California Regional Water Quality Control Board
San Diego Region

Draft

Staff Report for

Nutrient
Total Maximum Daily Loads
For Rainbow Creek

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Table of Contents

List of Tables

List of Figures

List of Attachments

Executive Summary

Rainbow Creek has been listed on the Clean Water Act Section 303(d) list as an impaired water body due to eutrophication as a result of extremely elevated nitrate concentrations reported in the mid-1980s. Rainbow Creek, designated as hydrologic subareas (HSAs) 902.22 and 902.23, is a small tributary to the Santa Margarita River located near Fallbrook, California. Total Maximum Daily Loads (TMDLs) are established for nitrates, total nitrogen, and total phosphorus to address this issue. The TMDLs will be implemented in a phased approach over the next 32 years in order to meet the goal of achieving water quality objectives and restoring beneficial uses.

Efforts to reduce nitrate concentrations from peak levels in the mid-1980s were successful; however, current concentrations remain in excess of water quality objectives for both nitrates in drinking water and biostimulatory substances. Phosphorus concentrations have also been found to be in excess of the objective for biostimulatory substances. These nutrient concentrations further appear to be contributing to excessive algal growth, which can lead to eutrophic conditions that may result in decreased water clarity, loss of aquatic habitat, and a decrease in dissolved oxygen (DO) that is detrimental to aquatic life. While eutrophic conditions have not been observed in the creek, several areas are susceptible to excessive algal growth during the spring, summer and fall.

Nutrient loading and the resulting algal growth impairing municipal supply, habitat and recreational beneficial uses of Rainbow Creek are results of excess nutrients generated from agriculture, commercial nurseries, residential runoff, septic tank disposal systems, and atmospheric deposition. The creek provides habitat to vegetation, and terrestrial and aquatic wildlife. The creek has a resident fish population of native arroyo chubs (*Gila orcutti*) that are listed as a "California Species of Special Concern," native amphibians that may be impacted by excessive nutrients, and an impaired aquatic insect population. The creek also has numerous trails that are frequented by hikers and horseback riders as well as residents that live along the riparian corridor.

The primary sources of nutrients that have been identified include agricultural fields and orchards, commercial nurseries, residential and urban areas, septic tank disposal systems, and atmospheric deposition. Nutrients enter the creek by way of overland surface runoff during storm events and dry weather flows, through groundwater gains to the creek of septic wastewater- and irrigation-contaminated groundwater, through springs of irrigation tailwater flows that feed tributaries, through atmospheric dry deposition, and from background sources.

Annual loads were calculated for surface water, groundwater and atmospheric deposition. Load reductions will be implemented using a two-phased approach. The first phase reductions will be implemented to meet the nitrates in the drinking water objective and similarly reduce phosphorus concentrations. The second phase load reductions will be phased-in over time until the biostimulatory substances objective is met.

Based on current loading calculations from these sources, a 28% reduction of the current annual load of nitrogen will be needed to meet the first phase target for drinking water. Concurrently, an

initial 28% load reduction will be required for phosphorus. These reductions are to be achieved by the end of fourth year following U.S. EPA approval of the TMDLs.

The 28% reductions in nitrogen and phosphorus result in a reduction of current nutrient loading to 4,130 kg N/yr and 415 kg P/yr, respectively. An explicit margin of safety of 10% was selected to account for unknowns, errors in assumptions, and potential future development in the watershed. An implicit margin of safety was also included because of conservative assumptions made in developing load allocations. A nitrogen load allocation of 2,210 kg N/yr was established for land uses and includes a 51% reduction of loading from commercial nurseries, agricultural fields, orchards, and residential land uses and a 50% reduction of loading from septic tank disposal systems. A phosphorus load allocation of 206 kg P/yr was established for land uses and includes an 54% reduction of loading from residential and commercial nursery land uses and 45% reduction of loading by agricultural field and orchard land uses. There were no waste load allocations in the watershed.

The second phase includes additional nitrogen and phosphorus load reductions in order to meet the targets for biostimulatory substances. Incremental load reductions will be used; current load allocations will be reduced by 10% every four years until biostimulatory targets have been achieved. This approach will allow for time to evaluate new information provided by investigations and monitoring, and provide for flexibility in making changes to the TMDLs as needed.

In implementing the TMDLs, the County of San Diego is encouraged to develop and implement a nutrient reduction and management program for the watershed that incorporates nutrient and urban management measures and a public outreach program to achieve the reductions. Additionally, the County of San Diego is directed to investigate groundwater quality and contribution to the creek and assess the quantity and status of septic tank disposal systems in the watershed to fill data gaps. Findings from the investigations will be used in the development of further implementation measures for the second phase of implementation.

The implementation plan also identifies the need for additional actions. Hines Nursery needs to discontinue the use of Rainbow Creek in their operations. The Regional Board will review and revise existing Waste Discharge Requirements, review and comment on environmental documents for development projects in the watershed, and ensure that landowners are in compliance with Waste Discharge Prohibitions contained in the Regional Board's Basin Plan.

Monitoring of nutrient concentrations and in-stream conditions, including alga abundance and benthic macroinvertebrate surveys, will be performed to measure the response of the ecosystem to the load reductions. Monitoring data will be used to assess the effectiveness of the TMDL implementation and to determine the need for further mass load reductions.

1.0 Introduction

In accordance with Section 303(d) of the Clean Water Act (CWA), the State must identify waterbodies that are not able to meet water quality standards based on available pollution controls. The CWA also requires States to establish a priority ranking for waters on the Section 303(d) list of impaired waters and establish Total Maximum Daily Loads (TMDLs) for such waters. A TMDL represents a strategy for meeting water quality objectives by allocating quantitative limits for point and non-point pollution sources.

The components of a TMDL include identification of the water quality problem, establishment of numeric targets, an analysis of the pollutant sources, establishment of a link between the numeric targets and pollutants, and development of individual load and wasteload allocations. A TMDL is defined as "the sum of the individual waste load allocations for point sources and load allocations for non-point sources and natural background" such that the capacity of the waterbody to assimilate pollutant loading is not exceeded. A TMDL is required to account for seasonal variations and includes a margin of safety to address uncertainty in the analysis. In addition, pursuant to the regulations at Title 40 of the Code of Federal Regulations, Part 130.6, states must develop water quality management plans to be used to directly implement plan elements, including TMDLs.

Once the TMDL and implementation plan are established, they are incorporated into the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan) of the California Regional Water Quality Control Board San Diego Region (hereinafter, Regional Board). The implementation plan must include a description of the necessary actions to achieve the water quality objectives, a time schedule for the actions to be taken, and a description of the monitoring and surveillance to be undertaken to determine compliance with the objectives. Additional requirements of the basin plan amendment process are the evaluation of economic and environmental considerations. Finally, incorporation of the TMDL into the Basin Plan requires approval by the Regional Board and the State Water Resources Control Board (SWRCB), and approval of any regulatory provisions by the Office of Administrative Law (OAL).

The U.S. Environmental Protection Agency (USEPA) has oversight authority for the 303(d) program. USEPA is required to review the State's TMDLs and either approve or disapprove them. If USEPA approves a State-established TMDL, the TMDL then becomes applicable for the intended waterbody.

The Regional Board's Basin Plan and applicable statewide plans serve as the State Water Quality Management Plan that governs the Rainbow Creek watershed and the entire San Diego Region. This staff report incorporates elements that address the statutory and regulatory requirements for a TMDL and provides documentation of the basis for this TMDL.

2.0 Problem Statement

Nutrient loading and algal growth are impairing municipal supply, habitat and recreational beneficial uses of Rainbow Creek and are a result of excess nutrients generated from agriculture, commercial nurseries, residential runoff, and septic tank disposal systems.

2.1 Nutrients and Nutrient Cycling

This section provides information about the nutrients that are discussed in this staff report, how they cycle through the environment, and how they are transported. The term nutrient refers to any organic or inorganic material that is necessary for life. In this staff report, nutrients refer to nitrogen and phosphorus. These nutrients occur naturally in the environment and are contributed by human activities including, but not limited to, the use of fertilizers and the disposal of waste effluents. These human activities often result in excessive quantities of nutrients reaching freshwater systems. An overload of nutrients can result in an imbalance of the natural cycling processes and can lead to problems ranging from annoyance due to an overabundance of algae and emergent vegetation to human health problems and adverse ecological effects. There are several chemical, physical, and biological processes that govern the fate and transport of these nutrients from their sources to a waterbody.

The primary reservoir of nitrogen is air, in the form of nitrogen gas (N_2). However, plants and animals cannot directly utilize nitrogen from air, but require nitrogen in mineral form such as ammonium ions (NH_4^+) or nitrate ions (NO_3^-) for uptake. Conversion into usable forms, both in the terrestrial and aquatic environments, occurs through the four processes of the nitrogen cycle. Three processes convert gaseous nitrogen into usable chemical forms: biological nitrogen fixation, ammonification, and nitrification. The fourth process, denitrification, converts fixed nitrogen back to nitrogen gas. Nitrification takes place under aerobic conditions, and denitrification takes place under anaerobic conditions. In the aquatic environment, organisms incorporate available dissolved inorganic nitrogen into plant and algae tissue, binding it as organic nitrogen. Dead organisms decompose, and organically bound nitrogen is released as ammonia ions and then converted to nitrite and nitrate, where the process begins again (USEPA 1999, 2000a).

Rocks and natural phosphate deposits are the main reservoirs of natural phosphorus. Release of these deposits occurs through weathering, leaching, erosion, and mining. The breakdown of mineral deposits of phosphorus produces inorganic phosphate ions (PO_4^{3-}), the biologically available form, that can be absorbed by plants from the soil or water. Phosphorus moves through the food web primarily as organic phosphorus, after it has been incorporated into plant or algal tissue, where it may be released as phosphate in urine or other waste excreted by organisms and then reabsorbed by plants or algae to start another cycle. Additionally, phosphorus readily sorbs to clay particles in the water column and sediments, reducing its availability for uptake by algae, bacteria and macrophytes (USEPA 1999, 2000a). Sorption occurs under aerobic conditions and desorption under anaerobic conditions (Allan 1995).

Both nitrogen and phosphorus are transported to receiving waterbodies from rain, overland runoff, groundwater, drainage networks, and industrial and residential waste effluents. Phosphorus, because of its tendency to sorb to soil particles and organic matter, is primarily transported in surface runoff with eroded sediments. Inorganic nitrogen, on the other hand, does not sorb as strongly and can be transported in both particulate and dissolved phases in surface runoff. Dissolved inorganic nitrogen also can be transported through the unsaturated zone and ground water. Because nitrogen has a gaseous phase, it can be transported to surface water via atmospheric deposition. Phosphorus associated with fine-grained particulate matter also exists in the atmosphere. This sorbed phosphorus can enter natural waters by both dry fall and rainfall. Finally, nutrients can be directly discharged to a waterbody by point and nonpoint discharges such as residential runoff, or untreated wastewater (USEPA 1999, 2000a).

2.2 Watershed Description

Rainbow Creek is a small tributary to the Santa Margarita River located in northern San Diego County, near the community of Fallbrook (Figure A-1). The Rainbow Creek watershed is designated in the Basin Plan as hydrologic unit subareas (HSAs) 902.22 and 902.23, and encompasses 6,893 acres (Figure A-2). The watershed is primarily rural, with sixty percent of the watershed undeveloped. Development within the watershed includes rural residential units (8.7%), agricultural uses (7.3%), orchards (11.8%), commercial nurseries (5.3%), and a mix of other uses (8%) (MRCD 1999).

Rainbow Creek headwaters begin in the hilly and sparsely developed area east of Rainbow Valley. The creek traverses the relatively flat Rainbow Valley Basin, located about 1.5 miles west of the headwaters and then enters another sparsely populated area with hilly terrain. Rainbow Creek eventually flows into the Santa Margarita River, approximately eight miles from the headwaters. For the purposes of this staff report, the creek is described as the upper, middle and lower reaches. The upper reaches include the creek and tributaries above Oak Crest sampling station, the middle reaches are the creek and tributaries between Willow Glen-4 and Oak Crest stations, and the lower reaches are the creek and tributaries between Stage Coach and Willow Glen-4 stations.

Rainbow Creek is an intermittent stream and is considered a gaining stream. The geology of Rainbow Valley Basin is much like a bowl, which has a restricted outlet. This condition limits groundwater flowing from the basin (Peterson 1989). Groundwater surfaces in the creek at the downstream edge of Rainbow Valley, in the vicinity of the Interstate 15 overpass (I-15). Groundwater also surfaces in the lower reaches of the creek beginning approximately 1 mile below I-15. Additionally, several tributaries join the creek in the lower reaches of the watershed. For the purpose of the discussions in this document, the upper reaches are described as the portions of the creek just below I-15 and above and the lower reaches are the portions below Willow Glen-4 station.

Rainbow Creek runs through the middle of Rainbow Valley and the community of Rainbow. Rainbow is the most developed part of the watershed, containing residential units, commercial and private nurseries and other agricultural operations. In Rainbow Valley, the majority of the length of the creek runs through nursery property, currently owned and operated by Hines Nurseries. The creek has been channelized on the nursery property and is currently being used as part of an irrigation water recovery system. Flynn Rainbow Nurseries, a previous owner, originally put in the recovery system as a best management practice (BMP) in 1989 to reduce downstream nursery discharges and to enable recycling of irrigation water.

According to Hines Nurseries, irrigation runoff is discharged directly into Rainbow Creek and one of its tributaries at numerous locations within the boundaries of the nursery site. An earthen dam located in the creek near the point of discharge from the site restricts water from leaving the site during normal operations. The runoff water is stored in the creek and in an adjacent storage pond within the boundaries of the nursery site. The stored runoff water is recycled back into the irrigation system. During storm conditions, the earthen dam is removed and storm water runoff is allowed to discharge downstream of the nursery (Biernacka 2001).

All development in the Rainbow Creek Watershed, except the Oak Crest Mobile Estates, use sub-surface sewage disposal systems (e.g., septic tank disposal systems). The Oak Crest Mobile Estates utilizes a small wastewater treatment plant with a concrete-lined evaporation pond. Since 1970, the County of San Diego has prohibited the installation of new or replacement septic tank disposal systems in areas of Rainbow Valley impacted by a high groundwater table. The prohibition was implemented because the high groundwater table prevented systems from being installed in compliance with the requirements at the time (Whitman 1970). In 1989, a groundwater evaluation of Rainbow Valley identified that the basin has a historically high groundwater table due to the geology, which has been worsened by in-basin use of imported water that provides recharge through irrigation return flows and septic tank disposal tanks, and the lack of groundwater production (Peterson 1989).

2.3 Historical Information

Nitrogen and phosphorus loading to Rainbow Creek were not a concern until the 1980's, when agricultural practices used in Rainbow Valley resulted in significant increases of nitrate concentrations in Rainbow Creek (Leedshill-Herkenhoff 1988). Prior to the early 1980s, the concentration in the creek was fairly constant, with an average of 4.4 milligrams of nitrate per liter (mg NO_3/L), which is equivalent to 0.99 mg NO_3-N/L (Table B-1, Attachment B). Nitrate, as nitrogen (NO_3-N) is an expression of nitrate as the amount of nitrogen in the nitrate compound. This expression is used for the purpose of comparing nitrate data with water quality objective for total nitrogen. Total nitrogen is a measure of all forms of nitrogen (i.e., ammonia, nitrite, nitrate, and organic nitrogen). Current nitrate data is also reported as nitrate, as nitrogen (Table B-2, Attachment B).

The historic nitrate concentration steadily increased through the early 1980's, peaking in 1986 with an average of 215.8 mg NO_3/L (48.7 mg NO_3-N/L) and on several occasions in 1985 and 1986, exceeding 300 mg NO_3/L (68 mg NO_3-N/L). These elevated nitrate concentrations exceeded drinking water standards for nitrate of 45 mg NO_3/L (10 mg NO_3-N/L) and threatened drinking water supplies downstream in the Santa Margarita River. Although fieldwork was not conducted to verify actual stream conditions, nutrient concentrations in Rainbow Creek were elevated to a degree that eutrophic conditions were expected to occur in the creek and may also have contributed to known eutrophic conditions in the Santa Margarita Lagoon. Based upon those assumptions and because of the elevated nitrate levels, Rainbow Creek was listed as an impaired waterbody due to eutrophication and given a high priority on the Clean Water Act (CWA), Section 303(d) list in 1996[1].

[1] The 2002 303(d) List Update proposes to change the cause of impairment from eutrophication to nutrients.

Following the 1996 listing, nitrate concentrations have decreased significantly. The United States Marine Corps Base Camp Pendleton (Camp Pendleton) was concerned that the elevated nitrate concentrations in Rainbow Creek could impact Camp Pendleton's drinking water supplies. To address this concern, the Mission Resource Conservation District (MRCD), in cooperation with Camp Pendleton, investigated the sources of the elevated nitrates in the early 1990's. MRCD conducted two CWA Section 319(h) studies (MRCD 1997, 1999) to educate homeowners and nurseries regarding nutrient problems in Rainbow Creek and provide them with best management practices to reduce discharges of nitrates. The programs developed by MRCD resulted in significant reductions of nitrate concentrations in Rainbow Creek. Monitoring performed during the latter study period shows the 1998-99 average (12 month average) nitrate concentration was 7.7 mg NO_3/L, or 1.7 mg NO_3-N/L at the Willow Glen-4 Station. This is an approximate 96% reduction from the 1986 average value (MRCD 1999). Although the MRCD study did not report the presence of algae, field investigations conducted by Regional Board staff in July 1999, at the end of the MRCD monitoring period, identified two areas in the lower reaches (downstream of Willow Glen-4) affected by excessive algal growth.

In addition to elevated nitrate concentrations, phosphorus was thought to be elevated (MRCD 1997). However, no historic data for phosphorus have been found. This conclusion was likely based on the assumption that nutrient sources such as fertilizer use from urban and agricultural sources may also contribute phosphorus, and to the eutrophic conditions observed downstream of Rainbow Creek. In response to this assumption, MRCD collected phosphate data as part of the above referenced studies. The 1999 Report indicated a 12-month average orthophosphate, as phosphorus (PO_4-P), or phosphate, concentration of 0.6 mg PO_4-P/L.

2.4 Monitoring Data for Year 2000

From January through October 2000, Regional Board staff and Hines Nurseries monitored water quality to determine whether nutrient concentrations were still being maintained at 1998-99 levels, whether those levels were effectively limiting excessive algal growth and whether they were adequate for maintaining beneficial uses. The 2000 monitoring data are presented in Table B-2 and a map of the monitoring locations can be found in Figure A-3. The monitoring was performed in accordance with protocols described in the respective monitoring plans (SDRWQCB 2000 and Hines Horticulture Inc. 2000).

The following observations are made about the data:

- The average nitrate concentrations were 9.2 mg NO_3-N/L and the average total nitrogen was 11.0 mg N/L between August and October 2000 at the Oak Crest station.

- The average orthophosphate concentration was 0.85 mg PO_4-P/L and the average total phosphorus (organic and inorganic) was 1.13 mg P/L between August and October 2000 at the Oak Crest station.

- The average nitrate concentration was 9.1 mg NO_3-N/L and the average total nitrogen was 9.7 mg N/L between January through October 2000 at the Willow Glen-4 station.

- The average nitrate concentration at the Willow Glen-4 station was 13.6 mg NO_3-N/L February through July. Concentrations during this time are assumed to be attributable to polluted runoff and irrigation return flows from orchards, commercial nurseries, and septic tank disposal systems. Erosion events leading to increased turbidity may also be a cause. (See Section 4.0 Source Identification).

- Concentrations of nitrate in the lower reaches, illustrated in Figure A-3, exceeded the objective for nitrates in drinking water throughout the entire sampling period and appear to be influenced by the two tributaries, below the Willow Glen-4 location. The two tributaries provide natural drainage of irrigation return flows from orchard and residential land uses.

- The average phosphate concentrations at the Willow Glen-4 station were 0.37 mg PO_4-P/L and the average total phosphorus was 0.43 mg P/L.

- Concentrations of both nitrogen and phosphorus appear to fluctuate considerably over the course of the monitoring period and indicate seasonal variation.

2.5 Water Quality Objectives

The Basin Plan has several water quality objectives that address nutrient concentrations in inland surface waters. The numeric water quality objectives applicable to Rainbow Creek are presented in Table 2-1 below.

Table 2-1 Applicable Water Quality Objectives

Water Quality Objective	Constituent	Established Level[1]
Inorganic Chemicals in Municipal Supply:		
Nitrate	Nitrate, as N	**10 mg NO_3-N/L**
Nitrate + Nitrite	Nitrate + Nitrite, summed as N	10 mg N/L
Nitrite	Nitrite, As N	1 mg NO_2-N/L
Un-Ionized Ammonia	Ammonia, As N	0.025 NH_3-N/L
Biostimulatory Substances	Total Nitrogen	**1.0 mg N/L**
	Total Phosphorus	**0.1 mg P/L**

[1] Levels in bold are addressed by the proposed TMDLs.

The objective for inorganic chemicals in municipal supplies states that nitrate in domestic or municipal supply is not to exceed 10 mg NO_3-N/L, nitrate plus nitrite summed as nitrogen is not to exceed 10 mg N/L, and nitrite is not to exceed 1 mg NO_2-N/L. This objective is based on the maximum contaminant levels (MCLs) set forth in California Code of Regulations, Title 22. The nitrate and nitrite MCLs are based on human health toxicity in infants and are applicable to surface waters designated as domestic water supplies. Nitrite data was reported in quantities that were less than the laboratory detection limit of 0.1 mg NO_2-N/L in Rainbow Creek during the 2000 monitoring period.

The objective for un-ionized ammonia states that the discharge of wastes is not to result in concentrations of un-ionized ammonia in excess of 0.025 mg N/L. The fraction of ammonia present as un-ionized ammonia depends on temperature and pH. Un-ionized ammonia is toxic to fish and other aquatic organisms. Ammonia data was reported in quantities that were less than the laboratory detection limit of 0.1 NH_4-N/L in Rainbow Creek during the 2000 monitoring period. The data is not adequate to determine if un-ionized ammonia exceeds the objective.

The objective for biostimulatory substances is narrative and addresses tolerance levels for algal and emergent plant growth. It contains numeric goals for total nitrogen and total phosphorus. The narrative objective states,

> *"Inland surface waters, … shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses."*

Additionally, it states that "*a desired goal for total phosphorus appears to be 0.1 mg/L total P*" in order to prevent plant nuisance in streams and other flowing waters. Analogous threshold values have not been set for nitrogen in the Basin Plan. Rather natural ratios of nitrogen to phosphorus (N:P) are to be determined by surveillance and monitoring. However, since data are lacking, the objective allows for the use of a weight to weight ratio of 10:1 (N:P) for the determination of an analogous threshold value for total nitrogen of 1.0 mg N/L. These values are not to be exceeded more than 10% of the time unless studies of the waterbody clearly show that water quality objective changes are permissible. The Regional Board must approve such changes.

Even with the nitrogen reductions made since the 1990s, both nitrogen and phosphorus concentrations in the creek exceed the numeric goals identified in the objective for biostimulatory substances, and the numeric objective of 10 mg NO_3-N/L for nitrate in drinking water. These nutrient concentrations also appear to be contributing to excessive algal and emergent plant growth during certain times of the year. As mentioned above, field investigations conducted by Regional Board staff on the lower reaches of Rainbow Creek (downstream of Willow Glen-4) in July 1999 identified two locations in the creek that were affected by excessive algal growth. The locations were at the Riverhouse monitoring station and at the property located at 2068 Willow Glen Road approximately 500 to 600 ft upstream of Riverhouse. In 2000, these two locations, as well as the Oak Crest and Willow Glen-4 monitoring stations, were determined to be affected by excessive algae growth. The Riverhouse station also exhibited excess emergent plant growth. Attachment C presents pictures illustrating the condition of the creek at these locations. .

Samples were collected from the creek in Fall 2000 for algae identification by the University of California Cooperative Extension. The following four green algae species were identified: *Cladophora*, *Enteromorpha*, *Odegonium* and *Chaetophora* (Mellano 2000). The sampling reflected the species that were present on the date of collection and does not reflect seasonal changes in species composition. The concentrations of nutrients are likely contributing to the observed excessive algal and emergent plant growth. There was at most limited or no riparian canopy at the sampled locations, allowing for maximum light availability and water temperature increase. A dense canopy of riparian vegetation exists along much of Rainbow Creek. The canopy can limit the availability of sunlight to aquatic plants, effectively limiting their development. Consequently, despite the presence of elevated nutrient concentrations, excessive quantities of green algae have not been observed to the same degree in the shady areas of Rainbow Creek.

2.6 Beneficial Uses

The Basin Plan identifies the beneficial uses of Rainbow Creek. They include contact and non-contact water recreation, municipal, industrial and process supply, and warm water, cold water and wildlife habitats. The beneficial use designations for the Rainbow Creek segments of Santa Margarita River hydrologic area are presented in Table 2-2. The Basin Plan provides detailed descriptions of the various beneficial uses.

Table 2-2 Beneficial Uses for the Rainbow Creek Hydrologic Subareas

HYDROLOGIC AREAS AND SUBAREAS	BENEFICIAL USE																			
	MUN	AGR	IND	PROC	GWR	FRSH	NAV	POW	REC1	REC2	COMM	WARM	COLD	SAL	WILD	RARE	MAR	MIGR	SPWN	SHEL
HA 902.00 – Santa Margarita River																				
HSA 902.22 Rainbow Creek	●	●	●						●	●		●	●		●					
HSA 902.23 Rainbow Creek	●	●	●						●	●		●	●		●					

HA = Hydrologic Area
HSA = Hydrologic Subarea
• = Existing Beneficial Use (Basin Plan, 1994)

Excess nutrients can adversely impact the following beneficial uses: municipal supply (MUN), habitat (WARM, COLD, and WILD) and recreation uses (REC1, REC2). Elevated nitrate concentrations exceed the limits for municipal water supply. Camp Pendleton relies entirely on local groundwater resources for its drinking water. Surface waters from the San Mateo, the San Onofre, the Las Flores, and the Santa Margarita River basins recharge the groundwater system beneath Camp Pendleton, making municipal supply a concern.

Elevated nutrient concentrations also contribute to excessive algal growth, which can lead to eutrophic conditions. Eutrophic conditions can result in decreased water clarity, loss of aquatic habitat, an increase in pH that can result in the dissociation of ammonium to form un-ionized ammonia, and a decrease in dissolved oxygen (DO) that is detrimental to aquatic life. Water flow, sunlight, and temperature are additional factors, which can either contribute to or limit the development of excessive algal growth even when nutrients are available in sufficient quantities. Eutrophication is the aging process by which a body of water becomes enriched in dissolved nutrients that stimulate the growth of aquatic plant life. Eutrophic conditions are characterized by algal blooms, excessive plant growth, large unsightly algal mats, decomposing plant matter, offensive odors, stagnation and low DO concentrations. Eutrophic conditions can impact aquatic life and habitat, resulting in a skewed benthic community composition that lacks diversity in aquatic macroinvertebrates. Recreational and aesthetic values include numerous trails that are utilized by hikers, horseback riders and residential development. The development of large unsightly algal mats and offensive odors associated with eutrophic conditions can impact both recreation and habitat-related beneficial uses and can constitute a nuisance. The depletion of DO concentrations and the production of un-ionized ammonia by plant matter decomposition can cause fish kills and other adverse effects on aquatic life; thereby impacting habitat related beneficial uses.

While the creek does have several areas susceptible to excessive algal growth during the spring, summer and fall, eutrophic conditions have not been observed. Fish kills or water quality degradation from decomposition of plant matter has not been observed. On June 4-5,1997, Regional Board staff conducted DO monitoring. The study measured temperature and DO concentrations from 1:00 p.m. in the afternoon until 6:00 a.m. the following morning at locations on the Santa Margarita River, Rainbow Creek, Sandia Creek, and De Luz Creek. The purpose was to identify the DO diel cycle (24-hour cycle) and to determine if the concentrations dropped below the DO objective. The study looked at measurements in pool and riffle areas of the stream and in backwater areas with less flow. The monitoring showed concentrations above 5 mg DO/L in flowing waters and concentrations that dipped below 5 mg DO/L in backwater areas. The Basin Plan states that DO shall not be less than 5 mg/L for inland waters designated for warm water beneficial uses. Backwater areas that exhibited low DO were uninhabitable by fish because of dense algal mats or very shallow water. The study found that DO concentrations remained at levels above the DO objective in flowing water, even just before dawn when DO depletion is most likely to occur (SDRWQCB 1997). DO depletion occurs when oxygen is used up through respiration of biological organisms and biodegradation of organic material at a time when it is not being produced through the photosynthesis of algae. This condition is most likely to occur just before sunrise when the absence of sunlight is the longest. At the time of the 1997 monitoring, DO concentrations were not low enough to cause adverse effects on aquatic life. DO is not expected to be depressed below the water quality standard; however, there are no current DO results to support the assumption. Additional DO monitoring will be required in the Implementation Plan.

Rainbow Creek provides habitat to vegetation, birds, fish and wildlife, including amphibians and benthic invertebrates. A survey performed by staff on December 8, 1998 described the creek as having a riparian canopy consisting of sycamores, willows and coast live oaks with an understory of a variety of low scrubs and herbaceous plants (Pardy 1998). Invasive exotic plants were also identified in the survey and included giant reed, castor bean, cockleburr, eucalyptus, palms, iceplant, tree tobacco, and tamarisk. The Least Bell's Vireo (*Vireo bellii pusillus*), a federally and state listed endangered species, is known to inhabit the riparian woodland of the Santa Margarita Watershed (Hunsacker II 1992).

Pardy (1998) also identified the presence of a resident population of arroyo chubs (*Gila orcutti*). These small minnows are omnivorous grazers that feed on algae and other plants as well as on small crustaceans and aquatic insect larvae (Moyle 1976). Arroyo chubs are native to the Santa Margarita River watershed and are listed as a "California Species of Special Concern" by the California Department of Fish and Game (2000). This listing requires that special consideration be taken in addressing issues to secure long-term viability for the species, with an emphasis on their susceptibility to predation.

Amphibians are known to inhabit the Santa Margarita River (Hunsacker II 1992). Pacific treefrogs (*Hyla regilla*) and California treefrogs (*Hyla cadavarina*) were observed at the Rainbow Glen Tributary monitoring location as well as at locations in the lower reaches of the creek (below Willow Glen-4) during the 2000 monitoring period. Rouse et al. (1999) reviewed a number of studies on the effects of nitrate concentrations on amphibians (primarily tadpoles). Lethal nitrate concentrations for several species were in the range of 13-40 mg NO_3-N/L. Chronic effects occurred at concentrations below 10 mg NO_3-N/L. Lethal effects for fish egg and fry were below 10 mg NO_3-N/L. The paper concluded that it is highly probable that amphibian survival is adversely affected by nitrate levels of 2.5 mg NO_3-N/L and greater. Therefore, aquatic life habitat may be potentially affected by nitrate at current concentrations; however, it is important to recognize that the species tested do not include those present in the creek.

Rainbow Creek has an impaired aquatic insect population, which may be related to its elevated nutrient concentrations. The creek's benthic macroinvertebrate community may be sensitive, in varying degrees, to temperature, DO, sedimentation, scouring, nutrient enrichment and chemical and organic pollution (Giller and Malmqvist 1998, Johnson et al. 1993). Elevated concentrations of nutrients and other pollutants, such as herbicides and pesticides, may cause changes in the aquatic insect community. These changes can include loss of species diversity, loss of pollutant sensitive species, and an increase in pollutant tolerant species (Waters 1995).

Benthic macroinvertebrate surveys conducted in 1991-92 (Hunsaker 1992) and in 1998-99 (CDFG 2000) found an abundance of pollutant tolerant insects and a lack of pollutant sensitive insects. Hunsaker (1992) found that benthic community indicators in Rainbow Creek were poor compared to other tributaries and the Santa Margarita River. The 1998-99 California Department of Fish and Game surveys indicate that Rainbow Creek was "below average" compared to other tributaries in the watershed in both the May 1998 and May 1999 surveys. Low species diversity, an absence of sensitive species, and a skewed benthic community, with one or two functional feeding groups dominating was observed during these two sampling periods. The creek was "average" in both the September 1998 and November 1998 monitoring events, showing improved species diversity and a more well-distributed community structure with four of five functional feeding groups represented, although it continued to show an absence of sensitive species. Shredding insects, which feed mostly on decomposing coarse particulate organic matter, were completely absent from all four sampling events. Their absence is notable because shedders are usually associated with streams that have an intact riparian canopy, such as exists along most of Rainbow Creek.

2.7 Summary

In summary, nitrate, total nitrogen, and total phosphorus concentrations exceed water quality objectives for municipal water supply (MUN) and may impair warm water (WARM), cold water (COLD), and wildlife (WILD) beneficial uses. Excessive algae in localized areas also present a nuisance, impair aesthetic and recreational uses (REC1 and REC2), and may impair warm water (WARM), cold water (COLD), and wildlife (WILD) beneficial uses. Runoff from agriculture, nursery and residential land uses contribute to increased nutrient concentrations in Rainbow Creek as a result of storm water runoff, irrigation return flows and groundwater. Existing benthic community impairment is likely a result of nutrient-enriched runoff or other pollutants, such as pesticides, associated with these same land uses. The proposed TMDLs are intended to improve water quality, restore and protect the beneficial uses of the creek impacted by nutrient enrichment, and prevent the occurrence of future eutrophic conditions.

3.0 Numeric Targets

Numeric targets are established at levels that will ensure attainment of water quality objectives and the protection of beneficial uses. The numeric targets for nutrients are intended to achieve the numeric objective for nitrates in municipal water supply and ultimately the narrative water quality objective for stimulation of algal and emergent plant growth by nutrients. Numeric targets are established for nitrates, total nitrogen, and total phosphorus to meet drinking water standards in the short-term, and to reduce existing periodic algal blooms and prevent future eutrophic conditions.

Lacking a quantitative method, ratios of nitrogen to phosphorus (N:P) concentrations are used to indicate which nutrient is limiting. Allan (1995) states that it has been shown that nitrogen and phosphorus occur in algal tissue in a remarkably consistent ratio of atomic weights of 16:1 and that the N:P ratio indicates which nutrient is likely to be the limiting factor in algal growth. For example, ratios higher than the natural ratio of 16:1 indicate a surplus supply of nitrogen and suggest that the availability of phosphorus is more likely to limit algal growth. Conversely, ratios below 16:1 indicate a nitrogen limitation (Allan 1995). Allan (1995) states that joint limitation by both nutrients is likely where N:P ratios are between 10:1 and 20:1. Assuming the N:P ratio of 16:1, ratios calculated from the empirical data presented in Attachment B-2 reveal both high and low ratios over the monitoring period. Primarily, phosphorus appears to be the limiting nutrient during the spring and summer; however, there are occurrences where nitrogen or both may be limiting. Therefore, targets for both nitrogen and phosphorus are appropriate to provide greater assurance that eutrophic conditions and excessive algal growth are prevented, and beneficial uses are protected. Table 3-1 presents the numeric targets.

Table 3-1 Numeric Targets

Constituent or Factor	TMDL Targets
NITRATE, As N	10 mg NO_3-N/L
TOTAL NITROGEN	1.0 mg N/L
TOTAL PHOSPHORUS	0.1 mg P/L

3.1 Target for Nitrates

The purpose of this target is to meet the water quality objective for nitrates in municipal water sources. The numeric target for nitrates is set at 10 mg NO_3-N/L to ensure that these surface waters are protected as drinking water sources and to assure compliance with the numeric objective at all times.

3.2 Targets for Biostimulatory Substances: Total Nitrogen and Total Phosphorus

The Basin Plan states that inland waters are not to contain concentrations of nitrogen and phosphorus that stimulate aquatic growth to the extent that they cause a nuisance or adversely affect beneficial uses. The targets for total nitrogen and total phosphorus are the numeric goals set forth in the Basin Plan, which are intended to prevent nuisance algae and emergent plant growth in flowing waters. The targets are 1.0 mg N/L and 0.1 mg P/L, respectively, and are not to be exceeded more than 10% of the time. These targets are established as final endpoints and are to be implemented by incremental load reductions over time. It is fully expected that reductions in nutrient concentrations will result in a reduction of algal biomass and emergent plant growth. The final goal is to eliminate algae-related nuisance and impairment of beneficial uses, and to improve aquatic life beneficial uses. Currently, no site-specific data are available that correlates in-stream nutrient concentrations with abundance of algae. Therefore, monitoring of algal biomass will be included in the monitoring strategy, but is not established as a target at this time.

4.0 Source Identification

The Source Identification phase of TMDL development identifies all known sources of nutrients that may contribute to both elevated nutrient concentrations and the stimulation of algal growth in Rainbow Creek. Nutrient sources in the Rainbow Creek watershed are:

- Agricultural fields
- Orchards
- Commercial nurseries
- Residential areas
    - Landscape maintenance
    - Septic tank disposal systems
    - Backyard livestock/pets
- Atmospheric deposition
- Undeveloped land

Agricultural fields around Rainbow Creek are largely used to raise row crops, such as pumpkin and aloe. Orchards in the watershed are mostly tree-crop orchards, such as citrus (oranges, lemons, limes) and avocado. Agricultural fields, orchards, and commercial nurseries all contribute nutrients to the watershed by fertilizer application. Residential areas contribute nutrients from septic tank disposal systems, landscape maintenance, and/or backyard livestock (e.g. horses) and pet wastes. Atmospheric deposition contributes nutrients directly to the waterbody through dryfall and rainfall. Undeveloped land contributes nutrients from decaying plant material, soil erosion, air deposition, and wild animal waste, these contributions are small and generally considered to represent background levels.

Nutrients from these sources reach Rainbow Creek primarily by two routes: directly in overland flow (stormwater runoff and dry weather flows) and indirectly in groundwater. Nutrients applied directly to land (e.g. fertilizers, pet wastes) can be carried overland in stormwater runoff and irrigation or can percolate through the soil to reach groundwater. Septic tank disposal systems contribute nutrients primarily into groundwater. Nutrient loads from both runoff and groundwater have been evaluated for all of the identified nutrient sources in Rainbow Creek.

One other nutrient source was identified but was determined to be insignificant and will not be addressed in this staff report. CalTrans operations along the Interstate 15 corridor were evaluated as nutrient sources from roadways and parkway/median maintenance, but were not significant (CalTrans 2001).

4.1 Nitrate/Total Nitrogen

4.1.1 Surface Water Loads

Several land uses in the Rainbow Creek watershed were identified as potential sources of nitrogen (see Table 4-1)(MRCD 1999). Nutrients from these various land uses can reach Rainbow Creek in stormwater and in dry weather runoff.

Nitrogen loads from these land uses were calculated by multiplying the nitrogen export coefficient for the land use by the area. Table 4-1 contains nitrogen export coefficients and the corresponding annual nitrogen loads for the various land uses in the watershed.

Table 4-1 Calculated Annual Total Nitrogen Surface Water Loads to Rainbow Creek from Various Land Uses

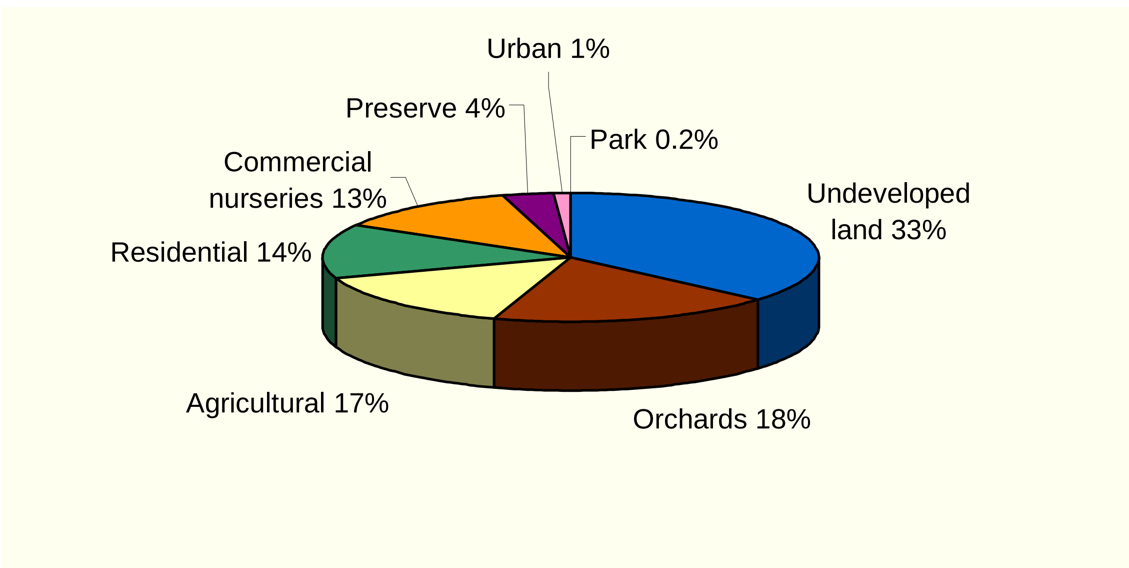
Land Use	Nitrogen Export Coefficient kg/ha/yr	Area acres (ha)	Annual Total Nitrogen Load kg/yr
Commercial nurseries	4.1[1]	368 (148.9)	611
Agricultural fields	3.7[1]	502 (203.2)	752
Orchards	2.5[2]	811 (328.2)	821
Park	3.4[3]	5 (2)	6.8
Preserve	3.4[3]	139 (56.3)	191
Residential	2.6[1]	604 (244.4)	635
Urban	3.8[1]	26 (10.5)	40
Undeveloped land	0.9[1]	4136 (1674)	1507
Total		6,591 (2,668)	**4,600**[4]

1. Source: SCCWRP 2000
2. Source: Boynton et al. 1993
3. Source: North Carolina State University 2001
4. Rounded to two significant figures

Nutrient export coefficients were obtained from literature values since no site-specific data existed for Rainbow Creek. Efforts were made to select export coefficients that most appropriately represented the land use types in Rainbow Creek, and that best represented the environmental conditions in Southern California.

Figure 4-1 shows a visual representation of the percentage of the total nitrogen contribution to the watershed for each of the identified land uses.

Figure 4-1 Land Use Contributions to Annual Total Nitrogen Surface Water Loads in Rainbow Creek



4.1.2 Groundwater Loads

In addition to the total annual nitrogen loading to surface water runoff from various land uses, nitrogen can also reach Rainbow Creek from septic tank disposal systems and irrigation infiltration from groundwater that surfaces in the creek. The groundwater load estimate is based on two calculation approaches: septic wastewater load calculations and calculations based on Oak Crest Station dry weather data. The estimated groundwater load is 1,100 kg N/yr.

Approach 1: Septic Wastewater Load Calculations
This approach estimates the total nitrogen load contributed from septic tank disposal systems in the watershed. This estimate assumes that all septic tank disposal systems are functioning properly, which underestimates the actual mass loading. It also does not account for contributions from Rainbow Conservation Camp's percolation ponds, from irrigation infiltration, or plant uptake.

For San Diego County, the estimated mass nitrogen loading from a typical septic tank disposal system is 10.4 g/capita/day (San Diego County 1994). The estimated number of septic tank disposal systems in the watershed is roughly 407 units and the average number of people per household (and per septic tank disposal system) is 2.91 (Van Rhyn 2001). The annual total nitrogen load from septic tank disposal systems in the watershed would therefore be:

10.4 g/capita/day * 407 units * 2.91 capita/unit * 365 days/yr * 1 kg/1000 g $\approx$ 4,500 kg/yr

This total nitrogen load should be reduced by denitrification in the leach fields. Typically denitrification in the leach field removes 30% of the total nitrogen by loss to the atmosphere as nitrogen gas (N_2) (Dames and Moore 1996). Therefore, the total nitrogen load to groundwater from the leach fields would be 3,150 kg/yr.

Many of the septic tank disposal systems in the Rainbow Creek watershed are not functioning properly because:

1. All septic tank disposal systems in Rainbow Valley are at least 30 years old (installed prior to 1970), because a 1970 County of San Diego policy prohibited new construction or replacement of septic tank disposal systems (Whitman 1970). This policy is still in effect today.

2. Many septic tank disposal systems have leach fields close to or submerged in the groundwater table during all or part of the year (Lambert 2001).

3. Not all septic tank disposal systems are properly maintained.

Thus the total nitrogen load to groundwater should be higher than the estimated annual load of 3,150 kg N/yr, but there is no data to calculate the actual value. Also the Rainbow Conservation Camp (located on Figure A-2 as “prison,”) in the eastern end of the watershed has a percolation pond that may be contributing nitrogen to the groundwater, but sufficient data are not available to estimate this load. For these reasons, the estimated load of 3,150 kg N/yr will be used. Total nitrogen loads from septic tank disposal systems will be further evaluated by investigations described in the Implementation Plan and Monitoring Strategy.

The estimated total nitrogen load of 3,150 kg N/yr from septic tank disposal systems is the groundwater load. It is not known how much of this total nitrogen reaches the surface water, but it is not likely to be all of it. Some will be removed through plant uptake. However, site-specific uptake rates are not known. The actual removal rates will vary seasonally, with higher removal rates occurring in the summer months, but an annual average removal rate for nitrogen will be accounted for when a site-specific uptake rate is determined.

Not all of the total nitrogen in the groundwater will reach the surface water in Rainbow Creek. The groundwater basin in Rainbow Valley flows southwesterly and funnels into a fairly narrow “neck” downstream of the town of Rainbow. It appears that the groundwater surfaces near the Oak Crest-3 monitoring station.

The percentage of the total flowing groundwater that surfaces at that location is unknown, but based on review of the groundwater basin characteristics, it is assumed that approximately 20% to 50% of the annual total flow of groundwater surfaces to the creek. Therefore, it can be assumed that 20% to 50% of the annual total nitrogen load (3,150 kg N/yr) to the groundwater is contributed to the creek. Based on this assumption, between 630 to 1600 kg N/yr in groundwater would surface near Oak Crest-3 and reach Rainbow Creek.

Approach 2: Calculations based on Oak Crest Dry Weather Data
A second approach to estimating the total nitrogen load from groundwater is to calculate the load from concentration and flow data during dry weather conditions. Based on actual water quality concentrations, this approach accounts for all up-gradient sources that impact the groundwater of Rainbow Valley, as well as take into account for biological and chemical processes. It is assumed that surface flows during dry weather near Oak Crest-3 are comprised entirely of surfacing groundwater flows and can be used to estimate the total nitrogen load from groundwater to surface water (see Attachment B-2). Total nitrogen concentrations at Oak Crest-3 were averaged for samples taken between August 22 and October 10, 2000 (during low flow conditions). The average total nitrogen concentration was 11 mg N/L. Sufficient flow rate data at Oak Crest-3 were not collected, but flow rates at the next downstream monitoring station, Willow Glen-4, were measured at a permanent USGS gaging station. The average flow rate at Willow Glen-4 from July 5 to October 10, 2000 was 0.07 cfs. Assuming the flow rate at Willow Glen-4 is comprised entirely of groundwater flows during this time period and is similar to flows at Oak Crest-3, the calculated total nitrogen load using Oak Crest-3 concentrations and Willow Glen-4 flow rates is:

$$0.07 \text{ cfs} * 11 \text{ mg N/L} * 28.3185 \text{ L/ft}^3 * 3600 \text{ s/hr} * 24 \text{ hr/d} * 365 \text{ d/yr} * \text{kg}/10^6 \text{ mg} \approx 690 \text{ kg N/yr}$$

This total nitrogen load should be considered as the minimum since it is calculated using dry weather conditions. The groundwater contribution to the creek should increase during wet weather. Data from more than one dry season should be collected to better estimate groundwater contributions using this approach.

Based on these two approaches for determining the total nitrogen load to Rainbow Creek from groundwater, it is reasonable that the total nitrogen load is within the range of 630 kg N/yr and 1600 kg N/yr. Using the simple average, the total nitrogen load to Rainbow Creek from groundwater is therefore estimated to be 1,100 kg N/yr.

Nutrients can reach groundwater by infiltration of nutrients through the soil, when fertilizers are applied to orchards, agricultural crops, and nurseries. Predominant soil types in the Rainbow Creek watershed are Fallbrook, Fallbrook-Vista, Las Posas, Visalia, Placentia, and Grangeville (USDA 1973). These soils have percolation rates ranging from 9.5 min/inch to greater than 95 min/inch (USDA 1973). In general, soil percolation rates are fairly low, with the predominant soil type in the watershed, Las Posas (LrG), having a percolation rate of 95 min/inch or greater. Nutrient loading to groundwater from irrigation infiltration is not well understood and will not be quantified at this time. Total nitrogen contributions to groundwater from irrigation will be further evaluated under the Implementation Plan and Monitoring Strategy.

4.1.3 Atmospheric Deposition

Total nitrogen loads from atmospheric deposition are most significant in large lakes or reservoirs when the waterbody is large compared to the total watershed area (USEPA 1999). In the Rainbow Creek watershed, nutrient loads from atmospheric deposition are not likely to be significant as compared to other sources, because the surface area of the creek is small compared to the area of the watershed. Atmospheric deposition is calculated using water surface area only, since total nitrogen depositions on land are included in the nutrient export coefficients.. Atmospheric deposition loads to Rainbow Creek were estimated using established atmospheric deposition rates.

The length of the creek, including tributaries, is approximately 15 miles, and the average width of the creek is approximately 5 feet. The surface area of the creek is approximately 0.01 square miles, or 4 hectares. With an atmospheric deposition rate of 10.3 kg N/ha/yr (USEPA 1996), the load from air deposition would be approximately 40 kg N/yr.

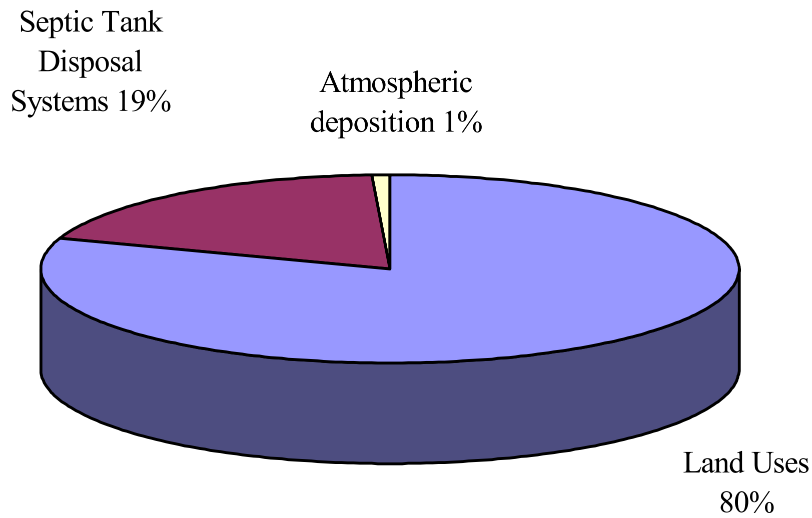
The annual total nitrogen load to Rainbow Creek from all identified sources is given in Table 4-2:

Table 4-2 Annual Total Nitrogen Load by Source Type in Rainbow Creek Watershed

Source Type	Annual Load (kg N/yr)
Land Uses (surface water)	4,600
Septic Tank Disposal Systems (ground water)	1,100
Air Deposition (surface water)	40
Total	**5,740**

Figure 4-2 shows the percentage of total nitrogen load contributions to the Rainbow Creek watershed from the three sources listed in Table 4-3.

Figure 4-2 Annual Total Nitrogen by Source Type in the Rainbow Creek Watershed



4.2 Total Phosphorus

4.2.1 Surface Water Flows

It is assumed that the sources of total phosphorus in runoff from various land uses are the same as those identified for total nitrogen. To estimate total phosphorus loads from different land uses, phosphorus export coefficients can be used. Land uses in the Rainbow Creek watershed identified as potential sources of phosphorus are listed in Table 4-3, with corresponding export coefficients and annual loads.

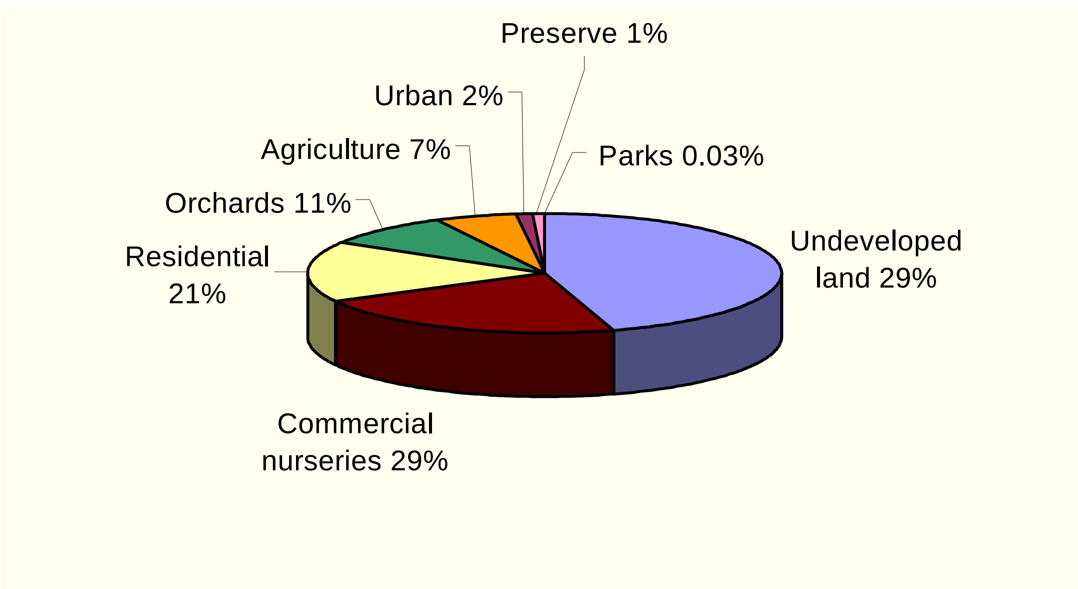
Table 4-3 Calculated Annual Total Phosphorus Loads to Rainbow Creek from Various Land Uses

Land Use	Phosphorus Export Coefficient kg/ha/yr	Area Acres (ha)	Annual Total Phosphorus Load kg P/yr
Commercial nurseries	1.1[1]	368 (148.9)	164
Agricultural fields	0.2[1]	502 (203.2)	40.6
Orchards	0.2[2]	811 (328.2)	65.6
Park	0.1[3]	5 (2)	0.2
Preserve	0.1[3]	139 (56.3)	5.6
Residential areas	0.5[2]	604 (244.4)	122
Urban areas	0.8[2]	26 (10.5)	8.4
Undeveloped land	0.1[3]	4136 (1674)	167
Land Uses Total		6,591 (2,668)	**573**[4]

1. Source: SCCWRP 2000
2. Source: Boynton 1993
3. Source: North Carolina State University 2001
4. Rounded to three significant figures

Figure 4-3 is a visual representation of the percentage of the total phosphorus contribution to the watershed for each of the identified land uses.

Figure 4-3 Land Use Contributions to Annual Total Phosphorus Loads in the Rainbow Creek Watershed



Total phosphorus can be released into the surface water from sediment. Total phosphorus releases from sediment in Rainbow Creek are not known at this time. They will be determined during the implementation phase.

4.2.2 Groundwater Loads

Septic tank disposal systems are not considered to be significant total phosphorus sources in groundwater. Phosphates are less soluble in water than total nitrogen components, and readily adsorb to soil particles; consequently, phosphates do not travel far with groundwater. Existing data for total phosphorus concentrations in soil below leach fields demonstrate this phenomenon. Phosphate concentrations 1 ft below a leach field were 10 mg P/L, while at 3 ft below the leach field they were 1 mg P/L (Metcalf and Eddy 1991). Infiltration of phosphate from land applications is not considered significant for the same reason. Therefore, groundwater loads of total phosphorus are not considered significant in Rainbow Creek. Total phosphorus contributions to groundwater from septic tank disposal systems will be further investigated and is discussed in the Implementation Plan and Monitoring Strategy.

4.2.3 Atmospheric Deposition

The general atmospheric deposition rate for total phosphorus is 0.634 kg P/ha/yr (USEPA 1996). With a creek surface area of 4 hectares, this source would contribute approximately 3 kg/year.

The annual load of total phosphorus to Rainbow Creek from all sources is given in Table 4-4:

Table 4-4 Annual Total Phosphorus Load by Source Type in Rainbow Creek Watershed

Source Type	Annual Total Phosphorus Load (kg P/yr)
Land Uses (surface water)	573
Groundwater	0
Air Deposition (surface water)	3
Total	**576**

5.0 Linkage Analysis

The Linkage Analysis describes the relationship between the numeric target and the allowable pollutant-level by determining the waterbody's total assimilative capacity, or loading capacity, for the pollutant. The loading capacity is the maximum amount of pollutant loading that a waterbody can receive while meeting its water quality objectives. The Linkage Analysis therefore represents the critical quantitative link between the TMDL and attainment of the water quality standards.

Mass loading source allocations are made to meet the concentration-based numeric targets. For Rainbow Creek, the relationship between mass loading reduction and creek nutrient concentrations is currently unknown. This is largely because of the difficulty in making this linkage for non-conservative constituents such as nitrogen and phosphorus. Biological processes on land and in the creek result in both the uptake and release of nutrients at varying rates. It is therefore unlikely that a directly proportional relationship exists between mass loading and observed concentrations for nitrogen and phosphorus in the creek. Due to the uncertainty of this relationship in Rainbow Creek, the Implementation Plan and Monitoring Strategy will provide for the collection of data needed to assess these relationships.

The Implementation Plan and Monitoring Strategy will use an iterative approach to determine appropriate load reductions for total nitrogen and total phosphorus. Initially, load reductions will assume that they will translate into a proportional concentration reduction. Data will be collected to determine observed total nitrogen and total phosphorus concentrations resulting from the initial load reductions. From the observed total nitrogen and total phosphorus concentrations, a preliminary relationship between load and concentration will be determined. This relationship will be refined by further load adjustments to produce a relationship that can be used with confidence to establish the linkages between total nitrogen and total phosphorus loads and concentrations. This iterative approach is discussed further in the Implementation Plan and Monitoring Strategy.

5.1 Total Nitrogen

For Rainbow Creek, the total nitrogen loading capacity is the maximum amount of total nitrogen that can enter the water column without exceeding the numeric target. The current estimated total nitrogen load is 5,740 kg N/yr (Table 4-2) and results in an average concentration of 14 mg N/L in Rainbow Creek (Attachment B-2). This average concentration was based on the average total nitrogen concentration observed during the highest loading period (January through June) at the Willow Glen-4 station. The Willow Glen-4 data set is complete for this time period. Since total nitrogen is almost entirely comprised of nitrate, it will be compared with the numeric target for drinking water supply (10 mg NO_3-N/L) as an interim goal. To lower the current concentration to 10 mg N/L, a reduction of approximately 28% is needed. Therefore, the current total nitrogen load needs to be reduced by 28%, from 5,740 kg N/yr to 4,130 kg N/yr. The resulting creek nitrate and total nitrogen concentrations will be evaluated with the monitoring program and if the numeric target is not achieved, the loading will be further reduced.

To achieve the biostimulatory numeric target, total nitrogen loads must be reduced further. Assuming a proportional reduction, to reach the biostimulatory numeric target of 1.0 mg N/L, current total nitrogen concentrations will have to be reduced by 93%, to a load of 402 kg N/yr (5,740 – (5,740 * 0.93)). In the source analysis, the total nitrogen load from currently undeveloped land is 1,507 kg N/yr (Table 4-1). Since the total nitrogen load needed to achieve the target is lower than current contributions from background sources, the biostimulatory TMDL for total nitrogen is set at 1,507 kg N/yr. This would mean that load allocations for existing sources would be zero. Actual total nitrogen mass load reductions required to achieve the numeric target of 1.0 mg N/L will be established once empirical data gathered under the Implementation and Monitoring Program have been obtained. In the interim between reaching the drinking water supply numeric objective and obtaining sufficient data to determine more accurately the relationship between the load reductions and creek concentrations, additional total nitrogen load reductions of 10% every 4 years will be required (Section 9.0 Implementation Plan and Monitoring Strategy).

5.2 Total Phosphorus

To achieve the biostimulatory numeric target of 0.1 mg P/L for total phosphorus, the current average concentration of 0.3 mg P/L (calculated from the second quarter of data at the Willow Glen-4 station) must be reduced by 67%. The current estimated total phosphorus load to Rainbow Creek is 576 kg P/yr (Table 4-4). Using the same approach as for total nitrogen, the total phosphorus mass loads would require a reduction of 67%, or 576 kg P/yr to 189 kg P/yr. The Source Analysis (Table 4-3) shows that the total phosphorus load from currently undeveloped land is 167 kg P/yr. Assuming a linear relationship between total phosphorus load and creek total phosphorus concentration, the required reduction of total phosphorus would result in a target value almost equal to total phosphorus loads from undeveloped land, leaving 3 kg P/yr to be allocated to existing sources. Because of this and because of the uncertainty in applying a linear approach, initial reductions for total phosphorus will be the same as for total nitrogen. Current total phosphorus loads will be reduced by 28% to 415 kg P/yr, and the resulting total phosphorus concentration in Rainbow Creek will be evaluated with the monitoring program. Actual mass load reductions to achieve the numeric target of 0.1 mg P/L will be established once the data gathered with the Implementation and Monitoring Program have been evaluated. In the interim between making the 28% reduction and obtaining sufficient data to determine more accurately the relationship between the load reductions and creek concentrations, additional total phosphorus load reductions of 10% every 4 years will be required (Section 9.0 Implementation Plan and Monitoring Strategy).

Table 5-1 summarizes the initial loading capacities of Rainbow Creek for total nitrogen and total phosphorus.

Table 5-1 Initial Rainbow Creek Loading Capacities for Total Nitrogen and Total Phosphorus

Numeric Target	Pollutant	Current Annual Load, kg/yr	Reduction, %	Interim Load Capacity, kg/yr
Drinking Water	Total Nitrogen	5740	28	4130
Biostimulatory	Total Phosphorus	576	28	415

The total nitrogen and total phosphorus load capacities will be adjusted as necessary once additional data have been obtained from the Implementation Plan and Monitoring Strategy.

6.0 Pollutant Load Allocations and Margin of Safety

A TMDL must be less than or equal to the loading capacity after taking into account the load allocations for all sources. A TMDL can be divided into a wasteload allocation (WLA) for point sources subject to an NPDES permit, and a load allocation (LA) for all other sources including point, nonpoint and natural background. The TMDL must also contain an explicit and/or implicit margin of safety (MOS), which accounts for unknowns and uncertainties in the analysis. The TMDL is represented by the following equation:

$$TMDL = \sum(WLA) + \sum(LA) + MOS$$

6.1 Margin of Safety

TMDLs are required to include an MOS that accounts for limitations in the accuracy of the modeling used to develop the TMDL and for the uncertainty in the relationship between pollutant loads and receiving water quality. The MOS can be expressed either implicitly or explicitly. An implicit MOS is incorporated through making conservative assumptions in the TMDL analysis. An explicit MOS can be applied by reserving a portion of the TMDL and not allocating it to any other sources. An implicit MOS can be incorporated into a TMDL by allocating a conservative load to background sources. These nutrient TMDLs utilize both an implicit and an explicit MOS. An explicit MOS of 10% is reserved to account for uncertainties. A conservative background load is also assigned (the implicit MOS).

Uncertainties in the source analysis and linkage analysis of the total nitrogen and total phosphorus TMDLs are:

For total nitrogen:

- Lack of site-specific nutrient export coefficients
- Unknown condition and maintenance status of septic tank disposal systems
- Unknown effect of rising groundwater table on septic tank disposal systems
- Unknown contribution of nutrients from the Conservation Camp percolation ponds
- Lack of data on groundwater contributions to surface water
- Unknown loading of nutrients to groundwater from irrigation
- Undefined relationship between nutrient loads and corresponding creek concentrations
- Future watershed development

For total phosphorus:

- Lack of site-specific nutrient export coefficients
- Unknown loading from overland surface runoff during storm events
- Unknown loading from stream sediment
- Undefined relationship between nutrient loads and creek concentrations
- Future watershed development

6.2 Initial Total Nitrogen Load Allocations

The Linkage Analysis (see Table 5-1) determined that the initial total nitrogen mass load that is required to meet the drinking water numeric target in Rainbow Creek is 4,130 kg N/year. The target represents a 28% reduction of current total nitrogen mass loads to the creek.

In determining the load allocations for the total nitrogen TMDL, the allowable pollutant load of 4,130 kg N/yr is divided between the MOS, background, and the land uses. Subtracting a 10% MOS, the total mass load is:

4,130 kg N/yr – (0.10) 4,130 kg N/yr = **3,717kg N/year**

This TMDL requires an initial overall 35% reduction of current total nitrogen loads to the creek, and will be allocated among WLAs, LAs, and background loads.

For the purposes of this TMDL, background total nitrogen loads are subtracted separately from the load allocations. Background loads of nitrogen occur naturally through decaying plant material (such as leaf litter), soil erosion, and wild animal waste. Background loads are based on 0.9 kg/ha/yr, which is the value for undeveloped land (See Table 4-1). The undeveloped land area is 4,136 acres (1,674 ha)(See Table 4-1). Thus, the total nitrogen load to the creek would be:

0.9 kg N/ha/yr * 1,674 ha = 1,507 kg N/yr

There are no identified total nitrogen point sources to Rainbow Creek, so the WLA for the creek is 0 kg N/yr. The remaining allocation for nonpoint sources (LAs) is therefore:

3,717 – 1,507 – 0 = **2,210** kg N/yr

This total LA does not include an allocation for undeveloped land, because it was considered under background loads.

In summary, the nitrogen TMDL equation is:

TMDL = $\sum$(WLA) + $\sum$(LA) + Background + MOS

$\sum$ WLA	0 kg N/yr
$\sum$ LA	2,210 kg N/yr
Background	1,507 kg N/yr
MOS	413 kg N/yr
TMDL	4,130 kg N/yr

Total nitrogen contributions from all land uses other than undeveloped land need to be reduced by approximately 47% to meet the LA of 2,210 kg N/yr (see Table 6-1). The load allocations are divided among significant land uses and sources. Significant land uses were determined from the potential to generate total nitrogen load (see Table 4-1). The significant land uses, including commercial nurseries, agricultural fields, orchards, and residential areas, will be required to reduce their total nitrogen contributions by approximately 51% to meet the overall reduction required to meet drinking water standards. Septic tank disposal systems will require a 50% reduction. This is slightly less than the above-mentioned land uses, because reductions in septic wastewater loads will be more significant in the long-term, so to meet the initial short-term target, the emphasis is placed on the remaining land-uses that directly contribute to surface water. Load allocations for septic tank disposal systems will be re-evaluated, as more information becomes available from TMDL implementation. Park, preserve, urban areas, and air deposition receive no load reductions. Total nitrogen contributions from park, urban areas, and air deposition are relatively insignificant. Placing controls on preserve and air deposition are not practical.

The 51% and 50% reductions for significant land uses and sources are higher than the average required reduction of 47% to account for the inability to reduce loads from parks, preserve, urban areas, and air deposition. Table 6-1 below lists the load allocations for all identified nitrogen sources other than undeveloped land.

Table 6-1 Total Nitrogen Load Allocations to Meet Drinking Water Target

Source	Current Annual Load, kg N/yr	Reduction, %	Annual Load Allocations, kg N/yr
Commercial nurseries	611	51	300
Agricultural fields	752	51	370
Orchards	821	51	402
Park	6.8	0	7
Preserve	191	0	191
Residential areas	635	51	310
Urban areas	40	0	40
Septic tank disposal systems	1100	50	550
Air deposition	40	0	40
Total	**4,200**	**47**	**2,210**

6.3 Initial Total Phosphorus Load Allocations

The Linkage Analysis (Table 5-1) determined that the initial total phosphorus mass loading capacity of Rainbow Creek required to attain the interim biostimulatory numeric target is 415 kg P/yr. This interim target represents a 28% reduction of current total phosphorus loads to the creek.

In determining the load allocations for the total nitrogen TMDL, the allowable pollutant load of 415 kg P/yr is divided between MOS, background, and land uses. As described above, a 10% MOS is subtracted, and the total phosphorus load that the creek should receive is:

415 kg P/yr – (0.10) 415 kg P/yr = **373 kg P/yr**

Therefore, the total phosphorus loading capacity for Rainbow Creek is 373 kg P/yr, which represents an overall reduction of 35% of current total phosphorus loads to the creek.

For the purposes of this TMDL, background total phosphorus sources are subtracted separately from the load allocations. Background total phosphorus loads will be allocated based on load data for undeveloped land, which is 0.1 kg P/ha/yr (Table 4-3). The undeveloped land area is 4,136 acres (1,674 ha). The resulting total phosphorus load to the creek from background sources would be:

0.1kg P/ha/yr * 1,674 ha = 167 kg P/yr

There are no identified total phosphorus point sources in the Rainbow Creek watershed, so the WLA for the creek will be 0 kg P/yr.

The remaining allocations for nonpoint sources (LAs) are therefore:

373 – 167 – 0 = **206 kg P/yr**

This total LA does not include an allocation for undeveloped land, since it was considered under background loads.

In summary, the phosphorus TMDL equation is:

TMDL = ∑(WLA) + ∑(LA) + Background + MOS

∑ WLA	0 kg/yr
∑ LA	206 kg/yr
Background	167 kg/yr
<u>MOS</u>	<u>42 kg/yr</u>
TMDL	415 kg/yr

Total phosphorus contributions from land uses other than undeveloped land (background) need to be reduced by approximately 50% to meet the LA of 206 kg P/yr (see Table 6-2). In allocating load reductions, the load allocations are divided proportionately among significant land uses. Significant land uses were determined from the total phosphorus load generated by each land use using the export coefficient and acreage (see Table 4-3). The greatest load reductions will be required for residential areas and commercial nurseries since these sources have the highest total phosphorus loads. Smaller reductions will be required for agricultural fields and orchards. No loading reductions will be required for the park, preserve, urban areas or air deposition. Total phosphorus contributions from park and preserve are insignificant. Contributions from air deposition and urban areas are insignificant and impractical to control. Table 6-2 lists the load allocations for all identified total phosphorus sources other than undeveloped land.

Table 6-2 Initial Total Phosphorus Load Allocations

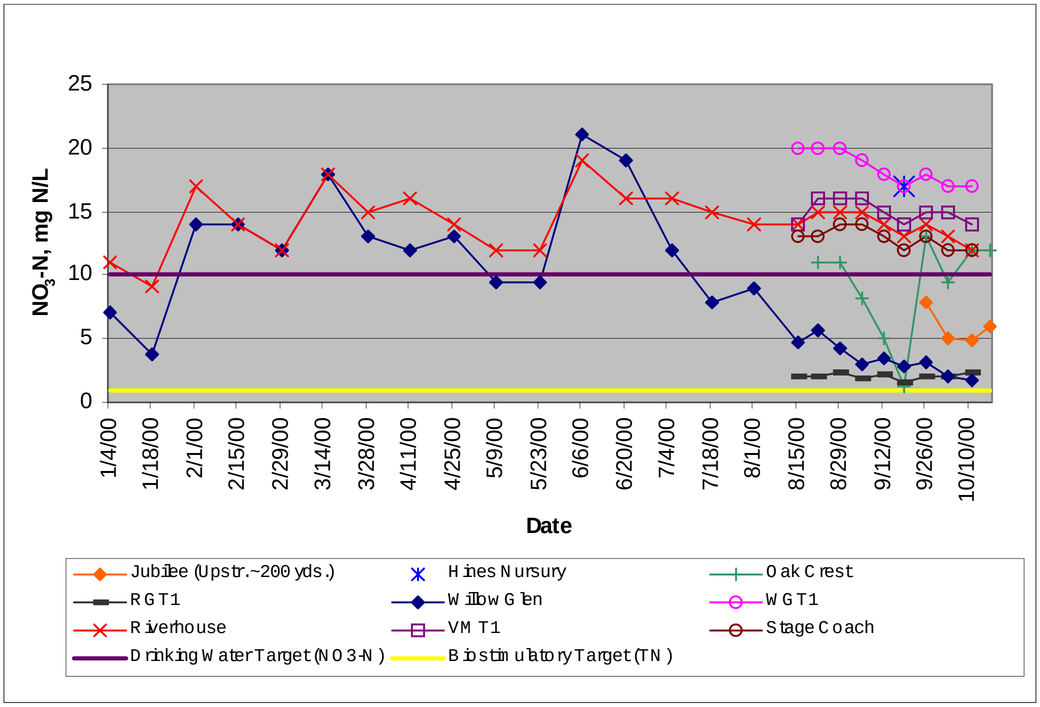
Source	Current Annual Load, Kg P/yr	Reduction, %	Annual Load Allocations, Kg P/yr
Commercial nurseries	164	54	75
Agricultural fields	40.6	45	22
Orchards	65.6	45	36
Park	0.2	0	0.2
Preserve	5.6	0	6
Residential areas	122	54	56
Urban areas	8.4	0	8
Air deposition	3	0	3
Total	**409**	**50**	**206**

7.0 Seasonal Variations and Critical Conditions

There are essentially two seasons in Southern California, a dry season, which makes up most of the year and a short wet season, primarily occurring between November and March, and averaging about 16 inches annually for inland North County (Escondido)(NWS 2002). The Fallbrook area has a temperate climate with the warmest daytime temperatures (> 90°F) occurring in August and September and the coolest daytime temperatures (< 60°F) occurring between November and March. Summer is the critical time period for eutrophic conditions because of available nutrients, low flows, warmer temperatures, and longer daylight hours. Winter is the least critical time of year because algal growth is limited as a result of cooler temperatures, less available light, and generally higher flows. Field surveys performed in December 1999 and January 2000 did not find algae in excessive quantities. Although late summer is the critical time period for eutrophic conditions, the critical time period for algal growth begins much earlier.

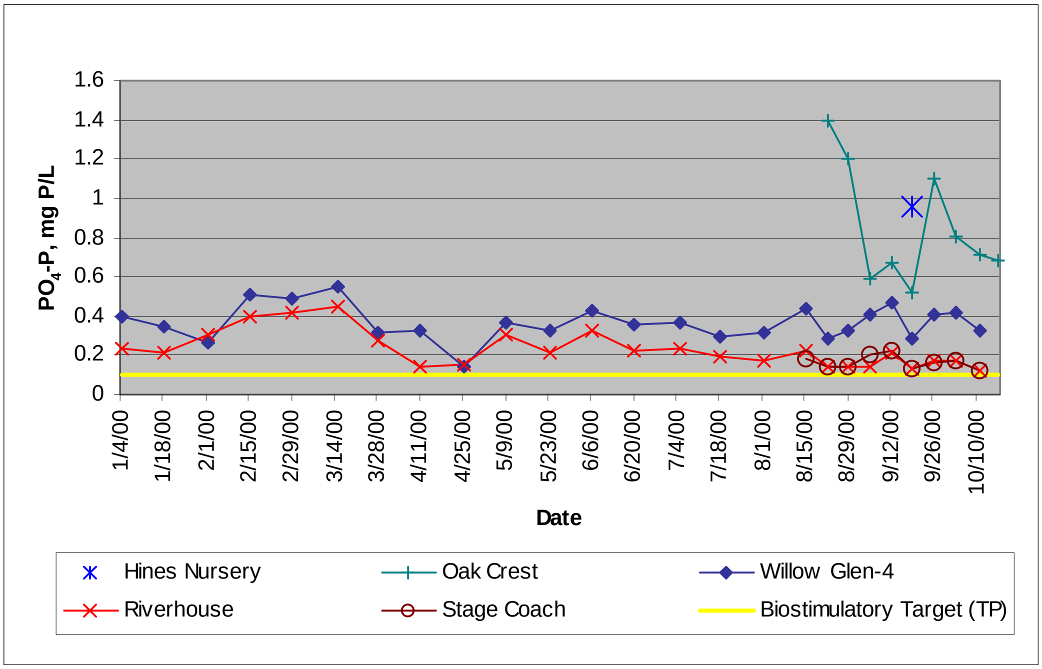
Algal growth, illustrated in photographs presented in Attachment C, begins flourishing in February, is well established by May, and is present through the summer months. Emergent plants and additional localized algal blooms are present in June, and continue to grow into October. When optimum conditions of adequate light, flow, water temperature and substrate exist, adequate nutrient quantities are needed for algal growth. Figure 7-1 shows the nitrate concentrations (Attachment B-2) at monitoring locations on Rainbow Creek and its tributaries (see Attachment A-3 for map). Data in Figure 7-1 reveals the impact of land uses on nitrate nitrogen concentrations in the creek. Jubilee and RGT1 are both mostly surrounded by vacant lands, and are less impacted by irrigated fields and orchards. Levels at these sites are relatively low. Concentrations at Oak Crest Mobile Estates range from 1.2 to 17 mg NO_3-N/L. In the lower reaches of the creek, below Willow Glen-4, nitrate levels are above 10 mg NO_3-N/L in February, and average 14 mg NO_3-N/L through mid-October. WGT1 and VMT1 receive orchard drainage and nitrate levels are quite high. Riverhouse and Stagecoach are similarly impacted heavily by orchards. Riverhouse levels are high year round, possibly a result of tributary effects and orchard input. Willow Glen-4 has seasonally elevated winter concentrations, followed by a reduction in the late summer months. This is possibly because of lower flows, and assimilation during the longer flow through time between Rainbow Valley and this station.

Figure 7-1 Rainbow Creek Nitrate Concentrations During 2000



Orthophosphate concentrations in Rainbow Creek average 0.33 mg PO_4-P/L (range 0.12 - 1.4 mg PO_4-P/L). Creek concentrations (Attachment B-2) are illustrated in Figure 7-2. Levels in all tributaries and the most upstream location were below the detection limit of 0.05 mg P/L, and do not appear in the figure. Orthophosphate concentrations at Oak Crest Mobile Estates vary more (range 0.52 - 1.4 mg PO_4-P/L). Concentrations in the lower reaches range from 0.12 to 0.55 mg PO_4-P/L. In the lower reaches of the creek, concentrations may increase during the period of January through March and decline between March and April. This appears to coincide with the wet season and with field observations that found an increase in algal biomass.

Figure 7-2 Orthophosphate Phosphorus Concentrations for Year 2000



Based on observations of seasonal variation and critical conditions (development of excessive algae) during the 2000 monitoring period, nutrient loading controls appear to be needed between February and September. Because sediments act as a sink for nutrients, availability of plentiful nutrients during the initial growth period can result in accumulations of algae later in the year. The target for nitrates is also applicable to the entire year because it is health-related and is not to be exceeded at any time. Therefore, controls on nutrient loading should be implemented all year long. Water quality monitoring will be required to demonstrate compliance with targets and will be discussed in the Implementation Plan.

8.0 Public Participation

40 CFR 130.7 requires that TMDLs be subject to public review. Public participation has been provided for through public workshops and by a Technical Advisory Committee (TAC). The Regional Board conducted two public workshops. The first was held in April 1999, the second in November 1999. The TAC was formed in November 1999 and has met on an as needed basis. The TAC provided review, technical and local input and comments on both the draft TMDL staff report (submitted to USEPA in April 2000) and drafts of the technical sections of this TMDL staff report. Participants on the TAC included representatives from: Camp Pendleton, MRCD, Fallbrook Public Utility District, Hines Nurseries, Inc., County of San Diego, San Diego State University/Santa Margarita Ecological Reserve, the Santa Margarita River Watermaster, UC Cooperative Extension, and CalTrans (District 11). Public participation will also be provided

through the Regional Board's Basin Plan amendment process. A chronological list of events, including dates of workshops and meetings, is provided in Attachment D.

9.0 Implementation Plan and Monitoring Strategy

9.1 Introduction

The Porter-Cologne Water Quality Control Act, which is contained in Division 7 of the California Water Code (CWC), establishes the responsibilities and authorities of the California Regional Water Quality Control Boards (Regional Boards), including the authority and responsibility for regional water quality control and planning. In adopting water quality objectives for water quality control, CWC Section 13242 requires the Regional Boards to adopt an implementation plan for achieving water quality objectives. This Implementation Plan is part of the overall water quality control planning process, and is contained in the Region's Water Quality Control Plan (Basin Plan). This plan fulfills the regulatory and legislative requirements of a water quality implementation plan, and is consistent with state water quality control policies.

This Implementation Plan describes the proposed implementation actions in a two-phased approach. Phase I consists of actions to attain the nitrates in drinking water target and to reduce total phosphorus by [end of 4^{th} year after U.S. EPA approval]. The focus of Phase I is on the development of a nutrient reduction and management plan (NRMP). The NRMP will identify and implement nutrient and urban management measures for reducing nutrient loads, and provide source reduction through public, nursery, and agricultural community outreach efforts. Phase I will include investigation of groundwater quality and nutrient contributions to the creek, and an assessment of the quantity and status of septic tank disposal systems in the watershed. Phase II will continue implementation of NRMP programs and re-evaluate the NRMP schedule to ensure that changes and new information are incorporated. This two-phased approach allows immediate reductions through already-demonstrated measures, and provides additional time to develop more appropriate and final solutions.

Monitoring of nutrient concentrations and in-stream conditions, including algae abundance and benthic macroinvertebrates will be performed to measure the ecosystem response to the load reductions. Monitoring data will be used to assess the effectiveness of the implementation of these TMDLs in achieving water quality standards and in determining the need for revised mass load reductions.

9.2 Overview of Applicable Laws, Regulations, and Policies

This subsection describes the legal and regulatory authority of the San Diego Regional Board to assure attainment of the Rainbow Creek Nutrient Total Maximum Daily Loads. It also describes applicable state policies.

9.2.1 Federal Water Pollution Control Act

The Federal Water Pollution Control Act of 1972 (33 U.S.C. 1251 et seq.), as codified at Title 33 of the U.S. Code, is commonly known as the Clean Water Act (CWA). The CWA defines a comprehensive national water policy with a primary goal "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" [CWA 101(a)]. The CWA requires each state to adopt water quality standards applicable to all its intrastate waters and requires dischargers to meet "water-quality-based" effluent limits. The CWA also requires that states survey their waters to determine which waters are not meeting water quality standards.

Total Maximum Daily Loads - Section 303(d)
Section 303(d) of the CWA mandates that the State shall establish total maximum daily loads (TMDLs). A TMDL identifies the maximum amount of a pollutant that can be added to a waterbody (its loading capacity) without exceeding water quality standards. The TMDL includes consideration of seasonal variations and a margin of safety, which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. [CWA 303(d)(1)(C)]

Nonpoint Source Management Programs– Section 319
Nonpoint sources (NPS) of water pollution are generally defined as sources which are diffuse in nature, usually associated with human's uses of land, and are not subject to regulation under the federal National Pollutant Discharge Elimination System for surface water discharges. Section 319 of the CWA requires the State to develop Nonpoint Source Management Plans.

NPDES Program – Section 402
The CWA prohibits point source discharges of pollutant into waters of the United States unless they are in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES Program is the regulatory process, which issues and enforces permits under Sections 307, 402, 318, and 405 of the CWA. Point sources are, in general, discrete conveyances such as pipes, human-made ditches, channels, and discrete fissures from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff. The United States Environmental Protection Agency (USEPA) has primary responsibility for enacting the NPDES permit program. The USEPA has delegated the authority to implement the program to the SWRCB and Regional Boards.

9.2.2 Code of Federal Regulations - Title 40
The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the Executive Departments and agencies of the Federal Government. Title 40 (Protection of the Environment), Chapter 1 (Environmental Protection Agency), Subchapter D (Water Programs) are the rules promulgated by the USEPA that specify the codified requirements of water quality legislation, including the CWA.

9.2.3 Porter-Cologne Water Quality Control Act
The California Water Code (CWC, Section 13000 et seq.), known as the Porter-Cologne Water Quality Control Act or Porter-Cologne Act, is the principal law governing water quality regulation in California. It establishes a comprehensive program to protect water quality and the beneficial uses of the waters of the State, including regulatory controls applicable to both point and non-point sources of pollution.

The Porter-Cologne Act establishes the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (Regional Boards), which are charged with implementing its provisions and have primary responsibility for protecting water quality in California. Furthermore, Section 13160 designates SWRCB as the State's water pollution control agency for all purposes stated in the CWA and is authorized to exercise any powers delegated to the State by the CWA.

The Regional Boards have the authority to specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted [CWC 13243]. Primarily, discharges are regulated through issuance of NPDES and Waste Discharge Requirement (WDR) permits. Anyone discharging or proposing to discharge materials that could affect water quality (other than to a community sanitary sewer system regulated by an NPDES permit) is required to file a report of waste discharge [CWC 13260] and may be subject to prescribed WDRs [CWC 13263]. The SWRCB and the Regional Board can make their own investigations or may require dischargers to carry out water quality investigations and report on water quality issues. The Porter-Cologne Act provides several options for enforcing requirements or discharge prohibitions, including cease and desist orders, cleanup and abatement orders, administrative civil liability orders, civil court actions, and criminal prosecutions. Additionally, the Porter-Cologne Act allows for waivers of WDRs if dischargers comply with conditions established by the Regional Board [CWC 13269].

9.2.4 Water Quality Control Plan for the San Diego Basin

The Porter-Cologne Act requires adoption of water quality control plans, which contain the guiding policies of water pollution management for all areas within each region of California [CWC 13240]. All regional water quality control plans, commonly referred to as basin plans, identify the existing and potential beneficial uses of waters of the State and establish water quality objectives to protect these uses within the respective region. Each basin plan contains implementation, surveillance, and monitoring plans for a region. The Water Quality Control Plan for the San Diego Basin (Basin Plan) and applicable statewide plans serve as California's Water Quality Management Plan and governs the surface waters of Rainbow Creek in the Santa Margarita River Watershed.

9.2.5 Applicable State Plans and Policies

The SWRCB has adopted several statewide Water Quality Control Plans that are incorporated by reference into the Basin Plan. Additionally, both the SWRCB and Regional Boards adopt policies, separate from the water quality control plans that provide detailed direction on the implementation of certain plan provisions. Applicable State Plans and Policies that must be considered in establishing and implementing water quality objectives include the "State Policy for Water Quality Control," the "Nonpoint Source Management Plan," and the "Plan for California's Nonpoint Source Pollution Control Program," and are described below.

State Policy for Water Quality Control

This state policy, adopted on July 6, 1972, serves as the basis for water quality control policies. It contains twelve general principles to implement the provisions and intent of the Porter-Cologne Act. The three principles applicable to these TMDLs are listed below.

- (1) Water rights and quality control decisions must assure protection of available fresh water and marine water resources for maximum beneficial use.

- (11) Water quality control must be based on the latest scientific findings. Criteria must continually be refined, as additional knowledge becomes available.

- (12) Monitoring programs must be provided to determine the effects of discharges on all beneficial water uses including effects on aquatic life and its diversity and seasonal fluctuations.

Nonpoint Source Management Plan (Resolution No. 88-123)
This statewide policy, adopted on November 15, 1988, is the basis for managing polluted runoff in California from nonpoint sources. The primary goal of the program is to measurably improve water quality and the implementation of Best Management Practices (BMPs) by meeting several objectives that are specified in the plan. The plan identified a three-tiered management approach to address nonpoint source problems and outlined steps to initiate systematic management of nonpoint sources in California.

The "three-tiered approach" utilizes three different options of enforceable policies and mechanisms under the Porter-Cologne Act to ensure water quality objectives are achieved. Through the "three-tiered approach," the NPS Program recognizes that many NPS problems are best addressed through the self-determined implementation of best management practices by dischargers (Tier 1). However, persistent NPS water quality problems not effectively resolved through self-determined actions will be addressed through regulatory-based encouragement of BMPs and effluent requirements (Tier 2 and Tier 3).

Plan for California's Nonpoint Source Pollution Control Program (NPS Program Plan)
This NPS Program Plan is the first significant upgrade of California's Nonpoint Source (NPS) Pollution Control Program (NPS Program) since its inception in 1988. The NPS Program Plan includes "Volume I: Nonpoint Source Program Strategy and implementation Plan for 1998-2013 (PROSIP)" and "Volume II: California Management Measures for Polluted Runoff (CAMMPR)." The documents were submitted for final federal approval on February 4, 2000, to the U.S. Environmental Protection Agency (USEPA) and the National Oceanic and Atmospheric Administration (NOAA). A letter granting full approval of the NPS Program Plan was signed on July 17, 2000.

The purpose of the NPS Program Plan is to improve the State's ability to effectively manage NPS pollution and conform to the requirements of the federal Clean Water Act. The plan achieves this goal by providing a single unified, coordinated statewide approach, the above-mentioned "three-tiered approach," in dealing with NPS pollution structured around 61 management measures. The management measures serve as general goals for the control and prevention of polluted runoff. Site-specific management practices are then used to achieve the goals of each management measure.

9.3 TMDL Implementation Plan Requirements

State law requires that TMDLs be included in water quality control plans. Therefore, TMDLs are generally adopted as basin plan amendments. Like water quality objectives, a plan of implementation, as well as an assessment of economic and environmental impact must be considered when adopting TMDLs.

The CWC [Section 13242] requires an implementation program for achieving water quality objectives to include, at a minimum, a:

- Description of the nature of actions which are necessary to achieve the water quality objectives, including any recommendations for appropriate action by any entity, public or private;

- Time schedule for actions to be taken; and

- Description of surveillance to be undertaken to determine compliance with the objectives.

Additional guidance regarding implementation is provided in Federal and State law. 40 CFR 130.6(c)(6) calls for identification of implementation measures necessary to carry out a Water Quality Control Plan, including addressing financing, the time needed to implement the plan, and economic, social and environmental impacts of carrying out the plan. State law requires the Regional Board to consider economic factors in relation to environmental analysis of the reasonably foreseeable methods of compliance when adopting a performance standard [Public Resources Code 21159], and identify the total cost of the program and potential sources of financing when implementing an agricultural water quality control program [CWC 13141].

With regard to environmental review, all basin plan amendments are subject to the requirements of the California Environmental Quality Act (CEQA). However, the basin planning process has been certified by the Secretary of Resources as being exempt from the requirement of CEQA to prepare an environmental impact report (EIR) or negative declaration and initial study [California Code of Regulations (CCR) Title 14, Section 15251(g)]. Under the basin planning process, the plan amendment, as well as the staff report and backup materials, serve as a "functional equivalent" to an environmental impact report or negative declaration and initial study. The documents that are required for planning actions pursuant to state regulations include an environmental checklist, and a written report that describes the proposed activity, evaluates reasonable alternatives, and mitigates any significant adverse impacts [23 CCR 3777]. The CEQA Notice of Filing, Environmental Checklist Form, and Notice of Decision must be filed to comply with CEQA. Environmental impacts are evaluated and discussed in section 9.9.

This Implementation Plan includes a description of implementation actions, including recommendations for appropriate action by the appropriate parties, time schedules for actions to be taken, and a description of the monitoring and surveillance activities to be undertaken to assess progress toward attaining water quality standards and milestones. Economic considerations regarding the implementation of these TMDLs will also be evaluated. Economic considerations are discussed in section 9.10. The evaluation will include a description of potential sources of funding for implementation of BMPs for NPS pollution control. The potential environmental and social impacts of the proposed implementation of these TMDLs will be assessed and attached to this staff report prior to release for public review.

Additionally, CWA Section 303(e) requires the State to have a Continuing Planning Process (CPP). The CPP is the process for which basin plans are reviewed as new data and information become available or as specific needs arise. It is this process that is followed in adopting approved TMDLs into the basin plan.

When implementing a phased approach, the numeric target, load allocations, and margin of safety must be set; however, there is recognition that the collection and analysis of new data may alter these numeric values. Meanwhile, efforts by dischargers can be implemented to reduce pollutant loading. Implementation efforts can be measured by progress toward achieving water quality standards or other appropriate measures. The phased approach provides for further pollution reduction without the delay of new data collection and analysis. The concept of periodically reviewing and potentially revising the TMDL and its implementation plan is consistent with the State's CPP. Accordingly, the Regional Board is committed to periodic review and refinement of these TMDLs via the Basin Plan amendment process.

9.4 Responsible Parties

This section defines terms applicable to responsible parties, and designates the parties responsible for control of discharges of nutrient wastes into Rainbow Creek.

The Rainbow Creek watershed lies within the unincorporated portions of the County of San Diego. Sources of nutrients to Rainbow Creek include wet and dry weather runoff, agricultural, orchard, and nursery irrigation return flows, septic wastewater discharges, and atmospheric deposition that result from human habitation and land use practices.

<u>County of San Diego</u>

The County possesses local planning and land use authority pursuant to the California Planning and Zoning Law (Government Code §§65000 et seq.) and the Subdivision Map Act (Government Code §§66410 et seq.). The County government is therefore the principal land use planning authority within the State and can institute the first level of management requirements for specific parcels of land. Therefore, the County of San Diego is one of the responsible parties for implementation of and monitoring for these TMDLs.

Under State planning law, the County has adopted a comprehensive, long-term general plan for the physical development of the county. While the general plan is a long-range look at the future of a community, a zoning ordinance spells out the immediate allowable uses for each property in the community. Each property in the community is assigned a "zone" listing the kinds of uses that will be allowed on that land (e.g., single family residential, multi-family residential, neighborhood commercial, agricultural, etc.) and setting development standards (e.g., minimum lot size, maximum building height, minimum front-yard depth). The distribution of agricultural, residential, commercial and other zones is based on the pattern of land uses established in the community's general plan. Zoning is adopted by ordinance and carries the weight of local law. All local governments use some form of a permitting process whereby a permit is issued for a specific project, such as building construction, grading projects for roads and bridges, new septic tank disposal system installations as well as repairs. These permits can be conditioned based on conformance with the zoning ordinance.

Subdivision regulation, like zoning, is an exercise of police power and is a principal instrument for implementing a general plan. The Subdivision Map Act sets forth other mandates that must be followed for subdivision processing.

The County of San Diego is currently subject to Order No. 2001-01, "Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems Draining the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, and the San Diego Unified Port District", NPDES No. CAS0108758. Based on promulgated regulation 40 CFR 122.26, dated November 16, 1990, the municipality is responsible for controlling all storm and non-storm water flows (i.e., urban runoff) from urban development that is transported through the conveyance system. TMDLs are incorporated into NPDES permits.

Individual Landowners

Landowners/land users (such as homeowners, nurseries, businesses, etc.) are identified as responsible parties and are required to comply with all local, state, and federal laws and regulations. Stakeholders are strongly encouraged to participate with nutrient management efforts because they are sources of nutrient discharge to Rainbow Creek.

CalTrans

The California Department of Transportation (CalTrans) is also identified as a responsible party since they are responsible for maintaining parkways and medians along their roadways. CalTrans operations were not identified as a significant source of nutrients. CalTrans are responsible for ensuring that their future operations do not contribute to the impairment of Rainbow Creek.

Regional Board

The Regional Board is responsible for preserving and enhancing the quality of waters and to ensure beneficial uses in the San Diego Region under the CWC. This responsibility includes regulation of NPDES permits and WDRs for the discharges of waste as necessary, and taking enforcement actions against illicit discharges through Notice of Violations, Time Schedule Orders, Cease and Desist Orders, Cleanup and Abatement Orders, and Administrative Civil Liabilities. The Regional Board is therefore a responsible party for ensuring waste discharges to Rainbow Creek are appropriately regulated, and enforcement action is taken for any identified illicit discharges.

9.5 Implementation Plan of Water Quality Attainment for Rainbow Creek

The intent of this implementation plan is to reduce and control existing and future sources of nutrients to Rainbow Creek resulting from human activities and to provide a remedy to beneficial use impairments identified in this staff report. The purpose of the implementation plan is to provide a general approach to address nonpoint source issues and provide a framework for triggering more stringent implementation. The implementation plan also provides a schedule and a framework for a monitoring program.

This implementation plan describes the approach recommended by Regional Board to achieve the objectives of the TMDLs. The approach is based on the three-tiered management approach described in the NPS Program, which includes:

- Tier 1 - Self-Determined Implementation of Management Practices (i.e., voluntary),
- Tier 2 - Regulatory-based encouragement of BMPs (i.e., waiver of waste discharge requirements), and
- Tier 3 – Effluent limitations and enforcement.

Primarily, the plan uses a combination of voluntary and cooperative efforts (Tier 1) by the landowner/land user, and assistance and oversight by the local regulatory agency to implement appropriate best management practices (BMPs) to achieve management measures. Additionally, permitting and enforcement actions (Tier 2 and 3) by the Regional Board may also be used, if necessary, to implement the TMDLs.

The Regional Board, by authority of CWC 13225(c), can require a local agency to investigate and report on any technical factors involved in water quality control, provided that the cost of the report bears a reasonable relationship to the need for the report.

Consistent with the three-tiered approach, the County of San Diego is designated as the lead agency to coordinate, develop, and implement a watershed management plan for nutrients based on the land use authority that it possesses. The watershed management plan, hereinafter referred to as nutrient reduction and management plan (NRMP), outlines the strategy for implementing nonpoint source "management measures" and appropriate BMPs to achieve the source control needed to attain load allocations and monitoring. This NRMP therefore utilizes local agency assisted self-determined management and regulatory-based management approaches. The NRMP should also establish a basis for determining when to use more stringent management measures. While the NRMP is based on attaining cooperation from landowners, the NRMP should also include provisions for more proactive measures, such as ordinance development and enforcement, and include guidance for making land-use planning decisions in the watershed.

In accordance with these TMDLs, landowners/land users are required to comply with local laws and regulations and with applicable waste discharge prohibitions in the Basin Plan. In doing so, landowners/land users need to manage their properties and land-use activities to reduce nutrient sources to the creek and groundwater. The Regional Board encourages landowners/land users to participate in the NRMP program and work cooperatively with the County.

These TMDLs are implemented in a two-phased approach with a monitoring component. The first phase is to reduce the current annual total nitrogen and total phosphorus loading to Rainbow Creek by 28% in the first four years (by [end of 4th year after USEPA approval]). These reductions are made to achieve the nitrates target of 10 mg NO_3-N/L and begin the first phase of reductions for the total phosphorus target. The second phase is to reduce loading in incremental steps with the ultimate goal of achieving the targets for biostimulatory substances, 1.0 mg N/L and 0.1 mg P/L. In making incremental load reductions, load allocations will be reduced by 10% every four years until the targets have been achieved. If monitoring data indicate that load reductions are not adequate to result in the nutrient target concentrations, then load allocations will be reevaluated and reduced.

9.5.1 Phase I Measures – Nitrate Target and Initial Phosphorus Reduction

To meet a 28% reduction of the current annual load of total nitrogen and total phosphorus by [4 years from date of USEPA approval], the following measures or alternatives are proposed for implementation and are detailed in this section:

1. Implementation Measures by County of San Diego
   - A. Investigations
   - B. Ordinances
   - C. Land Use Planning
   - D. CEQA Responsibilities
   - E. Nutrient Reduction Management Plan
   - F. Monitoring Strategy
2. MS4 Permit
3. Existing Waste Discharge Requirements
4. Existing Waste Discharge Prohibitions
5. New Waste Discharge Requirements and Prohibitions
6. Enforcement Authority of Regional Board
7. CEQA Document Review by Regional Board

9.5.1.1 Implementation Measures by County Of San Diego

The nutrient load reductions will be implemented pursuant to Water Code Section 13225 as follows:

A) Investigations. The Regional Board will direct the County of San Diego to undertake an investigation to assess nutrient loading to Rainbow Creek from groundwater and septic tank systems. The TMDLs were developed using simple models and numerous assumptions; further investigation is needed to fill data gaps. Additional information that can be collected during implementation will provide data needed to more accurately define the conditions of the watershed, including specific information on groundwater and septic tank disposal systems in the watershed. The overall objective of the investigations is to verify nutrient loading from groundwater and determine actual contributions from septic tank disposal systems and irrigation infiltration.

The Regional Board will also direct the County of San Diego to submit an interim report on the status of the investigations by [end of 2nd year after USEPA approval]. Additionally, the County of San Diego will be directed to submit a report of the findings from the investigation and an evaluation of the status of the watershed (pertaining to the items described below) no later than [end of the 4th year after USEPA approval].

<u>Groundwater</u>

The groundwater investigation and report shall include information on, at a minimum, the following:

- Identify the contribution of groundwater discharge to surface flow

- Determine the source of tributary flows in the lower watershed (e.g. groundwater springs/ perched aquifer, subsurface irrigation flows)
- Determine the basin storage capacity
- Determine average linear velocity of groundwater flow
- Determine hydraulic gradient
- Determine hydraulic conductivity
- Determine depth to groundwater and seasonal influence
- Identify all aquifers
- Identify all water supply and monitoring wells in the watershed
- Identify well construction data
- Identify the nutrient concentration gradient in the groundwater column
- Determine whether nutrient concentrations are increasing, decreasing, or static
- Determine uptake rates to describe nutrient removal (include seasonal fluctuation)
- Determine nutrient loading to groundwater from irrigation infiltration
- Characterize the groundwater water quality that is entering the creek

Monitoring parameters (see Table 9.7.1-1) should include nutrient concentrations and physical parameters.

Septic Tank Disposal Systems
The septic tank disposal systems study should include, at a minimum, the following:

- Verify the number and location of all septic tank disposal systems
- Evaluate the condition of the systems; determine how many are functioning properly, need to be pumped, need to be removed/replaced, are too close to groundwater table, etc.
- Refine estimated septic tank disposal system nitrogen load calculated in the TMDL
- Evaluate total phosphorus contributions to the groundwater and determine whether septic tank disposal systems are a significant source. Estimate total phosphorus loading if found to be a significant source
- Identify other subsurface disposal systems that may contribute nutrients to the groundwater
- Evaluate the feasibility of alternative sewage disposal options for Rainbow Valley
- Evaluate the need for and feasibility of establishing an entity, such as a management district, to oversee, manage, and resolve sewage disposal issues

B) Ordinances. The Regional Board will request that the County of San Diego enforce any existing water quality control ordinances and adopt new ordinances as necessary to attain the nutrient load reductions in Tables 6-1 and 6-2. The Regional Board will direct the County of San Diego to submit a report on actions it has taken to enforce existing ordinances and adopt new ordinances by [end of 2nd year after USEPA approval] and every four years thereafter.

C) Land Use Planning. Pursuant to the County of San Diego's local planning and land use authority, the Regional Board will request that the County review and revise its land use policies and decision making practices and project approval processes to ensure that new development in the Rainbow Creek watershed does not contribute to exceedances of the nutrient load reductions in Tables 6-1 and 6-2. The Land Use Planning process provides an opportunity to review activities that have the potential to impact water quality and may include the enactment of zoning ordinances, the issuance of conditional use permits and the approval of tentative subdivision maps. The Regional Board will direct the County of San Diego to submit a report on the changes it has implemented in its land use policies and decision making practices and project approval processes by [end of 2nd year after USEPA approval] and every four years thereafter.

D) CEQA Responsibilities. The Regional Board will request that the County of San Diego review and revise its environmental review process pursuant to CEQA to ensure that new development in the Rainbow Creek watershed does not contribute to exceedances of the nutrient load allocations in Tables 6-1 and 6-2. For example, diligent performance of environmental review under CEQA and requirements for mitigation of the adverse environmental consequences to water quality of new development and detrimental agricultural practices can significantly reduce nutrient loading to Rainbow Creek. The County should aggressively review proposed projects that have the potential to contribute nitrogen and phosphorus to the Rainbow Creek watershed and take appropriate actions. The CEQA process should be used to ensure compliance with the TMDL and force project proponents to mitigate for nutrient impacts. The Regional Board will direct the County of San Diego to submit a report on the changes it has implemented in its environmental review processes by [end of 2nd year after USEPA approval] and every four years thereafter.

E) Nutrient Reduction Management Plan. The Regional Board will request that the County of San Diego develop and implement a watershed wide Nutrient Reduction and Management Plan (NRMP) for new and existing land use activities in the watershed.

The Regional Board recognizes that the preferable route for managing nutrient loads in Rainbow Creek is through the voluntary cooperation of land users since the most effective land management will most likely come from those with personal interests in land and water resources. Therefore, the approach in implementing these TMDLs is to develop and implement an NRMP that will assist landowners to make the needed reductions for achieving water quality objectives and restoring beneficial uses. Because voluntary actions may not be sufficient to resolve nutrient problems, the Regional Board will use its authority to require the County of San Diego to prepare a technical report describing how it will use its existing authority to develop an NRMP for the land use activities. The Regional Board will issue a letter pursuant to 13225(c) that will specify the report submittal date.

The NRMP will function as the principal planning and guidance document for the watershed. It should provide an inventory of land users, assess the need for management measures, identify and evaluate appropriate BMPs for land uses, provide information and offer assistance to land-users (i.e., community outreach), and describe a monitoring program. The plan should be flexible enough to accommodate modifications, as new information becomes available from the above-mentioned investigations. Additionally, the NRMP should evaluate and measure the effectiveness and success of the NRMP in meeting nutrient reductions. The proposed NRMP should be submitted to the Regional Board for review within 1 year after USEPA approval of the TMDL.

The NRMP should include the following three components:

1. Management Measures and Best Management Practices

The NRMP should address, at a minimum, management measures for agriculture and nursery management, residential runoff management, and septic tank disposal system management (SWRCB & CCC, 2000). The NRMP should specify management, structural, and vegetative best management practices (BMPs) for each management measure and evaluate the effectiveness. BMPs should be specified that prevent or control pollutants at the source. Management BMPs prevent pollution by controlling land uses with laws (zoning ordinances, discharge permits) and planning (nutrient management plans, road maintenance programs). Structural and vegetative BMPs control pollution by intercepting the flow of water from the source before it reaches a waterbody. The basic management measures are described below.

a) *Agriculture and Nursery Management.* Manage agricultural and nursery fertilizer application and irrigation practices to reduce runoff of nutrients in wastewater, as well as soil erosion to the creek (to prevent phosphorus transport). Encourage management practices for wet and dry weather runoff, fertilizer usage, and irrigation practices should be encouraged.

   Nutrient Management. Provide information and assistance to growers for nutrient management. Elements may include determination of crop nutrient needs and a crop nutrient budget, identification of the types, amounts, and timing of nutrients necessary to produce a crop based on realistic crop yield expectations, soil sampling and tests to determine crop nutrient needs, and proper calibration of nutrient equipment. Additionally, if manure is to be used as a soil amendment and/or is disposed of on land, the plan should discuss steps to assure that subsequent irrigation does not leach excess nutrients to surface or ground water.

   Irrigation Water Management. Address measures that promote effective irrigation while reducing pollutant delivery to surface and ground waters. Apply irrigation water uniformly based on an accurate measurement of crop water needs and the volume of irrigation water applied, considering limitations raised by such issues as water rights, pollutant concentrations, water delivery restrictions, salt control, wetland, water supply, and frost/freeze temperature management. Apply additional precautions when chemicals are applied through irrigation.

b) *Residential Surface Flow Management.* Address residential runoff management to reduce discharges of pollutants and runoff flow from existing and proposed development. This is primarily directed at management of livestock and pet waste, fertilizer application and irrigation practices to reduce runoff of nutrients from development. Develop measures to protect and restore the creek by minimizing pollutant loading and negative impacts resulting from urbanization, minimize soil erosion and sedimentation problems, maintain predevelopment hydrologic conditions, protect groundwater resources, and manage aquatic and riparian resources.

c) *Septic Tank Disposal System Management.* Address septic tank disposal system management to reduce impact to groundwater. Elements for this measure may include encouraging septic tank disposal system owners to perform routine maintenance on their systems, such as annually pumping septic tank disposal tanks. Establish authority, such as through the creation of a Maintenance District, to develop and implement a program for routine inspection and certification of septic tank disposal system compliance to determine that the systems are operating in a manner that protects water quality. Develop consistent inspection and reporting protocols and certification of inspection forms for septic tank disposal tank pumpers. Ensure that leachfields are located sufficiently above the groundwater table by relocating them, using mound systems, or installing underdrains or french (curtain) drains (discharges from such drains must be retained on-site to avoid NPDES requirements for an off-site discharge). Evaluate alternative septic tank disposal waste disposal systems appropriate for the community such as constructed wetlands, overland flow, or slow rate land application.

<u>2. Community Outreach and Assistance Programs</u>

Develop a community outreach program that implements pollution prevention and education programs to reduce nutrients generated from activities that cause excess delivery of nutrients and/or leaching of nutrients, and irrigation activities that cause nutrient pollution of surface and ground waters. The recommendations and proposed methods of implementation are:

a) Increase community awareness of the nature and importance of the watershed through distribution of information. Involve the general public in watershed protection programs. In public schools, participate in Adopt-a-Watershed and other watershed-awareness activities. Distribute newsletters and brochures to increase public awareness of watershed issues. Provide watershed and polluted runoff information at local establishments and trail entrances.

b) Provide the community with information on proper septic tank disposal tank maintenance and the impact of septic tank disposal system operations on water quality. Provide homeowner education and encourage appropriate system operation and maintenance. This may be in the form of a septic tank disposal system newsletter and brochures.

c) Provide the community with information on the proper application of fertilizers and irrigation water. Raise awareness of and increase the use of applicable urban management measures and management practices where needed to control and prevent adverse impacts to surface and ground water. This is in the form of soil fertility seminars and soil fertility brochures. The general public should be targeted, as well as the agricultural and horticultural community.

<u>3. Monitoring Plan</u>

The NRMP must include a monitoring element that describes the details of the watershed monitoring program. The purpose of the monitoring program is to provide an assessment of progress in achieving water quality standards, as well as NRMP effectiveness in addressing management measures. The monitoring plan requirements are described in more detailed below in Section F Monitoring Strategy.

F) Monitoring Strategy. The Regional Board will direct the County of San Diego to develop and implement a monitoring and reporting program to evaluate ambient water quality in Rainbow Creek, the effectiveness of the NRMP, and the effectiveness of the nutrient load reductions. The

Regional Board will require the County to submit reports annually and due on March 1 of the year following the monitoring year.

1. Water Quality Monitoring

The County should monitor the flow and nutrient concentrations in the creek to both meet nutrient targets and demonstrate that load reductions are being met. Sampling for the drinking water objective will be conducted year round, while objectives for biostimulatory substances only need to be collected during the critical period of February through September of each year. Water quality monitoring will be used to demonstrate that numeric targets are being met. Monitoring results will also be useful in demonstrating the effectiveness of the NRMP programs and the TMDLs, and in further evaluating the condition of the watershed. As part of the NRMP, the County of San Diego should include a monitoring component that will monitor the flow and nutrient concentrations in the creek to meet nutrient targets and demonstrate that load reductions are being met. The monitoring should address the items described below and presented in Table 9-2. Sampling for nitrates in drinking water (10 mg NO_3-N/L) and biostimulatory substances (1.0 mg N/L and 0.1 mg P/L) will be conducted year-round.

a) Monitoring Stations. It is recommended that, at a minimum, monitoring should be performed at established locations for comparison with previous monitoring results. The locations are Jubilee, Hines Nursery, Oak Crest, Rainbow Glen Tributary, Margarita Glen Tributary, Willow Glen-4, Willow Glen Tributary, Riverhouse, Via Milpas Tributary, and Stage Coach (See Figure A-3). A sampling location between Oak Crest and Willow Glen-4 is also recommended. The results from each monitoring station will represent the water quality from the reach above it to the next monitoring location. Additional monitoring points may be added, as needed, to adequately address reaches and particular interests. For instance, a monitoring location might be placed downstream of Oak Crest Mobile Estates to represent nutrient loading from this property. The County is encouraged to make cooperative agreements with stakeholders/landowners to perform the monitoring at additional locations. However, the County should coordinate efforts to provide consistency in the monitoring program.

b) Monitoring Parameters. The monitoring should include, at a minimum, water quality, flow measurements, physical parameters, algal biomass, and biological assessment monitoring of benthic macroinvertebrates (see Table 9-2). The water quality measurements should include nitrogen (including nitrate, nitrite, ammonia and total Kjeldahl nitrogen (TKN)), phosphorus (including orthophosphate and total), dissolved oxygen, pH, turbidity, and temperature. Flow rate measurements will be needed to calculate loading, provide additional information about the hydrology of the watershed, and may be used to identify patterns in algal growth.

c) Algal Biomass. Algal biomass should be quantified by mass and/or by % cover of bottom (USEPA 2000). Collection and measurement of algal biomass should be performed uniformly or by a standardized method (see USEPA 2000). A sample design should be proposed. Additionally, characterization of algal species composition is recommended to provide a more reliable indicator of trophic status and evidence of nutrient condition (USEPA 2000). The growth of algae is stimulated principally by nutrients such as nitrogen and phosphorus, but also requires adequate water temperature, light, flow and dissolved oxygen.

It is assumed at this time that both are co-limiting. Characterization of algal species composition may give a better understanding of the relationships between all the factors that affect algal growth, including sunlight, nitrogen, phosphorus, temperature, and dissolved oxygen.

d) Biological Assessment Monitoring. Biological assessment monitoring of benthic macroinvertebrates should be performed at a minimum of three stations on Rainbow Creek and a reference stream. Biological assessment monitoring should be performed in accordance with the California Stream Bioassessment Methods Manual (Harrington and Born 2000). Any change in the stream's biological integrity (e.g., an increase or decrease in diversity and abundance of sensitive species) will be used as an indicator of changes in the health of the creek.

   Sampling done in 1998-99 for the San Diego Ambient Bioassessment Program indicates that benthic macroinvertebrate communities vary seasonally. The seasonal trend could be due in part to rainfall and consequent streamflow conditions (e.g., scouring). Thus, sites should be sampled for benthic macroinvertebrates at least twice each year: once during the spring (i.e., May), and again in the fall (preferably in October).

The components of the water quality monitoring plan, described above, are presented in Table 9-2. Components of the groundwater monitoring related with the groundwater investigation are also included in the table.

Table 9-2 Components for Water Quality Monitoring

Parameter	Type of sample
Surface Water Monitoring	
Total nitrogen, nitrate, ammonia[1], nitrites, TKN, orthophosphate and total phosphorus concentrations	Grab
Temperature	In Situ
pH	In Situ
Dissolved Oxygen	In Situ
Turbidity	In Situ
TDS	Grab
Flow rate measurements of surface water	Field Measurement
Algal biomass (% cover of bottom and/or Chl a/ash free dry weight (AFDM))	In Situ and/or Grab
Benthic macroinvertebrate community analysis	Grab
Groundwater Investigation Monitoring	
Total nitrogen, nitrates, ammonia, nitrites, TKN, orthophosphate and total phosphorus concentrations	Grab
Temperature	Field Measurement
pH	Grab
Dissolved Oxygen	Grab
TDS	Grab
Depth to Groundwater	Field Measurement

[1] Laboratory detection limits should be sufficient to determine compliance with the objective for un-ionized ammonia in surface waters (25 µg/L).

The monitoring described in Table 9-2 contains the minimum monitoring to be performed. The County may include additional monitoring of parameters, frequency, and/or sampling locations. The County may select alternative or additional monitoring points if it is deemed useful and if they provide rationale. A certified laboratory should be used with an approved QA/QC plan for field monitoring.

2. NRMP Program Effectiveness. Assessing the performance of the NRMP program elements and the specific BMPs that comprise them is crucial to the successful implementation of the TMDLs. The effectiveness of BMP implementation is ultimately measured over time by changes in the pollutant levels in downstream receiving waters, which comply with water quality standards. Information collected through water quality monitoring will be useful in identifying trends and assessing the effectiveness of the program in general. However, monitoring data alone can not be relied upon to assess the effectiveness of individual program elements or BMPs that comprise the overall program. The basis for measuring the overall effectiveness of the program must therefore be a collective assessment of the effectiveness of the BMPs implemented within that program. Long and short-term strategies for assessing the effectiveness using direct and indirect measurements should be tracked and evaluated. Specific measures should be developed and tracked at both the programmatic and specific BMP level. A suite of measures, which allows for assessment on a variety of levels and time frames, should therefore be developed. The effectiveness of the program elements, must be measured, assessed, and reported as part of an annual report. Any recommendations, findings, and suggested changes to the program should be included in the annual report.

Baseline conditions must be defined and all future comparisons showing improvements will be made relative to these baseline conditions. In addition, the largest incremental improvements in receiving water quality are often realized at the beginning of an implementation program. In the absence of a well-defined baseline, these improvements cannot be adequately measured.

The Regional Board will require the County to include an assessment of the performance of NRMP program elements in the annual monitoring reports.

3. Load Reduction Effectiveness. Assessing the effectiveness of the load reductions is also crucial to the successful implementation of the TMDLs. Achievement of the load reductions presented in Tables 6-1 and 6-2 needs to be assessed and determined. Also, a determination must be made whether the expected water quality improvements in Rainbow Creek are observed. The Regional Board will require the County to include an assessment of the load reduction effectiveness in the annual monitoring reports.

9.5.1.2 MS4 Permit

The Waste Discharge Requirements for discharges of urban runoff associated with Municipal Separate Storm Sewer Systems (MS4) in the County of San Diego contained in Order No. 2001-01, NPDES No. CAS0108758, require the County to reduce sources of pollutants, including nutrients, associated with urban development. These requirements are applicable to any areas in the Rainbow Creek watershed where the County operates and maintains an MS4. To the extent the MS4 permit applies in the Rainbow Creek Watershed, the County shall implement the requirements of Order No. 2001-01.

9.5.1.3 Existing Waste Discharge Requirements

The Regional Board will review and, if necessary, revise waste discharge requirements for existing dischargers in the Rainbow Creek watershed to incorporate effluent limitations in conformance with the nutrient load reductions. This review will be done in accordance with the

Regional Board review and update schedule for waste discharge requirements. There are three existing regulated dischargers in the Rainbow Creek watershed: Oak Crest Mobile Estates, Rainbow Conservation Camp, and Temecula Truck Inspection Facility. The Rainbow Truck Weigh and Inspection Facility, discharges under the terms of a waiver of waste discharge requirements (Order No. 2000-235 on November 8, 2000).

9.5.1.4 Existing Waste Discharge Prohibitions.
Prohibitions against discharges of waste that cause pollution or nuisance, described in the Basin Plan, including discharges of nutrients that would cause or contribute to violation of water quality objectives are applicable to landowners in the Rainbow Creek watershed. Dischargers of nutrients in the Rainbow Creek watershed shall also comply with all other applicable waste discharge prohibitions contained in this Basin Plan.

<u>Hines Nursery</u>
As described above in Section 2.2 Watershed Description, Hines Nursery is discharging irrigation runoff directly into Rainbow Creek and one of its tributaries as part of their normal operations. The existing irrigation recycle system was put in place as a BMP measure to minimize downstream discharges of irrigation runoff to Rainbow Creek. Irrigation runoff is piped to, conveyed by, and stored in the creek and in an adjacent storage pond for pumping back into the irrigation system. An earthen dam located in the creek near the point of discharge from the site restricts water from leaving the site during normal operations. However, periodic exceedance of the system capacity, either by increased storm water runoff or by putting too much water into the system, allows for the discharge of irrigation waters downstream of the nursery.

Additionally, the streambed has been altered over the years (Summers 2002). The creek has been channelized with un-engineered riprap and much of the riparian vegetation has been removed. The County of San Diego and the Army Corps. of Engineers modified the creek, in cooperation with Flynn Rainbow Nurseries, to address flooding concerns raised by a severe flood in 1992. An adjacent nursery removed riparian vegetation and made channel modifications in connection with the construction of a greenhouse. Flynn Rainbow Nurseries made modifications in connection with the installation of the irrigation recycle system. Hines Nursery currently maintains the earthen dam, which is prone to occasional wash out during high storm flows, and performs occasional slope stabilization of the walls of the creek to avoid subsidence problems. The Regional Board has not authorized these modifications to the creek.

Hines Nursery is in violation of the waste discharge prohibition for discharge of waste to waters of the state in a manner causing a condition of pollution, contamination, and nuisance. The nursery is currently working with the Regional Board to correct the discharge. In a letter dated July 28, 1999, the nursery stated their intentions to install a new recycle system by mid-2000, pending the acquisition of the land on which the nursery sets. The land was successfully acquired on May 24, 2001. The system is expected to capture approximately 90% of the runoff and utilize a system of canals, pipes and lift pumps and an above ground storage pond. During storm conditions, storm water will be allowed to enter the creek, but only after a “first flush” (0.5 inches of rain) has been captured in the reservoir (Summers 2002). System installation is expected to take 3 years to complete. The Regional Board has not reviewed or authorized the proposed recycle system.

9.5.1.5 New Waste Discharge Requirements and Prohibitions
To the extent that voluntary actions by landowners within the watershed fail to attain conformance with nutrient load reductions, the Regional Board may consider adoption of new waste discharge requirements for landowners and new Basin Plan waste discharge prohibitions applicable to nutrient discharges in the Rainbow Creek watershed.

9.5.1.6 Enforcement Authority of Regional Board
The Regional Board will use its enforcement authority as necessary to ensure compliance with waste discharge requirements and Basin Plan waste discharge prohibitions.

9.5.1.7 CEQA Document Review by Regional Board
The Regional Board should review and comment on environmental documents (e.g., notice of preparations, negative declarations, and environmental impact reports) for new development projects in the Rainbow Creek watershed. Review of these documents will help assure that nutrient issues are addressed and mitigated, if necessary, in accordance with the TMDLs.

9.5.2 Phase II – Nitrogen and Phosphorus Reductions
Following the implementation of the initial reductions during the first 4 years after approval of the TMDLs for Rainbow Creek, Phase II activities will continue to reduce nutrient loading in incremental steps (10% every 4 years) with the ultimate goal of achieving the water quality objectives for biostimulatory substances. To do this, the continuation of the implementation measures described in Phase I is necessary. Additionally, programs developed as part of the NRMP should be continued. NRMP programs should be assessed annually and their effectiveness evaluated to ensure progress towards attainment of water quality standards, assure flexibility in the program, and allow for improvements to the program as new information becomes available through monitoring or other means. It is expected that more stringent measures will be needed to meet the additional reductions, as they are phased-in.

9.6 TMDL Review by Regional Board
The Regional Board will track implementation and review submitted reports from the County of San Diego on the results of monitoring. Tracking TMDL implementation, monitoring water quality progress, and modifying TMDLs and implementation plans to ensure attainment of water quality standards is important to:

- Address uncertainties in aspects of TMDL development,
- Oversee TMDL implementation to ensure that implementation is being carried out, and
- Ensure that the TMDLs remains effective, given changes that may occur in the watershed after the TMDLs are developed, and
- Ensure water quality standards are achieved.

The basis for the TMDLs and phased implementation schedule will be re-evaluated every 5 years to determine the need for modifying the source analysis, load allocations, and potentially the numeric targets for biostimulatory substances. Revisions to the source analysis and load allocations will largely be based on findings from the investigations of groundwater and septic tank disposal systems, and empirical data collected from Rainbow Creek under the Monitoring

Strategy. Numeric objectives also may be revised if appropriate based on the surveillance and monitoring data obtained from status and annual reports. The first re-evaluation will begin in the 5th year following approval by US EPA. Subsequent evaluations will be performed on a four-year cycle.

The re-evaluation of the TMDLs should include the assessment of information provided from the groundwater and septic tank disposal investigations, and annual reports submitted by responsible parties as well as any new information that becomes available. This assessment should include reviewing the effectiveness of the implementation measures to determine whether a positive affect on the water quality and health of the creek can be measured. Program elements that should be reviewed include the effectiveness of BMPs, the success of public outreach programs, the effectiveness of enforcement measures, the need for alternative approaches, and a policy review.

9.7 Schedule of Implementation

The following schedule is provided to summarize milestones and due dates for the implementation of the TMDLs.

Table 9-1 Schedule of Implementation

Action	Description	Responsible Party	Completion Date
Phase I Measures			
1. Implementation measures by County of San Diego			
A. Investigations	1. Submit interim report to Regional Board 2. Submit report of findings to Regional Board	County of San Diego	1. End of 2nd year after USEPA approval 2. End of 4th year after USEPA approval
B. Ordinances	1. Submit Status Reports to Regional Board 2. Submit Annual Reports to Regional Board	County of San Diego	1. End of 2nd year after USEPA approval 2. Every 4 year after USEPA approval
C. Land Use Planning	Review and revise land use policies, decision making practices and project approval processes.	County of San Diego	1. End of 2nd year after USEPA approval 2. Every 4 years after USEPA approval
D. CEQA Responsibilities	Review and revise environmental review process for new development.	Regional Board	1. End of 2nd year after USEPA approval 2. Every 4 years after USEPA approval
E. Nitrate Reduction and Management Plan	Land-owners/land users comply with existing prohibitions. Regional Board apply regulatory authority as needed	Landowners and Regional Board	Submit within 1 year after USEPA approval of the TMDL.
Monitoring Strategy	Develop and implement a monitoring and reporting program	County of San Diego	Every year after USEPA approval.
2. MS4 Permit	To the extent the MS4 permit applies in the Rainbow Creek Watershed, the County shall implement the requirements of Order No. 2001-01.	County of San Diego	On-going
3. Existing Waste Discharge Requirements	Review and revise waster discharge requirements	Regional Board	In accord with Regional Board review and update schedule.
4. Existing Waste	Comply with Basin Plan discharge	Landowers	On-going

Action	Description	Responsible Party	Completion Date
Discharge Prohibitions	prohibitons.		
5. New Waste Discharge Requirements and Prohibitions	If landowners within the watershed fail to attain conformance with nutrient load reductions	Regional Board	On-going
6. Enforcement Authority of Regional Board	Regional Board will use its enforcement authority as necessary.	Regional Board	On-going
F. CEQA Document Review by Regional Board	Review environmental documents of projects in the watershed for compliance with the TMDLs	Regional Board	On-going
Phase II Measures			
G. Continue NRMP	Continue the implementation of NRMP programs	County of San Diego	On-going
H. Re-evaluate NRMP	Evaluate NRMP program effectiveness and submit summary/proposals of changes made to program if needed	County of San Diego	End of 4th year after USEPA approval and biannually thereafter
TMDL Review by Regional Board			**Begin Date**
I. TMDL Review by Regional Board	Evaluate effectiveness of all TMDLs and revise TMDLs if needed	Regional Board	5th year after USEPA approval and every five years thereafter

10.0 Environmental Review

Under the basin planning process, the plan amendment, as well as the staff report and backup materials, serve as a "functional equivalent" to an environmental impact report or negative declaration and initial study. Pursuant to state regulations the documents that are required for planning actions include an environmental checklist, and a written staff report that describes the proposed action, evaluates reasonable alternatives to the proposed action, and mitigates any significant adverse impacts that are identified [23 CCR 3777].

In summary, the proposed action is to incorporate total maximum daily loads (TMDLs) for nitrogen and phosphorus and assign load allocations in order to attain water quality objectives and restore beneficial uses in Rainbow Creek. Initial load allocations are assigned to general land use categories and nutrient sources to reduce nutrient inputs to the creek. The implementation plan uses an iterative process to investigate, and identify and implement actions needed to achieve the reductions. This process is based on the three-tiered approach that ranges from self-determined implementation to regulatory enforcement, with emphasis placed on self-determined, or voluntary, actions assisted by local government watershed planning.

The adoption of a Basin Plan amendment to incorporate TMDLs and a TMDL implementation plan for Rainbow Creek will not in itself have a significant effect on the environment. A significant effect is defined under CEQA as a substantial, or potentially substantial, adverse change in the environment (Public Resources Code §21000 et seq.). However, implementation of the TMDLs will involve projects, which may have environmental impacts. The precise nature, location, and significance of these impacts cannot be determined at this time, since the implementation program establishes a process for identifying subsequent projects rather than specifying particular remedial projects at specific locations. Further CEQA documents may be required for specific implementation projects once determined. Overall, the long-term impacts of implementing the TMDL on water quality, aquatic and terrestrial life, and recreational uses of water will be beneficial. The environmental checklist, found in Attachment E, presents the potential for environmental impacts. A discussion of related issues of concern, potential alternatives, and mitigation on the subject of this Basin Plan amendment is presented below.

10.1 Issues of Concern

This section summarizes controversial issues associated with the project that have been identified during the development of the TMDLs.

Need for the TMDL

Over the course of the development of the TMDL, some stakeholders have expressed satisfaction with the fact that current concentrations are substantially less than the concentrations observed in the mid-1980s, and do not feel that beneficial uses are impaired. In essence, they felt that there is no need for TMDLs to be established for the watershed. The discussion in the problem statement in this staff report supports the need for the TMDLs.

Feasibility of attaining the biostimulatory targets and load allocations

Stakeholders have questioned whether it will be technically feasible to attain the biostimulatory targets or reduce loading to the levels required to meet the proposed TMDLs. First, the TMDL targets are very near or below background concentrations that have been observed in the region. Second, stakeholders question the likelihood of an agricultural community to completely reduce nutrient loads to near zero, which would be necessary to attain the targets. This staff report includes provisions to investigate and monitor to fill data gaps that will assist in determining the assimilative capacity, and provide opportunities to re-evaluate the TMDLs and allocations.

There is additional criticism about the method used to estimate loading. The current loading was estimated using a simple model, based on literature values of nutrient export rates from particular land use types. The load allocations were also based to a large extent, on the same nutrient export rates (i.e., a land use with a higher nutrient export rate will have a larger reduction to make compared to a land use with a lower export rate). The criticism is that nutrient export coefficients aren't expressly site-specific or tailored to the local topography, soil and vegetation types. The premise is based on the fact that the use of the export coefficients introduces errors in the loading estimates and overestimate load reduction. The staff report identifies these uncertainties and includes provisions to fill data gaps. Furthermore, the TMDLs will be re-evaluated, as new information becomes available.

10.2 Alternatives

This section describes reasonable alternatives to the proposed project, which would feasibly attain the basic objective of the project but would avoid or substantially lessen any of the significant effects of the action, and evaluate the comparative merits of the alternatives. The four alternatives include taking "no action", using a regulatory approach to TMDL implementation, and deferring the Phase II TMDLs until either site-specific water quality objectives are developed or new nutrient criteria are established.

1) <u>No Action</u>

The "no action" alternative is not to adopt the Basin Plan amendment to incorporate the nutrient TMDLs and implementation plan. Selection of the "no action" alternative would mean the continuation of the existing programs and operations. There are currently no formal management or public outreach measures occurring in the watershed. Previous community outreach efforts developed during two 319(h) grants promoted nonpoint source control and septic tank disposal system maintenance to the residents. These activities are no longer funded and have not been continued.

If TMDLs are not implemented in this watershed, implementation of BMPs will eventually be required for control of surface runoff under the statewide Nonpoint Source Plan, which could lead to some improvement in the water quality of the creek. However, without control of nutrient sources to groundwater, Rainbow Creek will remain in violation of water quality objectives and the impairment of aquatic and terrestrial habitat, and recreational beneficial uses will continue.

Ultimately, if the State does not adopt the proposed TMDLs and implementation plan, the USEPA is required to develop and adopt TMDLs pursuant to section 303(d) of the CWA. It is likely that the USEPA would adopt TMDLs based on the recommended nutrient criteria of 0.38 mg/L total nitrogen and 0.022 mg/L total phosphorus for streams in the xeric west ecoregion [USEPA 2000b]. Additionally, under revisions to the federal TMDL regulations, which are scheduled to take effect in April 2003, the USEPA would also adopt an implementation program. Thus, the "no action" alternative would eventually lead to federal, rather than state, requirements for implementation projects with environmental impacts similar to those discussed in this staff report.

2) <u>Regulatory Approach to TMDL Implementation</u>

This alternative is a variation on the proposed action. This alternative would adopt the proposed TMDLs but would use a regulatory approach to implement remedial water quality control (e.g., waste discharge requirements, enforcement orders, etc.) instead of a primarily community-based watershed management approach. The regulatory approach would involve evaluating compliance of individual landowners with waste discharge prohibitions in the Basin Plan. All landowners would be requested to submit a report of waste discharge followed by issuance of permits (i.e., waivers of waste discharge, waste discharge requirements, etc.) as needed. The regulatory approach could hasten implementation and ensure more rapid improvements in water quality and beneficial uses. However, this alternative would require a larger allocation of Regional Board staff resources for permit writing and enforcement, and would not be well received by the local community.

3) <u>Establish Phase II TMDLs Based on Site-Specific Water Quality Objectives</u>

This alternative pertains to the adoption of the TMDLs for biostimulatory substances. The proposed TMDLs are based on numeric goals presented in the narrative objective for biostimulatory substances, found in the Basin Plan. In accordance with the Basin Plan, this objective must be met to assure beneficial uses. As mentioned above, there are issues of concern regarding the feasibility of applying these numeric goals as targets. One possible alternative is to develop site-specific nutrient water quality objectives for Rainbow Creek that are set above the current objective for biostimulatory substances, provided that beneficial uses are shown to be unimpaired. This would involve performing more extensive study to establish the "true" assimilative capacity of Rainbow Creek. Once the site-specific objective is adopted, nitrogen and phosphorus TMDLs could be developed and allocated.

In order to adopt a new site-specific objective for Rainbow Creek, an analysis that evaluates the beneficial uses, water quality conditions, economic considerations, the need for housing and the need to develop and use recycled water must be performed [CWC 13241]. The analysis must demonstrate that reasonable protection of beneficial uses and the prevention of nuisance can be assured at the proposed level.

This alternative assumes that the Phase I TMDLs would be adopted, but would delay the adoption of nutrient TMDLs that would assure attainment of water quality standards until TMDLs can be developed based on a new site-specific objective for biostimulatory substances. This is not a feasible alternative. By definition, the TMDL must require load reductions to reach the existing water quality objectives. And as mentioned previously, the USEPA will develop and adopt TMDLs pursuant to section 303(d) of the CWA if the State does not adopt the proposed TMDLs in a timely manner. It is likely that the USEPA would adopt TMDLs based on the recommended nutrient criteria published in December of 2000.

4) <u>Defer Adoption of Phase II Targets until New Nutrient Criteria is Established</u>
The USEPA has charged the State and Regional Boards with adopting numeric nutrient criteria by the end of 2004. As mentioned above, the USEPA has proposed nutrient criteria for adoption by the states. These criteria are more stringent in that they are substantially lower in allowable concentrations than the biostimulatory water quality objective for nitrogen and phosphorus discussed in this staff report. Alternatively, the State and Regional Boards are currently in the process of developing region-specific numeric criteria for California. It is not known whether the new numeric criteria will be more or less stringent than the current biostimulatory objective.

This alternative assumes that the Phase I TMDLs would be adopted, but would delay the adoption of nutrient TMDLs that would assure attainment of water quality standards until the new numeric criteria are adopted and can be evaluated in the context of the TMDL requirements. This is not a feasible alternative. By definition, the TMDL must require load reductions to reach the existing water quality objectives. And as mentioned previously, if the State does not adopt the proposed TMDLs, the USEPA will likely develop and adopt TMDLs pursuant to section 303(d) of the CWA.

10.3 Mitigation

The proposed action will not have any direct adverse environmental impacts. The implementation of TMDLs will in effect lead to an overall improvement in the quality of water and therefore the quality of the environment. Potential, or indirect, impacts could arise from projects that result from TMDL implementation; however, these projects and their impacts are speculative at this time. Additionally, subsequent environmental documents prepared for specific implementation projects will identify site-specific mitigation needs. Therefore, no mitigation, or mitigation monitoring, is currently required.

11.0 Economic Considerations

State law requires the Regional Board to consider economic factors in relation to environmental analysis of the reasonably foreseeable methods of compliance when adopting a performance standard, and identify the total cost of the program and potential sources of financing when implementing an agricultural water quality control program. A TMDL in combination with the load allocations may be considered a performance standard [Govt. Code § 11342(d)]. Additionally, water quality control measures of agricultural land uses are included in the recommended implementation plan.

Section 11.1 below provides the estimated costs for the County of San Diego to develop a NRMP and to implement the monitoring, investigation, and outreach elements. The estimated implementation costs for potential BMPs that may be implemented by landowners and land users are provided in Section 11.2.

11.1 Costs of Investigations and NRMP

The County of San Diego will voluntarily perform an investigation of groundwater and septic tanks, which will serve to fill data gaps. The County will also voluntarily develop an NRMP and act as program coordinator to work with the community and provide assistance. The County has provided preliminary cost estimates for the monitoring and program elements expected to be included in this program. A summary of these estimated costs is provided in Table 11-1.

Table 11-1 Summary of First Year and Subsequent Annual Cost for Conducting Rainbow Creek TMDL Studies

Item	First Year Cost	Annual Cost
Develop NRMP	$50,000	$10,000
Surface Water Monitoring Program[1]	$150,070	$150,070
Groundwater and Septic Investigation[2] Program	$102,480	$50,000
Equipment and Outreach[3]	$66,000	$20,000
Total	$368,550	$230,070

1. See Table 11-2
2. See Table 11-3
3. See Table 11-4

<u>Costs to Develop Nutrient Reduction and Management Plan (NRMP)</u>

The estimated cost to prepare the initial Draft and Final NRMP is $50,000. It is anticipated that revisions will be made to the NRMP based on the results of investigations, and to incorporate lessons learned regarding BMP effectiveness and community responsiveness. The revisions to the NRMP may cost approximately $10,000 per year. The costs associated with the NRMP document are presented in Table 11-1.

Surface Water Monitoring Program Costs

Consistent with the Monitoring Strategy described in Section 9.5.1, the surface water monitoring program would likely include bimonthly monitoring for nutrients, physical parameters, and flow, monthly monitoring of chlorophyll a (water column), and algal biomass monitoring (algae sample) every other month, at 11 stations on Rainbow Creek and its tributaries. Bioassessment would also be performed at 4 locations on Rainbow Creek and at 1 reference station twice per year. Staff time to perform monitoring, data management, and report preparation have also been estimated. Table 11-2 presents the estimated annual costs associated with surface water monitoring.

Table 11-2 Total Annual Cost Estimates for Surface Water Monitoring Program

Monitoring Parameters	**Total Number of Samples**	**Cost per sample**	**Total Estimated Cost**
Nutrients	264	$140	$36,960
Physical	264	$30	$7,920
Chlorophyll a	132	$50	$6,600
Algal Biomass	66	$15	$990
Bioassessment	30	$400	$12,000
Staff Time	**Hours**	**Rate**	
Field Staff Time (field preparation, equip. maintenance, water sampling, field measurements, sample submission, etc.)	480	$50	$24,000
Data Management	160	$60	$9,600
Data Analysis	120	$60	$7,200
Report Preparation	160	$60	$9,600
Other	120	$60	$7,200
Total			**$150,070**

Groundwater and Septic Investigation Program Costs

The groundwater and septic investigations will likely include the quarterly monitoring of 6 well or hydropunch locations. Other costs are expected to include soil characterization, well drilling and hydropunch, and tracer studies. County staff time to perform monitoring, data management, and report preparation have also been estimated. The equipment costs (i.e., well installations) are assumed to be incurred in the first year only. Costs for continued groundwater monitoring and additional studies as needed are anticipated to be about $50,000 per year in subsequent years. Table 11-3 presents the estimated annual costs associated with surface water monitoring.

Table 11-3 Total Annual Cost Estimates for Groundwater and Septic Investigation Program

Monitoring Parameters	Total Number of Samples	Cost per sample	Total Estimated Cost
Nutrients	24	$140	$3,360
Physical	24	$30	$720
General Mineral	24	$150	$3,600
Other Costs			
Well Drilling/Hydropunch			$20,000
Consultant Services			$20,000
Soil Characterizations			$5,000
Special Studies (tracer, other)			$20,000
Additional Sampling Equipment (steel tape, chalk, gloves, disposable bailers, buckets, 55-gallon drums, disposal, etc.)			$5,000
Staff Time	**Hours**	**Rate**	
Field Staff Time (transportation time, manual well purging, sampling, equipment, etc.)	160	$50	$8,000
Data Management	40	$60	$2,400
Data Analysis	120	$60	$7,200
Report Preparation	80	$60	$4,800
Other	40	$60	$2,400
		Total	**$102,480**

<u>Equipment and Outreach Costs</u>
The equipment and installation costs are expected to be incurred in the first year only. Costs for continued outreach is anticipated to be about $20,000 per year in subsequent years. Potential equipment and outreach costs were identified and are presented in Table 11-4.

Table 11-4 Estimated Equipment and Outreach Costs

Item	Total Estimated Costs
Flow monitoring equipment and installation	$30,000
Multi-parameter probe	$5,000
Rain gauge installation and maintenance	$6,000
Rainfall Chemistry	$10,000
Miscellaneous field equipment	$5,000
Public Outreach	$10,000
	$66,000

11.2 BMP and Other Implementation Costs

Landowners and land users (such as homeowners, nurseries, and other businesses) are responsible for taking measures to reduce and/or control discharges (e.g., surface runoff, or septic tank discharge) from their properties to assure compliance with the TMDLs described in this staff report. It is expected that best management practices (BMPs) will include, but not limited to, the practical management of wet and dry weather runoff, fertilizer usage, and irrigation practices. The cost of implementing these TMDLs will range widely, depending on which BMPs the responsible parties select to meet the load allocations.

It is reasonable to expect that the predominant BMP type will be management BMPs. Management BMPs for agricultural operations to control surface runoff and infiltration may include managing fertilizer use or effective irrigation. Such BMPs are typically low in cost and may offer cost savings as a result of lower fertilizer and water usage. Some examples of management BMPs include:

- Cropland Nutrient Management. As part of this plan, fertilizer reductions are enacted in order to only apply nutrients at rates that ensure adequate soil fertility for crop production, thus reducing the availability of excess nutrient to runoff water.
- Soil Conservation and Water Quality Plans. Soil conservation and water quality plans are comprehensive plans that address natural resource management concerns on agricultural lands and utilize BMPs to control erosion and runoff.
- Irrigation Water Management. Irrigation water management is a strategy for managing crop water use. The primary purpose is to assess the performance of the irrigation system, measure the outputs and uniformity, and make recommendations to improve the irrigation system performance.

Another possible solution to reduce nutrient loading is the use to use structural BMPs near and around Rainbow Creek. Some examples of structural BMPs include:

- Forest and Grass Buffers. Buffers are linear strips of vegetation along rivers and streams that help to filter nutrients, sediment, and other pollutants carried in runoff as well as excess nutrients in groundwater.
- Stormwater Management Systems. These systems include extended detention areas (dry basins or ponds), retention ponds, stormwater wetlands, pond-wetland systems, stormwater conversions (conversion from dry to retention), and sand filters.
- Runoff Control for Animal Confinement Areas. A facility with an existing animal waste storage structure may not have runoff controls for animal confinement areas. As a result, run-off from up-slope areas and roof flows to feedlots can carry nutrients to surface waterbodies. Control measures include up-slope diversions and directed downspouts to minimize off-site water entering the facility.
- Stream Protection (with fences). Direct animal contact with surface waters and the resultant streambank erosion are primary causes of nutrient loss from pastures. Stream protection with fencing involves fencing narrow strips of land along streams to exclude or limit animals from entering the stream.
- Stream Protection (without fences). Stream protection without fences involves the use of troughs or “water holes” away from streams. In some instances, trees are planted away from the stream to provide shade for the livestock. This approach will greatly reduce the amount of time livestock spends in or near a stream.

Nutrient loading from septic tank disposal systems is thought to be significant in the Rainbow Creek watershed. Some landowners are maintaining their septic systems on a regular basis.

However the efficiency of septic system maintenance is not documented and its impacts are unknown. The implementation plan includes investigations by the County of San Diego to assess this source. It is anticipated that nutrient loading reductions may be achieved through three types of management practices. These practices include:

- Regular maintenance of the septic tank. This includes regular inspections and pumping of the septic tank.
- Denitrification of household wastewater.
- Connection to a centralized sewer treatment system.

Table 11-5 provides estimated costs for selected BMPs.

Table 11-5 Estimated Best Management Practice Costs

BMP	Estimated Cost
Cropland Nutrient Management	see 1 below
Soil Conservation and Water Quality Plans	see 1 below
Forest and Grass Buffers	$2,200 to $8,700 per acre[2]
Runoff Control for Animal Confinement Areas	$16,000 to $20,000[3]
Stream Protection (with fences).	$15,000 to $25,000 per 1000 linear ft.[4]
Stream Protection (without fences).	$500 to $5000 per 1000 linear ft.[5]
Regular maintenance of the septic tank	$30 to $500 per house
Denitrification of wastewater	$10,000 to $20,000 capital costs plus $1,000 to $2000 annual costs per house[6]
Centralized sewer treatment system	$5,000 to 20,000 capital costs plus $600 to $1200 annual costs per house[7]

1. May offer cost savings as a result of lower fertilizer and water usage.
2. $0.05 to $0.20 per ft^2 x $43,500 ft^2 per acre.
3. Unlined drainage ditches @ $15 per linear ft. x 1000 ft. plus $1,000 to $5,000 for retention pond.
4. $15 to $25 per linear ft. x 1000 ft.
5. Ranges from moving watering troughs to creating shaded areas away from stream.
6. Wastewater treatment system for single-family home. Includes sand and carbon filtering, storage tanks, pumps, and operation and maintenance costs.
7. Dependent upon grants and capital financing options (e.g. bonds), capital costs for system construction may be $5,000 to $20,000 per household or more. The capital costs may be structured as one-time fee and/or payments over time. Annual household costs for monthly service charges may range from $600 to $1200 per year ($50 to $100 per month).

<u>Commercial Nurseries</u>
Commercial nurseries were identified as contributing approximately 13 percent of the nitrogen surface water load. Some of the management and structural BMPs identified above may be appropriate for commercial nurseries to implement.

Hines Nursery identified a new system that is expected to recycle 90 percent or more of the non-storm water runoff from their nursery. The engineering, design, and construction of the new proposed recycling system is estimated to cost $1.5 to 2 million dollars. This does not include ongoing operation and maintenance costs, which may range from several hundred to a few thousand of dollars per month.

11.3 Potential Sources of Funding
Potential sources of funding include:
- Federal Clean Water Action Section 319(h) grants.
- Federal Clean Water Action Section 205(j) grants.
- State of California Proposition 13 funded grants.
- Other state, federal and other business loans, grants, and other assistance programs. These may include assistance from U.S. Small Business Administration and from conservation programs through various agencies such as the U.S. Department of Agriculture and Natural Resource Conservation Service
- Various secured and unsecured loans, including home equity loans and business loans.

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