.28	0.28	No Data	0.09 - 0.46	2	14.46
Totals =	**0.68**	**0.97**	**0.37**		**128**	

Orthophosphate as P

	Annual Ave	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Range	Sample Size
2013	1.12	1.58	0.67	0.15 - 1.7	12
2012	0.77	1.07	0.52	0.018 - 1.5	11
2011	0.49	0.87	0.11	0.029 - 1.3	12
2010	0.70	1.22	0.19	0.03 - 1.4	12
2009	0.76	0.98	0.59	0.014 - 1.3	13
2008	0.64	1.23	0.34	0.037 - 1.3	9
2007	0.92	1.16	0.69	0.17 - 1.2	10
2006	0.50	0.86	0.07	0.033 - 1	11
2005	0.48	0.90	0.12	0.036 - 0.97	13
2004	0.49	0.57	0.38	0.01 - 0.87	9
2003	0.11	No Data	0.11	0.1 - 0.11	2
2002	0.36	0.52	0.14	0.053 - 0.83	12
2001	0.31	0.36	0.27	0.053 - 0.54	6
Totals =	**0.63**	**0.94**	**0.32**		**132**

Dissolved Oxygen (mg/L)

	Annual Ave	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Range	Sample Size	Number of Exceedances		% exceed based on <7	Exceedances Per Season	
						13>	<7		Wet	Dry
2012	7.47	6.09	8.85	3.1 - 10.54	12	0	4	33	0	4
2011	8.22	6.86	9.57	4.57 - 10.87	12	0	3	25	0	3
2010	9.00	7.78	10.22	4.99 - 11.77	12	0	3	25	0	3
2009	6.66	5.41	7.73	3.13 - 11.20	13	0	7	54	2	5
2008	8.07	5.46	9.82	3.83 - 12.29	10	0	4	40	1	3
2007	6.22	4.50	8.64	1.91 - 10.21	12	0	6	50	0	6
2006	7.28	5.77	9.69	3.69 - 10.75	13	0	7	54	1	6
2005	7.94	6.35	9.52	2.99 - 10.94	14	0	4	29	0	4
2004	8.20	6.14	11.30	1.46 - 13.99	10	1	4	40	1	4
2003	10.52	No Data	10.52	9.28 - 11.75	2	0	0	0	0	0
2002	8.18	6.40	10.57	1.58 - 11.59	14	0	4	29	0	4
2001	8.12	6.17	11.36	2.26 - 14.11	8	2	3	38	1	4
Totals =	**7.99**	**6.08**	**9.81**		**132**	**3**	**49**		**6**	**46**

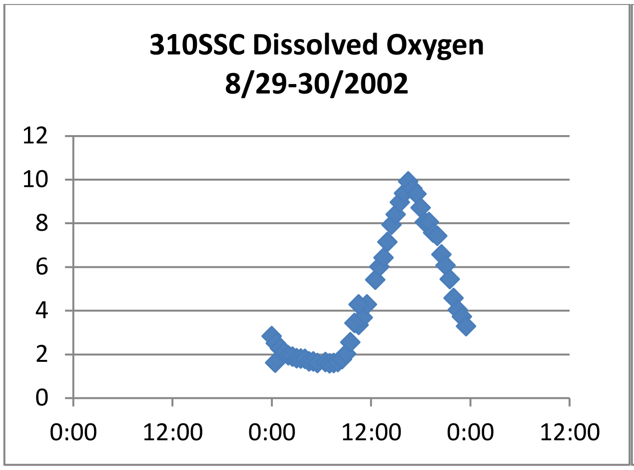
Exceedances = 13>DO mg/L>7; Greater than = >; Less than = <

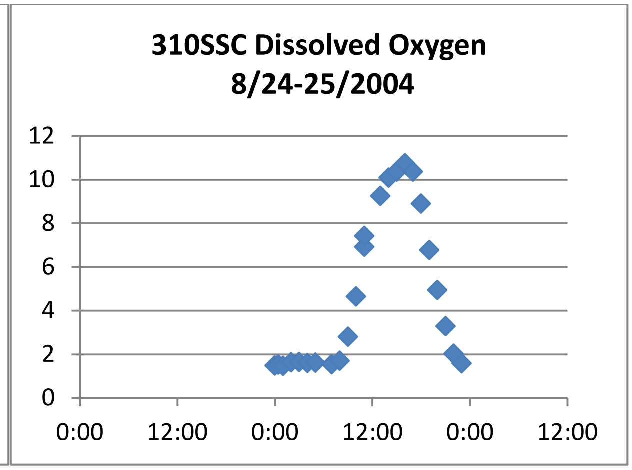
Observed Dissolved Oxygen Violations

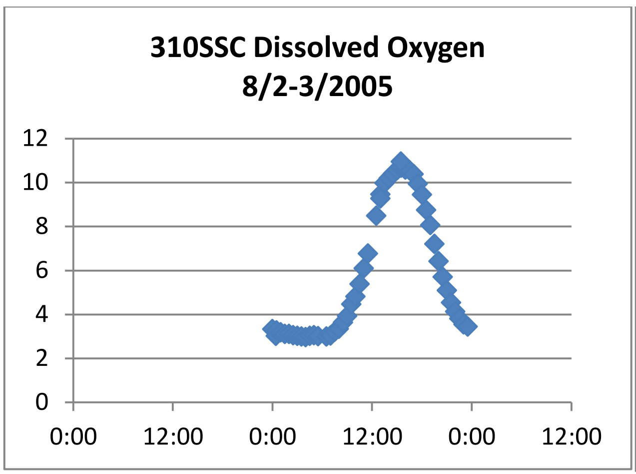
	Number of Observations	Observed Dissolved Oxygen Violations (which months) (DO below 7.0 mg/L)											
Year		J	F	M	A	M	J	J	A	S	O	N	D
2012	12									X	X	X	X
2011	12										X	X	X
2010	12										X	X	X
2009	13	X				X		X	X	X		X	X
2008	10						X		X	NR	X	NR	X
2007	12	NR						3X	X		X	X	NR
2006	13		NR				X		3X	X	X	X	NR
2005	14							NR	2X			X	X
2004	10	NR	NR		NR	X[a]		NR	2X	NR		X	X
2003	2	NR			NR	NR	NR	NR	NR	NR	NR	NR	NR
2002	14								2X	X		X	
2001	8	NR	NR	NR			X[a]	2X[ab]	X	NR	NR	X	
Totals =	**113**	1				2	3	6	13	4	6	10	7

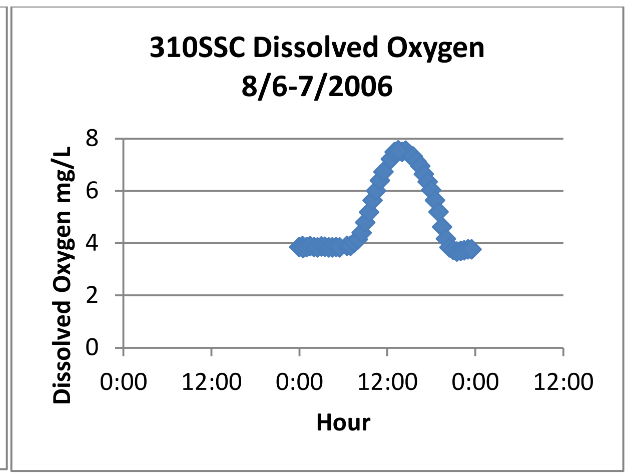
a = Supersaturation above 13 mg/L
b = one of the two measurements supersaturated
NR – Not recorded

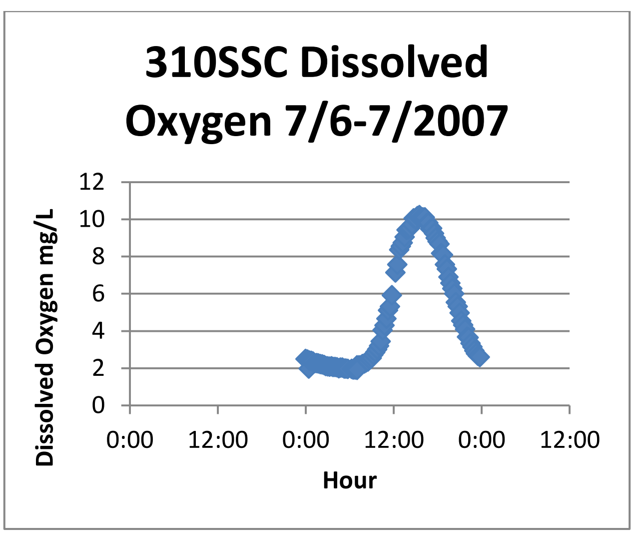
DO Graphs, 24-Hour











Dissolved Oxygen (%SAT)

	Annual Ave	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Range	Sample Size	Exceedances		
						Number < 85		
						Wet	Dry	Percent
2012	76.37	63.83	88.90	39.1 - 101.1	12	2	5	58
2011	82.53	71.92	93.15	47.4 - 101.2	12	0	5	42
2010	89.26	78.75	99.77	49.2 - 111	12	0	3	25
2009	63.32	52.97	72.20	29.9 - 100.6	13	6	5	85
2008	80.43	54.60	97.65	37.4 - 128	10	1	4	50
2007	62.62	45.34	86.62	19.1 - 106.5	12	3	7	83
2006	74.37	51.48	98.64	38.2 - 113.8	13	0	7	54
2005	82.82	66.84	98.97	30.2 - 114.4	14	0	4	29
2004	84.42	62.78	116.88	15 - 150.1	10	0	4	40
2003	106.20	No Data	106.20	97-115	2	0	0	0
2002	84.11	65.45	109.00	16 - 123.8	14	0	5	36
2001	85.72	62.27	124.80	22.8 - 156.7	8	0	4	50
Totals =	**78.81**	**61.48**	**99.40**		**132**	**12**	**53**	

Exceedances = DO < 85 percent saturation

Chlorophyll a

	Chlorophyll a (ug/L)				Number of Observations	Percent Exceedances
Year	**0 – 1**	**>1 - 15**	**>15 - 40**	**>40**		
2012	1	11	0	0	12	0
2011	3	6	0	0	9	0
2010	1	9	2	0	12	0
2009	0	11	1	1	13	8
2008	1	8	0	0	9	0
2007	4	6	0	0	10	0
2006	1	9	0	0	10	0
2005	5	9	1	0	15	0
2004	6	2	0	0	8	0
2003	2	0	0	0	2	0
2002	11	1	0	0	12	0
2001	4	2	0	0	6	0
Totals =	**39**	**74**	**5**		**118**	

Turbidity (NTU)

Season	Sample Count	Median	Mean	Geomean	Range	Number of measurements greater than 25	Percent Greater than 25	Percentile	
								25th	75th
All Year	120	0.40	38.1	0.27	0.01-3000	8	7.5	0.1	2.6
Dry	67	0.16	11.0	0.15	0.01-605	2	3.0	0.1	1.9
Wet	52	1.55	73.8	0.52	0.01-3000	7	13.5	0.1	4.3

Mean for all years (2001 - Aug 2012)

Algal Mat Coverage

Year	Percent Cover					Number of Observations	Months Algal Mats Observed											
	0	1 - 25	26 - 50	51 - 75	76 - 100		J	F	M	A	M	J	J	A	S	O	N	D
2012	8	4	0	0	0	12							X	X	X		X	
2011	9	2	1	0	0	12								X	X	X		
2010	7	4	0	0	0	11							X		X	X	X	
2009	8	3	1	1	0	13				X		X		X	X		X	
2008	6	3	1	0	0	10					X	X		X		X		
2007	7	3	0	0	0	10				X	X							
2006	6	5	0	0	0	11							2X	X	X	X		
Sub totals =	**51**	**24**	**3**	**1**	**0**	**79**				2	2	2	4	5	5	4	3	
2005	6	5	1	0	1	13						X		2X	X	X	X	X
2004	0	3	0	0	0	3					X						X	X
2003	0	1	0	0	0	1					X							
2002	4	2	2	0	4	12		X		X	X	X	X	X	X	X		
2001	2	2	0	1	1	6				X	X	X	X					
Totals =	**63**	**36**	**6**	**2**	**6**	**113**												

Data for years 2001 through 2005 not used for assessment purposes. Data for these years was originally reported as attached algae and subsequently changed to Algal Mat Coverage

Sodium, Chloride, and Total Dissolved Solids Annual Average Concentrations

Year	Average		
	Sodium	Chloride	Total Dissolved Solids
2013	112	120.1	675
2012	219.6	378.3	1134
2011	59.0	81.9	562
2010	65.8	77.1	553
2009	98.5	133.1	668
2008	82.4	109.0	644
2007	95.9	121.1	672
2006	62.2	71.0	512
2005	128.5	86.7	692
2004	86.2	96.0	606
2003	No Data	No Data	434
2002	67.7	77.7	609
2001	86.2	114.3	599
Average all years	**98.9**	**123.4**	**659**

Total Dissolved Solids (mg/L)

Year	Average	Average		Range	Number of Samples
		Jun-Dec	Jan-May		
2013	675	781	526	340-880	12
2012	1134	1503	690	570-5100	11
2011	562	707	358	260-820	12
2010	553	719	320	190-860	12
2009	668	766	532	210-1400	12
2008	644	903	438	290-1200	9
2007	672	770	525	400-840	10
2006	512	626	313	260-720	11
2005	692	987	347	208-3300	13
2004	606	691	436	240-805	9
2003	434	No Data	434	368-500	2
2002	609	733	434	354-825	12
2001	599	655	483	366-795	6
Average all years	**659**	**820**	**449**		**131**

Chloride (mg/L)

Year	Average	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Number of Samples	Number of Exceedances	Percent Exceedances (Target = 106 mg/L)
2013	120.1	141.7	98.5	12	9	75
2012	378.3	658.0	145.1	11	8	73
2011	81.9	142.7	21.2	12	5	42
2010	77.1	123.3	30.8	12	6	50
2009	133.1	172.5	93.7	12	8	67
2008	109.0	190.0	68.5	9	4	44
2007	121.1	154.0	88.2	10	8	80
2006	71.0	120.0	21.0	11	5	45
2005	86.7	156.5	26.9	13	5	38
2004	96.0	115.5	72.3	9	6	67
2003	No Data	--	--	--	--	--
2002	77.7	147.0	66.2	7	2	29
2001	114.3	127.7	101.0	6	4	67
Average all years	**123.4**	**187.4**	**69.5**	**124**	**70**	

Sodium (mg/L)

Year	Average	July-Dec Ave (Dry)	Jan-June Ave (Wet)	Number of Samples	Number of Exceedances	Percent Exceedances (Target = 69 mg/L)
2013	112	143.3	81.3	12	9	75
2012	219.6	360.0	102.7	11	9	82
2011	59.0	92.2	25.8	12	5	42
2010	65.8	102.8	28.7	12	6	50
2009	98.5	120.5	76.5	12	8	67
2008	82.4	143.3	52.0	9	5	56
2007	95.9	120.0	71.8	10	8	80
2006	62.2	94.0	24.0	11	5	45
2005	128.5	244.5	29.1	13	6	46
2004	86.2	103.4	64.8	9	6	67
2003	No Data	--	--	--	--	--
2002	67.7	118.6	59.2	7	3	43
2001	86.2	95.0	77.3	6	4	67
Average all years	**98.9**	**147.1**	**56.5**	**124**	**74**	

310SSU (CCAMP)

Nitrate as N (mg/L)

	Annual Ave	July-Dec Ave	Jan-June Ave	Range	Sample Size	Number of Exceedances*	% exceed
2009	0.18	0.32	0.07	0.026 - 0.88	7	0	0
2003	0.018	No Data	0.018	0.014 - 0.022	2	0	0
2002	0.06	0.16	0.02	0.011 - 0.31	7	0	0
				Totals =	**16**		

Total Orthophosphate (P), (mg/L)

	Annual Ave	July-Dec Ave	Jan-June Ave	Range	Sample Size	Number of Exceedances*	% exceed
2009	0.01	0.01	0.01	0.006-0.034	7	0	0
2003	0.01	No Data	0.01	0.01-0.01	2	0	0
2002	0.01	0.01	0.01	0.01-0.01	7	0	0
				Totals =	**16**		

Total Nitrogen (TN), Total Phosphate (TP), and TN/TP Ratio

Sample Date	Total N (mg/L)	Total P (mg/L)	TN:TP Ratio
1/22/02	0.228	0.02	11.40
2/26/02	0.14	0.02	7.00
3/19/02	0.23	0.02	11.50
4/16/02	0.13	0.18	0.72
5/14/02	0.124	0.02	6.20
11/13/02	0.52	0.02	26.00
12/12/02	0.121	0.02	6.05
2/11/03	0.132	0.03	4.40
3/12/03	0.324	0.02	16.20
2/11/09	0.3331	0.012	27.76
3/12/09	0.1591	0.012	13.26
4/9/09	0.0761	0.012	6.34
5/14/09	0.223	0.012	18.58
10/14/09	3.919	0.39	10.05
11/12/09	0.1041	0.016	6.51
12/10/09	0.1111	0.016	6.94

Dissolved Oxygen (mg/L)

	Annual Ave	July-Dec Ave	Jan-June Ave	Range	Sample Size	Number of Exceedances*	% exceed
2009	10.65	10.92	10.45	9.11 - 11.69	7	0	0
2003	10.19	No Data	10.19	10.12 - 10.26	2	0	0
2002	10.33	10.61	10.21	8.65 - 11.97	7	0	0
				Totals =	**16**		

*****13>DO mg/L>7

Chlorophyll-a (µg/L)

	Annual Ave	July-Dec Ave	Jan-June Ave	Range	Sample Size	Number of Exceedances*	% exceed (40 µg/L)
2009	8.7	16.3	3.0	0.04 - 43.87	7	1	14
2003	0.1	No Data	0.1	0.1 - 0.1	2	0	0
2002	0.3	0.1	0.42	0.0 – 0.8	7	0	0
				Totals =	**16**		

Algal Mat Coverage

	Percent Cover					Number of Observations	Months Algal Mats Observed											
Year	**0**	**1 - 25**	**26 - 50**	**51 - 75**	**76 - 100**		J	F	M	A	M	J	J	A	S	O	N	D
2009	5	2	0	0	0	7											X	X

Data for years 2001 through 2005 not used for assessment purposes. Data for these years was originally reported as attached algae and subsequently changed to Algal Mat Coverage

TDS, Chloride and Sodium (mg/L)

	Annual Ave Total Dissolved Solids		Annual Ave Chloride		Annual Ave Sodium	
		Sample Size		Sample Size		Sample Size
2012	No Data		No Data		No Data	
2009	283	7	12.2	5	15.2	5
2003	293	2	No Data	0	No Data	0
2002	319	7	10.9	7	17.6	7
Totals =		**16**		**12**		**12**
	Total Dissolved Solids		**Chloride**		**Sodium**	
Median for all Years	313		11.5		17	
75th Percentile	352		13.25		19	

Range of nitrate (N) and orthophosphate (P) concentrations at upper San Simeon Creek (310SSU) and lower Arroyo De La Cruz (310ADC)

Constituents in mg/L	Surface Water Sites	
	310SSU	**310ADC**
Nitrate as N*	0.11	0.093
Nitrate as N (Range)	0.01 – 0.88	0.02 - 0.49
Nitrate 75th percentile	0.052	0.103
Orthophosphate as P*	0.01	0.01
Orthophosphate as P (Range)	0.004-0.034	0.003-0.026
Orthophosphate as P 75th percentile	0.01	0.01
Dissolved Oxygen (Range for all years)	8.65 - 11.97	2.3 -10.7
TDS*	300	296
Sodium*	16	19
Chloride*	11.7	23
Salinity (ppt)	0.24	0.30

*Mean for all years (2001-2012)

Cambria WWTP Effluent
(Effluent is discharged to percolation ponds located in the San Simeon Creek Watershed)

Nitrate as N (mg/L)

	Annual Ave	Jun-Dec Ave	Jan-May Ave	Range	Sample Size
2012	30.7	31.6	29.4	16.9 - 43.6	12
2011	28.8	31.2	27.2	21.5 - 37.8	5
2010	24.0	26.6	21.5	18 - 33.2	4
2009	35.2	31.4	39.1	22.4 - 42.1	4
2008	31.5	30.1	34.4	26.4 - 34.4	3
2007	22.5	18.5	26.5	8.4 - 35	4
2006	36.3	37.1	35.6	28.1 - 43	4
2005	17.6	20.1	15.2	13.8 - 25.3	4
2004	15.6	16.4	14.8	13.8 - 17.8	4
2003	34.5	35.2	33.8	26.5 - 41	4
2002	17.6	26.5	8.8	4.5 - 32	4
Totals =	**27.3**	**28.4**	**26.1**		**52**

Total Dissolved Solids, Sodium, and Dissolved Oxygen (mg/L)

Annual Ave	Total Dissolved Solids	Sodium	Dissolved Oxygen
2012	952	182	3.9
2011	829	152	
2010	847	165	
2009	840	163	3.6
2008	840	155	
2007	945	174	
2006	866	169	
2005	857	131	
2004	847	138	
2003	905	155	6.0
2002	860	203	7.4

GROUNDWATER

Monitoring Well No. SS3 (mg/L) (Up gradient of wastewater percolation ponds)

Sampling Date	NO3-N	TDS	Na	Cl	SO4	B
1/14/2001	1.1	380	22	21		
4/14/2001	0.8	340	20	20		
7/14/2001	1	380	19	22		
10/14/2001	0.9	360	19	24		
1/25/2002		370	20	18		
4/30/2002	0.6	340	18	19	48	0.18
10/31/2002	0.9	380	18	23	50	0.17
1/14/2003		370	19	18		
4/11/2003	0.8	340	18	18	42	0.17
10/7/2003	0.9	360	19	21	46	0.2
4/14/04	0.7	350	19	17	42	0.2
10/14/04	0.8		23	26	46	0.2
4/14/05	1.3	400	21	22	42	0.2
10/14/05	1	380	22	22	45	0.2
4/14/06	0.9	370	20	19	44	0.2
10/14/06	0.9	350	19	20	46	0.27
1/4/2007		400	20	21		
4/3/2007	0.5	350	20	18	45	0.18
7/10/2007		360	19	21		
10/10/2007	0.4	370	20	21	48	0.1
1/12/2008						
1/13/2008		320	18	20		
4/7/2008	1	320	22	21	43	0.2
7/8/2008		360	21	18		
10/8/2008	0.4	290	18	20	0.49	0.2
4/7/2009	0.4	360	19	19	44	0.2
10/7/2009						
1/1/2010		350	21	22		
4/12/2010	0.6	330	19	21	42	0.2
7/7/2010		340	18	21		
10/4/2010						
10/18/2010						
1/11/2011		360	20	24		
4/11/2011	1.1	370	18	25	45	0.2
7/10/2011		360	18	21		
10/10/2011	0.6	370	20	19	48	0.2
1/10/2012						
4/10/2012	0.5	340	20	21	50	0.2
7/10/2012		360	18	19		
Average for all years	**0.8**	**357.4**	**19.6**	**20.9**	**43.0**	**0.2**

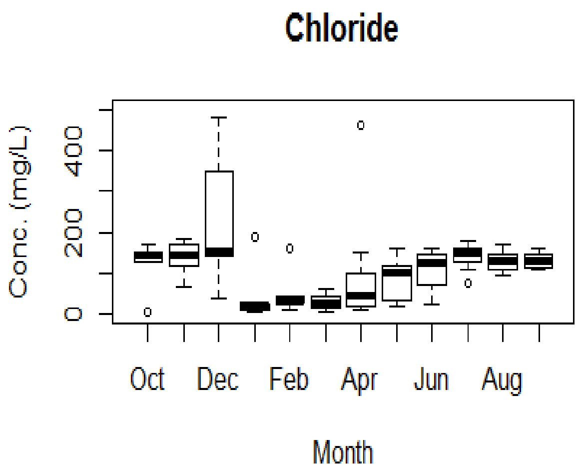
Monitoring Well No. 9P7 (mg/L) (Adjacent to the wastewater percolation ponds)

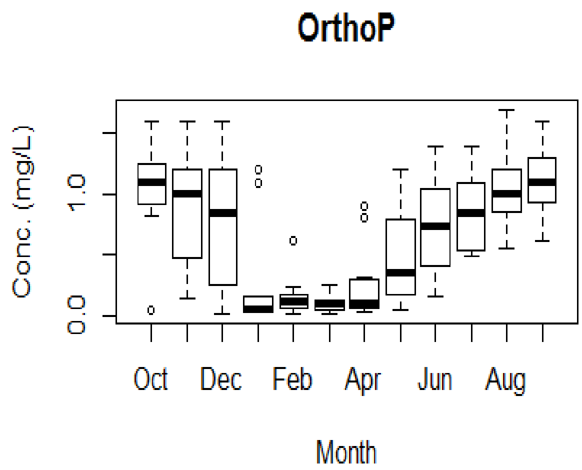
Sampling Date	NO3-N	TDS	Na	Cl	SO4	B
1/14/2001	8.8	620	51	120		
4/14/2001	4	520	53	64		
7/14/2001	4.1	510	80	110		
10/14/2001	8.3	750	110	200		
1/25/2002						
4/30/2002	1.2	420	33	40	55	0.23
10/31/2002	13	790	104	196	82	0.35
1/14/2003						
4/11/2003	1.2	410	27	32	49	27
10/7/2003	19.3	720	85	145	76	0.3
4/14/04	4.9	480	48	59	56	0.2
10/14/04	5	520	52	64	62	0.2
4/14/05	2.5	480	50	51	54	0.2
10/14/05	2.6	430	54	42	49	0.2
4/14/06	2.2	420	33	37	48	0.2
10/14/06	4.2	460	42	50	52	0.25
1/4/2007						
4/3/2007	0.4	420	32	34	51	0.21
7/10/2007						
10/10/2007	13.5	640	78	98	62	0.2
1/12/2008						
1/13/2008						
4/7/2008	6	480	43	66	57	0.2
7/8/2008						
10/8/2008	11.1	500	55	82	67	0.3
4/7/2009	0.4	500	52	76	63	0.3
10/7/2009	4.7	470	38	52	57	0.2
1/1/2010						
4/12/2010	0.7	380	29	39	51	0.2
7/7/2010						
10/4/2010	3.7	500	156	55	50	0.4
10/18/2010						
1/11/2011						
4/11/2011	0.8	400	23	40	47	0.2
7/10/2011						
10/10/2011	0.3	400	31	46	46	0.3
1/10/2012						
4/10/2012	0.6	370	20	27	47	0.1
7/10/2012						
10/10/2012	2.3	430	29	35	44	0.1
Average for all years	**4.8**	**500.8**	**54.2**	**71.5**	**55.7**	**0.2**

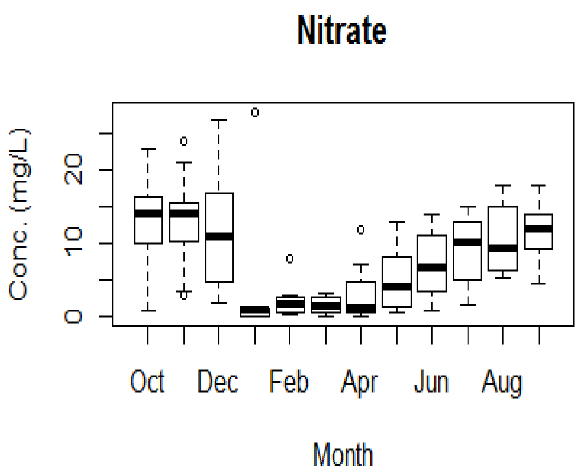
Monitoring Well No. 16D1 (mg/L) (Down gradient of wastewater percolation ponds)

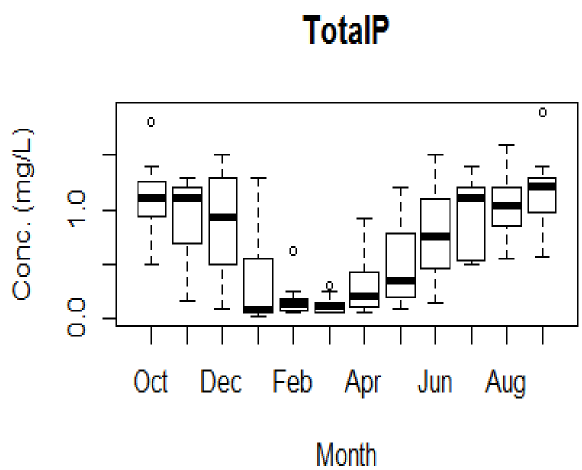
Sampling Date	NO3-N	TDS	Na	Cl	SO4	B
1/14/2001	6.8	770	130	180		
4/14/2001	6.5	770	120	200		
7/14/2001	6.6	750	120	180		
10/14/2001	3.4	770	130	210		
1/25/2002						
4/30/2002	7.4	740	110	170	82	0.37
10/31/2002	6.2	820	120	110	84	0.36
1/14/2003						
4/11/2003	14.3	870	140	209	87	0.38
10/7/2003	14.1	820	128	185	83	0.3
4/14/04	12.6	770	127	158	84	0.4
10/14/04	7.3	740	123	163	89	0.3
4/14/05	7	730	115	137	65	0.3
10/14/05	7.3	710	124	143	63	0.3
4/14/06	17	800	117	188	84	0.3
10/14/06	21.6	700	125	144	70	0.36
1/4/2007						
4/3/2007	15.4	860	142	189	80	0.34
7/10/2007						
10/10/2007	20.4	810	127	161	80	0.3
1/12/2008						
1/13/2008						
4/7/2008	16.1	770	137	196	96	0.3
7/8/2008						
10/8/2008	15.7	730	134	179	95	0.3
4/7/2009	24.5	840	136	176	98	0.4
10/7/2009	16.4	770	121	164	92	0.3
1/1/2010						
4/12/2010	11.3	750	131	170	89	0.4
7/7/2010						
10/4/2010	11.9	740	32	152	82	0.2
10/18/2010						
1/11/2011						
4/11/2011	10.7	700	119	131	87	0.3
7/10/2011						
10/10/2011	8.3	670	113	141	80	0.4
1/10/2012						
4/10/2012	11.9	760	141	201	88	0.3
7/10/2012						
10/10/2012	15	830	137	187	80	0.2
Average for all years	**12.1**	**768.8**	**123.0**	**170.2**	**84.8**	**0.3**

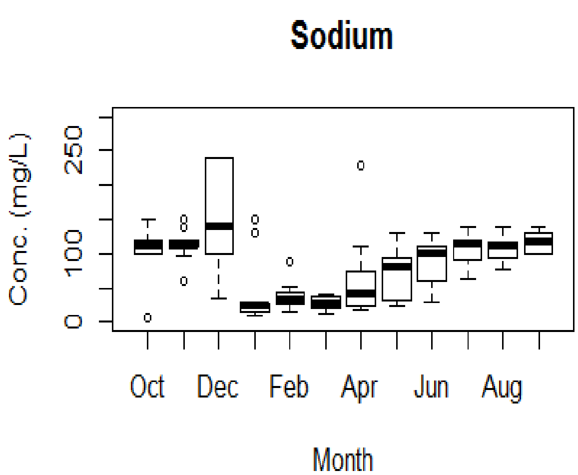
Monthly Distributions for Nitrate, Phosphorus, Sodium, and Chloride



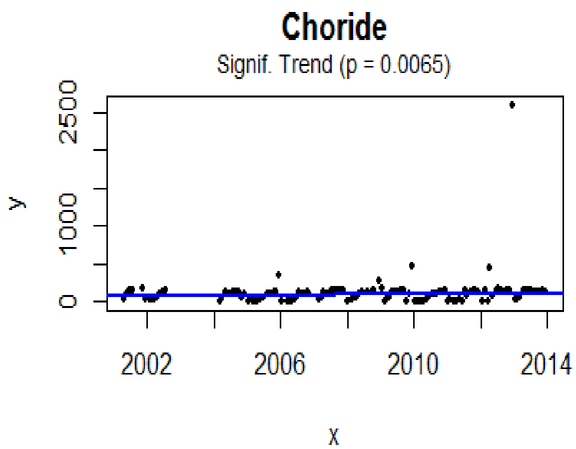


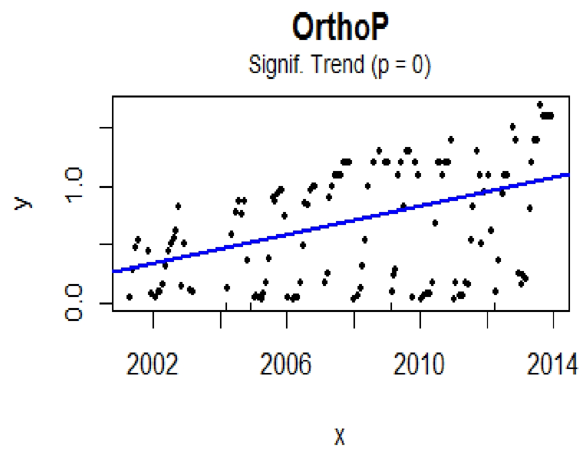


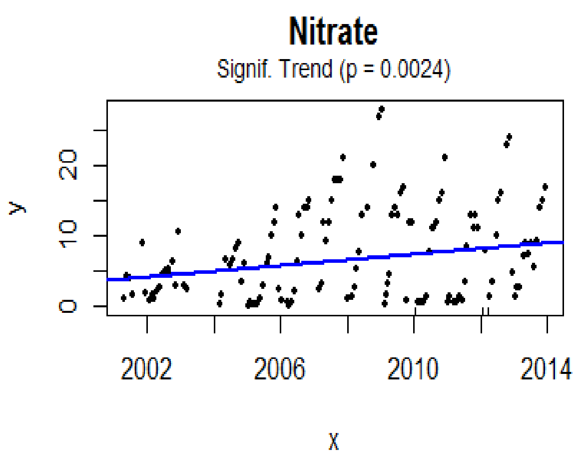


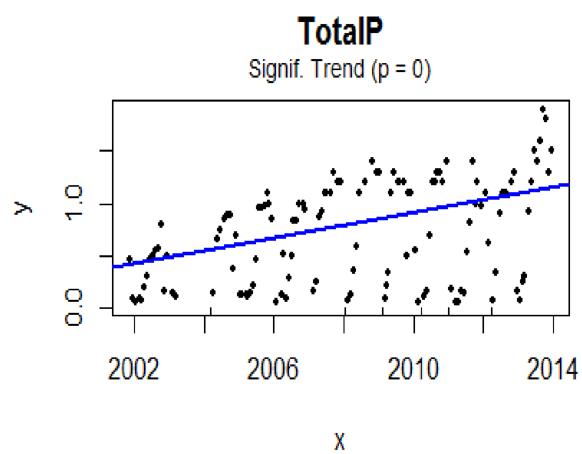


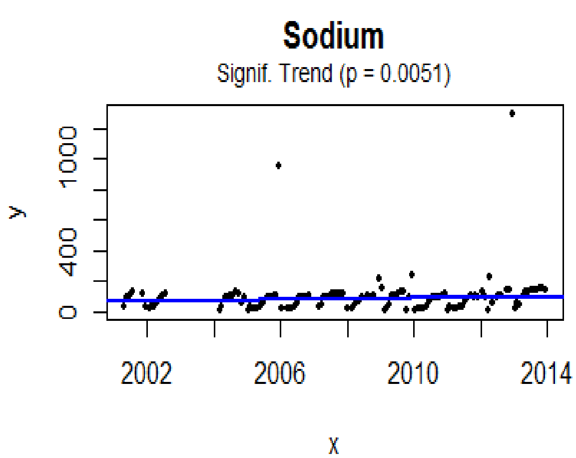
Overall Trends for Nitrate, Phosphorus, Sodium, and Chloride

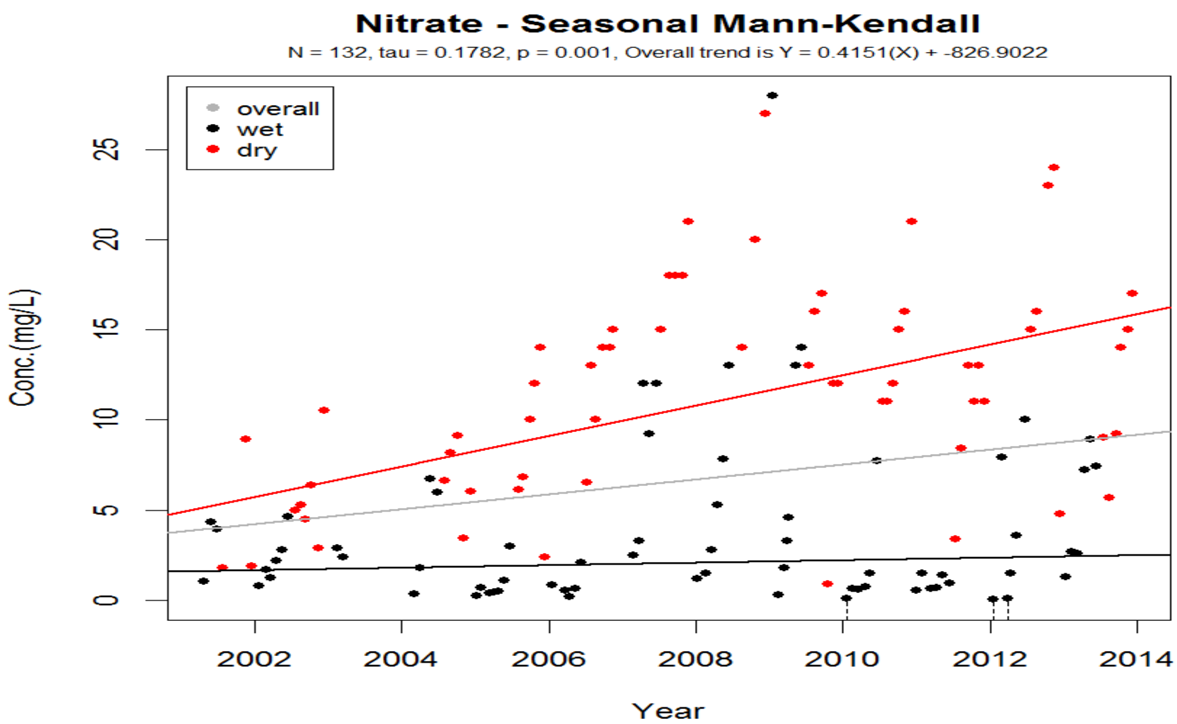


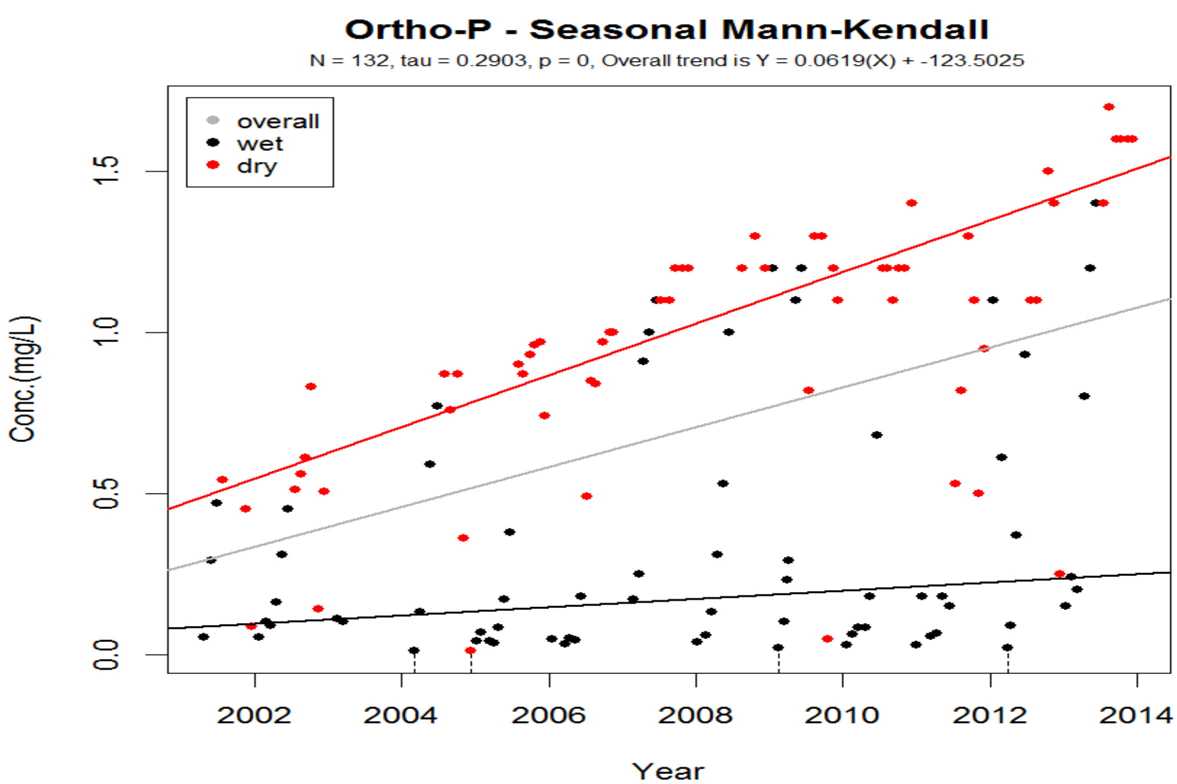


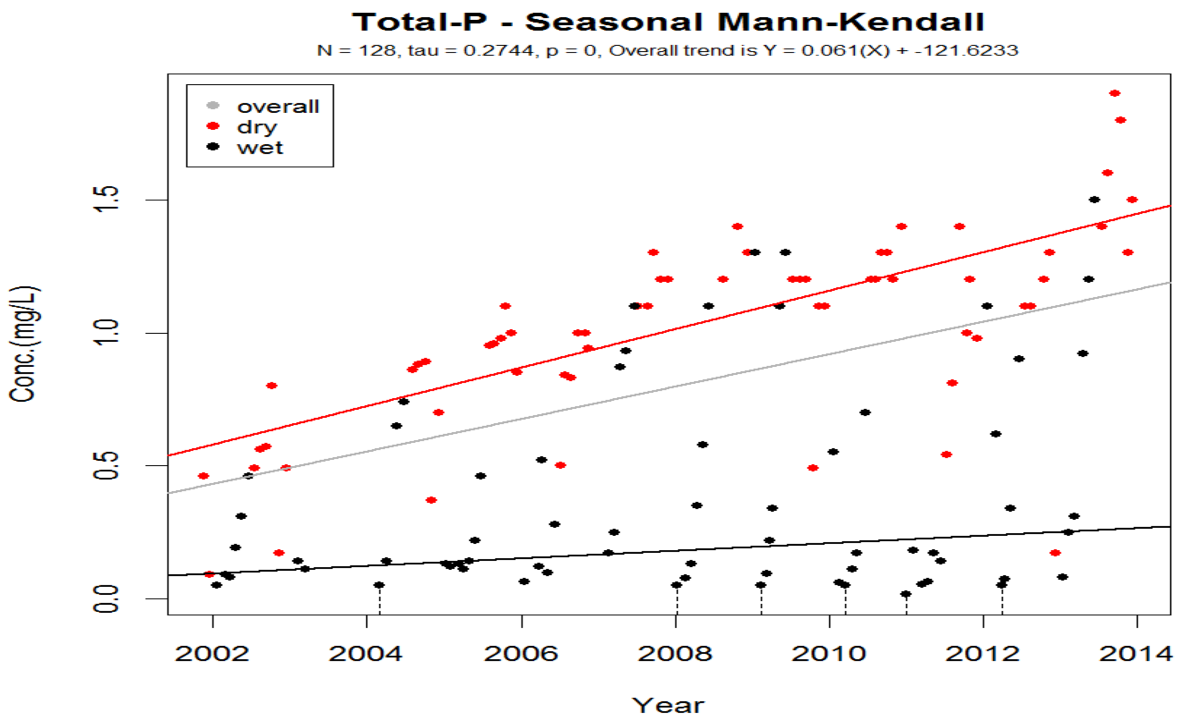


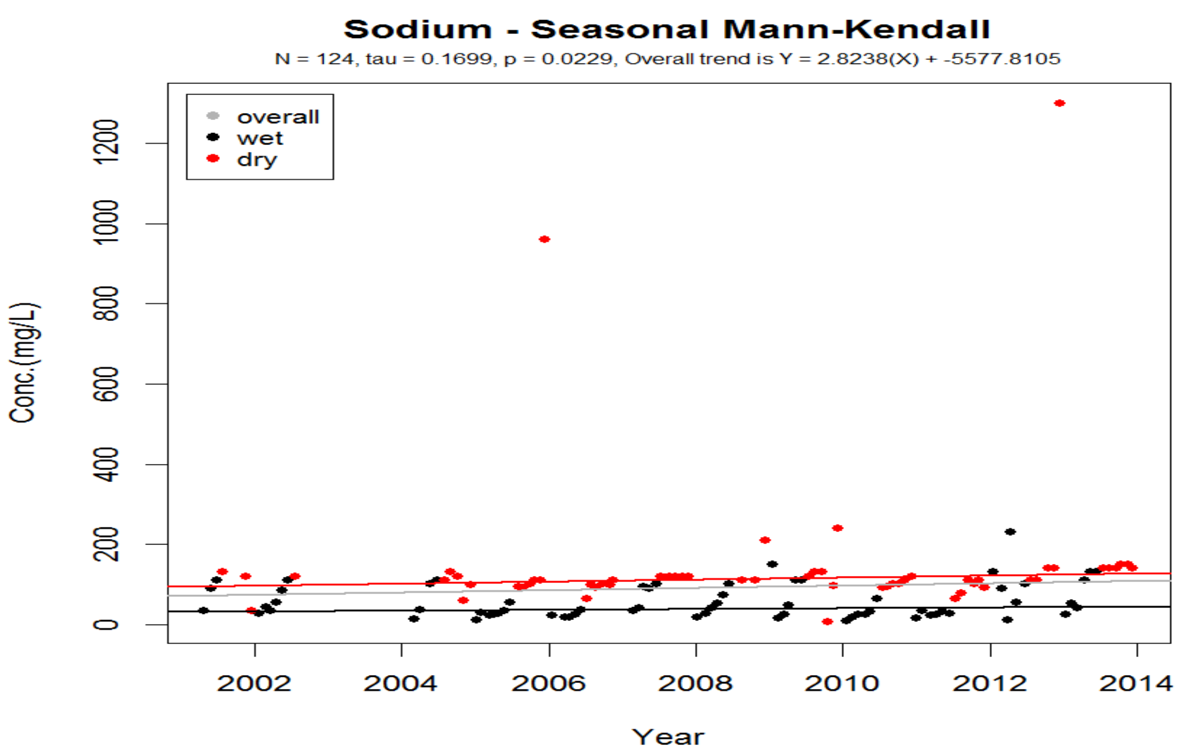


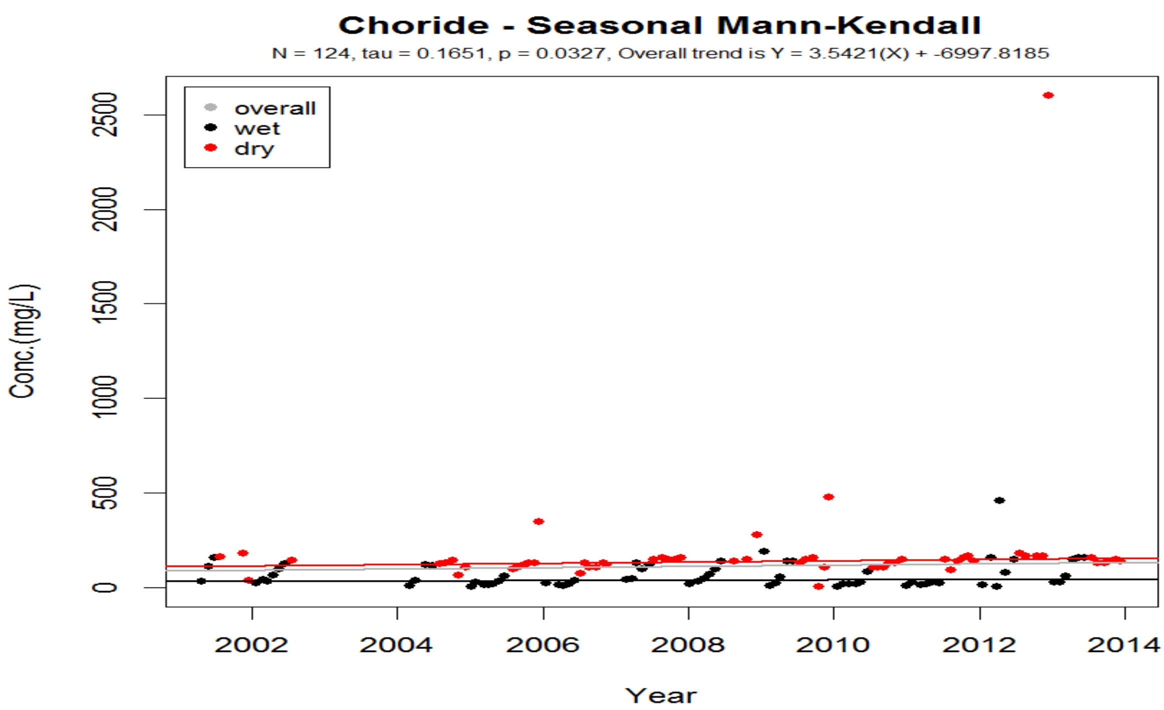



Nitrate - Seasonal Mann-Kendall
N = 132, tau = 0.1782, p = 0.001, Overall trend is Y = 0.4151(X) + -826.9022
overall
wet
dry
Conc.(mg/L)
0
5
10
15
20
25
2002
2004
2006
2008
2010
2012
2014
Year

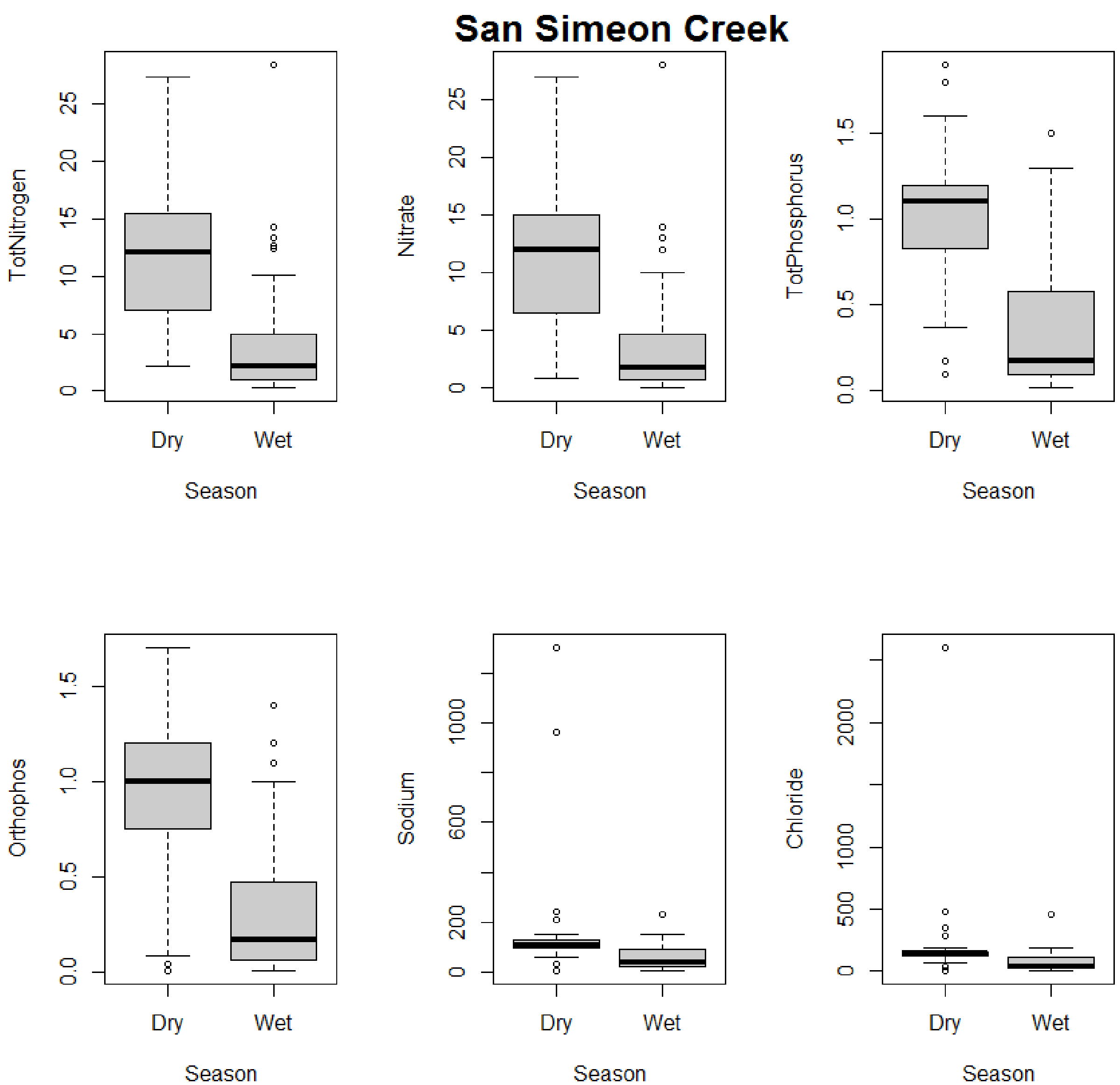

Ortho-P - Seasonal Mann-Kendall
N = 132, tau = 0.2903, p = 0, Overall trend is Y = 0.0619(X) + -123.5025
overall
wet
dry
Conc.(mg/L)
0.0
0.5
1.0
1.5
2002
2004
2006
2008
2010
2012
2014
Year


Total-P - Seasonal Mann-Kendall
N = 128, tau = 0.2744, p = 0, Overall trend is Y = 0.061(X) + -121.6233
overall
dry
wet
Conc.(mg/L)
0.0
0.5
1.0
1.5
2002
2004
2006
2008
2010
2012
2014
Year

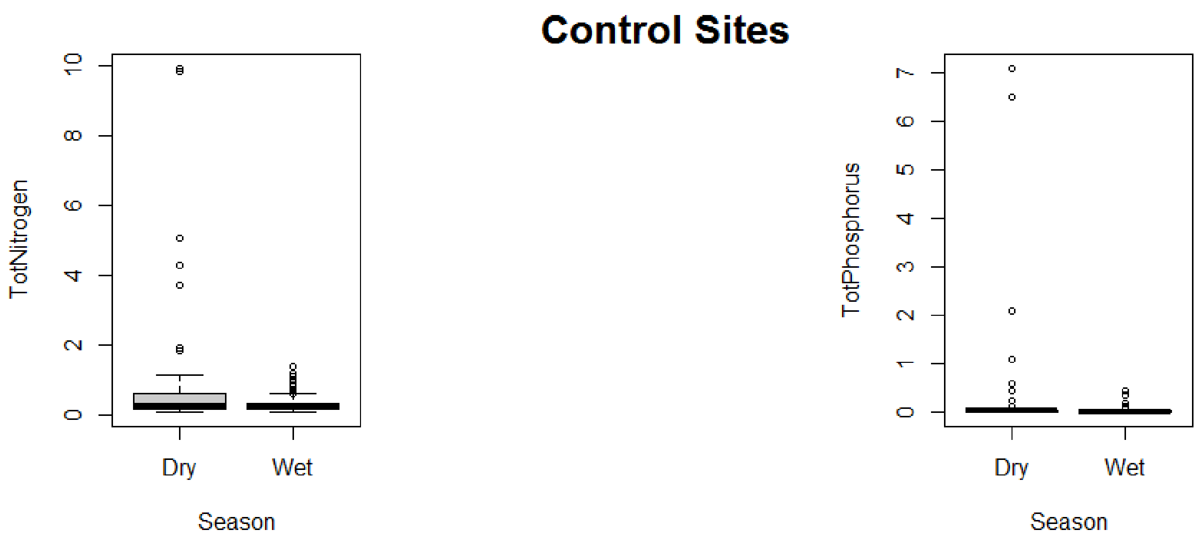

Sodium - Seasonal Mann-Kendall
N = 124, tau = 0.1699, p = 0.0229, Overall trend is Y = 2.8238(X) + -5577.8105
overall
wet
dry
Conc.(mg/L)
0
200
400
600
800
1000
1200
2002
2004
2006
2008
2010
2012
2014
Year


Choride - Seasonal Mann-Kendall
N = 124, tau = 0.1651, p = 0.0327, Overall trend is Y = 3.5421(X) + -6997.8185
overall
wet
dry
Conc.(mg/L)
0
500
1000
1500
2000
2500
2002
2004
2006
2008
2010
2012
2014
Year

310SSC - Results Mann-Whitney Non-Parametric, Two-Sample Test for Total Nitrogen, Nitrate, Total Phosphorus, Phosphorus, Sodium, and Chloride



Reference Sites - Results Mann-Whitney Non-Parametric, Two-Sample Test for Total Nitrogen, and Total Phosphorus



11 APPENDIX B – STEPL SPREADSHEETS

STEPL Output

N=0.08, P=0.031, BOD=0.160

San Simeon Creek Watershed

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	242.78	37.71	953.10	5.58
Cropland	11920.73	4082.18	24087.69	2994.22
Pastureland	41598.77	19837.68	312007.44	11569.55
Forest	814.90	362.66	1838.18	124.42
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	131.81	51.63	538.24	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	2263.20	270.18	0.00	0.00
Total	**56972.19**	**24642.04**	**339424.65**	**14693.77**

San Simeon Creek Upper Watershed

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	0.00	0.00	0.00	0.00
Cropland	2347.38	2465.30	4739.97	599.37
Pastureland	31952.29	39777.72	226549.52	8968.56
Forest	805.29	710.82	1807.77	128.41
Feedlots	0.00	0.00	0.00	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	62.18	24.35	253.89	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	1451.74	186.14	0.00	0.00
Total	**36618.88**	**43164.33**	**233351.15**	**9696.34**

12 Appendix C – San Simeon Creek Nutrient Numeric Target Development

Appendix C: San Simeon Creek Nutrient Numeric Target Development

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C.1 Introduction

This appendix describes the development of nutrient numeric targets for the San Simeon Creek watershed. The Central Coast Water Board Basin Plan has narrative objectives regarding biostimulatory substances, which states: “Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.” The Basin Plan does not specify what levels of aquatic growths constitute a nuisance.

Central Coast Water Board staff develops technically defensible numeric water quality targets that are protective of the Basin Plan’s narrative objective for biostimulatory substances. Targets should be based on established methodologies or peer-reviewed numeric criteria. It is important to recognize that definitive and unequivocal scientific certainty is not necessary in a TMDL process with regard to development of nutrient water quality targets protective against biostimulation. Numeric targets should be scientifically defensible, but are not required to be definitive.

Impacts related to biostimulation are an ongoing and active area of research. If the water quality objectives for biostimulatory substances are changed in the future, then any TMDLs and allocations that are potentially adopted for biostimulatory substances pursuant to this project may sunset and be superseded by revised water quality objectives.

Recent biostimulation research of inland surface waters within the California central coast region indicates that existing nutrient numeric water quality objective found in the Basin Plan (i.e., the 10 mg/L nitrate-nitrogen MUN objective) is unlikely to reduce benthic algal growth below even the highest benchmarks for water quality [20] (UCSC 2010). Therefore, the 10 mg/L nitrate-nitrogen MUN objective is not sufficiently protective against biostimulatory impairments. Consequently, staff concludes that it is necessary to set nutrient numeric targets more stringent than the existing numeric objectives found for nitrate in the Basin Plan (i.e., the 10 mg/L MUN objective).

USEPA’s (USEPA 2000b) Nutrient Criteria Technical Guidance Manual, Rivers and Streams, recommends three general approaches for criteria setting:

(1) Statistical analysis of data: identification of reference reaches for each stream class based on best professional judgment or percentile selections of data plotted as frequency distributions;
(2) Use of predictive relationships (e.g., trophic state classifications, models, biocriteria); and
(3) Application and/or modification of established nutrient/algal thresholds (e.g., nutrient concentration thresholds or algal limits from published literature).

USEPA (USEPA 2000b) states that a weight of evidence approach combining any or all three approaches above will produce criteria of greater scientific validity. Staff followed USEPA (USEPA 2000b) guidance for the development of draft targets with the goal being to account for physical and hydrologic variation within the San Simeon Creek watershed.

Using the weight of evidence approach, staff:

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[20] USEPA guidance documents and assessment data were examined to produce a set of possible expected benchmarks for algal abundance and biostimulatory substances (University of California, Santa Cruz 2010).

1. Conducted statistical analysis to evaluate seasonal variation in San Simeon Creek and five adjacent reference streams (Section C2)
2. Conducted statistical analysis to identify the 75th percentile of data to establish reference conditions (Section C3)
3. Used predictive relationships (California Nutrient Numeric Endpoint (CA NNE NNE) approach (Tetra Tech 2006) to model nutrient response indicators to develop potential nutrient water quality criteria (Section C4)
4. Compared potential nutrient water quality criteria to established nutrient/algal thresholds (e.g., nutrient concentration thresholds or algal limits from published literature) (Section C5).

C.2 Consideration of Seasonal Variation

Staff analyzed San Simeon Creek data both monthly and seasonally. A typical wet season includes the months October 15 through May 15 and the typical dry season includes the months of May 16 through October 14. Based on data analysis, staff used the months of January through June to represent the wet season and the months of July through December to represent the dry season.

To confirm the use of alternative wet/dry seasons staff evaluated data using:

- Seasonal comparison of total nitrogen and nitrate data for the conventional wet/dry season versus alternative wet/dry seasons
- Statistical cluster analysis

Seasonal comparison of total nitrogen and nitrate

Staff evaluated total nitrogen data (2001 – 2013) from San Simeon Creek (310SSC) on a seasonal basis, considering both typical and adjusted wet-dry seasons. Data summarized in Table 1 shows elevated total nitrogen concentrations are more likely to appear in the months July through December.

Table 28 - San Simeon Creek Total Nitrogen, Typical and Adjusted Wet-Dry Seasons

	Average Total Nitrogen			
	Typical Wet-Dry Season		**Adjusted Wet-Dry Season**	
Year	**Wet (Nov-Apr)**	**Dry (May-Oct)**	**Wet (Jan-June)**	**Dry (July-Dec)**
2013	8.0	9.3	5.5	11.8
2012	6.6	13.6	4.1	16.6
2011	4.7	6.7	1.1	10.3
2010	7.1	9.9	2.4	14.6
2009	9.1	12.8	9.5	12.3
2008	7.7	14.1	5.5	20.7
2007	10.0	15.6	8.2	18.5
2006	4.6	9.0	1.2	12.6
2005	3.2	7.0	1.2	9.4
2004	3.2	7.9	4.1	7.2
2003	2.9	No Data	2.9	No Data
2002	3.5	5.3	2.5	6.3
2001	4.3	3.8	3.5	4.6
Average for all Years	**5.8**	**9.6**	**4.0**	**12.1**

Figure 1 shows the total nitrogen box and whiskers plots for each month. The box and whiskers graphic illustrates the difference between the wet and dry season concentrations of total nitrogen.

For the months January through June, the total nitrogen medians for all months and 75th percentiles for five of six months are below the MUN beneficial use criteria of 10 mg/L nitrate as N. For the months July through December, the median for five of six months and 75th percentile of all six months show total nitrogen concentrations above the MUN beneficial use criteria of 10 mg/L nitrate as N.

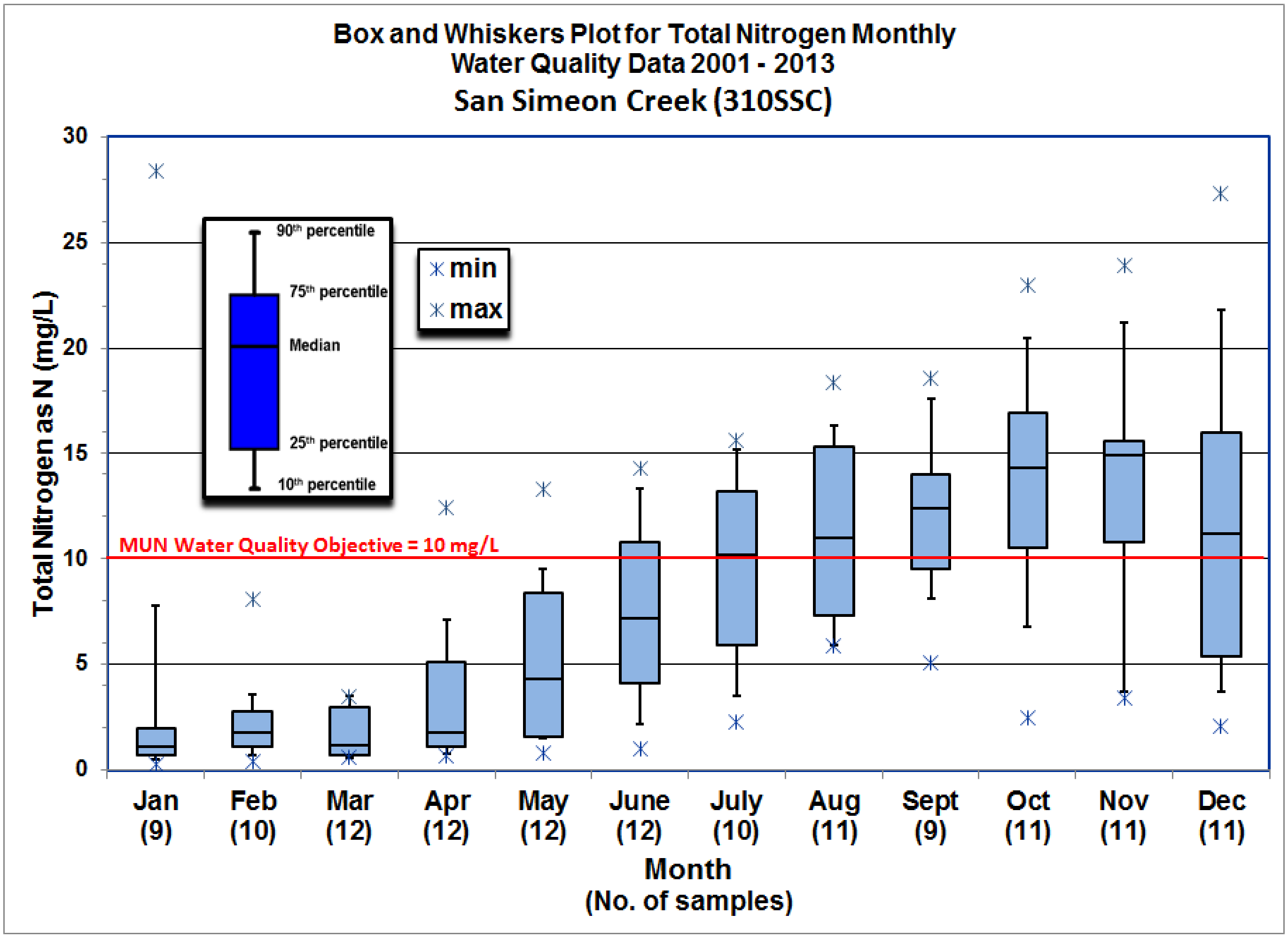


Figure 30 - San Simeon Creek Total Nitrogen Monthly Box and Whiskers Plots

For the same 2001 through 2013 period, staff evaluated nitrate data from San Simeon Creek (310SSC) (Table 2). Similar to total nitrogen, nitrate concentrations show a difference between the wet-dry seasons of January-June and July-December.

Table 29 - San Simeon Creek Nitrate, Typical and Adjusted Wet-Dry Seasons

	Average Nitrate (NO_3 as N)			
	Typical Wet-Dry Season		**Adjusted Wet-Dry Season**	
Year	**Wet (Nov-Apr)**	**Dry (May-Oct)**	**Wet (Jan-June)**	**Dry (July-Dec)**
2013	7.6	9.0	5.0	11.7
2012	6.4	13.5	3.8	16.6
2011	4.6	6.4	1.0	10.0
2010	6.5	9.7	1.9	14.3
2009	8.9	12.3	9.3	11.8
2008	7.6	13.7	5.3	20.3
2007	9.7	15.0	7.8	18.00
2006	4.1	8.6	0.85	12.08
2005	2.4	6.5	0.90	8.55
2004	2.9	7.3	3.71	6.67
2003	2.6	No Data	2.63	No Data
2002	3.2	4.4	2.21	5.76
2001	3.9	3.4	3.09	4.21
Average for all Years	**5.4**	**9.2**	**3.7**	**11.7**

ND = no data

As shown in Figure 2, nitrate also shows the same wet-dry distribution as total nitrogen, with relatively low concentrations in January through June and elevated concentrations in July through December.

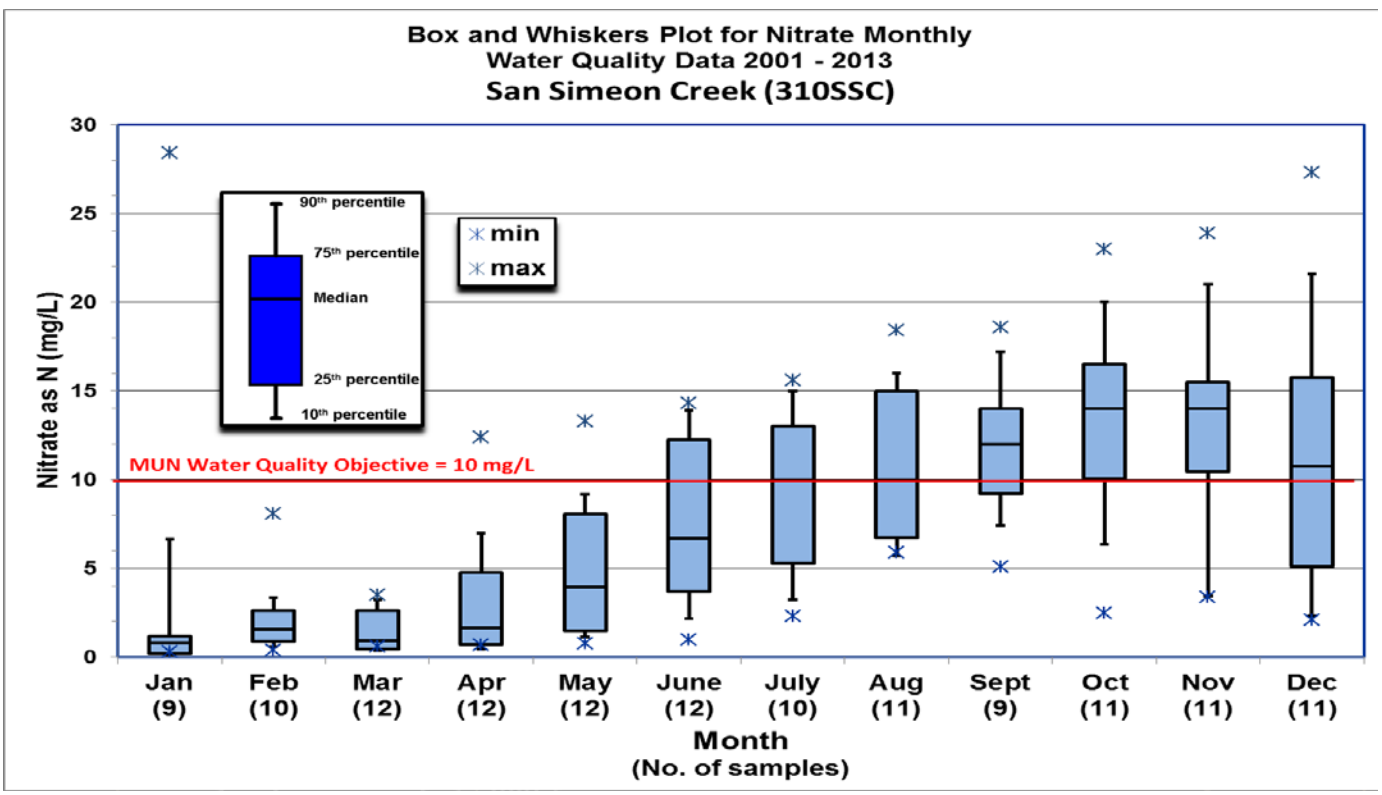


Figure 31 - San Simeon Creek Nitrate Monthly Box and Whiskers Plots

Statistical cluster analysis
To confirm the appropriateness of using alternative wet/dry seasons, staff evaluated nitrate and total nitrogen data (site 310SSC) using a two-mean cluster analysis (R Core Team (2014)). The goal of the two-mean cluster analysis is to “separate the data into two groups by minimizing the distances of the observations from two cluster centers” (J, Gareth et. Al., 2014). In this analysis, initially the nitrate data are randomly grouped. The analysis iteratively regroups the data until the data is clustered together such that there is the minimum of variation within each cluster. Figure 3 below shows that for the months of January through June most of the data falls into the cluster #1 group. In July the data flips and most of the data falls into the cluster #2 group. The cluster analysis implies that there is data similarity for the months of January through June and a separate data similarity for the months of July through December.

Month No.	1	2	3	4	5	6	7	8	9	10	11	12
Cluster #1	**8**	**10**	**14**	**11**	**9**	**8**	4	6	2	2	2	4
Cluster #2	1	0	0	1	3	4	**6**	**6**	**7**	**9**	**9**	**6**

Figure 32 - Distribution of Cluster Groups by Month of the Year

Figure 4 below is a second illustration of the nitrate cluster groups by month. In addition to the cluster groups, this graph includes a polygon that connects the median nitrate concentrations for each month. It is clear that median nitrate concentrations in January through June are low and that in July through December the median nitrate concentrations are elevated.

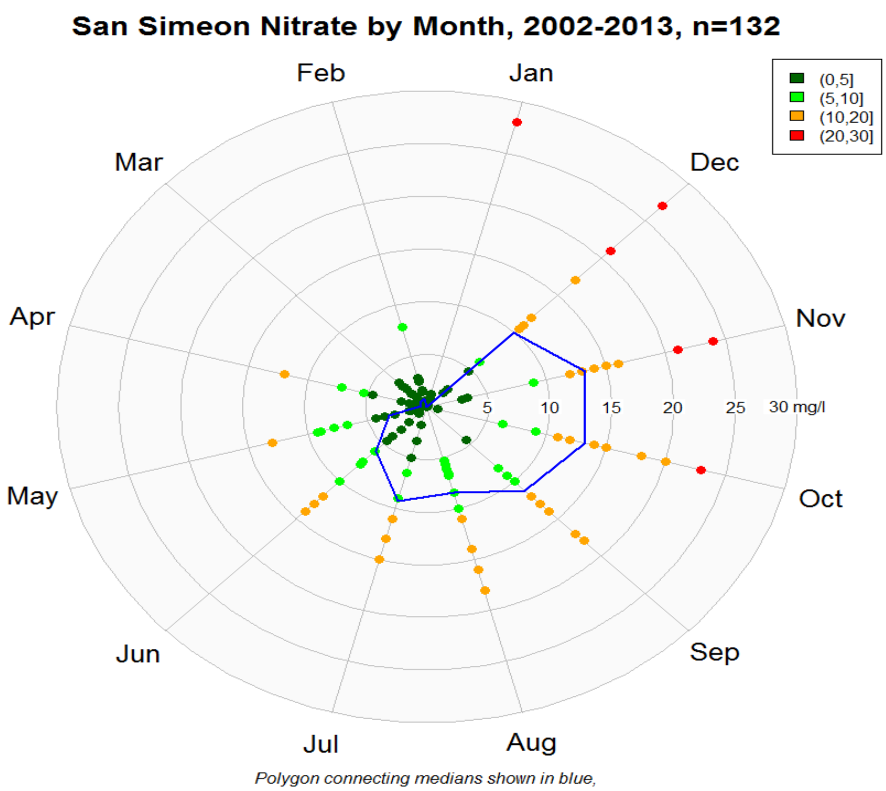
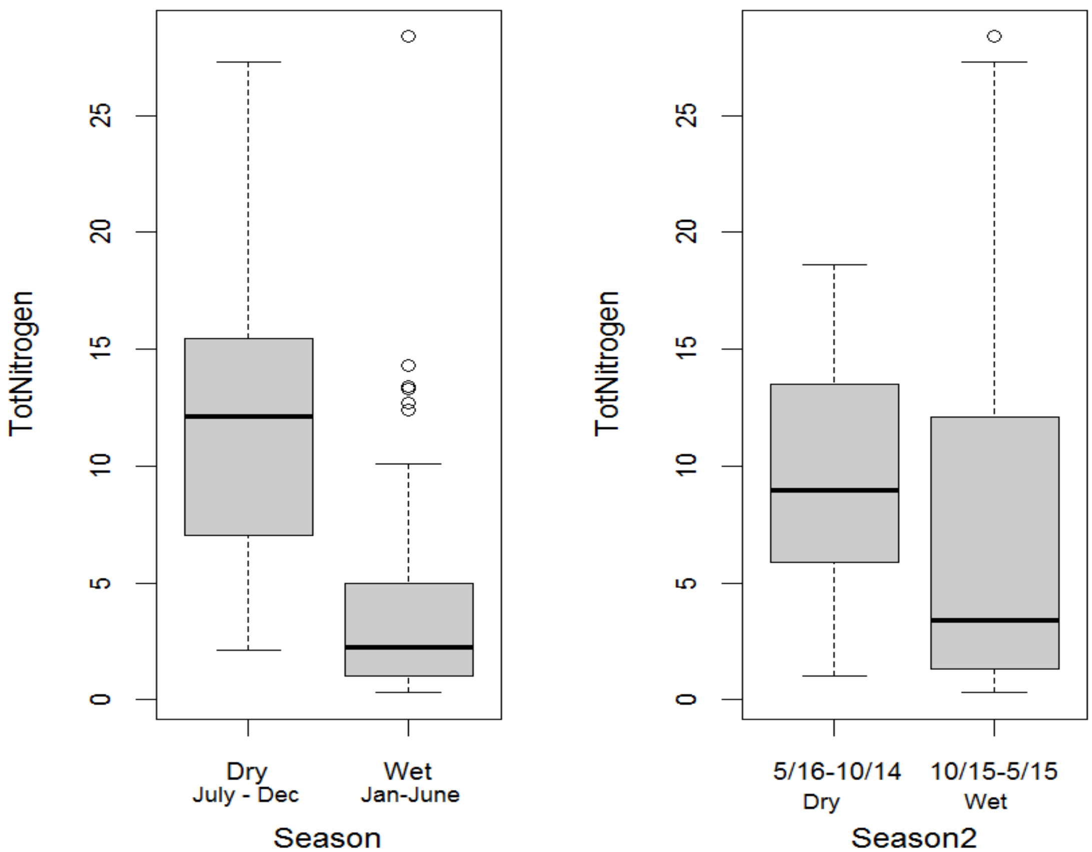


Figure 33 - Distribution of Cluster Groups with Medians Shown

Finally, staff conducted a Mann-Whitney non-parametric test on data from 310SSC to evaluate the difference between conventional wet and dry season and adjusted alternative wet and dry season. Using the Mann-Whitney non-parametric, two-sample test for the conventional wet and dry season, the dry season (May 16 through October 14) median (8.95 mg/L total nitrogen) is statistically different than the wet season (October 15 through May 15) median (3.35 mg/L total nitrogen) at San Simeon Creek (310SSC) for total nitrogen (Figure 5).

Using the same analysis for the adjusted alternative wet and dry season, the dry season (July through December) median (12.2 mg/L total nitrogen) is significantly larger than the wet season (January through June) median (2.2 mg/L total nitrogen) at San Simeon Creek (310SSC) for total nitrogen. As shown in Figure 5 below the data separation for the adjusted alternative wet and dry season is larger than what is observed for the conventional wet and dry season and there is less data overlap. Similar results were observed for 310SSC nitrate, total phosphorus, orthophosphorus, sodium, and chloride.

The cluster analysis confirms that the data separates into two select groups, the two groups sort consistent with the adjusted alternative wet and dry season, and that for the adjusted alternative wet and dry season those groups show a greater degree of separation than when the data is grouped using the conventional wet and dry season. Understanding seasonal variation in San Simeon Creek supports the development of seasonal numeric targets that are protective of beneficial uses.



Adjusted Alternative Wet and Dry Season

Conventional Wet and Dry Season

Figure 34 - Mann-Whitney Non-Parametric Test for Total Nitrogen

C.3 Evaluation of Reference Conditions (75th Percentiles)

One line of evidence for establishing nutrient water quality targets in the San Simeon Creek watershed is provided through the evaluation of reference conditions. USEPA defines a reference stream as "a least impacted waterbody within an ecoregion that can be monitored to establish a baseline to which other waters can be compared. Reference streams are not necessarily pristine or undisturbed by humans" (USEPA 2000b).

USEPA's Technical Guidance Manual for Developing Nutrient Criteria for Rivers and Streams (USEPA 2000b) describes two statistical ways of establishing a reference condition[21]. One method is to choose the 75th percentile of a reference population of streams (Figure 6).

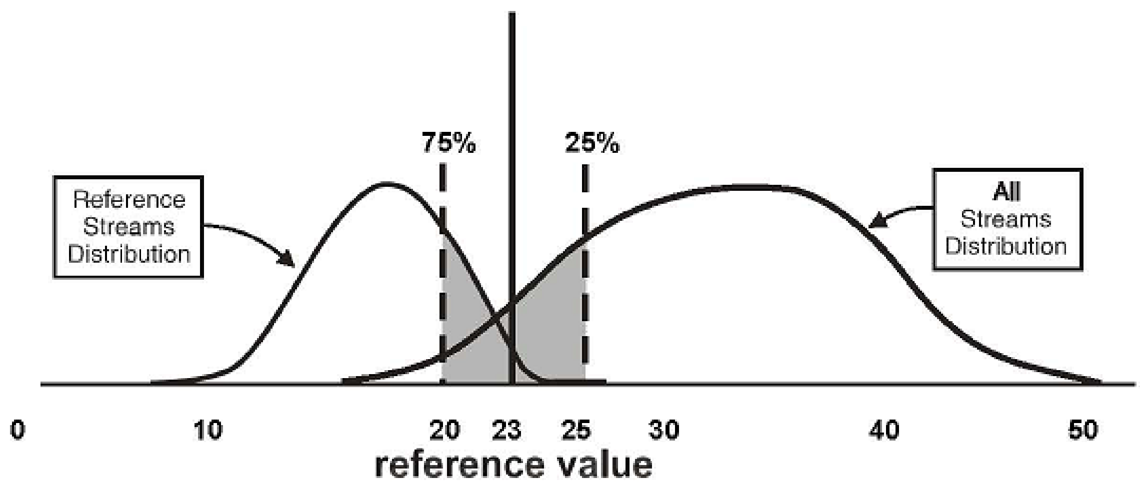


Figure 35 - Reference Values (concentration), Using Percentiles from Reference Streams

Using minimally impacted reference streams, staff selects the75th percentile, the upper (most impacted) 25 percent of the data. This is the preferred method to establish a reference condition. The 75th percentile was chosen by USEPA since it is likely associated with minimally impacted conditions, will be protective of designated uses, and provides management flexibility.

When reference streams are not identified, a second method is to determine the lower 25th percentile (least impacted) of the population of all streams within a region. In this case, the 25th percentile represents the best water quality of all streams. The 25th percentile of the entire population was chosen by USEPA to represent a surrogate for an actual reference population. As illustrated in Figure 6, data analyses to date indicates that the lower 25th percentile from an entire population roughly approximates the 75th percentile for a reference population (see case studies for Minnesota lakes in the Lakes and Reservoirs Nutrient Criteria Technical Guidance Document (USEPA, 2000a), the case study for Tennessee streams in the Rivers and Streams Nutrient Criteria Technical Guidance Document (USEPA,

[21] Criteria based on reference conditions - Criteria selected must first meet the optimal nutrient condition for that stream class and second be reviewed to ensure that the level proposed does not result in adverse nutrient loadings to downstream waterbodies (USEPA 2000b).

2000b), and the letter from Tennessee Department of Environment and Conservation to Geoffrey Grubbs (TNDEC, 2000)) (USEPA 2000a).
Staff evaluated a reference population of streams in close proximity to San Simeon Creek watershed. Within a 15 mile radius of San Simeon Creek, there a several watersheds with physical characteristics and land uses similar to the San Simeon Creek watershed. San Simeon Creek 310SSC is a CCAMP coastal confluence site. Reference sites selected from adjacent watersheds are also coastal confluence sites (Figure 7). Table 3 below shows physical characteristics and land use data for the reference watersheds.

For this analysis, these reference watersheds[22] can be considered minimally impacted. Staff evaluated data from five watersheds (Arroyo De La Cruz (310ADC), Pico Creek (310PCO), Santa Rosa Creek (310SRO), Villa Creek (310VIA), and Cayucos Creek (310CAY)) This allowed the use of USEPA's 75th percentile approach for developing nutrient criteria for reference streams, which is the preferred method to establish a reference condition..

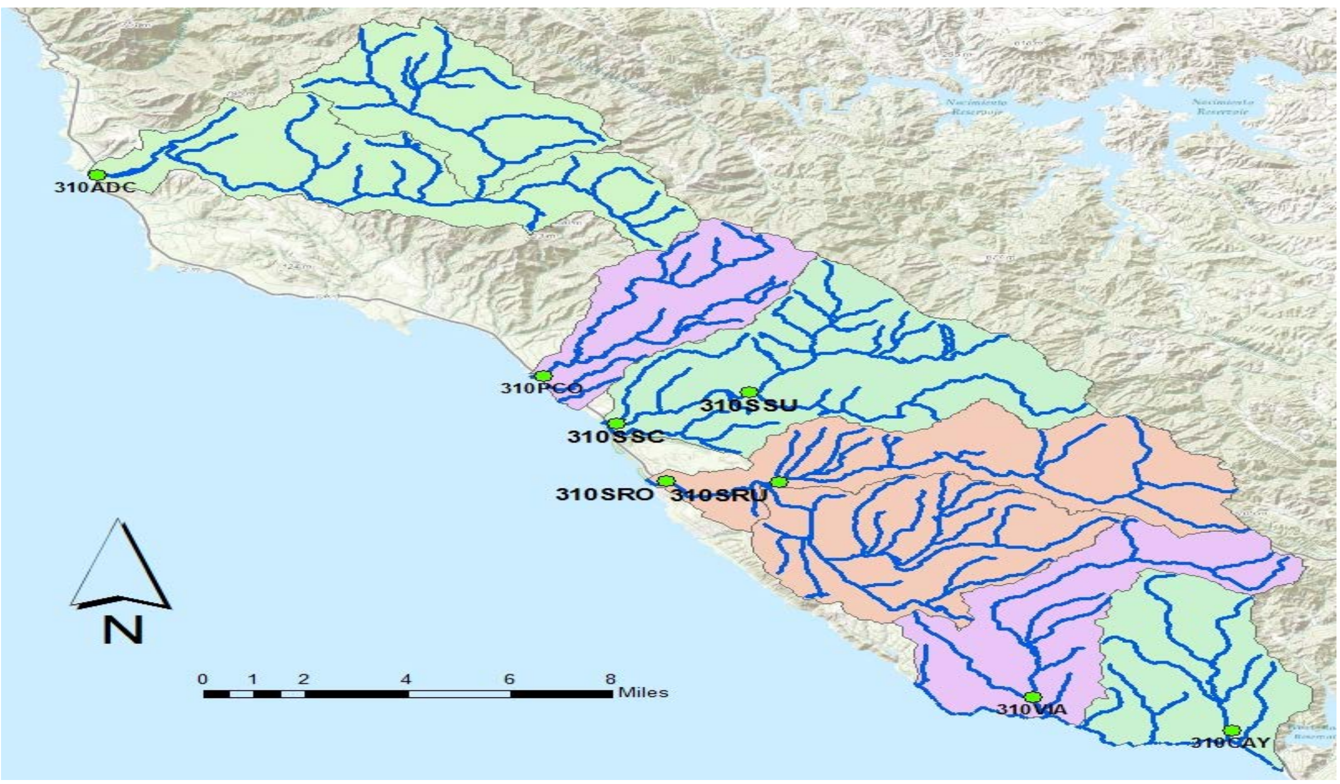


Figure 36 - San Simeon Creek (310SSC) and Reference Sites Arroyo De La Cruz (310ADC), Pico Creek (310PCO), Santa Rosa Creek (310SRO), Villa Creek (310VIA), and Cayucos Creek (310CAY)

[22] Reference watersheds are considered "slightly disturbed" by human activities. All are similar in hydrography, geography, and land use. Both the Santa Rosa Creek and the Cayucos Creek watersheds have urban populations and the other three do not. San Simeon Creek watershed is unique in that it receives a permitted point source discharge (approximately 500,000 gallon per day) to land (percolation ponds). The other watersheds do not have permitted municipal wastewater point source discharges.

Table 30 - Reference Streams Physical Characteristics and Land Use Data

PHYSICAL CHARACTERISTICS[1]					LAND USE				
WATERSHEDS (north to south)	**Area (acres)**	**Area (sq. miles)**	**Stream Length (miles)[3]**	**Ave. Ann. Rainfall (inches)[4]**	**Total Human Population**	**Public Ownership***	**Urban Area[5]**	**Agriculture/ Barren[5]**	**Open Space[5]**
Arroyo De La Cruz	27,303[6]	43	65	19.4	3	0.1%	0.2%	0.2%	> 99%
Pico	9,687[2]	15	29	18.1	477	0.3%	1%	< 0.1%	99%
Santa Rosa	30,354[2]	49	81	17.2	4,459	1%	5%	3%	92%
Villa	12,214[6]	19	NA	NA	NA	NA	NA	NA	NA
Cayucos	12,285[6]	19	NA	NA	NA	NA	NA	NA	NA

1 Source = SCCCSRP, December 2013
2 From: CDFFP CalWater 2.2 Watershed delineation, 1999 (www.ca.nrcs.usda.gov/features/calwater/)
3 From: CDFG 1:1,000,000 Routed stream network, 2003 (www.calfish.org/)
4 From: USGS Hydrologic landscape regions of the U.S., 2003 (1 km grid cells)
5 From: CDFFP Multi-source land cover data (v02_2), 2002 (100 m grid cells) (http://frap.cdf.ca.gov/data/frapgisdata/select.asp)
** National Forest Lands only; Military Reservations or State and County Parks not included.*
6 From: ArcMap, Watershed Boundary Dataset_12HU
NA = Data not available in the SCCCSRP, December 2013 report

Staff evaluated 216 total nitrogen samples and 198 total phosphorus samples from the five sites to determine the 75th percentiles. The year round 75th percentile for total nitrogen is 0.35 mg/L (as N) and the year round 75th percentile for total phosphorus is 0.04 mg/L (as P). Staff also evaluated 138 wet season (January – June) and 78 dry season (July – December) total nitrogen samples and the wet season 75th percentile is 0.33 mg/L (as N) and the dry season 75th percentile is 0.57 mg/L (as N). For total phosphorus, staff evaluated 129 wet season and 69 dry season samples and the wet season 75th percentile is 0.03 mg/L (as P) and the dry season 75th percentile is 0.05 mg/L (as P) (Figure 8 and 9).

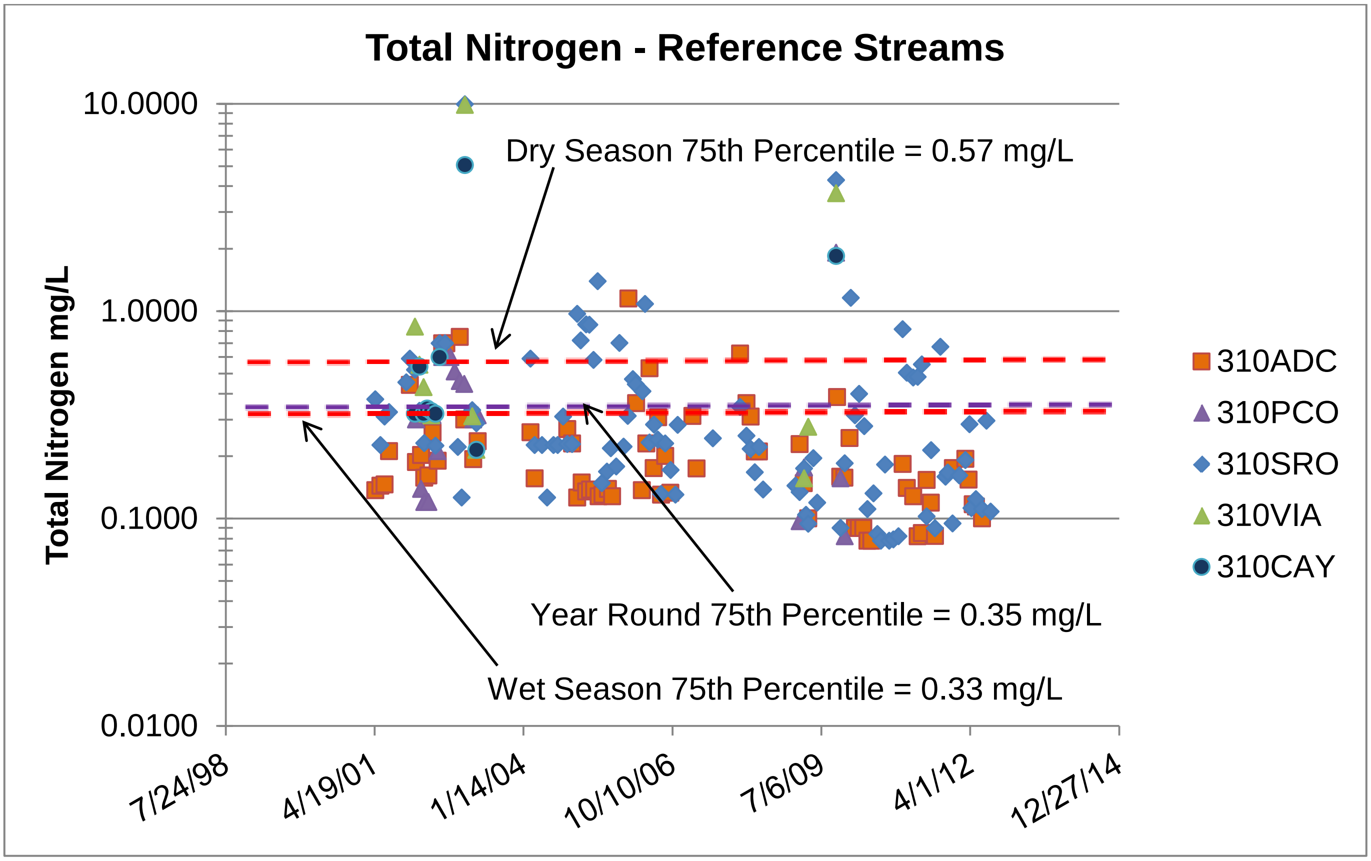


Figure 8 - Total Nitrogen 75th Percentiles for Reference Streams (Arroyo De La Cruz, Pico, Santa Rosa, Villa, and Cayucos Creeks)

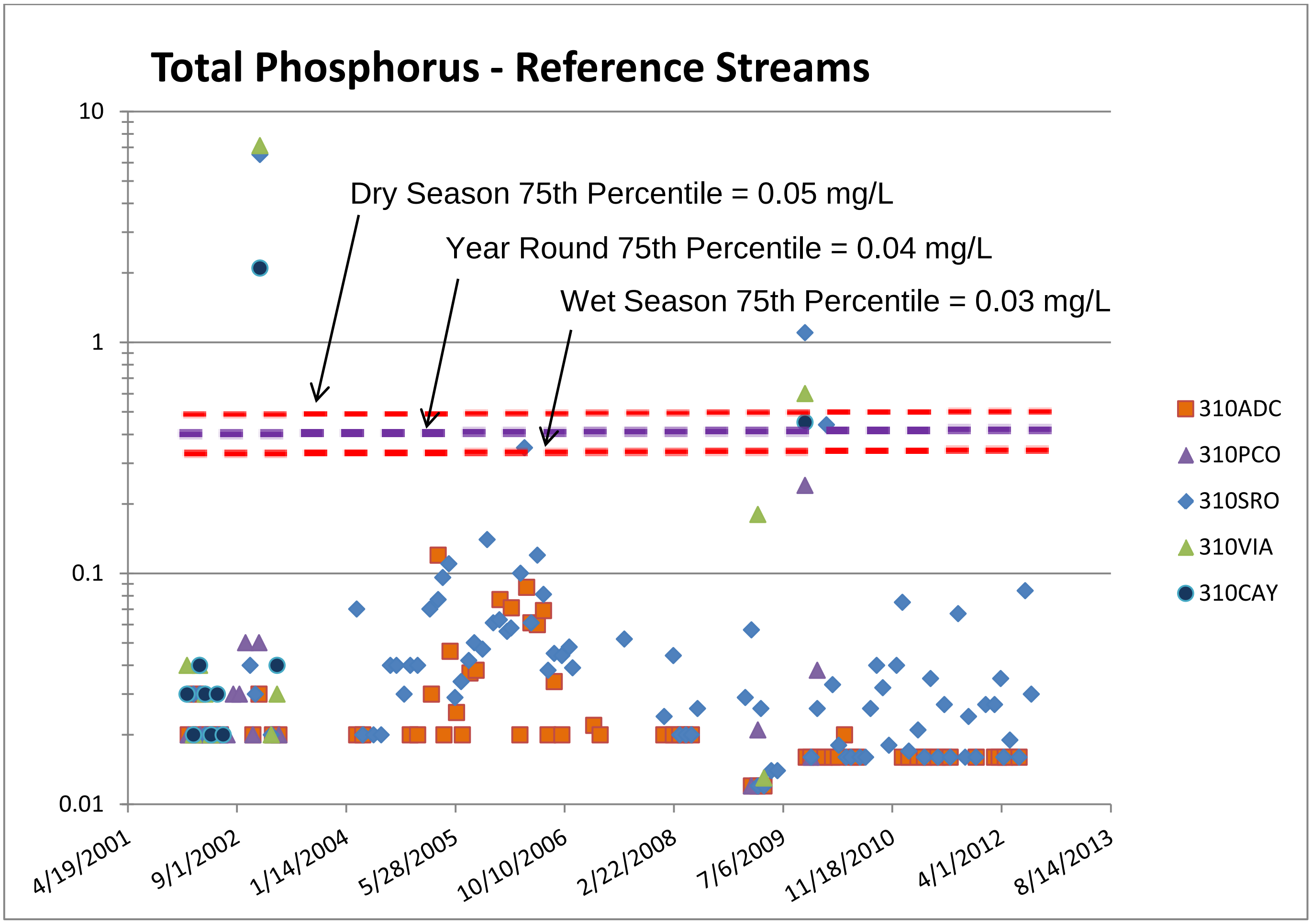


Figure 37 - Total Phosphorus 75th Percentiles for Reference Streams (Arroyo De La Cruz, Pico, Santa Rosa, Villa, and Cayucos Creeks)

C.4 California Nutrient Numeric Endpoints Approach

Another line of evidence for establishing nutrient water quality targets in the San Simeon Creek Watershed is application of the California Nutrient Numeric Endpoint (CA NNE) approach (Tetra Tech 2006). The CA NNE approach utilizes nutrient response indicators to develop potential nutrient water quality criteria. The CA NNE approach also includes a set of spreadsheet[23] scoping tools for application in stream/river systems (spreadsheet variant of QUAL2E model) and reservoirs (spreadsheet variant of BATHTUB model) to assist in evaluating the translation between response indicators (e.g. algal biomass) and nutrient concentrations.

It is important to recognize that the CA NNE spreadsheet tool is highly sensitive to user inputs for tree canopy shading and turbidity. Shading and turbidity have significant effects on light availability and consequently photosynthesis and potential biostimulation. For example, higher levels of turbidity can preclude good sunlight penetration and limit the production of algal biomass.

[23] Nutrient source loading estimates from nonpoint sources were accomplished using the US Environmental Protection Agency's STEPL model. STEPL (Spreadsheet Tool for Estimating Pollutant Load) allows the calculation of nutrient loads from different land uses and source categories. This model does not allow for the inclusion of point source discharges.

Nutrient target results provided by the CA NNE spreadsheet tool can vary substantially, based on even small changes in turbidity input. Therefore it is important to have plausible canopy and turbidity conditions that reasonably represent reach-scale conditions. The default turbidity concentration in the NNE spreadsheet tool is 0.6 NTU. The USEPA (USEPA2000a) ecoregional criteria (Ecoregion III-6) for turbidity in reference conditions is 1.9 NTU. Both concentrations represent ambient conditions in relatively undisturbed reference streams. Turbidity measurements for San Simeon Creek show a wet season geomean of 0.37 NTU and dry season geomean of 0.17 NTU, similar to the default turbidity concentration in the NNE spreadsheet tool of 0.6 NTU.

Staff also used field observations and digital datasets for tree canopy cover (source: National Land Cover Dataset, 2001) to estimate plausible canopy shading for San Simeon Creek. Figure 10 shows infrared aerial of tree canopy cover in the area surrounding station 310SSC. Figure 11 shows a tree canopy cover assessment conducted by CAL FIRE, Fire and Resource Assessment Program (CalFRAP 2010). Evaluation of the data shows the dominant canopy cover in lower San Simeon creek ranges between 1 and 40 percent.

Figure 38 - Infrared Aerial of Tree Canopy Cover Lower San Simeon Creek

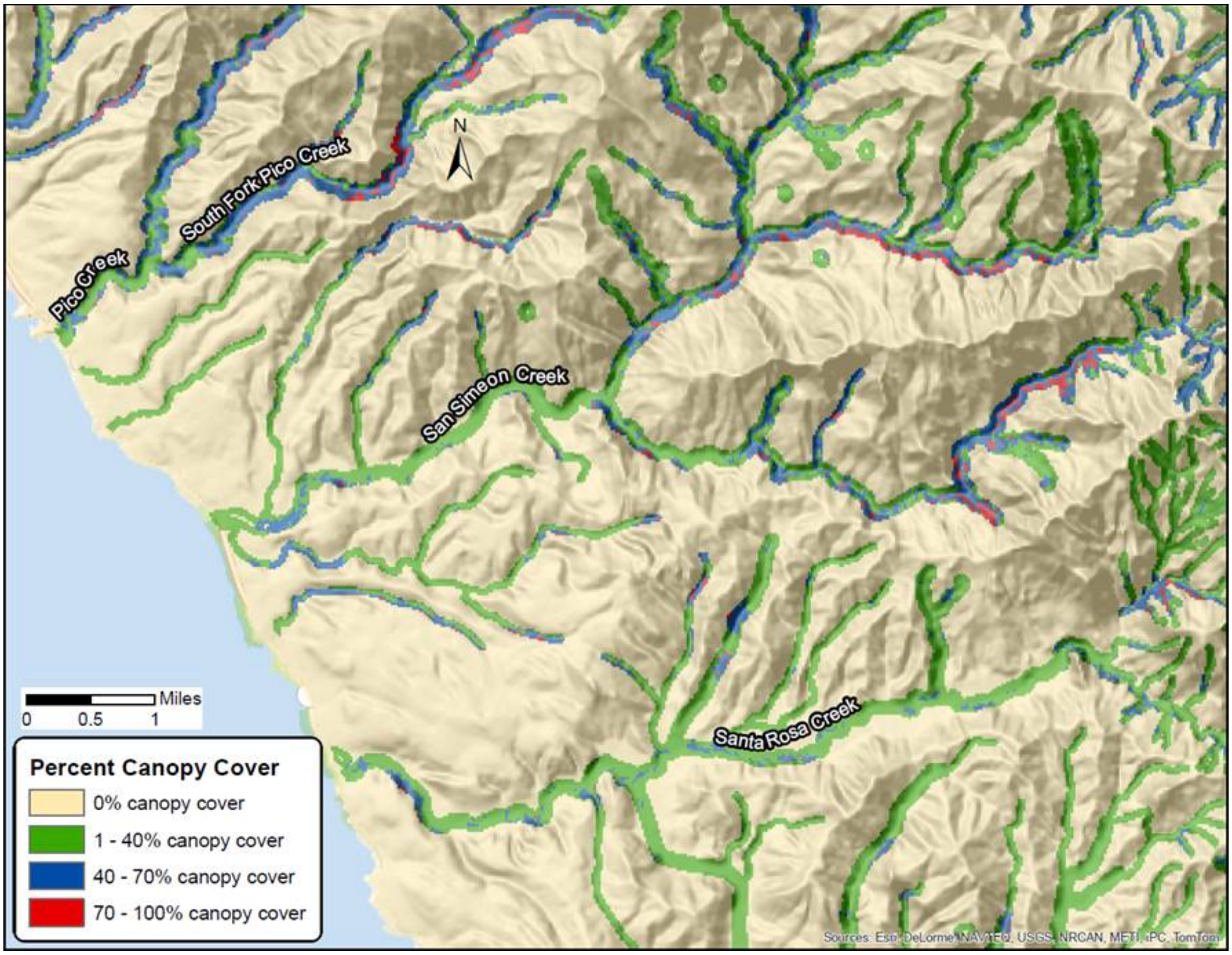


Figure 39 - CalFRAP Estimate of Tree Canopy Cover for Lower San Simeon Creek

Staff used the CA NNE benthic biomass spreadsheet tool (Benthic Biomass Indicator v14a) based on the QUAL2E model to develop potential water quality targets for response variables (e.g., benthic chlorophyll *a* density and corresponding estimated algal biomass density). These targets determine how much algae can be present without impairing designated beneficial uses. Numeric models were used to convert the initial water quality targets for the response variables into numeric targets for nutrients.

The CA NNE Approach also defines three risk categories for variables (measures of algal growth and oxygen deficit): 1) Presumably unimpaired; 2) Potentially impaired; and 3) Presumably impaired. Additional detail on the three risk categories is provided by Tetra Tech, 2006, as reproduced below:

> The California NNE approach recognizes that there is no clear scientific consensus on precise levels of nutrient concentrations or response variables that result in impairment of a designated use. To address this problem, waterbodies are classified in three categories, termed Beneficial Use Risk Categories (BURCs). BURC I waterbodies are not expected to exhibit impairment due to nutrients, while BURC III waterbodies have a high probability of impairment due to nutrients. BURC II waterbodies are in an intermediate range, where additional information and analysis may be needed to determine if a use is supported, threatened, or impaired. Tetra Tech (2006) lists consensus targets for response indicators defining the boundaries between BURC I/II and BURC II/III.

Table 4 below synthesizes the consensus BURC boundaries for various secondary indicators developed by Tetra Tech (2006) for the CA NNE approach. The BURC II/III boundary provides an initial scoping point to establish minimum requirements for a TMDL.

Table 31 - Nutrient Numeric Endpoints for Secondary Indicators – Risk Classification Category Boundaries: I & II and II & III

Beneficial Use Risk-Category I. Presumptive unimpaired (use is supported).
Beneficial Use Risk Category II. Potentially impaired (may require an impairment assessment)
Beneficial Use Risk Category III. Presumptive impaired (use is not supported or highly threatened)

RESPONSE VARIABLE	RISK – CATEGORY BOUNDARY	BENEFICIAL USE COLD	WARM	REC-1	REC-2	MUN[1]	SPWN	MIGR
Benthic Algal Biomass in streams (mg chl-a/m^2) Maximum	I / II	100	150	C	C	100	100	B
	II / III	150	200	C	C	150	150	B
Planktonic Algal Biomass in Lakes and Reservoirs (as µg/L Chl-a)[2] – summer mean	I / II	5	10	10	10	5	A	B
	II / III	10	25	20	25	10	A	B
Clarity (Secchi depth, meters.)[3] – lakes summer mean	I / II	A	A	2	2	A	A	B
	II / III	A	A	1	1	A	A	B
Dissolved Oxygen (mg/l) Streams – the mean of the 7 daily minimums	I / II	9.5	6.0	A	A	A	8.0	C
	II / III	5.0	4.0	A	A	A	5.0	C
pH maximum – photosynthesis driven	I / II	9.0	9.0	A	A	A	C	C
	II / III	9.5	9.5	A	A	A	C	C
DOC (mg/l)	I / II	A	A	A	A	2	A	A
	II / III	A	A	A	A	5	A	A

A = No direct linkage
B = More research needed to quantify linkage
C = Addressed by Aquatic Life Criteria

[1] For application to zones within water bodies that include drinking water intakes.
[2] Reservoirs may be composed of zones or sections that will be assessed as individual water bodies
[3] Assumes that lake clarity is a function of algal concentrations, does not apply in waters of high non-algal turbidity

Using the updated NNE Benthic Biomass Predictor v14a, staff developed total nitrogen and total phosphorus NNE nutrient criteria for 20 and 40 percent canopy cover. The analysis also evaluated wet and dry conditions. Attachment 1 contains Tables 7 and 8 with the results of the analysis. Table 5 below summarizes the NNE results:

Table 32 - NNE Results

	Wet Season (January – June)		Dry Season (July – December)	
Canopy Closure	20%	40%	20%	40%
Allowable Total Nitrogen (as N)	1. 4	1.9	1.3	1.7
Allowable Total Phosphorus (as P)	0.031	0.039	0.029	0.037
Max algal contribution to DO deficit (mg/L)	3.97	3.44	6.38	5.45

C.5 Ecoregional Criteria

One additional line of evidence for establishing nutrient water quality targets is the application and/or modification of established nutrient/algal thresholds (e.g., nutrient concentration thresholds or algal limits from published literature). USEPA's Ambient Water Quality Criteria Recommendations (USEPA 2000a) for subecoregion III-6 contains criteria for total nitrogen (0.5 mg/L as N) and total phosphorus (0.03 mg/L as P). Subecoregion III-6 is shown in Figure 12 below.

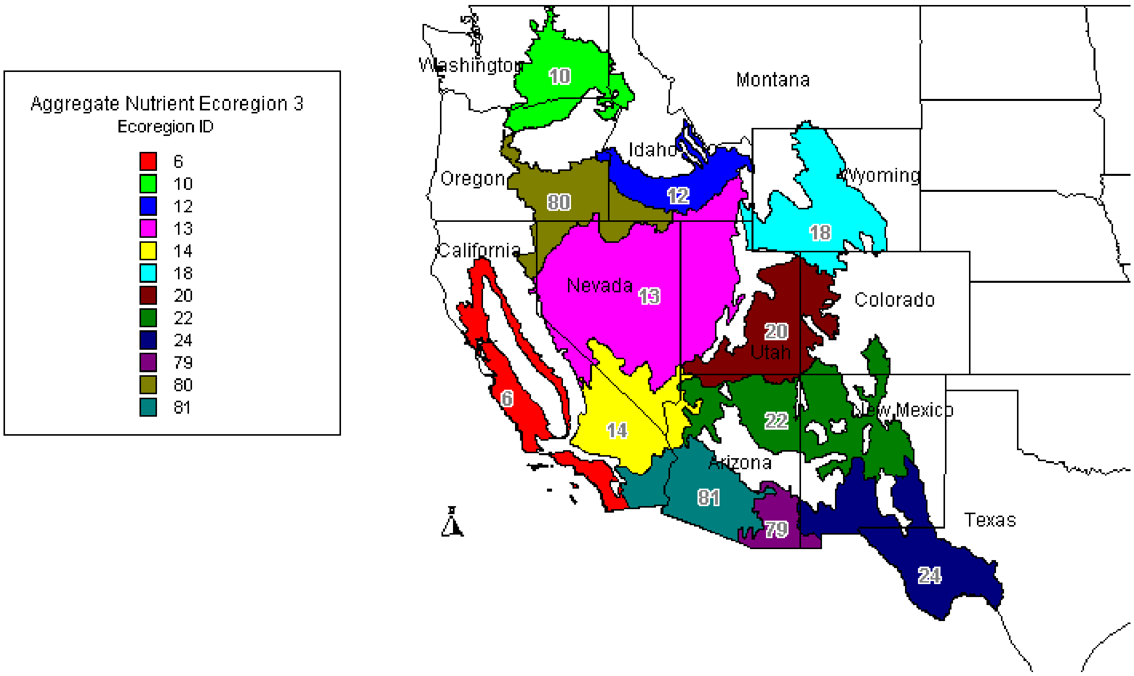


Figure 40 - USEPA Aggregate Nutrient Ecoregions (December 2000, EPA 822-B-00-016)

C.6 Nutrient Target Selection Process

In developing nutrient targets, it is important to recognize that:

1. Ambient nutrient concentrations in and of themselves, are not sufficient to predict the risk of biostimulation because algal productivity depends on several additional factors such as stream morphology, hydraulics, light availability, etc.; and,
2. An important tenet of the CA NNE approach (Tetra Tech 2006) is that targets should not be set lower than the value expected under natural conditions.

Staff developed targets by using a combination of recognized methods to bracket and calibrate nutrient targets appropriate to local conditions. Both USEPA and researchers (UC Santa Cruz, 2010) have recognized that combining these approaches results in scientifically valid numeric criteria for nutrients. Staff used recognized nutrient target development methodologies including the USEPA recognized statistical-approaches and the CA NNE approach.

Staff also considered seasonal criteria for the 75th percentile approach. For San Simeon Creek, conditions of low dissolved oxygen and conditions supporting excessive algal mat growth typically develop during the months of July through December (dry season). Of the 27 observations of elevated algal mat growth, 21 occurred in during the dry season. Similarly, 46 of 52 low dissolved violations occurred during the dry season. During this same period of July through December, total nitrogen is consistently elevated with a median dry season (2001 – 2013) concentration of 12.2 mg/L as compared to the wet season (January – June) median concentration of 2.2 mg/L.

In summary using the evaluation of reference conditions, California nutrient numeric endpoints approach, and ecoregional criteria staff was able to evaluate a range of plausible nutrient thresholds for San Simeon Creek using the strengths of various approaches. After establishing plausible ranges of potential nutrient thresholds (e.g. using a combination of the evaluation methods), the development and selection of final nutrient TMDL targets were determined using the following hierarchical approach, as illustrated below (Figure 13):

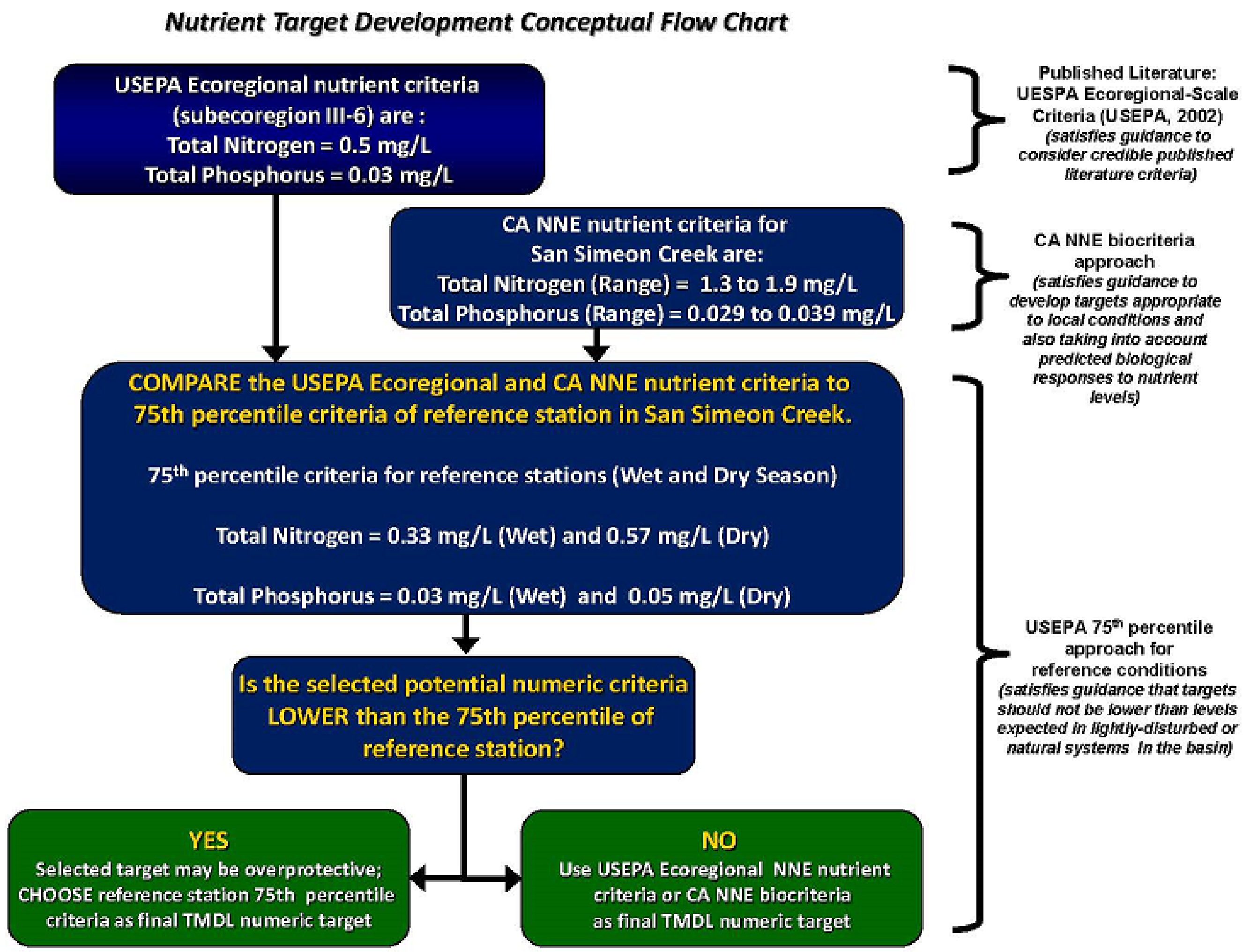


Figure 41 - Nutrient Target Development Conceptual Flow Chart

Summary of published technical guidance used by staff in nutrient target development:

- Using a combination of recognized approaches (e.g., literature values, statistical approaches, and predictive modeling approaches) result in criteria of greater scientific validity (source: USEPA 2000b,).
- Targets should not be lower than expected concentrations found in background/natural conditions (source: CA NNE guidance – Tetra Tech, 2006).

C.7 Nutrient Target Selection

Staff compared USEPA subecoregion III-6 criteria (0.5 mg/L) for total nitrogen to the dry season 75th percentile concentration for reference streams (0.57 mg/L) and the dry season NNE concentrations (1.3 to 1.7 mg/L). Subecoregion III-6 criteria for total nitrogen is lower than the dry season 75th percentile concentration for reference streams and lower than the modeled NNE concentrations (Figure 14). Additionally, for total nitrogen, the USEPA subecoregional criteria is consistent with San Simeon Creek data (Boyle 1977) of 0.5 mg/L collected pre-discharge of wastewater into spray fields and/or percolation ponds in the San Simeon Watershed.

When NNE estimated concentrations are plotted on a graph of total nitrogen data from the reference stations (sample size = 216), the NNE estimated concentrations for total nitrogen are between the 90th and 92nd percentile of dry season reference stream data (Figure 14). Although the NNE estimated concentrations are higher than the USEPA subecoregion concentration and the reference streams dry season 75th percentile concentration, the NNE estimated concentrations are lower than the 10 mg/L (NO_3 as N) required for protection of the MUN beneficial use.

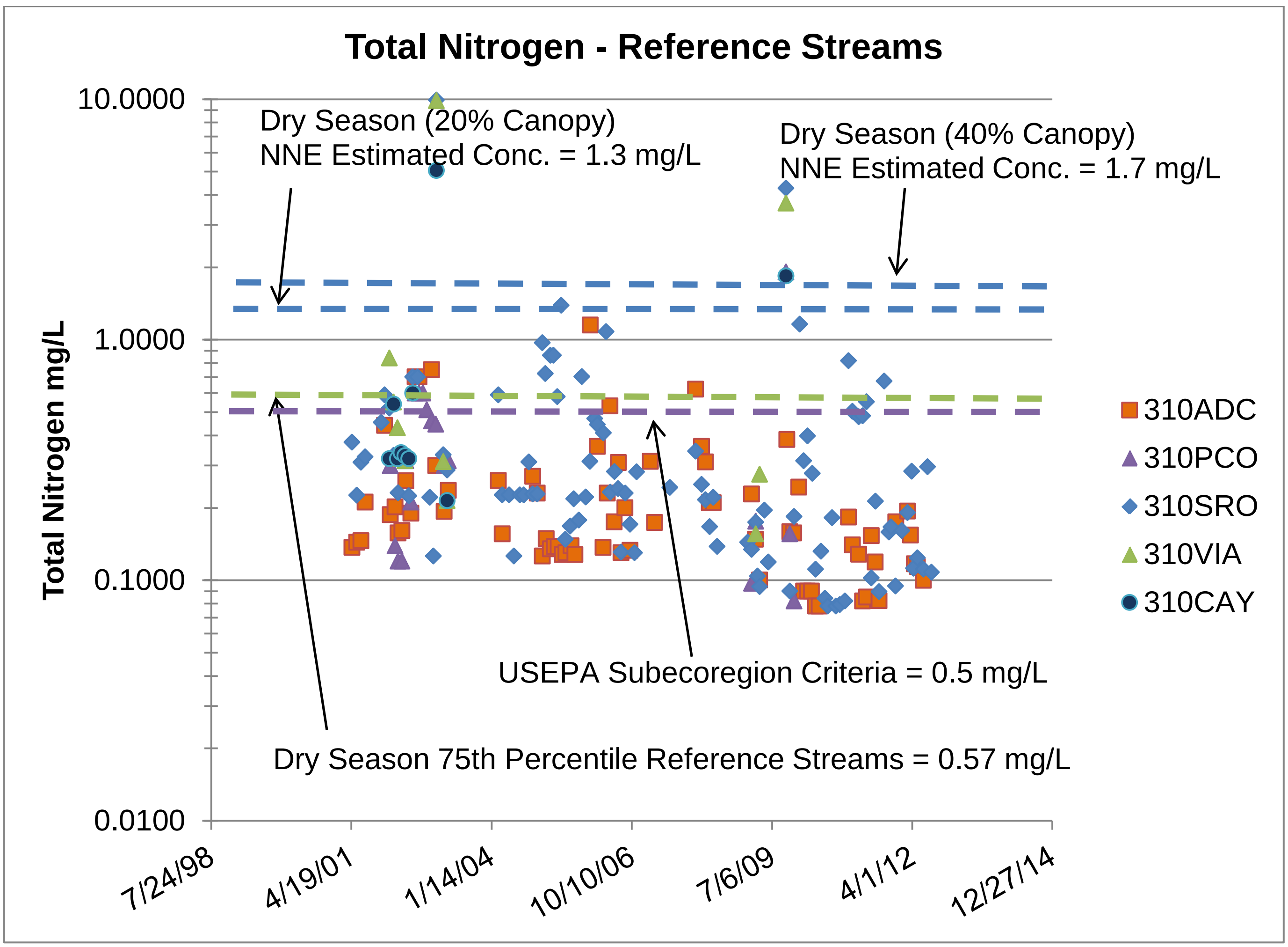


Figure 42 - CA NNE Predicted Total Nitrogen Thresholds for San Simeon Creek Watershed

NNE results model suggest that water quality and beneficial uses will be protected during the dry season using estimated NNE concentrations (1.3 to 1.7 mg/L) as numeric targets. The analysis indicates that water quality and beneficial uses would also be protected during the dry season using the 75th percentile for reference streams total nitrogen concentration of 0.57 mg/L or the USEPA subecoregion III-6 criteria (0.5 mg/L) as targets. However, since water quality and beneficial uses should be protected during the dry season using an estimated NNE concentration as a numeric target, use of the 75th percentile for reference streams or the USEPA subecoregion III-6 criteria may be over protective.

Staff followed published guidance to develop targets that are not below (i.e., more stringent) concentrations that may be expected under minimally disturbed conditions (75th percentile of the reference streams) and recommends a target protective of beneficial uses. As discussed above, impaired water quality conditions in San Simeon Creek typically occur in the dry portions of a year, consistent with periods of lower flow. Conversely, the data confirms that during the wet season, total nitrogen concentrations in San Simeon Creek are not influencing dissolved oxygen concentrations and algal mat growth such that beneficial uses are impaired.

To ensure that beneficial uses are protected during the dry season (July through December), staff recommends the dry season NNE concentration of 1.3 mg/L (20 percent canopy cover[24]) total nitrogen as the TMDL instream numeric target. This concentration is protective of the beneficial uses.

As shown in Figure 15, the CA NNE estimated concentrations for total phosphorus (0.029 to 0.042 mg/L) bracket the USEPA subecoregion III-6 criteria (0.03 mg/L). However, the reference stream dry season 75th percentile concentration of 0.05 mg/L falls outside the range of CA NNE estimated concentrations for total phosphorus.

[24] A canopy cover of 20% is conservative based on field observations, and review of CalFRAP data and digital datasets for tree canopy cover (source: National Land Cover Dataset, 2001).

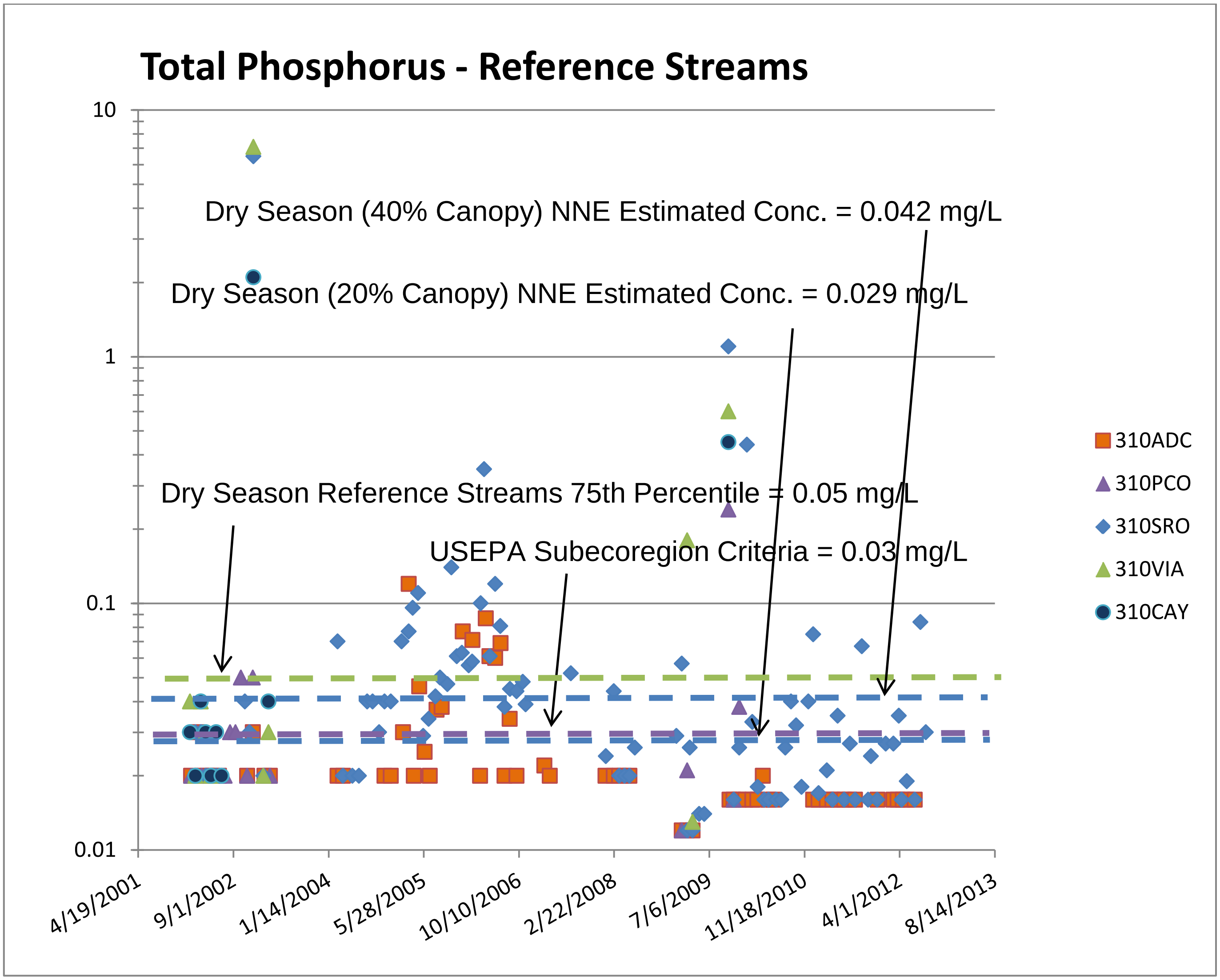


Figure 43 - CA NNE Predicted Total Phosphorus Thresholds, San Simeon Creek Watershed

Staff followed published guidance to develop targets that are not below (i.e., more stringent) concentrations that may be expected under natural conditions. As discussed above, the documented impacts to beneficial uses occur during the dry season. For total phosphorus, the USEPA ecoregional and NNE criteria appear to be over-protective for the San Simeon Creek watershed since they are lower than d the dry season reference streams 75th percentile. Therefore, staff recommends 0.05 mg/L, the dry season reference streams 75th percentile for total phosphorus, as the TMDL numeric target. This value is protective of the beneficial use. Table 6 below summarizes the numeric criteria.

Table 33 - Summary of Total Nitrogen and Total Phosphorus Targets

Parameter	Selected Targets	
Total Nitrogen	1.3 (mg/L)	Dry Season NNE 20% Canopy Cover
Total Phosphorus	0.05 (mg/L)	Dry Season75th Percentile

ATTACHMENT 1

Table 34 - San Simeon Creek Nutrient Numeric Endpoint Analysis (CA NNE Approach) – 20% Tree Canopy Cover

NNE Parameters:

- Beneficial Use Risk-Classification: (BURC): II / III
- Beneficial Use: **COLD**
- Response Variable: Benthic Algal biomass in streams
- Numeric Target: 150 mg chl-a/m^2
- Method: Revised QUAL2k, benthic chl a

Stream Condition Input:

Dry Season
(based on plausible ranges of local conditions)
- 20% Tree Canopy Cover
- Ambient (low) Turbidity (0.17 NTU):
  NTU turbidity = turbidity geomean of July - Dec

Unshaded Solar Radiation (cal/cm^2/d)

	Average	Minimum	Maximum
Enter manually	402	192	633
	Latitude	Month Range	
Estimate	35.59	Jul	Dec

Stream Inputs

Stream Depth (m)	0.5
Stream Velocity (m/s)	0.3
Water Temperature (°C)	16.3
Days of Accrual (optional)	365
Canopy Closure	
f	0.9
Closure (%)	20
Light Extinction Coeff. (1/m)	0.457

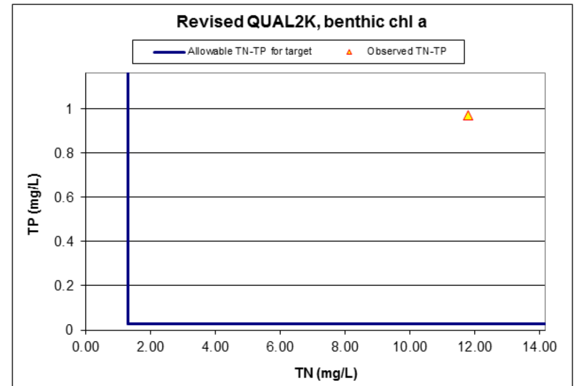
Calculate

Method & Target Selection

Select Method:	Revised QUAL2K, benthic chl a
Target Max Benthic Chl a (mg/m^2)	150
Corresponding Algal Density (g/m^2 AFDW)	60

California Benthic Biomass Tool, v14a (July 2012)

Max algal contribution to DO deficit (mg/L)	6.38



Allowable TN: 1.3 Allowable TP: 0.029

NNE Parameters:

- Beneficial Use Risk-Classification: (BURC): II / III
- Beneficial Use: **COLD**
- Response Variable: Benthic Algal biomass in streams
- Numeric Target: 150 mg chl-a/m^2
- Method: Revised QUAL2k, benthic chl a

Stream Condition Input:

Wet Season
(based on plausible ranges of local conditions)
- 20% Tree Canopy Cover
- "Typical" Wet Season Turbidity (0.37 NTU):
  NTU turbidity = turbidity geomean of Jan - June

Unshaded Solar Radiation (cal/cm^2/d)

	Average	Minimum	Maximum
Enter manually	456	217	649
	Latitude	Month Range	
Estimate	35.59	Jan	Jun

Stream Inputs

Stream Depth (m)	0.5
Stream Velocity (m/s)	0.3
Water Temperature (°C)	15.1
Days of Accrual (optional)	365
Canopy Closure	
f	0.9
Closure (%)	20
Light Extinction Coeff. (1/m)	0.477

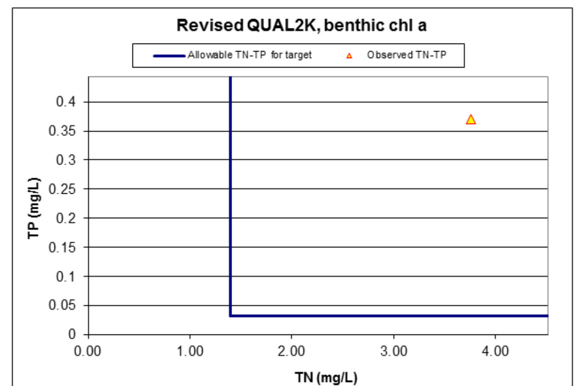
Calculate

Method & Target Selection

Select Method:	Revised QUAL2K, benthic chl a
Target Max Benthic Chl a (mg/m^2)	150
Corresponding Algal Density (g/m^2 AFDW)	60

California Benthic Biomass Tool, v14a (July 2012)

Max algal contribution to DO deficit (mg/L)	3.97



Allowable TN: 1.4 Allowable TP: 0.031

Table 35 - San Simeon Creek Nutrient Numeric Endpoint Analysis (CA NNE Approach) – 40% Tree Canopy Cover

NNE Parameters:
- Beneficial Use Risk-Classification: (BURC): II / III
- Beneficial Use: **COLD**
- Response Variable: Benthic Algal biomass in streams
- Numeric Target: 150 mg chl-a/m^2
- Method: Revised QUAL2k, benthic chl a

Stream Condition Input:

Dry Season

(based on plausible ranges of local conditions)
- 40% Tree Canopy Cover
- Ambient (low) Turbidity (0.17 NTU):
  NTU turbidity = turbidity geomean of July - Dec

Unshaded Solar Radiation (cal/cm^2/d)

	Average	Minimum	Maximum
Enter manually	402	192	633
Estimate	Latitude 35.59	Month Range: Jul	Dec

Stream Inputs

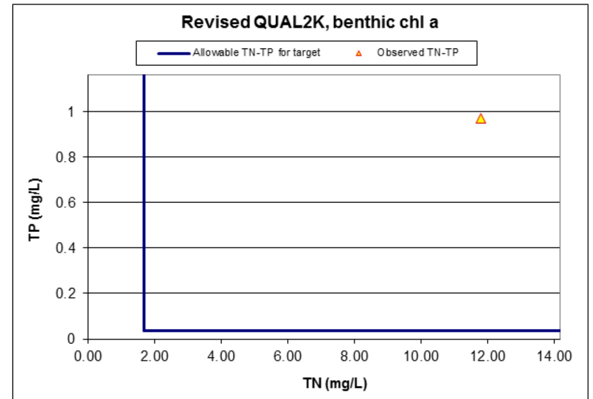
Stream Depth (m)	0.5
Stream Velocity (m/s)	0.3
Water Temperature (°C)	16.3
Days of Accrual (optional)	365
Canopy Closure	
f	0.9
Closure (%)	40
Light Extinction Coeff. (1/m)	0.457 ← Calculate

Method & Target Selection

Select Method:	Revised QUAL2K, benthic chl a
Target Max Benthic Chl a (mg/m^2)	150
Corresponding Algal Density (g/m^2 AFDW)	60

California Benthic Biomass Tool, v14a (July 2012)

Max algal contribution to DO deficit (mg/L)	5.45



Allowable TN: 1.7 Allowable TP: 0.037

NNE Parameters:
- Beneficial Use Risk-Classification: (BURC): II / III
- Beneficial Use: **COLD**
- Response Variable: Benthic Algal biomass in streams
- Numeric Target: 150 mg chl-a/m^2
- Method: Revised QUAL2k, benthic chl a

Stream Condition Input:

Wet Season

(based on plausible ranges of local conditions)
- 40% Tree Canopy Cover
- “Typical” Wet Season Turbidity (0.37 NTU):
  NTU turbidity = turbidity geomean of Jan - June

Unshaded Solar Radiation (cal/cm^2/d)

	Average	Minimum	Maximum
Enter manually	456	217	649
Estimate	Latitude 35.59	Month Range: Jan	Jun

Stream Inputs

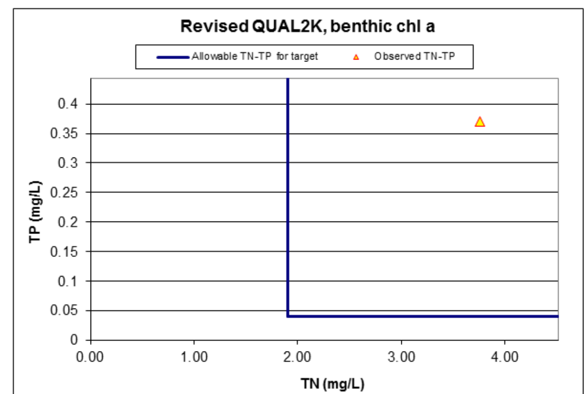
Stream Depth (m)	0.5
Stream Velocity (m/s)	0.3
Water Temperature (°C)	15.1
Days of Accrual (optional)	365
Canopy Closure	
f	0.9
Closure (%)	40
Light Extinction Coeff. (1/m)	0.477 ← Calculate

Method & Target Selection

Select Method:	Revised QUAL2K, benthic chl a
Target Max Benthic Chl a (mg/m^2)	150
Corresponding Algal Density (g/m^2 AFDW)	60

California Benthic Biomass Tool, v14a (July 2012)

Max algal contribution to DO deficit (mg/L)	3.44



Allowable TN: 1.9 Allowable TP: 0.039

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13 APPENDIX D – LOAD CALCULATIONS

Load Calculations for San Simeon Creek 310SSC

Constituent	Data Period	flow rate (ft3/sec) (Measured)	Annual Average Concentration (mg/L)	Mean Load (lbs/year)	Calculated Loading Capacity (lbs.)	Plus 10% margin of safety
Total Nitrogen	2001 - 2013	7.53	7.45	115,806	19,252	17,327
Nitrate	Pre -1980	7.53	0.5	7,413	--	--
Total Phosphorus	2001 - 2013	7.53	0.63	10,070	741	667
Sodium	2001 - 2013	7.53	98.9	1,466,284	1,022,989	920,690
Chloride	2001 - 2013	7.53	123.4	1,829,519	1,571,548	1,408,263

I. Load at 310SSC - CCAMP flow rate

a) Average Total Nitrogen Load (2001–2013) Using current instream Total Nitrogen Levels
Flow rate = 7.53 ft^3/sec
Total Nitrogen Concentration = 7.82 mg/L
= 7.53 ft^3/sec × 28.32 L/ft^3 × 7.82mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15×10^7) sec/year

= 115,806 lbs/year

b) Average Nitrate Load – Using pre-1980 instream Total Nitrogen levels
Flow rate = 7.53 ft3/sec
Total Nitrogen Concentration = 0.5 mg/L
= 7.53 ft^3/sec × 28.32 L/ft^3 × 0.5 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 7,413 lbs/year

c) Average Total Phosphorus Load
Flow rate = 7.53 ft3/sec
Total Nitrogen Concentration = 0.68 mg/L
= 7.53 ft^3/sec × 28.32 L/ft^3 × 0.68 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 10,070 lbs/year

d) Average Sodium Load

Flow rate = 7.53 ft3/sec

Total Nitrogen Concentration = 98.9 mg/L

= 7.53 ft^3/sec × 28.32 L/ft^3 × 98.9 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 1,466,284 lbs/year

e) Average Chloride Load

Flow rate = 7.53 ft3/sec

Total Nitrogen Concentration = 123.4 mg/L

= 7.53 ft^3/sec × 28.32 L/ft^3 × 123.4 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 1,829,519 lbs/year

II. Calculated Loading Capacity at 310SSC - CCAMP flow rate

f) Target Total Nitrogen Load

Flow rate = 7.53 ft3/sec

Total Nitrogen Concentration = 1.3 mg/L

= 7.53 ft^3/sec × 28.32 L/ft^3 × 1.3 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 19,252 lbs/year

g) Target Total Phosphorus Load

Flow rate = 7.53 ft3/sec

Total Nitrogen Concentration = 0.05 mg/L

= 7.53 ft^3/sec × 28.32 L/ft^3 × 0.05 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 741 lbs/year

h) Target Sodium Load

Flow rate = 7.53 ft3/sec

Total Nitrogen Concentration = 69 mg/L

= 7.53 ft^3/sec × 28.32 L/ft^3 ×69 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 1,022,989 lbs/year

i) <u>Target Chloride Load</u>

Flow rate = 7.53 ft3/sec
Total Nitrogen Concentration = 106 mg/L
= 7.53 ft^3/sec × 28.32 L/ft^3 × 106 mg/L × 1.0 gm/1000 mg × 1.0 lbs/453.6 gm × (3.15 × 107) sec/year

= 1,571,548 lbs/year