California Regional Water Quality Control Board
San Diego Region

Draft

Basin Plan Amendment and Technical Report for
Total Nitrogen and Total Phosphorus
Total Maximum Daily Loads
For Rainbow Creek

Rainbow Valley

Resolution No. R9-2004-0401
Basin Plan Amendment and Technical Report

Public Review Draft
October 15, 2004

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
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Documents also are available at: http://www.swrcb.ca.gov/rwqcb9

BASIN PLAN AMENDMENT AND TECHNICAL REPORT FOR TOTAL NITROGEN AND TOTAL PHOSPHORUS TOTAL MAXIMUM DAILY LOADS FOR RAINBOW CREEK

Resolution No. R9-2004-0401
Basin Plan Amendment and Technical Report

Adopted by the
California Regional Water Quality Control Board
San Diego Region
on _____, 2004

Approved by the
State Water Resources Control Board
on _____, 2004
and the
Office of Administrative Law
on _____,2004
and the
United States Environmental Protection Agency
on _____. 2005

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Acronyms and Abbreviations

1988 Plan – Nonpoint Source Management Plan, November 1988
ACL – Administrative Civil Liability
AG – Attorney General
Basin Plan – Water Quality Control Plan for the San Diego Basin – Region 9
BMP – Best Management Practices
CalEPA – California Environmental Protection Agency
CalTrans – California Department of Transportation
CAMMPR – Volume II: California Management Measures for Polluted Runoff
CAO – Cleanup and Abatement Orders
CARCD – California Association of Resource Conservation Districts
CCR – California Code of Regulations
CDFFP – California Department of Forestry and Fire Protection
CDO – Cease and Desist order
CEQA – California Environmental Quality Act
CESA – California Endangered Species Act
CFB – California Farm Bureau
CFR – Code of Federal Regulations
County – County of San Diego
CTR – California Toxics Rule
CWA – Clean Water Act
CWC – California Water Code
DA – District Attorney
DPR - Department of Parks and Recreation
EIR – Environmental Impact Report
FY – Fiscal Year
GIS – Geographic Information System
LA – Load Allocation
LC – Loading Capacity
MAA – Management Agency Agreement
MCRD – Mission Resource Conservation District
MM – management measure
MOA - Memorandum of Agreement
MOS – Margin of Safety
MOU – Memorandum of Understanding
MP – management practice
MS4 – Municipal Separate Storm Sewer Systems
N – total nitrogen
N:P – Nitrogen to Phosphorus Ratio
NGO – non-governmental organization
NO_3 – nitrate
NOV – Notice of violation
NPDES – National Pollutant Discharge Elimination System
NPS – nonpoint source
NRCS – Natural Resources Conservation Service
NRMP – Nutrient Reduction and Management Plan
NRPI – Natural Resources Project Inventory
OAL – State Office of Administrative Law
OSDS – Onsite Disposal System
P – Total phosphorus

Porter-Cologne Act - Porter Cologne Water Quality Control Act
PRC – Public Resources Code
Program – NPS Pollution Control Program
Program Plan – *Plan for California's Nonpoint Source Pollution Control Program 1998-2013*
QA/QC – Quality Assessment/Quality Control
Regional Board – California Regional Water Quality Control Board, San Diego Region
State Board – State Water Resources Control Board
RCDs –Resource Conservation Districts
RWQCB – Regional Water Quality Control Board
SbMA – Subdivision Map Act
Section – §
SSO – Site Specific Objective
SWPPP – Storm Water Pollution Prevention Program
SWRCB – State Water Resources Control Board
TAC – Technical Advisory Committee
TMDL – Total Maximum Daily Load
UC – University of California
UCCE University of California Cooperative Extension
USC – United States Code
USDA – U. S. Department of Agriculture
USEPA – U. S. Environmental Protection Agency
WDR – Waste Discharge Requirements
WLA – Wasteload Allocation

TENTATIVE

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

RESOLUTION NO. R9-2004-0401

A RESOLUTION ADOPTING AN AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR THE SAN DIEGO REGION (9) TO INCORPORATE TOTAL MAXIMUM DAILY LOADS (TMDLs) FOR TOTAL NITROGEN AND TOTAL PHOSPHORUS IN THE RAINBOW CREEK WATERSHED, SAN DIEGO COUNTY

WHEREAS, The California Regional Water Quality Control Board, San Diego Region (hereinafter, Regional Board), finds that:

1. **BASIN PLAN AMENDMENT:** The proposed amendment of the Water Quality Control Plan for the San Diego Region (Basin Plan) described in the recitals below was developed in accordance with California Water Code §13240 et seq.

2. **NECESSITY STANDARD [Government Code §11353(b)]:** This regulatory action meets the "Necessity" standard of the Administrative Procedures Act, Government Code, §11353, subdivision (b). Amendment of the Basin Plan to establish and implement of, total maximum daily loads (TMDLs) for Rainbow Creek is necessary because water quality in Rainbow Creek does not meet applicable water quality objectives for total nitrogen and total phosphorus (hereinafter nutrients) even with implementation of waste discharge requirements containing technology based effluent limits or water quality based effluent limits for discharges of pollutants to Rainbow Creek and its tributaries. These TMDLs for nutrients are necessary to ensure attainment of applicable water quality objectives and restoration of beneficial uses designated for Rainbow Creek.

3. **CLEAN WATER ACT SECTION 303(d):** Rainbow Creek is identified on the Clean Water Act Section 303(d) list of impaired waters due to excessive nutrient concentrations. Section 303(d) requires the Regional Board to develop and implement TMDLs under the conditions that exist in Rainbow Creek.

4. **BENEFICIAL USE IMPAIRMENTS**: Rainbow Creek supports a multitude of beneficial uses. The most sensitive beneficial uses are those designated for protection of aquatic life as described in the Basin Plan definition of the COLD and WARM beneficial uses. The municipal supply (MUN), warm freshwater habitat (WARM), cold freshwater habitat (COLD), wildlife habitat (WILD), contact water recreation (REC-1), and non-contact water recreation (REC-2) are threatened or impaired due to excessive levels of nutrients.

5. **WATER QUALITY OBJECTIVES**: The Basin Plan establishes that 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. The Basin Plan establishes the following numerical water quality objective for biostimulatory substances for the protection of the COLD and WARM beneficial uses:

   Total Nitrogen 1.0 mg/L
   Total Phosphorus 0.1 mg/L

   These values are not to be exceeded more than 10% of the time unless studies of the specific water body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board.

   The Basin Plan establishes that waters designated for use as domestic or municipal supply shall not contain concentrations of nitrate in excess of the maximum contaminant levels set forth in California Code of Regulations, Title 22. The maximum contaminant level (MCL) for nitrate (as nitrogen) is 10 mg/L.

6. **WATER QUALITY OBJECTIVE VIOLATIONS:** Concentrations for nutrients in Rainbow Creek routinely exceed applicable water quality objectives for nutrients and nitrate. Sampling surveys conducted by the Regional Board in Rainbow Creek in Year 2000 documented water column concentrations as high as 21 mg/L of nitrate as nitrogen, 23 mg/L of total nitrogen and 1.7 mg/L of total phosphorus.

7. **ADVERSE EFFECTS OF NUTRIENTS:** 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. Nutrient concentrations in Rainbow Creek appear to be contributing to excessive algal growth. Excessive algae present a nuisance that threatens to impair aesthetic and recreational uses (REC1 and REC2). Excessive algae can create conditions that are harmful to aquatic life and degrade water quality, and threaten to impair warm water (WARM), cold water (COLD), and wildlife (WILD) beneficial uses.

8. **NUMERIC TARGETS:** TMDL Numeric Targets interpret and implement water quality standards (i.e., numeric and narrative water quality objectives and beneficial uses) and are established at levels necessary to achieve water quality standards. The Regional Board has set the total nitrogen and total phosphorus TMDL Numeric Targets for both the numeric and narrative water quality objectives equal to the numeric water quality objectives cited in Finding 5. The numeric targets for nitrate (as nitrogen) is 10 mg/L, total nitrogen is 1.0 mg/L and total phosphorus is 0.1 mg/L. Attainment of the TMDL numeric targets will result in attainment of water quality standards in Rainbow Creek.

9. **TOTAL MAXIMUM DAILY LOADS [40 CFR 130.2(i)]:** The Total Maximum Daily Loads (TMDLs) for total nitrogen and total phosphorus discharges into Rainbow Creek are calculated to be 1,658 kilograms of nitrogen per year (kg N/yr) and 165 kilograms of phosphorus per year (kg P/yr). The TMDLs are equal to the assimilative or Loading Capacity (LC) of Rainbow Creek for total nitrogen and total phosphorus and are defined as the maximum amount of total nitrogen and total phosphorus that Rainbow Creek can receive and still attain water quality objectives and protection of designated beneficial uses. The TMDLs are comprised of the sum of all individual Wasteload Allocations (WLAs) for point source discharges of nutrients, the sum of all Load Allocations (LAs) for nonpoint source discharges of nutrients, and natural background. The TMDLs include a margin of safety (MOS) that takes into account any uncertainties in the TMDL calculation. (i.e. TMDL = LC =

∑ WLAs + ∑ LAs + MOS). The TMDL calculations also account for seasonal variations and critical conditions.

10. **ALLOCATIONS AND REDUCTIONS:** A 74 percent (74 %) overall reduction of total nitrogen loading and an 85 percent (85%) overall reduction of total phosphorus to Rainbow Creek are required to meet the TMDLs of 1,658 kg N/yr and 165 kg P/yr. The assigned allocations from each source translate into a percent reduction of nutrients from current loading.

Percent Reduction by Source	Total Nitrogen	Total Phosphorus
Point Sources		
Caltrans	74%	58%
Nonpoint Sources		
Commercial Nurseries	77%	90%
Agricultural Fields	77%	90%
Orchards	77%	90%
Park	50%	50%
Residential Areas	77%	90%
Urban Areas	50%	50%
Septic Tank Disposal Systems	77%	Not Applicable

11. **DISCHARGERS:** The Regional Board has identified Caltrans, commercial nurseries, agricultural fields, orchards, parks, residential areas, urban areas, and septic tank disposal systems as causing or permitting the discharge of total nitrogen and total phosphorus to Rainbow Creek.

12. **IMPLEMENTATION ACTIONS**: The necessary actions to implement the TMDL are described in the *Basin Plan Amendment and Technical Report for Total Nitrogen and Total Phosphorus Total Maximum Daily Loads For Rainbow Creek, dated October 15, 2004*. The TMDL Implementation Action Plan describes actions that are specific to the pollutant and waterbody for which the TMDL is being established; persons responsible for implementing specified control actions; a time line description of when activities necessary to implement the TMDL will occur; the legal authorities under which implementation will occur; milestones that will be used to measure progress; and the time required to attain water quality objectives.

13. **IMPLEMENTATION MONITORING:** Water quality monitoring will be required to evaluate the overall TMDL implementation effectiveness and success in attaining nutrient water quality objectives in Rainbow Creek and its tributaries.

14. **COMPLIANCE SCHEDULE:** Nutrient wasteload and load reductions are required over a 16-year phased compliance schedule period. The first fourth-year phase consists of nutrient reductions to attain the nitrate water quality objective and reduced phosphorus concentrations in Rainbow Creek. Incremental reductions of nutrient load are required throughout the subsequent 12-year period.

15. **SCIENTIFIC PEER REVIEW:** The scientific basis of this Basin Plan amendment has undergone external peer review pursuant to Health and Safety Code Section 57004. The Regional Board has considered and responded to all comments submitted by the peer review panel.

16. **STAKEHOLDER PARTICIPATION:** Interested persons and the public have had reasonable opportunity to participate in review of the amendment to the Basin Plan. Efforts to solicit public review and comment include four (4) public workshops held between April 1999 and December 2004; two (2) public review and comment periods of at least 45 days preceding the Regional Board

public hearing; and written responses from the Regional Board to oral and written comments received from the public.

17. **ECONOMIC ANALYSIS:** The Regional Board has considered the costs of implementing this Basin Plan amendment, and finds these costs to be reasonable relative to the water quality benefits derived from implementing the amendment.

18. **CEQA REQUIREMENTS:** The Basin Planning process has been certified as functionally equivalent to the California Environmental Quality Act (CEQA) requirements for preparing environmental documents and is, therefore, exempt from those requirements (Public Resources Code Section 21000 et seq.). The required environmental documentation (Basin Plan amendment, staff report, and environmental checklist) has been prepared.

19. **DE MINIMIS ENVIRONMENTAL EFFECTS**: This Basin Plan amendment results in no potential for adverse effect, either individually or cumulatively, on fish and wildlife resources or the habitat upon which they depend. Any and all effects on the environment are expected to be beneficial.

20. **PUBLIC NOTICE**: The Regional Board has notified all known interested parties and the public of its intent to consider adoption of this Basin Plan amendment in accordance with Water Code Section 13244.

21. **PUBLIC HEARING:** The Regional Board has, at a public meeting on May 8, 2002 and December 8, 2004, held public hearings and heard and considered all comments pertaining to this Basin Plan amendment.

NOW, THEREFORE, BE IT RESOLVED that

1. **AMENDMENT ADOPTION**: The Regional Board hereby adopts this amendment to the Basin Plan to incorporate the Rainbow Creek Total Nitrogen and Total Phosphorus TMDLs as set forth in Attachment A hereto.

2. The Regional Board hereby approves the report *Basin Plan Amendment and Technical Report for Total Nitrogen and Total Phosphorus Total Maximum Daily Loads For Rainbow Creek, dated October 15, 2004*.

3. **CERTIFICATE OF FEE EXEMPTION**: The Executive Officer is authorized to sign a Certificate of Fee Exemption.

4. **AGENCY APPROVALS:** The Executive Officer is directed to submit the Basin Plan amendment to the State Water Resources Control Board (State Board) in accordance with California Water Code Section 13245. The Regional Board requests that the State Board approve the Basin Plan amendment and forward it to Office of Administrative Law (OAL) and the United States Environmental Protection Agency for approval.

5. **NON-SUBSTANTIVE CORRECTIONS:** If, during the approval process for this amendment, the State Board or OAL determines that minor, non-substantive corrections to the language of the amendment are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the Regional Board of any such changes.

I, John H. Robertus, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, San Diego Region, on TBD.

TENTATIVE

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JOHN H. ROBERTUS
Executive Officer

ATTACHMENT A
TO RESOLUTION NO. R9-2004-0401

DRAFT BASIN PLAN AMENDMENT

This Basin Plan Amendment establishes Total Maximum Daily Loads (TMDLs) and associated wasteload and load reductions for nutrients in Rainbow Creek, a tributary of the Santa Margarita River. This Amendment includes a program to implement the TMDLs and monitor their effectiveness. Chapters 2, 3, and 4 of the Basin Plan are amended as follows:

1. **Chapter 2, Beneficial Uses**
   Table 2-2. ***Beneficial Uses of Inland Surface Waters, Santa Margarita River Watershed, Rainbow Creek, Hydrologic Unit Basin Numbers 2.23 and 2.22.***

Add the following footnote 3 to Rainbow Creek, Hydrologic Unit Basin Numbers 2.23 and 2.22:

> [3]Rainbow Creek is designated as an impaired water body for total nitrogen and total phosphorus pursuant to Clean Water Act Section 303(d). Total Maximum Daily Loads (TMDLs) have been adopted to address these impairments. See Chapter 3, Water Quality Objectives for Biostimulatory Substances and Chapter 4, Total Maximum Daily Loads.

2. **Chapter 3, Water Quality Objectives**
   Inland Surface Waters, Enclosed Bays and Estuaries, Coastal Lagoons, and Ground Waters

   Water Quality Objectives for Biostimulatory Substances:

Insert the following as new paragraph 5:

> Rainbow Creek is designated as an impaired water body for total nitrogen and total phosphorus pursuant to Clean Water Act Section 303(d). Total Maximum Daily Loads (TMDLs) have been adopted to address these impairments. See Chapter 2, Beneficial Uses Table 2-3. Beneficial Uses of Inland Surface Waters, Santa Margarita River Watershed, Rainbow Creek, Hydrologic Unit Basin Numbers 2.23 and 2.22, Footnote 3 and Chapter 4, Total Maximum Daily Loads.

3. **Chapter 4, Implementation**

Add the following new section to Chapter 4:

TOTAL MAXIMUM DAILY LOADS

Total Maximum Daily Loads (TMDLs) for Total Nitrogen and Total Phosphorus in the Rainbow Creek Watershed

On TBD, the Regional Board adopted Resolution No. R9-2004-0401, A Resolution Adopting An *Amendment To The Water Quality Control Plan For The San Diego Region (9) To Incorporate Total Maximum Daily Loads (TMDLs) For Total Nitrogen and Total Phosphorus In The Rainbow Creek Watershed, San Diego County*. The Basin Plan Amendment was subsequently approved by the State Water Resources Control Board on [Insert Date], the Office of Administrative Law on [Insert Date], and the United States Environmental Protection Agency on [Insert Date].

The TMDL is described in the Basin Plan Amendment and Technical Report for Total Nitrogen and Total Phosphorus Total Maximum Daily Loads For Rainbow, dated October 15, 2004.

Problem Statement

Nitrate, total nitrogen, and total phosphorus concentrations in Rainbow Creek exceed the Inorganic Chemicals nitrate and Biostimulatory Substances water quality objectives. These exceedances threaten to unreasonably impair the municipal supply (MUN), warm freshwater habitat (WARM), cold freshwater habitat (COLD), and wildlife habitat (WILD) beneficial uses of Rainbow Creek. Excessive nutrient levels in Rainbow Creek promote the growth of algae in localized areas, creating a nuisance condition, that unreasonably interferes with aesthetics and contact and non-contact water recreation (REC1, REC2) and threatens to impair WARM, COLD and WILD beneficial uses. State highways, agricultural fields and orchards, commercial nurseries, residential and urban areas, and septic tank disposal systems contribute to increased nutrient levels in Rainbow Creek as a result of storm water runoff, irrigation return flows, and ground water contributions to the creek.

Numeric Targets

The Numeric Targets for nitrate, total nitrogen, and total phosphorus are set equal to the Inorganic Chemicals nitrate water quality objective for municipal water supply and the numeric goals of the Biostimulatory Substances water quality objective as defined in the Basin Plan and shown below.

Table 4 - A. Rainbow Creek Nitrate, Total Nitrogen, and Total Phosphorus Numeric Targets

Constituent	Water Quality Objective	Numeric Target
Nitrate (as nitrogen)	10 mg NO_3-N/L	10 mg NO_3-N/L
Total Nitrogen	1.0 mg N/L	1.0 mg N/L
Total Phosphorus	0.1 mg P/L	0.1 mg P/L

If the Inorganic Chemicals nitrate and Biostimulatory Substances water quality objectives in Rainbow Creek are modified in the future then the TMDL will be recalculated and the numeric targets will be set equal to the new water quality objectives.

Source Assessment

Seventy-nine percent (79%) and seventy percent (70%) of total nitrogen and total phosphorus mass loading, respectively, are attributable to controllable sources, which include certain land use activities, septic tank disposal systems (total nitrogen only), and Interstate 15 (I-15). The land use activities include commercial nurseries, agricultural fields, orchards, residential areas, urban areas, and park areas. Background and direct atmospheric deposition are not considered to be controllable sources.

Table 4 - B. Summary of Total Nitrogen and Total Phosphorus Sources to Rainbow Creek

Source	Total Nitrogen Mass Load (kg N/yr)	Percent Contribution (% N)	Total Phosphorus Mass Load (kg P/yr)	Percent Contribution (% P)
Land Uses Runoff	2,662	69	262	67
Background	779	20	116	29
Septic Tank Disposal Systems	200	5	0	0
I-15 Runoff (Caltrans)	187	5	12	3
Direct Atmospheric Deposition	40	1	2	1
Combined Sources	**3,868**	**100**	**392**	**100**

Total Maximum Daily Loads or Loading Capacity

The TMDLs for nutrients in Rainbow Creek are 1,658 kg N/yr for total nitrogen and 165 kg P/yr for total phosphorus in order to attain and maintain the Inorganic Chemicals – Nitrate and Biostimulatory Substances water quality objective in Rainbow Creek waters.

The annual loading limit of total nitrogen and total phosphorus to Rainbow Creek shall be reduced incrementally from the current load of 3,868 kg/yr and 392 kg/yr, respectively, to 1,658 kg/yr and 165 kg/yr, respectively, by no later than December 31, 2021. The annual nutrient loading limits to be attained by December 31, 2021 are listed in Table 4-C.

Table 4 - C. Annual Nutrient Loading Capacity and Compliance Date

TMDL	December 31, 2021[1]	
Total Nitrogen – Annual Load	1,658 kg/yr	3,648 lbs./yr
Total Phosphorus – Annual Load	165 kg/yr	365 lbs./yr

[1] Compliance to be achieved no later than this date. The Regional Board may require earlier compliance with these targets when it is reasonable and feasible.

Margin of Safety

Explicit and implicit margins of safety (MOS) were considered for these TMDLs. An explicit MOS of 5% is reserved to account for uncertainties and calculated to be 83 kg/year. An implicit MOS has been incorporated through numerous conservative assumptions in the analysis.

Load Allocations and Wasteload Allocations

A seventy-four percent (74 %) and an eighty-five percent (85%) overall reduction of total nitrogen and total phosphorus loading, respectively, to Rainbow Creek is required to meet the TMDLs described in Table 4 – C.

The load allocations for the initial annual loading are provided in Table 4 – D.1. and D.2., below. A margin of safety (MOS) of 5% is subtracted from this nutrient TMDL to account for unknowns, errors in assumptions, and potential future development in the watershed. This 5% is reserved for unknowns and is not allocated to any source. Allocations (other than for background and margin of safety) will be further reduced by 20% every 4 years until the biostimulatory targets for nitrogen and phosphorus are met. In the event that a nonpoint source becomes a permitted discharge, the portion of the load allocation that is associated with the source can become a wasteload allocation.

Table 4 – D.1. Annual Total Nitrogen Allocations for Rainbow Creek

Source	Annual Total Nitrogen Load Allocations			
	2009 kg/yr[1]	**2013 kg/yr[1]**	**2017 kg/yr[1]**	**2021 kg/yr[1]**
Load Allocations (LA)				
Commercial nurseries	396	315	202	116
Agricultural fields	511	405	261	151
Orchards	617	480	315	182
Park	5	3	3	3
Residential areas	507	401	260	149
Urban areas	40	27	27	27
Septic tank disposal systems	200	100	46	46
Air deposition	40	40	40	40
Wasteload Allocations (WLA)				
Caltrans highway runoff	122	49	49	49
Unidentified & future point sources	33	33	33	33
Total LA & WLA	**2,471**	**1,853**	**1,236**	**796**
Background[2]	779	779	779	779
MOS (not allocated)	83	83	83	83
Total	**3,333**	**2,715**	**2,098**	**1,658**

[1] To calculate pounds per year, multiply by 2.2.
[2] Background is calculated based on reference concentrations in San Diego streams and Rainbow Creek annual flow volumes..

Table 4 – D.2. Annual Total Phosphorus Allocations for Rainbow Creek

Source	Annual Total Nitrogen Load Allocations			
	2009 kg/yr[1]	2013 kg/yr[1]	2017 kg/yr[1]	2021 kg/yr[1]
Load Allocations (LA)				
Commercial nurseries	20	15	10	3
Agricultural fields	30	20	13	3
Orchards	50	40	24	6
Park	0.15	0.10	0.10	0.10
Residential areas	100	74	47	12
Urban areas	8	6	6	6
Air deposition	3	3	3	3
Wasteload Allocations (WLA)				
Caltrans highway runoff	8	5	5	5
Unidentified & future point sources	3	3	3	3
Total LA & WLA	**222**	**166**	**111**	**41**
Background[2]	116	116	116	116
Margin of Safety (not allocated)	8	8	8	8
Total	**346**	**290**	**235**	**165**

[1] To calculate pounds per year, multiply by 2.2.
[2] Background is calculated based on reference concentrations in San Diego streams and Rainbow Creek annual flow volumes.

Recalculations if Water Quality Objectives Change

If the water quality objectives for Biostimulatory Substances are changed in the future, then the MOS, TMDL and allocations and reductions will be recalculated using the method shown in Appendix D of the Basin Plan.

TMDL Implementation Action Plan

The necessary actions to implement the TMDLs are described in Section 9 of the *Technical Report for Total Nitrogen and Total Phosphorus Total Maximum Daily Loads (TMDLs) in Rainbow Creek*, dated October 15, 2004 and listed below.

A. Regional Board Actions

1. **Caltrans – Incorporate Wasteload Allocations in NPDES Storm Water Permit**
   The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment request that the State Water Resources Control Board to amend

Caltrans statewide NPDES storm water permit[1] to include the following requirements:

a. MS4 discharges to Rainbow Creek shall not exceed the following wasteloads for nitrogen and phosphorus:

Nitrogen Wasteload	Phosphorus Wasteload	Compliance Due Date
122 kg N/yr[1]	8 kg P/yr[1]	December 31, 2009
49 kg N/yr[1]	5 kg P/yr[1]	December 31, 20013

b. A directive to submit annual progress reports to the Regional Board on the progress on attaining the nutrient wasteload reductions in Rainbow Creek. The report shall be due on April 1 of each year shall be incorporated within Section 2, Program Management of Caltrans MS4 Order No. 99-06-DWQ, NPDES No. CAS000003. Reporting shall continue on an annual basis until the nutrient water quality objective is attained in Rainbow Creek.

2. **County of San Diego – Issue Water Code Section 13225 Order for Nutrient Reduction and Management Plan**
The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment, issue a CWC §13225 Order directing the County of San Diego to prepare and submit a Nutrient Reduction and Management Plan (NRMP) for the Rainbow Creek watershed containing the elements described below in Section C, County of San Diego Nutrient Reduction Management Plan Elements. The County may submit alternative or additional elements equivalent to those described in Section C that would result in equivalent protection from, or prevention of, nutrient discharges to Rainbow Creek.

3. **County of San Diego – Establish Management Agency Agreement (MAA)**
The Regional Board shall consider, following concurrence with the County of San Diego's Nutrient Reduction and Management Plan (NRMP) for Rainbow Creek, entering into a Management Agency Agreement (MAA) with the County of San Diego. The MAA shall set forth the commitment of both parties to undertake various oversight responsibilities for the nonpoint source nutrient load reduction component of this TMDL, and the County's commitments to implement the NRMP.

4. **County of San Diego – Issue Water Code Section 13225 Order for Groundwater Investigation and Characterization Report**
The Regional Board shall within 90 days of USEPA approval of the Basin Plan Amendment, issue a CWC §13225 Order directing the County of San Diego to

[1] The term "statewide NPDES storm water permit " refers to Order No. 99-06-DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System Permit, Statewide Storm Water Permit, and Waste Discharge Requirements for the State of California, Department of Transportation (Caltrans).

prepare and submit a workplan containing the elements described below in Section B, County of San Diego Actions, Items 3, Submit Groundwater Investigation and Characterization Workplan and Item 4, Groundwater Investigation and Characterization Report.

5. **CA Dept. of Forestry and Fire Protection – Issue Water Code Section 13267 Order**
   The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment, issue a CWC §13267 order directing the California Department of Forestry and Fire Protection, Rainbow Conservation Camp (CDFFP) to submit any additional technical information needed to 1) evaluate whether CDFFP's discharge is surfacing and/or contributing to the impairment of Rainbow Creek; and 2) estimate the actual nutrient load originating from the septic tank and percolation ponds to Rainbow Creek via groundwater flow. Based on the review of this information the Regional Board may further direct the CDFFP to implement an alternate means of wastewater disposal or additional treatment necessary to attain and maintain nutrient water quality objectives in Rainbow Creek.

6. **Establish Memorandum of Understanding (MOU) with Agencies or Organizations**
   The Regional Board shall consider entering into a memorandum of understanding (MOU) to document cooperative agreements with other agencies or organizations that are able to provide information, technical assistance, or financial assistance to dischargers to support the Regional Board's goals of attaining the nutrient load reductions required under this TMDL and compliance with the nutrient water quality objective. These agencies and organizations include, but are not limited to, the United States Department of Agriculture, Natural Resources Conservation Service (NRCD), Mission Resource Conservation District (MCRD), and the University Of California Cooperative Extension (UCCE).

7. **Adopt Waste Discharge Requirements (WDRs), Waivers, and Discharge Prohibitions**
   In conjunction with an MAA or MOU with another third-party representative, organization, or government agency describing an adequate NPS pollution control implementation program, the Regional Board shall adopt individual or general waivers or waste discharge requirements (WDRs) for NPS discharges in the Rainbow Creek watershed. The waivers or WDRs shall require NPS dischargers to either participate in the third party NPS program or, alternatively, submit individual pollution prevention plans that detail how they will comply with the waivers and WDRs. Alternatively, the Regional Board may adopt a discharge prohibition, which includes exceptions for those discharges that are adequately addressed in an acceptable third-party MAA or MOU NPS pollution control implementation program.

8. **Take Enforcement Actions**
   The Regional Board shall take enforcement action[2], as necessary, against any discharger failing to comply with applicable waiver conditions, waste discharge requirements (WDRs), discharge prohibitions, or take enforcement action, as necessary, to control the discharge of nutrients to Rainbow Creek, attain compliance with the nutrient wasteload and load reductions specified in this TMDL, or attain compliance with the nutrient water quality objectives. The Regional Board may also terminate the applicability of waivers and issue waste discharge requirements or take other appropriate action against any discharger(s) failing to comply with the waiver conditions.

9. **Review and Revise Existing Waste Discharge Requirements**
   The Regional Board shall, within two years of USEPA approval of the Basin Plan Amendment, review and, if necessary, update existing waste discharge requirements for discharges to land as well as groundwater in the Rainbow Creek watershed to incorporate effluent limitations for nutrients consistent with applicable nutrient groundwater quality objectives and surface water quality objectives[3].

10. **Recommend High Priority for Grant Funds**
    The Regional Board shall recommend that the State Board assign a high priority to awarding grant funding[4] for projects to implement the Rainbow Creek nutrient TMDLs. Special emphasis will be given to projects that can achieve quantifiable nutrient load reductions consistent with the specific nutrient TMDL load allocations.

11. **Incorporate Water Code Section 13291 Regulations in Basin Plan**
    The Regional Board shall incorporate regulations currently under development by

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[2] An enforcement action is any formal or informal action taken to address an incidence of actual or threatened noncompliance with existing regulations or provisions designed to protect water quality. Potential enforcement actions include a notice of violation (NOV), notices to comply (NTC), imposition of time schedules (TSO), issuance of cease and desist orders (CDOs) and cleanup and abatement orders (CAOs), administrative civil liability (ACL), and referral to the attorney general (AG) or district attorney (DA). The Regional Board generally implements enforcement through an escalating series of actions to: (1) assist cooperative dischargers in achieving compliance; (2) compel compliance for repeat violations and recalcitrant violators; and (3) provide a disincentive for noncompliance.

[3] There are currently three dischargers in the Rainbow Creek watershed currently regulated under waste discharge requirements for the discharge of waste to land or groundwaters: Oak Crest Mobile Estates (Order No. 1993-69), Rainbow Conservation Camp (Order No. 1995-20), and Temecula Truck Inspection Facility (Order No. 1992-56). The Rainbow Truck Weigh and Inspection Facility, discharges under the terms of a waiver of waste discharge requirements (Order No. 2000-235)

[4] The State Water Resources Control Board administers the awarding of grants funded from Proposition 13, Proposition 50, Clean Water Act 319(h) and other federal appropriations to projects that can result in measurable improvements in water quality, watershed condition, and/or capacity for effective watershed management. Many of these grant fund programs have specific set-asides for expenditures in the areas of watershed management and TMDL implementation for NPS pollution.

the State Water Resources Control Board pertaining to onsite wastewater treatment systems[5] into the Water Quality Control Plan for the San Diego Basin (Basin Plan) as soon as practicable upon their adoption by the State Board.[6]

B. County of San Diego Actions

1. **Control MS4 Discharges to Rainbow Creek**
   For nutrient discharges in the Rainbow Creek watershed subject to the County of San Diego's MS4 NPDES Storm Water Permit[7], the County shall require increasingly stringent best management practices, pursuant to the iterative process described in Receiving Water Limitation C.2.a.[8] of the permit, to reduce nutrients discharges in the Rainbow Creek watershed to the maximum extent practicable and restore compliance with the nutrient water quality objective.

2. **Submit Nutrient Reduction and Management Plan (NRMP)**
   The County of San Diego shall, upon direction by the Regional Board pursuant to a CWC §13225 Order, prepare and submit a NRMP for the Rainbow Creek watershed, consistent with the SWRCB NPS Implementation and Enforcement Policy and containing the elements described in Section C, County of San Diego Nutrient Reduction and Management Plan or their equivalent. The County may submit alternative or additional elements equivalent to those described in Section C that would result in equivalent protection from, or prevention of, nutrient discharges to Rainbow Creek.

3. **Submit and Implement Groundwater Investigation and Characterization Workplan**
   The County of San Diego shall, upon direction by the Regional Board pursuant to a CWC §13225 Order, prepare and submit a workplan designed to guide the collection of information to produce the technical report described in Item 4, Groundwater Investigation and Characterization report below.

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[5] "Onsite wastewater treatment system(s)" (OWTS) is any individual or community onsite wastewater treatment, pretreatment and dispersal system including, but not limited to, a conventional, alternative, or experimental sewage dispersal system such a septic tanks having a subsurface discharge.

[6] CWC §13291 directs the Regional Board to incorporate the regulations in the Basin Plan upon their adoption by the State Water Resources Control Board.

[7] The term "MS4 NPDES Storm Water Permit" refers to Order No.2001-001, NPDES No. CAS0108758, *Waste Discharge Requirements For Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities Of San Diego County, and the San Diego Unified Port District.*

[8] Receiving Water Limitation C.2.a provides that... "Upon a determination by either the Copermittee or the SDRWQCB that MS4 discharges are causing or contributing to an exceedance of an applicable water quality standard, the Copermittee shall promptly notify and thereafter submit a report to the SDRWQCB that describes BMPs that are currently being implemented and additional BMPs that will be implemented to prevent or reduce any pollutants that are causing or contributing to the exceedance of water quality standards…"

a. The workplan shall include a schedule for completion of all activities and submission of a final Groundwater Investigation and Characterization Report.
b. The workplan shall include a description of proposed actions including field methodologies, chemical analyses methods, sampling locations, and proposed monitoring well installations. Contingencies for collection of additional samples shall be proposed in the work plan.
c. The County of San Diego shall modify the workplan as requested by the Regional Board.
d. The County of San Diego shall implement the workplan sixty (60) days after submission of the workplan, unless otherwise directed in writing by the Regional Board. Before beginning these activities the County shall:
   (1) Notify the Regional Board of the intent to initiate the proposed actions included in the workplan submitted; and
   (2) Comply with any conditions set by the Regional Board.

4. **Submit Groundwater Investigation and Characterization Report**
The County of San Diego shall, on a schedule agreed to in writing by the Regional Board, submit a Groundwater Investigation and Characterization Report containing a technical analysis of the following elements. The report shall also present recommendations to refine assumptions, resolve uncertainties, and improve the scientific foundation of the TMDL with regard to quantifying groundwater nutrient loading to Rainbow Creek.
   a. Nutrient loading to groundwater from Rainbow Creek watershed land use activities;
   b. Nutrient mass loading to groundwater in the fractured rock aquifer and the alluvial deposits aquifer[9] from septic systems, deep percolation of applied irrigation water, and any other sources;
   c. Base flow contribution to Rainbow Creek from the fractured rock aquifer and the alluvial deposits aquifer;
   d. Concentration of nutrients in base flow discharged to Rainbow Creek from the fractured rock aquifer and alluvial deposits aquifer;
   e. Fate and transport characteristics of nutrients in the fractured rock aquifer and alluvial deposits aquifer;
   f. Mass balance of nutrients in the fractured rock aquifer and alluvial deposits aquifer (nutrient mass loading to groundwater, removals from the groundwater system including denitrification, plant uptake, and groundwater discharge, and change in the load and concentration of nutrients in groundwater;
   g. The location of existing monitoring wells and the proposed location of additional monitoring wells needed to characterize nutrient concentrations and their lateral and vertical extent in groundwater during the course of TMDL implementation. Methods for purging and sampling monitoring wells to provide representative samples for nutrients should be described; and

[9] Groundwater beneath the Rainbow Creek watershed is interpreted to occur in both the alluvial deposits where present and in the fractured rock. The groundwater investigation report shall assess the relative contribution from each aquifer

h. Field methodologies used for drilling, soil sampling, groundwater and surface water sampling, and SWCS sampling, well and peizometer construction, geophysical surveys, and other activities.

5. **Establish Management Agency Agreement (MAA)**
The County of San Diego is requested to enter into a MAA with the Regional Board setting forth the commitment of both parties to undertake various implementation oversight responsibilities for the nonpoint source nutrient load reduction component of this TMDL and the County's commitments to implement the NRMP.

C. County Of San Diego Nutrient Reduction And Management Plan

1. **NPS Nutrient Reduction and Management Plan (NRMP)**
The NRMP shall describe the activities the County of San Diego will undertake to oversee discharger efforts to reduce nutrients in the runoff or groundwater discharges from new and existing (1) commercial nurseries; (2) agricultural fields; (3) orchards; (4) parks; (5) residential area; (6) urban areas; and; (7) septic tank disposal system land uses (hereinafter referred to as key nutrient sources). The NRMP shall include the following elements as provided in items 2 through 17 below or alternative or additional elements equivalent to those described that would result in equivalent protection from, or prevention of, nutrient discharges to Rainbow Creek.

a. Legal authority
b. General Plan modification
c. Development project approval process
d. CEQA reviews
e. Pollution prevention
f. Source identification
g. Management Practice (MP) implementation
h. Inspection of nutrient sources
i. Enforcement of nutrient load reductions required under this TMDL
j. Reporting of non-compliant sites
k. Monitoring to assess compliance with nutrient load reductions
l. Groundwater investigation and characterization
m. Community education and outreach
n. Seek financial assistance
o. NRMP effectiveness
p. NRMP Annual Report

2. **Legal Authority**
The County of San Diego shall review its legal authority to ensure that it is adequate to mandate compliance with the nutrient load reductions specified in this TMDL through ordinance, statue, permit, contract or similar means. This legal authority must, at a minimum, authorize the County to:

a. Control the discharge of nutrients from nonpoint sources; and

b. Prohibit discharges of nutrients which cause or contribute to exceedances of the nutrient load reductions specified in this TMDL or nutrient water quality objectives.

Alternatively the County of San Diego shall certify that its existing legal authority is adequate to mandate compliance with the nutrient load reductions specified in this TMDL and prevent increases in nutrient loading to Rainbow Creek.

3. **General Plan Modification**
The County of San Diego shall modify its General Plan as necessary to ensure that future land use and zoning decisions do not result in an increase in the nutrient loading to Rainbow Creek. Alternatively the County of San Diego shall certify that its existing General Plan is adequate to prevent an increase in nutrient loading to Rainbow Creek.

4. **Modify Development Project Approval Process**
The County of San Diego shall modify its development project approval / permitting process as necessary to ensure that discharges from proposed developments in the Rainbow Creek watershed will comply with the nutrients load reductions specified in this TMDL and ensure that nutrient water quality objectives are not exceeded. The County shall ensure that all development in Rainbow Creek watershed will be in compliance with County storm water ordinances, permits, and all other applicable ordinances and requirements. . Alternatively the County of San Diego existing General Plan is adequate to prevent an increase in nutrient loading to Rainbow Creek. Alternatively the County of San Diego shall certify that its project approval / permitting process is adequate to ensure that discharges from proposed developments in the Rainbow Creek watershed will comply with the nutrients load reductions specified in this TMDL and ensure that nutrient water quality objectives are not exceeded.

5. **CEQA Reviews**
The County of San Diego shall review and revise as necessary 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 specified in this TMDL or violations of the nutrient water quality objective. 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 require appropriate mitigation. Alternatively the County of San Diego shall certify that its environmental review process pursuant to CEQA is adequate to ensure that new development in the Rainbow Creek watershed does not contribute to exceedances of the nutrient load allocations specified in this TMDL or violations of the nutrient water quality objective.

6. **Pollution Prevention (Nutrients)**
   The County of San Diego shall implement pollution prevention[10] methods for nutrients at sites owned by the County and shall require its use by owners or operators of nutrient sources, where appropriate.

7. **Source Identification (Nutrients)**
   The County of San Diego shall develop and update annually an inventory of the individual nutrient sources within the residential, urban, commercial nurseries; agricultural fields; orchards; parks; septic tank disposal system category of land uses. The use of an automated database system, such as Geographical Information System (GIS) is highly recommended.

8. **Threat to Water Quality Prioritization (Nutrients)**
   To establish priorities for inspection and oversight activities, the County of San Diego shall prioritize each inventory in item 7 above by threat to water quality and update it annually. Each individual nutrient source in each nonpoint source category should be classified as high, medium, or low threat to water quality. The inventory should include the following minimum information for each site: name; address; SIC codes as appropriate which best reflects the type of site, a narrative description characterizing the nutrient waste generated and the potential for nutrient discharges to Rainbow Creek.

9. **MP Implementation (Nutrients)**
   The County of San Diego shall:
   a. Designate a set of minimum MMs / MPs [11] for the high, medium, and low threat to water quality nutrient sources identified in item 7 above. The designated minimum MPs for the high threat to water quality nutrient sources should be site and source specific as appropriate.
   b. Establish a time line for installation of the designated minimum MPs at each nutrient source within its jurisdiction. If particular minimum MPs are infeasible for any specific site/source the county of San Diego shall require the implementation of other equivalent MPs.

10. **Inspection of Sites and Sources (Nutrients)**
    The County of San Diego shall inspect high priority sites and sources. The County shall conduct site inspections for compliance with its ordinances and permits as well

[10] Pollution Prevention is defined as practices and processes that reduce or eliminate the generation of pollutants, in contrast to source control, treatment, or disposal.

[11] In determining appropriate MPs the County of San Diego is encouraged to consult the State Water Resources Control Board's California Nonpoint Source Encyclopedia (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html). This publication contains extensive information on nutrient reduction management measures (MMs) and management practices (MPs) applicable to the NPS land use activities in the Rainbow Creek watershed. The County is also encouraged to consult the Regional Board's Watershed Management Approach for the San Diego Region, Nonpoint Source (http://www.swrcb.ca.gov/rwqcb9/programs/wmc.html) for additional information on management measures.

as nutrient load reductions required under this TMDL. Inspections should include review of MP implementation plans and effectiveness. Based upon site inspection findings, the County shall implement all follow-up actions necessary to obtain discharger compliance in implementing MPs. The County shall follow-up with appropriate enforcement action as necessary.

11. **Enforcement of Sites and Sources (Nutrients)**
The County of San Diego shall enforce its ordinances, statues, permits, and contracts as necessary to attain compliance with the nutrient load reductions specified in this TMDL.

12. **Reporting of Non-compliant Sites (Nutrients)**
The County of San Diego shall provide oral notification to the Regional Board of non-compliant sites that are determined to be recalcitrant in implementing MPs or attaining compliance with nutrient load reductions required under this TMDL within 24 hours of the discovery of noncompliance. This notification shall be followed up by a written report to be submitted to the Regional Board within 5 days of the incidence of non-compliance.

13. **Monitoring to Assess Compliance With Nutrient Load Reductions**
The County of San Diego shall conduct, or require nutrient sites or sources to conduct, a monitoring program to assess compliance of runoff or groundwater discahrges with the load reductions from each of the land use categories assigned a load reduction. This can be accomplished by placing sampling stations at strategic nodes that would monitor nutrient discharges from individual sources of a common land use category.

14. **Community Education and Outreach**
The County of San Diego shall develop a focused educational programs to raise community awareness of the nutrient impairment problem, promote pollution prevention, and increase the use of applicable management measures and practices where needed to control and reduce nutrient discharges to Rainbow Creek. Public education, outreach, and training programs should involve applicable user groups and the community[12].

15. **Seek Financial Assistance**
The County of San Diego is encouraged to seek grant funding[13] for projects to

[12] Consideration should be given to expanding the County of San Diego's ongoing community and education outreach program under the County's MS4 NPDES Storm Water Permit to address the Rainbow Creek nutrient impairment problem. Additional suggestions for the information to be included in pollution prevention and education programs is contained in the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html).

[13] Information on available grant funds is contained in the in the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html).

implement the Rainbow Creek nutrient TMDLs, particularly those that can achieve quantifiable nutrient load reductions consistent with the specific nutrient TMDL load allocations.

16. **Nutrient Reduction and Management Plan (NRMP) Effectiveness**
The County of San Diego shall, as part of the NRMP, to develop a long-term strategy for assessing the effectiveness of the NRMP. The long-term assessment strategy should identify specific direct and indirect measurements that the County will use to track the long-term progress towards achieving the nutrient load reductions required under this TMDL. Methods used for assessing effectiveness should include the following or their equivalent: surveys, pollutant loading estimations, and receiving water quality monitoring. The long-term strategy shall also discuss the role of monitoring data in substantiating or refining the assessment.

17. **Nutrient Reduction and Management Plan (NRMP) Annual Report**
The County of San Diego shall submit an annual NRMP report to the Regional Board by January 31 of each year following USEPA approval of this TMDL. The reporting period for this annual report shall be the previous fiscal year. For example, the report submitted January 31, 2006 shall cover the reporting period July 1, 2004 to June 30, 2005. The Report shall be incorporated in the annual Jurisdictional URMP Annual Report and the Watershed Specific URMP Annual Reports under the County's MS4 NPDES Permit. The report shall include the following information:

    a. Comprehensive description of all activities conducted by the County of San Diego to oversee implementation of the NRMP.
    b. An accounting of all: inspections conducted; enforcement actions taken; and education efforts conducted.
    c. An assessment of whether actions to implement designated minimum MPs at each nutrient source were actually carried out by dischargers.
    d. An assessment of the compliance of runoff or groundwater discharges with the load reductions from each of the land use categories assigned a load reduction.
    e. Identification of water quality improvements or degradation in Rainbow Creek with regard to attainment of the nutrient water quality objectives.
    f. An evaluation of the effectiveness of the NRMP in achieving the nutrient load reductions required under this TMDL.

D. Discharger Actions

1. **State of California, Department of Transportation (Caltrans) Actions**
Caltrans shall take all actions necessary to meet the nutrient wasteload reductions assigned to Caltrans. These nutrient wasteload reductions will eventually be incorporated into Caltrans statewide NPDES storm water permit. It is assumed that compliance with the nutrient wasteload reductions will be accomplished through the development and implementation of best management practices (BMPs). Caltrans shall also prepare and submit progress reports in accordance with the Caltrans statewide NPDES storm water permit or as otherwise directed by the Regional Board

in a CWC §13383 order.

2. **State of California Department of Forestry and Fire Protection (CDFFP) Actions**
CDFFP shall, upon direction by the Regional Board in a CWC §13267 order, undertake an investigation to 1) evaluate whether CDFFP's discharge is surfacing and/or contributing to the impairment of Rainbow Creek; and 2) estimate the actual nutrient load to Rainbow Creek from groundwater flow originating from the septic tank and percolation ponds.

3. **Nonpoint Source Dischargers (NPS Dischargers) Actions**
NPS discharges of nutrients in the Rainbow Creek watershed result from (1) commercial nursery; (2) agricultural field; (3) orchard; (4) park; (5) residential area; (6) urban area; and; (7) septic tank disposal system land use activities. Individual landowners and other persons (NPS Dischargers) engaged in these land use activities shall implement pollution prevention[14] methods and increase the use of applicable management measures and practices[15] where needed to control and reduce nutrient discharges to Rainbow Creek and attain nutrient load reductions. Individual landowners and other persons are encouraged to seek grant funding[16] for projects to implement the Rainbow Creek nutrient TMDLs, particularly those that can achieve quantifiable nutrient load reductions consistent with the specific nutrient TMDL load allocations. NPS dischargers will be subject to Regional Board enforcement action for failing to: comply with applicable waiver conditions, waste discharge requirements (WDRs), discharge prohibitions; attain compliance with the nutrient load reductions specified in this TMDL; or attain compliance with the nutrient water quality objectives. The Regional Board may also terminate the applicability of waivers and issue waste discharge requirements to any NPS dischargers failing to comply with waiver conditions.

[14] Pollution Prevention is defined as practices and processes that reduce or eliminate the generation of pollutants, in contrast to source control, treatment, or disposal.

[15] In determining appropriate management methods and practices to control nutrient discharges interested persons should are encouraged to consult the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html. This publication contains extensive information on nutrient reduction management measures (MMs) and management practices (MPs) applicable to the NPS land use activities in the Rainbow Creek watershed. Interested persons are also encouraged to consult the Regional Board's Watershed Management Approach for the San Diego Region, Nonpoint Source (http://www.swrcb.ca.gov/rwqcb9/programs/wmc.html) for additional information on management measures.

[16] Information on available grant funds is contained in the in the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html).

TMDL Implementation Monitoring Plan
The necessary actions to monitor TMDL implementation are described in Section 10 of the *Technical Report for Total Nitrogen and Total Phosphorus Total Maximum Daily Loads (TMDLs) in Rainbow Creek*, dated October 15, 2004 and listed below.

A. Regional Board Actions

1. **Issue Order to Submit Monitoring Plan to Caltrans and County of San Diego**
   The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment, issue an Order to Caltrans under CWC §13383 and a Order to the County of San Diego under CWC §13225, to prepare and submit an Implementation Monitoring Plan containing the elements described in **Section C. Implementation Monitoring Plan Elements** below. The Regional Board may amend this order at any time to include other nutrient dischargers in the Rainbow Creek watershed on a case-by case basis.

2. **Issue Order to Implement Monitoring Plan to Caltrans and County of San Diego**
   Upon concurrence with the County of San Diego's and Caltrans' Implementation Monitoring Plan the Regional Board shall issue an Order to Caltrans under CWC § 13383 and an Order to the County of San Diego under CWC § 13225, to implement monitoring. The Regional Board may amend this order at any time to include other nutrient dischargers in the Rainbow Creek watershed on a case-by case basis.

B. County of San Diego and Caltrans Actions

1. **Prepare and Submit Monitoring Plan**
   The County of San Diego and Caltrans shall collaborate to prepare and submit an Implementation Monitoring Plan for the Rainbow Creek watershed containing the elements described in **Section C. Implementation Monitoring Plan Elements** below, upon direction by the Regional Board in a CWC §13225 / CWC §13383 Order. The Implementation Monitoring Plan shall be modified as requested by the Regional Board.

2. **Implement Monitoring Plan**
   The County of San Diego and Caltrans shall implement the Implementation Monitoring Plan upon direction by the Regional Board pursuant to a CWC §13225 / §13383 Order. The Regional Board may amend this order at any time to include other nutrient dischargers in the Rainbow Creek watershed on a case-by case basis.

C. Implementation Monitoring Plan Elements

The Implementation Monitoring Plan shall contain the following elements:

1. **Surface Water Monitoring Stations**
   Monitoring stations shall be proposed that best serve the monitoring objectives described above in Section 10.2 Monitoring Objectives. Previously monitored locations that shall be considered include 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, in Appendix A). An additional sampling location between Oak Crest and Willow Glen-4 should also be considered. For instance, a monitoring location might be placed downstream of Oak Crest Mobile Estates to assess nutrient loading from this property. Monitoring stations shall also be considered at strategic nodes in Rainbow Creek and its tributaries that would monitor nutrient discharges from individual sources of a common land use category.

2. **Groundwater Monitoring Stations**
   The location of existing wells and the proposed location of additional monitoring wells needed to define nutrient concentration trends in groundwater. Methods for purging and sampling monitoring wells to provide representative samples for the waste constituents of interest should be described.

3. **Surface Water Monitoring Frequency**.
   Monitoring frequencies of the various monitoring parameters shall be proposed that best serve the monitoring objectives described above in Section 10.2 Monitoring Objectives. The frequencies should be adequate to evaluate ambient conditions and address any impact from low dissolved oxygen concentrations and algal growth.

4. **Groundwater Monitoring Frequency**
   Monitoring frequencies of the various monitoring parameters shall be proposed that best serve the monitoring objectives described above Section 10.2 Monitoring Objectives. The magnitude and timing of nutrient variability may vary significantly in monitoring wells that are located varying distances from nutrient sources. Sampling these wells will likely obtain water from varying depths in the aquifer. To define the nitrate variability at each well, the network will be sampled quarterly for two years. The observed variability will serve as a basis for determining the long-term sampling frequency for the network.

5. **Surface Water Quality Parameters**
   Surface Water Quality Parameters shall include nitrogen (including nitrate, nitrite, ammonia and total Kjeldahl nitrogen (TKN)), phosphorus (including orthophosphate and total), dissolved oxygen, pH, turbidity, and temperature.

6. **Groundwater Quality Parameters**
Groundwater Quality Parameters shall include total nitrogen, nitrate, ammonia, nitrites, TKN, orthophosphate, total phosphorus, pH, dissolved Oxygen and TDS.

7. **Hydrology**
Flow rate measurements shall be taken to calculate nutrient loading, to provide additional information about the hydrology of the watershed, and to identify patterns in algal growth.

8. **Algal Biomass**
Characterization of algal species composition is needed to provide a more reliable indicator of trophic status and evidence of nutrient condition (USEPA 2000a). 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 factors 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. Algal biomass should be quantified by mass and/or by % cover of bottom. Collection and measurement of algal biomass should be performed uniformly or by a standardized method.

9. **Biological Assessment Monitoring**
It is recommended that biological assessment monitoring of benthic microinvertebrates 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). Changes in the stream's biological integrity (e.g., an increase or decrease in diversity and abundance of sensitive species) could 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 (CDFG 2000a) 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).

10. **Monitoring Reports**
Monitoring reports shall be submitted in both electronic and paper formats and include the following information:

a. An executive summary addressing all sections of the monitoring report, comprehensive interpretations and conclusions, and recommendations for future actions.
b. A description of monitoring station locations by latitude and longitude coordinates, frequency of sampling, quality assurance/quality control procedures and sampling and analysis protocols.

c. The data/results, methods of evaluating the data, graphical summaries of the data, and an explanation/discussion of the data.
d. An assessment of the compliance of runoff characteristics with the required load reductions from each of the land use categories assigned a load reduction.
e. Identification and analysis of trends in surface and groundwater quality and assessment of compliance with nutrient water quality objectives.
f. An evaluation of the effectiveness of the TMDL implementation actions and the need for revisions to improve the implementation action plan.

Table 4-D.3. Required Monitoring Parameters

Parameter	Type of sample[1]
Surface Water Monitoring	
Total nitrogen, nitrate, ammonia[2], 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	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 (recommended)	Grab
Groundwater Monitoring	
Total nitrogen, nitrate, ammonia[2], nitrites, TKN, orthophosphate, and total phosphorus concentrations	Grab
pH	Grab or In Situ
Dissolved Oxygen	Grab or In Situ
TDS	Grab or In Situ

[1] A California certified laboratory should be used with an approved QA/QC plan.
[2] All laboratory detection limits should be sufficient to determine compliance with the water quality objective. For example, un-ionized ammonia in surface waters (25 µg/L).

11. **Quality Assurance / Quality Control Plan**

The monitoring program shall develop and implement a QA/QC plan for field and laboratory operations to ensure that data collected are of adequate quality given the monitoring objectives[17]. The QA/QC plan for field operations shall cover the following, at a minimum:

a. Quality assurance objectives;
b. Sample container preparation, labeling and storage;
c. Chain-of-custody tracking;
d. Field setup;
e. Sampler equipment check and setup;
f. Sample collection;
g. Use of field blanks to assess field contamination;
h. Use of field duplicate samples;
i. Transportation to the laboratory;
j. Training of field personnel; and
k. Evaluation, and enhancement if needed of the QA/QC plan.

The QA/QC plan for laboratory operations shall cover the following, at a minimum:

a. Quality assurance objectives;
b. Organization of laboratory personnel, their education, experience, and duties;
c. Sample procedures;
d. Sample custody;
e. Calibration procedures and frequency;
f. Analytical procedures;
g. Data reduction, validation, and reporting;
h. Internal quality control procedures;
i. Performance and system audits;
j. Preventive maintenance;
k. Assessment of accuracy and precision;
l. Correction actions; and
m. Quality assurance report.

12. **Reporting Period**

Annual reports should cover the period of October 1 through September 30. The reports should be submitted to the Regional Board by January 31 of the following year and should be incorporated within the annual receiving water monitoring reports required under the County of San Diego's MS4 NPDES Permit Receiving Waters Monitoring and Reporting Program.[18]

[17] For more information on QA/QC activities, including guidelines and example QA/QC documents, refer to http://www.swrcb.ca.gov/swamp/qapp.html

[18] The term "MS4 NPDES Storm Water Permit" currently refers to Order No.2001-001, NPDES No. CAS0108758, Waste Discharge Requirements For Discharges Of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities Of San Diego County, and the San Diego Unified Port District. Attachment B to this Order contains the Receiving Waters Monitoring and Reporting Program for Order No. 2001-01. The

13. **Reporting Frequency**
The first report shall be due in the first January following initiation of the monitoring program. Reporting shall continue on an annual basis until the nutrient water quality objective has been attained and maintained in Rainbow Creek.

Compliance Schedule

Total nitrogen and total phosphorus reductions are required over a 16-year phased compliance schedule period during which incremental load and wasteload reductions are required as shown in Table 4 – E, below. Twenty percent (20%) reductions are required every fourth year for the first three phases (by the end of year 12). The last (fourth) phase requires the remaining 14% total nitrogen reduction and 25% total phosphorus reduction needed to meet the TMDLs.

Table 4 - E. Total Nitrogen and Total Phosphorus Phased Load Reduction Compliance Schedule

Compliance Date	Total Nitrogen		Total Phosphorus	
	Current Load & Annual Loads (LA + WLA) kg N/yr	Cumulative % Reduction	Current Load & Annual Loads (LA + WLA) kg P/yr	Cumulative % Reduction
	3,089[1]		277[1]	
12/31/2009	2,471	20	222	20
12/31/2013	1,853	40	166	40
12/31/2017	1,236	60	111	60
12/31/2021	796	74	41	85

[1] Current annual nutrient loads that were from identified point and nonpoint sources (See Tables 4 - B). This value does not include the contribution for background.

Regardless of what actions are taken to achieve load and wasteload reductions, there may not be an immediate response in the water quality or biological condition of Rainbow Creek. For example, there may be significant time lags between when actions are taken to reduce nutrient loads and resulting changes in nutrient concentrations in Rainbow Creek. This is especially likely if nutrients from past activities are tightly bound to sediments or if nutrient-contaminated groundwater has a long residence time before its release to Rainbow Creek waters. A three-year response time is projected for Rainbow Creek to attain compliance with nutrient water quality objectives after reaching the desired nutrient wasteload and load reductions in 2021. Accordingly the projected date when Rainbow Creek will attain and maintain compliance with nutrient water quality objectives is December 31, 2024.

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annual receiving water monitoring report is described in Table 6, Item 28, page 51 of Order No. 2001-01.

Agricultural Program Costs and Potential Sources of Financing

Pursuant to CWC § 13141 the Regional Board has estimated the TMDL Implementation Program cost for agricultural water quality control in Table 4 - F.

Table 4 - F. Cost of Implementing Agricultural Water Quality Control

	Initial Capital Costs $ per Operation		Annual Operational Costs $ per Operation	
	Low	High	Low	High
Commercial Nurseries	$26	$41,075	$3	$4,108
Orchards	$26	$57,705	$3	$5,771
Agricultural Fields	$26	$57,705	$3	$5,771

Potential sources of financing include:

- Federal Clean Water Action Section 319(h) grants.
- Federal Clean Water Action Section 205(j) grants.
- State of California Proposition 13 funded grants.
- Small Communities Grants for Water Reclamation and Wastewater Treatment Facilities
- 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.

Recalculation Procedures
At the end of the Basin Plan, add the following Appendix D:

APPENDIX D
METHOD FOR RECALCULATION OF THE TOTAL MAXIMUM DAILY LOADS FOR NITOGEN AND PHOSPHORUS IN RAINBOW CREEK

This appendix describes the method for recalculating Rainbow Creek TMDLs for nitrogen and phosphorus if the water quality objectives for are modified in the future.

Numeric Target
The numeric targets are set equal to the new water quality objectives.

Margin of Safety
The explicit margin of safety (MOS) equals five percent of the loading capacity. The equation to calculate the loading capacity is given below.

Loading Capacity

The annual total nitrogen loading capacity is determined by multiplying the flow volume (in ft^3/yr) by the new water quality objective (in mg N/L) that will allow the creek to attain water quality standards. The equations below also use terms to convert milligrams to kilograms and cubic feet to liters. The loading capacity for nitrogen is as follows:

Low Flow (0-2.9 cfs)
17,764 * 1 e–3 ft^3/yr * **new water quality objective** in mg N/L * 28.32 L/ft3 * 1 e –6 kg/mg

= **new low flow loading capacity** in kg N/yr

Moderate – High Flow (3 – 39 cfs)
40,775 * 1 e–3 ft^3/yr * **new water quality objective** in mg N/L * 28.32 L/ft3 * 1 e –6 kg/mg

= **new moderate - high flow loading capacity** in kg N/yr

Total Annual Nitrogen Loading Capacity = sum of low flow and moderate - high flow loading capacity

Similarly, the annual total loading capacity for phosphorus is as follows:

Low Flow (0-2.9 cfs)
17,764 * 1 e–3 ft^3/yr * **new water quality objective** in mg P/L * 28.32 L/ft3 * 1 e –6 kg/mg

= **new low flow loading capacity** in kg P/yr

Moderate – High Flow (3 – 39 cfs)
40,775 * 1e–3 ft^3/yr * **new water quality objective** in mg P/L * 28.32 L/ft3 * 1 e –6 kg/mg

= **new moderate-high flow loading capacity** in kg P/yr

Total Annual Phosphorus Loading Capacity = sum of low flow and moderate - high flow loading capacity

Total Maximum Daily Load

The TMDLs for nitrogen and phosphorous are set equal to the total annual loading capacity for each pollutant. The allocations in Table D-1 below use the following equation to determine the total load allocations for nonpoint sources (LA) by subtracting background, the margin of safety (MOS), and the point source waste load allocations (WLA) from the TMDL.

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

Allocations

The allocations of the total annual nitrogen and phosphorous loading capacities to the margin of safety, background, and various point and non-point sources are presented in Table D-1.

Table D-1. Total Nitrogen and Phosphorus Allocations for Rainbow Creek TMDL

Source	Nitrogen Allocation	Phosphorus Allocation
Margin of Safety (MOS)	5%[1]	5%[1]
Background	779 kg	116 kg
Caltrans (WLA)	New WQO * volume of Caltrans runoff	New WQO * volume of Caltrans runoff
Unidentified and Future Point Sources (WLA)	2%[1]	2%[1]
Total Allocation for Nonpoint Sources (LA) = Total Annual Loading Capacity – MOS – Background – Caltrans – Unidentified and Future Point Sources		
Commercial nurseries	16%[2]	9%[2]
Agricultural fields	21%[2]	12%[2]
Orchards	25%[2]	18%[2]
Park	0.4%	0.3%
Residential areas	21%[2]	36%[2]
Urban areas	4%[2]	18%[2]
Septic tank disposal systems	6%[2]	0%[2]
Air deposition	6%[2]	6%[2]

[1] percent of the total annual nitrogen and phosphorous loading capacity
[2] percent of the total allocation for nonpoint sources

Executive Summary

Rainbow Creek, a tributary to the Santa Margarita River, is approximately eight miles in length and located in northern San Diego County near the community of Fallbrook. (See Attachment A for Rainbow Creek vicinity and watershed maps.) The Rainbow Creek watershed encompasses 7,085 acres and is primarily rural, with sixty five percent of the watershed undeveloped. Rainbow 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.

Water Quality Impairments

Rainbow Creek waters currently violate the Inorganic Chemicals - Nitrate (as NO_3) and the Biostimulatory Substances nitrogen and phosphorus water quality objectives contained in the Water Quality Control Plan for the San Diego Region (Basin Plan). The exceedance of these water quality objectives in Rainbow Creek waters represents an actual or threatened impairment of the municipal supply, aquatic and terrestrial habitat, and recreational beneficial uses designated for Rainbow Creek in the Basin Plan.

Nitrate, nitrogen, and phosphorus are jointly referred to as nutrients in this document[19]. The introduction of excessive nutrients into the Rainbow Creek ecosystem is referred to as "nutrient enrichment" and can have a number of adverse water quality effects. One of the most common effects is acceleration of a natural process called eutrophication[20] which can lead to eutrophic conditions where prolonged blooms of algae deprive light and oxygen from other organisms while turning waterways green and foul smelling. The excessive nutrient concentrations in Rainbow Creek waters appear to be contributing to excessive algal growth, which can lead to eutrophic conditions resulting 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 Rainbow Creek, the Regional Board found several areas susceptible to excessive algal growth during the spring, summer and fall that threaten to cause eutrophic conditions. Elevated nitrate levels in Rainbow Creek can also adversely affect the drinking water

[19] Nutrients are chemical elements and compounds found in the environment that plants and animals need to grow and survive. In this document the various forms of nitrogen and phosphorus are the nutrients of interest. The forms include nitrate, nitrite, ammonia, organic nitrogen (in the form of plant material or other organic compounds), and phosphates (orthophosphate and others). Nitrate is the most common form of nitrogen and phosphates are the most common forms of phosphorus found in natural waters.

[20] Eutrophication is a process whereby water bodies, such as lakes, estuaries, or slow-moving streams receive excess nutrients that stimulate excessive plant growth (algae, periphyton attached algae, and nuisance plants weeds). This enhanced plant growth, often called an algal bloom, reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms to die.

supplies of the downstream United States Marine Corps Base Camp Pendleton (Camp Pendleton).

Clean Water Act Section 303(d) List and TMDLs

The federal Clean Water Act section 303(d) requires that each State establish a process to systematically identify impaired or threatened waterbodies and the pollutant(s) causing the impairment. The Clean Water Act also requires States to establish a scientifically-based strategy—a Total Maximum Daily Load (TMDL)—for correcting the impairment or eliminating the threat and restoring the waterbody. A TMDL defines the amount of a pollutant that a waterbody can receive without violating applicable water quality standards. It is the sum of the allowable loads of a pollutant from all contributing point and nonpoint sources plus a margin of safety. Once this amount or load is determined, the State allocates a portion to each source of that pollutant within a particular watershed. The portion allocated to point sources is known as a "wasteload allocation" or WLA, and is typically enforced through conditions inserted into NPDES permits. The portion allocated to nonpoint sources and naturally-occurring pollutants is known as a "load allocation" or LA, and is enforced through the state's nonpoint source management program.

Rainbow Creek is listed on the State of California's 2002 Clean Water Act section 303(d) list as an impaired water body due to excessive nitrogen and total phosphorus concentrations. The Clean Water Act provides that the Regional Board must establish TMDLs for nitrogen and phosphorus designed to attain the applicable Biostimulatory Substances water quality objective and restore municipal supply, aquatic and terrestrial habitat, and recreational beneficial uses in the Basin Plan. Pursuant to this mandate, the goal of the nitrogen and phosphorus TMDLs described in this document is to attain and maintain the Biostimulatory Substances water quality objective and restore beneficial uses in Rainbow Creek through nutrient wasteload and load reductions implemented over the next 16 years.

Nutrient Sources

The primary point source discharge of nutrients in Rainbow Creek is from Caltrans owned right-of-ways (state highways) in the Rainbow Creek watershed. The primary nonpoint source discharge of nutrients is from 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 groundwater containing elevated levels of nutrients from septic tank wastewater and irrigation water discharges, through springs of irrigation tailwater flows that feed tributaries, through atmospheric dry deposition, and from background sources.

Nutrient Wasteload and Load Allocations

Annual wasteloads and loads for nitrogen and phosphorus are calculated for the point source and nonpoint source discharges described above. A nitrogen load allocation of 714 kg N/yr is established for nonpoint sources and includes a 77% reduction of loading

from commercial nurseries, agricultural fields, orchards, residential land uses, and septic tank disposal systems, and a 50% reduction from urban and park land uses. A wasteload allocation of 82 kg N/yr is established for point sources and includes a 74% reduction for Caltrans' NPDES discharges and a 2% placeholder for unknown and future point sources. A phosphorus load allocation of 33 kg P/yr was established for nonpoint source discharges and includes a 90% reduction of loading from residential, commercial nursery, agricultural fields, and orchard land uses, and a 50% reduction from urban and park land uses. A wasteload allocation of 8 kg P/yr was established for point sources and includes a 58% reduction for Caltrans' discharges and a 2% placeholder for unknown and future sources.

Based on current nutrient loading calculations from point and nonpoint sources, the Basin Plan amendment requires a 20% reduction of the current annual load of both nitrogen and phosphorus by the end of fourth year following U.S. Environmental Protection Agency approval of the TMDL Basin Plan amendment. This reduction will result in the attainment of the "drinking water " nitrate water quality objective in Rainbow Creek waters. The Basin Plan Amendment requires subsequent reductions in nitrogen and phosphorus loading of 3,868 kg N/yr and 392 kg P/yr, respectively, to 1,658 kg N/yr and 165 kg P/yr respectively over a period of 16 years until the biostimulatory targets, total nitrogen of 1.0 mg N/L and total phosphorus of 0.1 mg P/L, have been achieved. An explicit margin of safety of 5% 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.

TMDL Implementation

Sources of nutrients to Rainbow Creek include both point sources and nonpoint sources. Caltrans is a point source discharger of nutrients and will be responsible for meeting nutrient wasteload reductions to be incorporated in the MS4 NPDES Storm Water Permit. For nutrient discharges in the Rainbow Creek watershed subject to the County of San Diego's MS4 NPDES Storm Water Permit, the County will be directed to implement increasingly stringent best management practices to reduce nutrients discharges in the Rainbow Creek watershed to the maximum extent practicable and restore compliance with the nutrient water quality objective. The California Department of Forestry and Fire Protection (CDFFP) will be required to evaluate whether the Rainbow Conservation Camp discharge is surfacing and/or contributing nutrients to Rainbow Creek.

Controlling and reducing nutrient discharges in the Rainbow Creek watershed to meet the TMDL nutrient load reductions for nonpoint sources will be a long term and complicated undertaking. The Regional Board proposes to use a Third Party regulatory-based approach to mandate compliance with the nonpoint source (NPS) nutrient load reductions of this TMDL. The Regional Board will accomplish this by negotiating a Management Agency Agreement (MAA) between the Regional Board and the County of San Diego setting forth the commitments of both parties to undertake various implementation responsibilities for the NPS nutrient load reductions of this TMDL.

Under the terms of the proposed MAA, the County of San Diego will take the lead in establishing management measures (MMs) and management practices (MPs) and overseeing MP implementation by NPS dischargers to attain TMDL nutrient load reductions in the Rainbow Creek watershed. This will be accomplished through the County of San Diego's development and implementation of a Nutrient Reduction and Management Program (NRMP) for the watershed that incorporates nutrient management measures and a public outreach program to achieve the reductions. Additionally, the County of San Diego will be directed to investigate groundwater quality and contribution to the creek to fill data gaps. Findings from the investigations will be used in the development of further implementation measures to attain subsequent nutrient load reductions.

The Regional Board will adopt, in conjunction with the MAA, individual or general waivers or waste discharge requirements (WDRs) for NPS discharges in the Rainbow Creek watershed. The waivers or WDRs may require NPS dischargers to either participate in the third party NPS program or, alternatively, submit individual pollution prevention plans that detail how they will comply with the waivers and WDRs. The Regional Board may also adopt a discharge prohibition, which includes exceptions for those discharges that are adequately addressed in an acceptable third-party MAA or MOU NPS pollution control implementation program.

The County of San Diego and Caltrans are directed to develop and implement a Rainbow Creek watershed monitoring program to:

- Evaluate progress toward meeting nutrient water quality objectives in Rainbow Creek
- Check attainment of numeric targets and TMDL allocations
- Verify or refine assumptions, resolve uncertainties, and improve scientific understanding; and
- Evaluate the effectiveness of the TMDL implementation actions over time and determine the need for revisions to improve the implementation action plan

Scientific Peer Review

Health and Safety Code section 57004 provides that the scientific basis of any TMDL Basin Plan amendment must undergo external peer review before adoption by the Regional Board. The "scientific basis" and "scientific portions" of the TMDL are those foundations of the TMDL that are premised upon, or derived from, empirical data or other scientific findings, conclusions, or assumptions establishing a regulatory level, standard, or other requirement for the protection of public health or the environment.

An earlier version of the Rainbow Creek TMDL was submitted in November 2001 for external scientific peer review pursuant to Health and Safety Code section 57004. Three reviewers with expertise in the area of nutrients were selected by the State Water Resources Control Board to review the Regional Board's Rainbow Creek TMDL 2001 report: two professors from the Department of Civil and Environmental Engineering at

the University of California in Berkeley and one from the Department of Civil and Environmental Engineering at San Jose State University. The comments provided by the peer reviewers and the responses to those comments are provided Appendices J and K of this document.

On May 8, 2002, the Regional Board considered adoption of Tentative Resolution No. R9-2002-0108 to amend the Basin Plan to incorporate the Rainbow Creek Nutrients TMDLs. Based on public testimony at the hearing the Regional Board elected to revise the proposed Basin Plan amendment and to reconsider the amendment following adoption of the 2002 Clean Water Act section 303(d) List Update by the State Water Resources Control Board and the US Environmental Protection Agency (USEPA). This document constitutes the revised Rainbow Creek TMDL. The scientific basis of this revised TMDL has undergone a second external scientific peer review pursuant to Health and Safety Code Section 57004 in July 2004. The comments provided by the peer reviewer and the responses to those comments are provided with this staff report in Appendix N.

Basin Plan Amendment Adoption

The Regional Board is proposing to adopt Resolution No. R9-2004-0401 Amendment to the Water Quality Control Plan for the San Diego Region (9) to incorporate TMDLs for nitrogen and phosphorus in the Rainbow Creek Watershed, San Diego County. A copy of this Tentative Resolution and amendment language can be found immediately following this Executive Summary.

As with any Basin Plan amendment involving surface waters, once adopted by the Regional Board, this TMDL will not take effect until it has undergone subsequent agency approvals by the State Water Resources Control Board (SWRCB), the Office of Administrative Law (OAL), and USEPA.

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 purpose of a TMDL is to attain water quality objectives and restore and protect the beneficial uses of an impaired water body. A TMDL is defined as "the sum of the individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background (40 CFR 130.2) such that the capacity of the water body to assimilate pollutant loadings (i.e., loading capacity) is not exceeded".

The TMDL process begins with the development of a technical TMDL which includes the following 8 components: (1) A **Problem Statement** describing which water quality objectives are not being attained and which beneficial uses are impaired; (2) identification of **Numeric Targets** which will result in attainment of the water quality objectives and protection of beneficial uses; (3) A **Source Assessment** to identify all of the point and nonpoint sources in the watershed and estimate the current pollutant loading from each; (4) a calculation of the maximum **Loading Capacity**, or TMDL, of the waterbody for the pollutant; i.e., the maximum amount of the pollutant that may be discharged to the water body without causing exceedances of water quality objectives and impairment of beneficial uses; (5) a **Linkage Analysis** to confirm that the TMDL, or Loading Capacity, will result in the attainment of the water quality objectives; (6) the division and **Allocation** of the total Loading Capacity amongst each of the contributing sources in the watershed, wasteload allocations (WLA) for point sources and load allocations (LA) for non point sources; (7) a **Margin of Safety** (MOS) to account for uncertainties in the TMDL analysis; and (8) a description of how **Seasonal Variation and Critical Conditions** are accounted for in the TMDL. The document containing the above components is generally referred to as the Technical TMDL Report.

Upon completion of the Technical TMDL, a plan to implement the TMDL is developed along with a plan to monitor the results. The **Implementation Plan** describes the actions needed by each of the point and nonpoint source dischargers in the watershed to meet the load reductions specified in the TMDL and a time schedule taking such actions. The Implementation Plan also identifies agencies with authority to take pollutant-reducing actions and describes such actions. The purpose of the Monitoring Plan is to assess the effectiveness of the load reduction activities in attaining water quality objectives and restoring beneficial uses.

Once the TMDL and Implementation Plan are completed, the regulatory provisions 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) as a Basin Plan amendment. Additional requirements of the basin plan amendment process are the evaluation of economic and environmental considerations. As with any Basin Plan amendment involving surface waters, a TMDL adopted by the Regional Board will not take effect until it has undergone subsequent agency approvals by the State Water Resources Control Board (SWRCB), the Office of Administrative Law (OAL), and the United States Environmental Protection Agency (USEPA).

TMDLs are not self-implementing; nor are they enforceable simply by incorporation into the Basin Plan. Rather a TMDL must be made enforceable by the Regional Board in one of two ways: (1) the TMDL and load allocations are incorporated into waste discharge requirements and NPDES permits; or (2) a formal prohibition against a particular discharge of waste is established in the Basin Plan. The responsible point and nonpoint source dischargers of the pollutant within the watershed must then implement the TMDL. In other words, each responsible party must take any load reduction actions necessary to comply with its assigned load or wasteload allocation as specified in the TMDL.

2.0 Problem Statement

Nitrate concentrations in Rainbow Creek exceed the water quality objective for municipal supply (MUN) and total nitrogen and total phosphorus concentrations exceed the water quality objective for biostimulatory substances, and threaten to unreasonably impair the water quality necessary for warm freshwater habitat (WARM), cold freshwater habitat (COLD), and wildlife habitat (WILD) beneficial uses of Rainbow Creek. Excessive nutrient levels in Rainbow Creek promote the growth of algae in localized areas, creating a nuisance condition, that unreasonably interferes with aesthetics and contact and non-contact water recreation (REC1, REC2) and threatens to impair WARM, COLD and WILD beneficial uses. Runoff from agriculture, nursery and residential land uses contribute to increased pollutant nutrients in Rainbow Creek as a result of storm water runoff, irrigation return flows, and ground water contributions to the creek.

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. Excessive nutrients can first promote algal growth followed by a cascade of ecological impacts that ultimately impair benthic invertebrates and fish species. There are several chemical, physical, and biological processes that govern the fate and transport of these nutrients from their sources to a waterbody.

Plants and animals 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 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.

Through these processes, phosphate mineral deposits dissolve producing 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, once it has been incorporated into plant or algal tissue. After organisms consume plant matter, phosphate may be released as urine or other waste product excreted by organisms where it may then be 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, ground water, 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. 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 in Appendix A). The Rainbow Creek watershed is designated in the Basin Plan as hydrologic unit subareas (HSAs) 902.22 and 902.23, and encompasses 7,085 acres (Figure A-2 in Appendix A). The watershed is primarily rural, with sixty five percent of the watershed undeveloped. Development within the watershed includes rural residential units (8.7%), agricultural field uses (6.1%), orchards (11.0%), commercial nurseries (4.8%), and a mix of other uses (5%) (MRCD 1999b).

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 ground water flowing from the basin (Peterson 1989). Ground water surfaces in the creek at the downstream edge of Rainbow Valley, in the vicinity of the Interstate 15 overpass (I-15). Ground water 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.

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. Periodic exceedances of the system capacity, either by increased storm water runoff or by allowing too much water into the system, causes the discharge of irrigation waters downstream of the nursery (Biernacka 2001).

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 and the U.S. 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 as needed to avoid subsidence problems. The Regional Board has not authorized these modifications to the creek.

Nursery representatives are currently working with the Regional Board to correct the discharge. In a letter dated July 28, 1999 (Taylor), nursery representatives stated their intention to install a new recycle system by mid-2000, once they acquire the land the nursery occupies. The land was successfully acquired on May 24, 2001. The system is expected to capture approximately 90% of the runoff through utilization of 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.

All development in the Rainbow Creek Watershed, except the Oak Crest Mobile Estates and the Rainbow Conservation Camp, use sub-surface sewage disposal systems (e.g., septic tank – leach field disposal systems). 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 ground water table. The prohibition was implemented because the high ground water table prevented systems from being installed in compliance with the requirements at the time (Whitman 1970). In 1989, a ground water evaluation of Rainbow Valley identified that the basin has a historically high ground water 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 ground water production (Peterson 1989). Many of these septic tank disposal systems have leachfields close to or submerged in the ground water table during all or part of the year (Lambert 2001).

The Oak Crest Mobile Estates utilizes a small wastewater treatment plant with two concrete-lined evaporation ponds. The treatment facility is operated by Oak Crest Estates and Rainbow Municipal Water District and serves 112 residential units. The wastewater is discharged by spray irrigation on an area of about 5 acres. It does not appear that this facility is contributing to the nutrient load of Rainbow Creek (Dorsey 2003a)

The Rainbow Conservation Camp utilizes an onsite sewage treatment and disposal system. The Rainbow Conservation Camp is operated by the Department of Forestry and Fire Protection under Waste Discharge Requirements (Order No. 95-20) and is located near the headwaters of Rainbow Creek. The Camp is a correctional facility that houses a maximum of 111 people. The treatment system consists of a 15,000-gallon septic tank and three evaporation/percolation ponds for disposal. The ponds have earthen fill side slopes, bottoms and containment berms. Evaporation and percolation from the ponds is the primary means of effluent disposal; however, for several days during the year, effluent from the ponds may be pumped to a spray irrigation field covering approximately 2 acres of the facility. The ponds are suspected to not have the proper separation from ground water and/or bedrock and the percolated effluent appears to be surfacing downslope of the ponds toward Rainbow Creek. Effluent from the percolation ponds likely contributes recharge to the shallow ground water table in this area, and could be contributing flow, and therefore, nitrates to Rainbow Creek (Dorsey 2003b).

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, Appendix B). 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, Appendix B).

The historic nitrate concentration steadily increased through the early 1980's, peaking in 1986 with an average concentration 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. In 2002, the Regional Board recommended that the impairment listing be modified from the impairment condition of eutrophication to the causal pollutants of nitrogen and phosphorus in the 2002 303(d) List Update. The State Water Resources Control Board approved the update on February 4, 2003. The U.S. Environmental Protection Agency approved the update on June 6, 2003.

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 1997a, 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 1999b). Although the MRCD study did not include the reporting of 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 1997a). 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 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 water quality objective for inorganic chemicals in municipal supplies states that nitrate in domestic or municipal supply water should not exceed 10 mg NO_3-N/L, nitrate plus nitrite summed as nitrogen should not exceed 10 mg N/L, and nitrite should not exceed 1 mg NO_2-N/L. This water quality 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.

The water quality 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 water quality objective.

The water quality 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 water quality 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 were not 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 not available, the water quality objective requires 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. The numeric values provided by the Basin Plan 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. The use of a 10:1 ratio is a reasonable assumption and is supported by Allan (1995) who states that most estimates of the ratio of N:P in freshwaters are above 7:1 (by mass).

USEPA's Recommended Ecoregional Nutrient Criteria

USEPA (2000b) has published recommended nutrient criteria for causal (total nitrogen and total phosphorus) and response (chlorophyll a and turbidity) variables associated with the prevention and assessment of eutrophic conditions. The criteria are empirically derived from data in USEPA's STORET database to represent conditions of surface waters that are minimally impacted by human activities and protective of aquatic life and recreational uses. Ideally, USEPA wanted to base these criteria on actual reference conditions. The criteria would have been based on the 75th percentile of reference condition data. However, much of USEPA's data could not be considered to be reference conditions. Consequently, USEPA performed a statistical analysis of the entire body of non-reference data. The 25th percentile of each season (winter, spring, summer, fall) was calculated, and then the median of these four values was calculated. This approach assumes that the lower 25th percentile of all data overlaps with the 75th percentile of reference condition data, so therefore the 25th percentile data can be used to represent reference conditions.

Rainbow Creek watershed is located in subecoregion 6, the southern and central California chaparral and oak woodland of the Xeric West Ecoregion (Ecoregion III). USEPA's recommended criteria for total nitrogen and total phosphorus in streams in this subecoregion are presented in Table 2-2 below.

Table 2-2. USEPA's Recommended Nutrient Criteria for Subecoregion 6, Xeric West Ecoregion

Nutrient Parameter	Recommended Value
Total Nitrogen	0.5 mg N/L
Total Phosphorus	0.03 mg P/L

This Regional Board is mandated to adopt numeric nutrient water quality standards. The Regional Board has the option to adopt USEPA's recommended values or develop

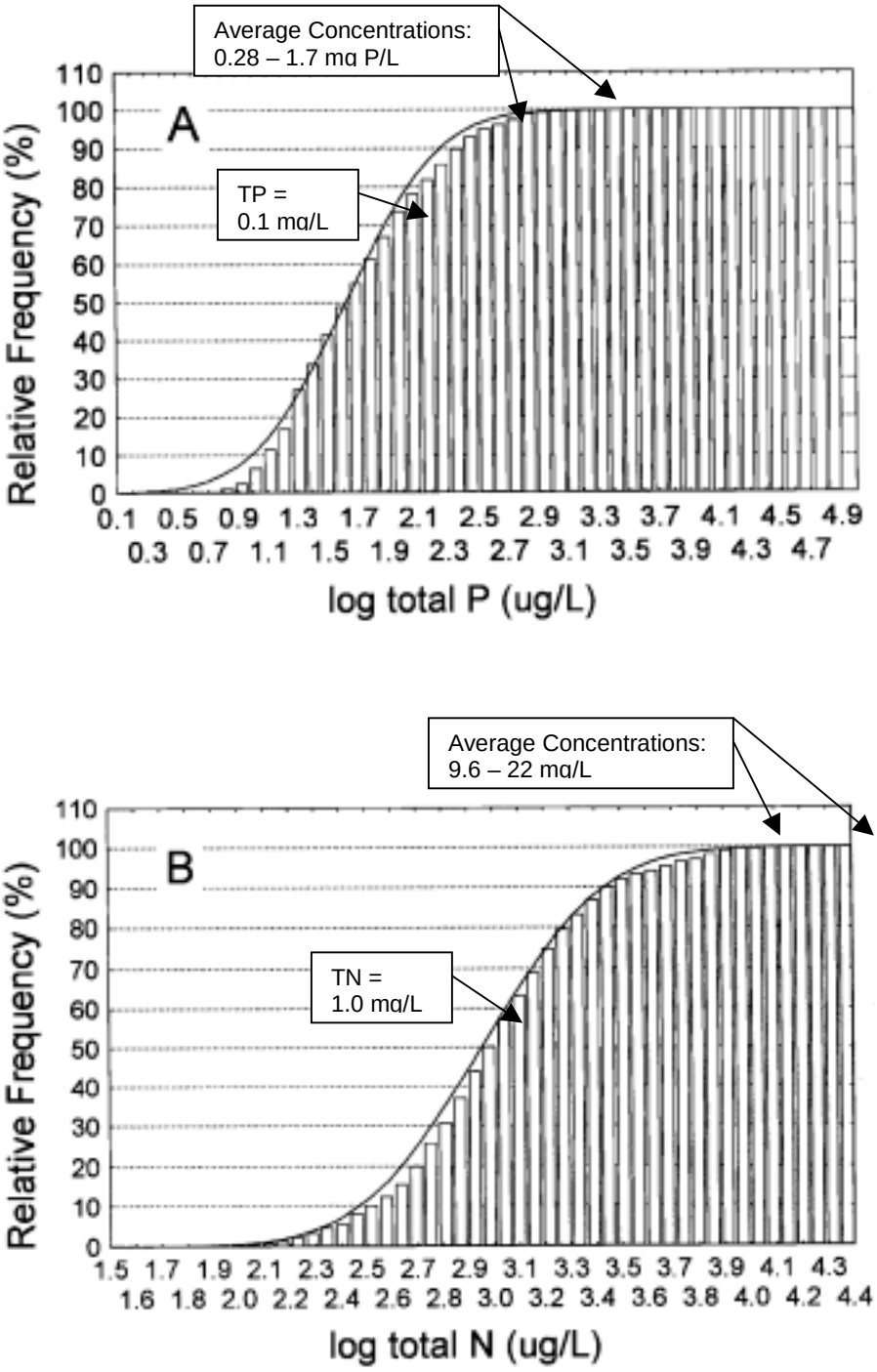
alternative criteria based on another scientifically defensible approach in establishing numeric nutrient water quality objectives for the Region. This Regional Board is participating with the USEPA's Regional Technical Advisory Group (RTAG) and the State and Regional Technical Advisory Group (STRTAG) to develop alternative region-specific criteria. The RTAG is a federal agency advisory body consisting of a subset of federal and state scientists and natural resources managers, university scientists and natural resources specialists, and interest groups (e.g., environmental groups, industry groups). The STRTAG is a subset of the RTAG, which consists of State Board and Regional Board RTAG members. The RTAG/STRTAG have drafted a work plan for criteria development that will use empirical data analysis and watershed modeling analysis. Once region-specific criteria are developed, they will be adopted as water quality objectives through the Basin Plan amendment process. New numeric nutrient water quality objectives may be available by 2007.

Scientific Support of Biostimulatory Substances Water Quality Objective

The numeric goals cited in the biostimulatory substances water quality objective of 1.0 mg N/L and 0.1 mg P/L are consistent with published scientific studies. Using the distribution of nutrient data from more than 1000 temperate streams (primarily located in North America and New Zealand), Dodds et al. (1998) defined the lowest third of the distribution as representing the oligotrophic category, the middle third the mesotrophic category, and the top third the eutrophic category. The cumulative frequency distributions suggest that total nitrogen and total phosphorus levels between 0.7 – 1.5 mg/L and 0.02 – 0.07 mg/L, respectively, define streams that are mesotrophic. Mesotrophic is a trophic state that has moderate concentrations of nutrients and plant growth. Oligotrophic is a trophic state that is deficient in plant nutrients, and does not support the development of extensive aquatic plant and animal communities. Eutrophic waters are characterized by high nutrient concentrations, resulting in high productivity of plant growth. Such waters have algal blooms and periods of oxygen deficiency.

Comparison of the numeric goals with the Dodds et al. (1998) distributions in Figure 2-1, show that total nitrogen is within the mesotrophic range and total phosphorus is near the lower end of the eutrophic range. This indicates that 75% of representative systems have less nutrient enrichment than a stream with 0.1 mg P/L. Presently, nutrient concentrations in Rainbow Creek are both on the plateau of the distribution curve in the eutrophic range.

Figure 2-1. Nutrient Cumulative Frequency Diagrams



Cumulative frequency diagram of TP (A, n=1366) and TN (B, n=1070) for temperate streams. The line indicates the log-normal distribution. (Dodds et al. 1998)

Allan (1995) reported that natural levels of dissolved inorganic nitrogen (DIN) are around 0.12 mg N/L and orthophosphate are around 0.01 mg PO_4-P/L (0.025 mg P/L for total dissolved phosphate) in minimally impacted small streams in the temperate zone and major rivers of the tropics and subarctic. In another paper, Dodds and Welch (2000) surveyed studies for the purpose of defining potential nutrient criteria that would address the concern of eutrophication. One study showed that total nitrogen should remain below 3 mg N/L and total phosphorus below 0.4 mg P/L for benthic chlorophyll to remain below what is considered to be not aesthetically pleasing or have compromised recreational uses. Levels of total nitrogen of 0.9 mg N/L and total phosphorus of 0.04 mg P/L were recommended based on the study by Dodds et al. (1998). Set at the median of the cumulative frequency distributions of nutrients, these recommended levels assume that approximately half the systems are impaired by excessive nutrients. Another study found that total nitrogen should be 0.47 mg N/L and total phosphorus should be 0.06 mg/L to ensure that chlorophyll is < 100 mg/m^2 most of the time.

Even with the nitrogen reductions made since the 1990s, both nitrogen and phosphorus concentrations in the creek exceed the numeric goals identified in the water quality objective for biostimulatory substances, and the numeric water quality 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 (2068WG) 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. Appendix C presents pictures illustrating the condition of the creek at these locations.

The University of California Cooperative Extension collected samples from the creek in Fall 2000 for algae identification. 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.

2.5 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 1998-99 levels reported by the MRCD (MRCD 1999b) were not maintained in 2000 and the presence of algal growth at those levels could not be determined.

The 2000 monitoring data are presented in Table B-2 and a map of the monitoring locations can be found in Figure A-3 (in Appendix A). 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. Five (5) of nine (9) water samples exceeded the nitrate water quality objective (10 mg NO_3-N/L). All nine water samples exceeded the biostimulatory substances water quality objective for total nitrogen (1.0 mg N/L).

- 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. All nine (9) water samples exceeded the biostimulatory substances water quality objective to total phosphorus (0.1 mg P/L).

- The average nitrate concentration was 9.0 mg NO_3-N/L and the average total nitrogen was 9.6 mg N/L from January through October 2000 at the Willow Glen-4 station. Ten (10) of 25 water samples exceeded the nitrate water quality objective during this period. All 25 water samples exceeded the biostimulatory substances water quality objective for total nitrogen.

- The average nitrate concentration at the Willow Glen-4 station was 13.4 mg NO_3-N/L February through July. Ten (10) of 13 water samples exceeded the nitrate water quality objective during this period. 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 Assessment).

- The average phosphate concentration at the Willow Glen-4 station from January through October 2000 was 0.37 mg PO_4-P/L and the average total phosphorus was 0.43 mg P/L. All 25 water samples exceeded the biostimulatory substances water quality objective for total phosphorus.

- Concentrations of nitrate, total nitrogen, and total phosphorus in the lower reaches, illustrated in Figure A-3 (in Appendix A), exceeded the water quality 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, Willow Glen Tributary (WGT1) and Via Milpas Tributary (VMT1), provide natural drainage of irrigation return flows from orchard and residential land uses.

- At the 2068WG station, the average nitrate concentration was 14.1 mg NO_3-N/L and the average total nitrogen was 14.7 mg N/L. The average total phosphorus concentration was 0.29 mg P/L. Twenty-three (23) of 24 water quality samples exceeded the nitrate water quality objective and all samples exceeded the biostimulatory substances water quality objectives for total nitrogen and total phosphorus.

- At the River House station, the average nitrate concentration was 14.2 mg NO_3-N/L and the average total nitrogen was 14.5 mg N/L. The average total phosphorus concentration was 0.28 mg P/L. Twenty-four (24) of 25 water quality samples exceeded the nitrate water quality objective and all samples exceeded the biostimulatory substances water quality objectives for total nitrogen and total phosphorus.

- At Stage Coach station, the average nitrate concentration was 12.9 mg NO_3-N/L and the average total nitrogen was 13.7 mg N/L. The average total phosphorus concentration was 0.3 mg P/L. All nine (9) samples exceeded the nitrate and biostimulatory substances water quality objectives for total nitrogen and total phosphorus.

- At WGT1 station, the average nitrate concentration was 18.4 mg NO_3-N/L and the average total nitrogen was 18.6 mg N/L. The average total phosphorus concentration was 0.17 mg P/L. All nine (9) samples exceeded the nitrate and biostimulatory substances water quality objectives for total nitrogen. Of the nine (9) samples, six (6) total phosphorus samples were below the detection of 0.05 mg P/L, and one (1) sample met and two (2) samples exceeded the biostimulatory substances water quality objectives for total phosphorus.

- At VMT1 station, the average nitrate concentration was 15.0 mg NO_3-N/L and the average total nitrogen was 15.3 mg N/L. The average total phosphorus concentration was 0.16 mg P/L. All nine (9) samples exceeded the nitrate and biostimulatory substances water quality objectives for total nitrogen. Of the nine (9) samples, five (5) total phosphorus samples were below the detection of 0.05 mg P/L, and three (3) samples met and one (1) sample exceeded the biostimulatory substances water quality objectives for total phosphorus.

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

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 2-3. The Basin Plan provides detailed descriptions of the various beneficial uses.

Table 2-3. 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 ground water 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 ground water 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 (USEPA 2000a). 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 (USEPA 2000a). 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 (USEPA 2000a). 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 (USEPA 1999).

While the creek does have several areas susceptible to excessive algal growth during the spring, summer and fall, eutrophic conditions were not observed during the monitoring period. Fish kills or water quality degradation from decomposition of plant matter were also not observed during the monitoring period. This may be due to the shade provided by the riparian canopy of the creek. Shading reduces the temperature of the water and limits the amount of light available for photosynthesis.

On June 4 and 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 water quality 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 water quality 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 (2000b). 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 II 1992) and in 1998-99 (CDFG 2000a) found an abundance of pollutant tolerant insects and a lack of pollutant sensitive insects. Hunsaker II (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 were 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, the nitrate concentration exceeds the water quality objective for municipal water supply (MUN) and nitrate, total nitrogen, and total phosphorus may impair warm water (WARM), cold water (COLD), and wildlife (WILD) beneficial uses. Excessive algae also present a nuisance, and impair aesthetic and recreational uses (REC1 and REC2) in localized areas where shading by the riparian canopy is not sufficient to limit algal growth. Excessive algae may also impair warm water (WARM), cold water (COLD), and wildlife (WILD) beneficial uses by creating conditions that are harmful to aquatic life and degrade water quality. 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 ground water. Existing benthic community impairment is likely a result of nutrient-enriched runoff or other pollutants 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

TMDL Numeric Targets interpret and implement water quality standards (i.e., numeric and narrative water quality objectives and beneficial uses) and are established at levels necessary to achieve water quality standards. 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 water quality 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 mole ratio of 16N:1P 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, or 7:1 by mass, ratios can be calculated from the empirical data presented in Appendix B, Table B-2. 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

If the Inorganic Chemicals nitrate and Biostimulatory Substances water quality objectives in Rainbow Creek are modified in the future then the TMDL will be recalculated and the numeric targets will be set equal to the new water quality objectives.

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 water quality 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 Assessment

The source assessment 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. The source assessment also determines nutrient inputs, measured as loads that will evaluate magnitude and support the formulation of the load allocation and wasteload allocation of the TMDLs (USEPA 1999). The following load estimates are determined using the best available methods that were known at the time of calculation and may be revised in the future. 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 (storm water runoff and dry weather flows) and indirectly in ground water. Nutrients applied directly to land (e.g. fertilizers, pet wastes) can be carried overland in storm water runoff and irrigation or can percolate through the soil to reach ground water. Septic tank disposal systems contribute nutrients primarily into ground water.

Nutrient loads from both runoff and ground water have been evaluated for all of the identified nutrient sources in Rainbow Creek. Surface runoff pollutant loads from various land uses were calculated by applying appropriate coefficients from published literature to the corresponding land use areas. Numerous studies have derived land use based loading coefficients characteristic of various watershed conditions for estimating nonpoint source pollutant yields (Boynton et al. 1993). Best professional estimates of probable values for nutrient export coefficients were determined for each pollutant using a hierarchical approach. First, coefficients from a variety of studies and publications

were accumulated. From these, values from Southern California watersheds were selected. In the absence of these data, median national values from Boynton et al. (1993) were selected. Because there are no export coefficients for some land use types (e.g., commercial nursery and park), areas with these land uses were assigned export coefficients for similar land use types (e.g., agriculture and idle land).

Surface runoff pollutant loads from the I-15 corridor resulting from vehicle exhaust and air deposition were estimated based on information provided by Caltrans' Internet Water Quality Planning Tool (Caltrans 2002). Caltrans maintenance operations along the I-15 corridor were evaluated as nutrient sources from roadways and parkway/median maintenance, but were not significant (Tesoro 2001).

Natural or undeveloped lands also contribute surface water loads through natural processes (e.g., leaf litter decay or soil erosion). Background loads were estimated using reference water quality concentration data and streamflow data.

Ground water loads were estimated using both site-specific monitoring data and per-capita septic disposal system nutrient load calculations. Air deposition load was calculated using a literature value deposition rate, which accounts for the amount of nutrients that deposit on the surface of the water. These source-specific load estimates account for the differences in magnitudes between sources and provide a basis for allocating loads in Section 6.0 Pollutant Load Allocations and Margin of Safety.

4.1 Nitrate/Total Nitrogen

4.1.1 Surface Water Loads

Land use, storm water discharges from the I-15 corridor, and natural sources were identified as potential sources of nitrogen to Rainbow Creek. This section provides discussion and estimates of the surface water loads from each of these sources.

Land Uses

Several land uses in the Rainbow Creek watershed were identified as potential sources of nitrogen (see Table 4-1)(MRCD 1999b). Specifically, the land uses of concern are characterized by human influence. Nutrients from these various land use activities can reach Rainbow Creek in storm water 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	3.7[1]	339 (137)	507
Agricultural fields	3.7[1]	436 (177)	655
Orchards	2.5[2]	781 (316)	790
Park	3.4[3]	5 (2)	7
Residential	2.6[1]	618 (250)	650
Urban	3.8[1]	34 (14)	53
Total		6,591 (2,668)	**2,662**

1. Source: SCCWRP 2000
2. Source: Boynton et al. 1993
3. Source: North Carolina State University 2001

Nutrient export coefficients were obtained from literature values since no site-specific values 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.

Caltrans I-15

Rainbow Creek receives storm water runoff from both highway surfaces and adjacent land areas via a storm drain system with outfalls discharging from both the north and south at the Rainbow Creek Bridge. Storm water from highways can contain pollutants from vehicle exhaust and atmospheric deposition. Storm water discharges from I-15 are considered point source in nature.

Rainfall runoff from I-15 can be calculated using the equation provided by Horner (1994):

$$Rv = 0.007\ IMP + 0.10$$

The runoff coefficient (Rv) is the ratio of runoff volume to rainfall volume, or the amount of rainfall that becomes runoff, and IMP is the percent impervious area. The total approximate drainage area is 120 acres, consisting of approximately 23 acres of impervious roadway and median, and 98 acres of vegetated land area (Tesoro 2001). Using the equation and converting the results to percentages, a 19% impervious catchment would deliver 23% in rainfall as runoff to Rainbow Creek.

The average annual rainfall in the vicinity of I-15 in the Rainbow Creek Watershed is 18 inches (Allan 2002). The estimated total annual volume of annual rainfall discharged as

storm water runoff to Rainbow Creek is calculated by multiplying the surface area (in acres), amount of rainfall (in inches/yr), and the percentage of rainfall that would run off of impervious surfaces (23%). The calculation is as follows:

120 acres * 18 in/yr * 43,560 ft^2/acre * 0.08 ft/in = 7.53 E +6 ft^3/yr * 0.23 = 1.73 E +6 ft^3/yr

The estimated storm water runoff load can be calculated using the representative concentrations of total nitrogen in freeway runoff in California (Caltrans 2002, in mg N/L) and volume of runoff discharged to Rainbow Creek (in ft^3/yr).

3.88 mg N/L * 1.73 E +6 ft^3/yr * 28.32 L/ft3 * 1 E –6 kg/mg = 187 kg N/yr

Background

Soil erosion and the decay of plant material and wild animal waste contribute background nitrogen and phosphorus loads from undeveloped land to Rainbow Creek. Available water quality concentrations from local streams similar to Rainbow Creek are used to determine background concentrations. Reference sites are relatively undisturbed by human influences. The definition of a reference condition ranges from a pristine, undisturbed state of a stream, to merely the "best available" or "best attainable" conditions. In the case of the San Diego streams used in this study, least and minimally impacted sites have been identified and used to determine background water quality (See Appendix D).

The background load to Rainbow Creek is calculated by multiplying the representative flow volume (ft^3/yr) determined in Appendix E using United States Geological Survey (USGS) flow gage data and the background concentration (in mg N/L) determined in Appendix D. The flow volume from the first two flow tiers (low and moderate-high) represents approximately 98% of the flows in Rainbow Creek used to represent Rainbow Creek's flow volume. The third, or "very high", flow tier represents less than 2%, thus it will not be used in TMDL calculations because it is due to extreme weather conditions.

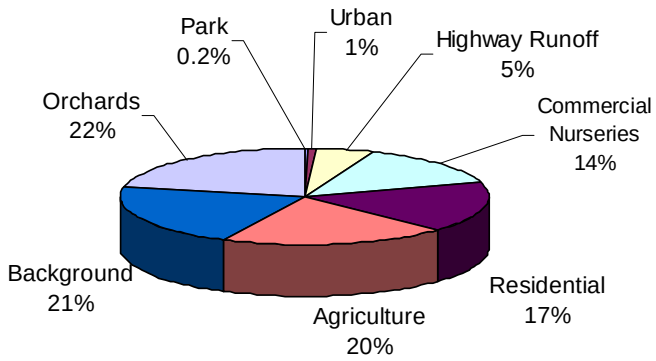
Low Flow (0-2.9 cfs)
17,764 e 3 ft^3/yr * 0.47 mg N/L * 28.32 L/ft3 * 1 e –6 kg/mg = 236 kg N/yr

Moderate – High Flow (3 – 39 cfs)
40,775 e 3 ft^3/yr * 0.47 mg N/L * 28.32 L/ft3 * 1 e –6 kg/mg = 543 kg N/yr

Total Nitrogen Load Attributable to Background Sources 779 kg N/yr

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

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



4.1.2 Ground Water Loads

Overview

Ground water that surfaces in Rainbow Creek also contributes to the nitrogen load. Nitrogen in ground water comes from two main sources: wastewater disposal systems and fertilizers that migrate to ground water via infiltration of rain or irrigation water. The total nitrogen load to Rainbow Creek from ground water is estimated to be 200 kg N/yr. This number is calculated using flow and nitrogen concentration data from Rainbow Creek during dry weather conditions.

Two different aquifer types underlie the channels of Rainbow Creek and its tributaries: alluvial deposits in the Rainbow Valley area, and crystalline bedrock everywhere else. The fact that Rainbow Creek is a gaining stream in both the Rainbow Valley area and bedrock areas of the watershed during dry weather conditions indicates that both the alluvial deposits and bedrock contribute baseflow to Rainbow Creek. However, because of the concentration of agricultural operations, population, and therefore septic tank disposal systems and because a high number of these are non-functioning systems, only baseflow discharged from the alluvial deposits is likely to contribute significant loads of nitrogen to Rainbow Creek.

Calculations

The total annual nitrogen load from ground water to Rainbow Creek was calculated using nitrogen concentration and flow data during dry weather conditions from the Oak Crest-3 Station. This station is located near the downstream (western) end of Rainbow Valley, near the point where the alluvial deposits pinch out against the bedrock. During the dry weather it is assumed that the flow measured at Oak Crest-3 Station is from ground water (i.e. baseflow). Because the creek channel upstream of the Oak Crest-3 Station is dammed by an earthen berm at the Hines Nursery that captures all of the streamflow in the creek, only the baseflow entering the channel of Rainbow Creek below the berm is

measured at the Oak Crest-3 Station. Because of this berm and because the baseflow may be higher outside of the dry season, the total nitrogen load calculated using the Oak Crest-3 Station dry season data may underestimate the total ground water load.

Total nitrogen concentrations at Oak Crest-3 Station were averaged for samples taken between August 22 and October 17, 2000 (during low flow conditions). The average total nitrogen concentration was 11 mg N/L. The average flow rate at Oak Crest-3 Station from August 22 to October 17, 2000, was 0.02 cfs (ft^3/s). Assuming the flow at Oak Crest-3 Station is comprised entirely of baseflow during this time period, and assuming that the average flow rate of 0.02 cfs represents the average year-round base flow component of stream flow in Rainbow Creek, the calculated total annual nitrogen load is:

0.02 ft^3/s * 11 mg N/L * 28.3185 L/ft^3 * 3,600 s/hr * 24 hr/d *365 d/yr * $kg/10^6$ mg ≈ 200 kg N/yr

Nitrogen Sources

The total annual nitrogen load to ground water in Rainbow Creek watershed has two possible sources: waste water disposal systems and fertilizer application in agricultural areas. Data on fertilizer application rates, volumes of applied water, and consumptive use of water and nitrogen uptake by plants in agricultural areas are not available, thus, the annual nitrogen load to ground water from fertilizer application could not be calculated. Total nitrogen contributions to ground water from fertilizer application will be evaluated further under the Implementation Plan and Monitoring Strategy.

The total annual nitrogen load to ground water from wastewater systems in the watershed is estimated to be 3,830 kg N/yr. The estimate does not account for plant uptake removal. With few exceptions, all wastewater disposal systems in the watershed are septic tank systems. For San Diego County, the estimated mass nitrogen loading from a typical septic tank system is 10.4 g/capita/day (San Diego County 1994). The estimated number of functioning septic tank systems in the watershed is roughly 237 units and the average number of people per household (and per septic tank disposal system) is 2.91 (Van Rhyn 2001). The estimated number of non-functioning septic tank disposal systems, defined as systems that are a threat to water quality because they are located in areas of high ground water, is 170 units (Rainbow Municipal Water District 2002). The total annual nitrogen load to ground water from functioning septic tank systems in the watershed therefore would be:

10.4 g/capita/day * 237 units * 2.91 capita/unit * 365 days/yr * 1 e –3 kg/g ≈ 2,600 kg N/yr

This nitrogen load should be reduced by denitrification in the leach fields of a functioning system. Typically, denitrification in the leach field removes 30 percent of the total nitrogen by loss to the atmosphere as nitrogen gas (N_2) (Oakley 1999). Therefore, the nitrogen load to ground water from the functioning leach fields would be 1,800 kg N/yr.

Because the non-functioning systems do not have adequate separation from ground water to allow denitrification to occur, a reasonable assumption is that all of the nitrogen from a septic tank system discharge reaches ground water and the 30 percent reduction does not occur. Therefore, the total annual nitrogen load to ground water from non-functioning septic tank systems in the watershed would be:

10.4 g/capita/day * 170 units * 2.91 capita/unit * 365 days/yr * 1 E –3 kg/g ≈ 1,900 kg N/yr

The total nitrogen load to ground water from septic tank system leach fields would be the sum of the functioning and nonfunctioning septic tank system loads, or 3,700 kg N/yr.

In addition to the small septic systems in the watershed, the Rainbow Conservation Camp, identified as "prison" on Figure A-2, is located in the eastern end of the watershed and has evaporation/percolation ponds that contribute nitrogen to the ground water and may be contributing nitrogen to Rainbow Creek. Wastewater from the camp is discharged to the onsite sewage treatment and disposal system. The treatment system effluent is transferred to one of three evaporation/percolation ponds. Evaporation and percolation from the ponds is the primary means of effluent disposal; however, for several days during the year, effluent from the ponds may be pumped to a spray irrigation field on approximately 2 acres of the facility.

The estimated nitrogen load to ground water is calculated using the average pond inflow minus evaporation losses, which is then multiplied by the average pond concentrations. Since the waste discharge requirements (WDRs) for the facility only require annual monitoring, the wastewater nitrogen concentration value was averaged from data provided for the years 2000 to the present. The evaporation losses were estimated using the same approach required by the Camp's WDRs. However, the calculation was revised to account for only one pond instead of two, due to that fact that only one pond is operating at any given time. This approach used surface area of the ponds and the average mean evaporation rate reported from the USGS Vail Lake Station by the California Department of Water Resources (CDWR 1979). The annual nitrogen load from the percolation ponds to ground water is as follows (Dorsey 2003b):

(11,353,529 L inflow/yr – 3,400,962 L evap./yr) * 16.5 mg N/L * 1 E –6 kg/mg ≈ 130 kg N/yr

Implementation measures will be taken to determine the impacts of the Camp treatment system on Rainbow Creek.

The estimated total annual nitrogen load to ground water from wastewater disposal systems is the sum of the annual nitrogen load from functioning septic systems, non-functioning septic systems, and the Camp treatment system, or 3,830 kg N/yr. The total nitrogen load to Rainbow Creek from ground water was calculated to be 200 kg N/yr. A comparison of these two numbers suggest that only a small fraction of the total annual nitrogen load to ground water is discharged to Rainbow Creek each year. In addition to

discharge to the creek, some of the nitrogen load will be removed through plant uptake. Site-specific uptake rates are not known. The actual removal rates will vary seasonally, with higher removal rates occurring in the spring and summer months, but an annual average removal rate for nitrogen will be accounted for when site-specific uptake rates are determined. Nonetheless, the plant uptake of nitrogen from ground water and the discharge of nitrogen laden ground water to the creek is not expected to be high enough to prevent nitrogen concentrations in ground water from rising over time because the annual nitrogen load to ground water from the disposal systems is so high. Consequently, the nitrogen concentration in the ground water that discharges into Rainbow Creek may increase over time, increasing the total annual nitrogen load from ground water to Rainbow Creek over time.

4.1.3 Atmospheric Deposition

Air pollutants are deposited to the earth, in most cases directly to a water body or to a land area that drains into a water body. These pollutants are deposited by wet or dry deposition. In wet deposition, pollutants are removed from the air by a precipitation event such as rain. Dry deposition occurs when particles settle out of the air and onto surfaces. 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 kg N/ha/yr (USEPA 1994), the load from air deposition would be approximately 40 kg N/yr.

4.1.4 Summary of Current Annual Total Nitrogen Load by Source

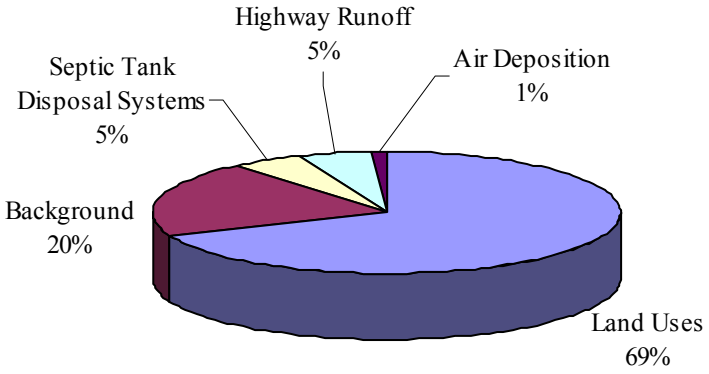
The annual load based on the calculations from the identified sources described in this section is 3,868 kg N/yr, and is summarized below in Table 4-2.

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

Source Type	Annual Total Nitrogen Load Estimate kg N/yr
Land Uses (surface runoff)	2,662
Caltrans I-15 (storm water runoff)	187
Background (surface runoff)	779
Septic Tank Disposal Systems (ground water)	200
Air Deposition (surface water)	40
Total	3,868

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

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



4.2 Total Phosphorus

4.2.1 Surface Water Flows

Land use, storm water discharges from I-15, and natural sources were identified as potential sources of phosphorus to Rainbow Creek. This section provides discussion and estimates of the surface water loads from each of these sources.

Land Uses

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	0.2[1]	339 (137)	27.4
Agricultural fields	0.2[1]	436 (177)	35.4
Orchards	0.2[2]	781 (316)	63.2
Park	0.1[3]	5 (2)	0.2
Residential areas	0.5[1]	618 (250)	125
Urban areas	0.8[1]	34 (14)	11.2
Land Uses Total		6,591 (2,668)	**262**[4]

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

Caltrans I-15

As with nitrogen, the estimated storm water runoff load is calculated using the representative concentration of total phosphorus in freeway runoff in California (Caltrans 2002) and the volume of runoff discharged to Rainbow Creek (see Section 4.1.1 for calculation).

0.25 mg P/L * 1.7 E +6 cfs/yr * 28.32 L/ft3 * 1 E –6 kg/mg = 12 kg P/yr

Background

Soil erosion and the decay of plant material and wild animal waste contribute background nitrogen and phosphorus loads from undeveloped land to Rainbow Creek. Available water quality concentrations from local streams similar to Rainbow Creek are used to determine background concentrations. Reference sites are relatively undisturbed by human influences. The definition of a reference condition ranges from a pristine, undisturbed state of a stream, to merely the "best available" or "best attainable"

conditions. In the case of the San Diego streams used in this study, least and minimally impacted sites have been identified and used to determine background water quality (See Appendix D).

As with nitrogen, the background load to Rainbow Creek is calculated by multiplying the representative flow volume (tiers 1 and 2, in ft^3/yr) determined in Appendix E using USGS flow gage data and the background concentration (in mg P/L) determined in Appendix D.

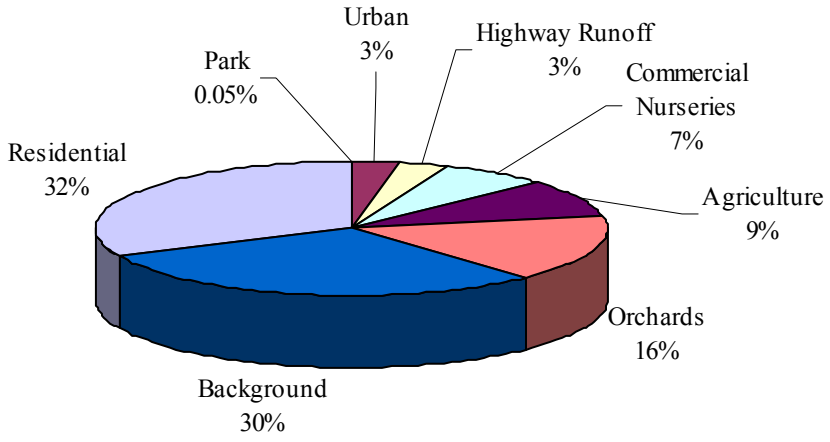
Low Flow (0-2.9 cfs)
17,764 e 3 ft^3/yr * 0.07 mg P/L * 28.32 L/ft3 * 1 e –6 kg/mg = 35 kg P/yr

Moderate – High Flow (3 – 39 cfs)
40,775 e 3 ft^3/yr * 0.07 mg P/L * 28.32 L/ft3 * 1 e –6 kg/mg = 81 kg P/yr

Total Phosphorus Load Attributable to Background Sources 116 kg P/yr

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 Surface Water 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 Ground Water Loads

Septic tank disposal systems are not considered to be significant total phosphorus sources in ground water. Phosphates readily adsorb to soil particles; consequently, phosphates do not travel far with ground water. 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 (Oakley 1999). Infiltration of phosphate from land applications is not considered significant for the same reason. Therefore, ground water loads of total phosphorus are not considered significant in Rainbow Creek. Total phosphorus contributions to ground water from septic tank disposal systems will be further investigated and is discussed in the Implementation Plan and Monitoring Strategy.

4.2.3 Atmospheric Deposition

Atmospheric phosphorus can be found in both organic and inorganic dust particles. Particles of organic origin, such as pollen, will contain phosphorus, as do all living organisms. Mineral dust will contain varying levels of phosphorus depending on its source. The general atmospheric deposition rate for total phosphorus is 0.6 kg P/ha/yr (USEPA 1994). With a creek surface area of 4 hectares, this source would contribute approximately 2 kg/year.

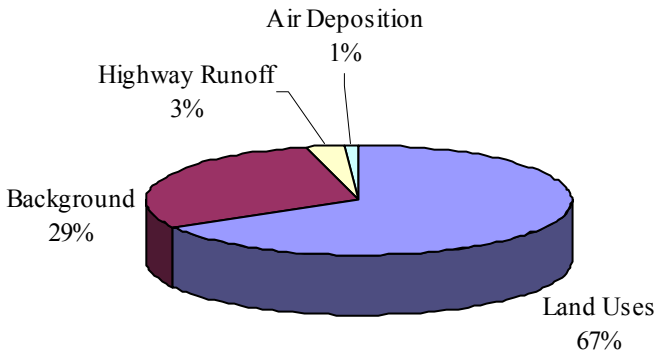
4.2.4 Summary of Current Annual Total Phosphorus Load by Source

The current annual load based on the calculations from the identified sources described in this section is 393 kg P/yr, and is summarized below in Table 4-4.

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

Source Type	Annual Total Phosphorus Load Estimate (kg P/yr)
Land Uses (surface runoff)	262
Caltrans I-15 (storm water runoff)	12
Background (surface runoff)	116
Septic Tank Disposal Systems (Ground water)	0
Air Deposition (surface water)	2
Total	**392**

Figure 4-4. Annual Total Phosphorus Load by Source Type in the Rainbow Creek Watershed



5.0 Loading Capacity and 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.

The proposed TMDLs will result in the attainment of the Biostimulatory Substances water quality objective and the restoration of beneficial uses in Rainbow Creek watershed. This is because the numeric targets are set equal to the numeric goals defined in the water quality objective as concentrations of nutrients that will prevent plant nuisance in flowing waters. The numeric targets are used directly to calculate the loading capacity (TMDLs).

If the Biostimulatory Substances water quality objectives change in the future, the numeric targets would be equal to the new water quality objectives, and a new loading capacity would be calculated to meet the new numeric targets.

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, in this case the biostimulatory target. The Regional Board reviewed daily streamflow-gage data from the U.S. Geological Survey's gaging station located near the Willow Glen-4 station for the period of November 11, 1989 to September 30, 2000 for Rainbow Creek and selected daily flow records from 8 years of records (USGS 2002). The daily streamflow data was evaluated to examine seasonal flow variations and determine the annual flow volume for Rainbow Creek (See Appendix E).

The flow data was divided into three flow tiers, which were determined based on frequency of flow rates and consideration of the time of year of occurrence. The first two flow tiers (low and moderate-high) represent approximately 98% of the flows in Rainbow Creek and will be used to calculate the TMDL. The third, or "very high", flow tier represents less than 2% will not be used in the TMDL calculation because it is due to extreme weather conditions. It is believed that very high flows would produce a mass load with a short residence time that would not create a nutrient-related problem within the watershed. In other words, compliance with the TMDL is required during flows with a magnitude less than 40 cfs.

The annual total nitrogen loading capacity is determined by multiplying the flow volume (in ft^3/yr) and the water quality concentration (in mg N/L) that will allow the creek to attain water quality standards. The loading capacity is as follows:

Low Flow (0-2.9 cfs)
17,764 e 3 ft^3/yr * 1 mg N/L * 28.32 L/ft3 * 1 e –6 kg/mg = 503 kg N/yr

Moderate – High Flow (3 – 39 cfs)
40,775 e 3 ft^3/yr * 1 mg N/L * 28.32 L/ft3 * 1 e –6 kg/mg = 1,155 kg N/yr

Total Annual Loading Capacity 1,658 kg N/yr

5.2 Total Phosphorus

Using the same approach as for total nitrogen, the annual flow volume for the low and moderate-high flow tiers and the biostimulatory numeric target of 0.1 mg P/L are used to calculate the total phosphorus loads for Rainbow Creek. The annual total phosphorus loading capacity is presented below:

Low Flow (0-2.9 cfs)
17,764 e 3 ft^3/yr * 0.1 mg P/L * 28.32 L/ft3 * 1 e –6 kg/mg = 50 kg P/yr

Moderate – High Flow (3 – 39 cfs)
40,775 e 3 ft^3/yr * 0.1 mg P/L * 28.32 L/ft3 * 1 e –6 kg/mg = 115 kg P/yr

Total Annual Loading Capacity 165 kg P/yr

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

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

Numeric Target	Load Capacity	
	kg/yr	lbs/yr
Total Nitrogen	1,658	3,648
Total Phosphorus	165	365

For convenience, the initial load capacity has been provided in the units of kilograms per year and pounds per year.

6.0 Margin of Safety and Pollutant Load Allocations

A TMDL is less than or equivalent to the loading capacity after taking into account the allocations for all sources and a margin of safety. 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 nonpoint and natural background. Presently, only one point source was found to be a contributing source, e.g., Caltrans. Additionally, 2% of the TMDLs will be set aside to account for unknown or future point sources. If, in the future, a source that is considered a nonpoint source in this document becomes a point source (i.e., a permitted discharge), then the portion of the load allocation that is associated with that source can be become a WLA. 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:

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

If the water quality objectives for Biostimulatory Substances change in the future then the TMDL would be recalculated and the new explicit MOS would be equal to 5 percent of the recalculated loading capacity.

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 5% is reserved to account for uncertainties. An implicit MOS has been incorporated through conservative assumptions in the analysis by treating nutrients as conservative pollutants (i.e., did not consider nutrient cycling within the environment).

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

For total nitrogen:

- Actual site-specific nutrient export coefficients and air deposition rates
- Actual condition and maintenance status of septic tank disposal systems
- Actual effect of rising ground water table on septic tank disposal systems
- Actual contribution of nutrients from the Conservation Camp percolation ponds to surface water
- Actual data on ground water contributions to surface water

- Actual loading of nutrients to ground water from irrigation
- The relationship between nutrient loads and corresponding creek concentrations
- Future watershed development

For total phosphorus:
- Actual site-specific nutrient export coefficients and air deposition rates
- Actual loading from overland surface runoff during storm events
- Actual loading from stream sediment
- The relationship between nutrient loads and creek concentrations
- Future watershed development

6.2 Total Nitrogen Load Allocations

The Linkage Analysis (see Table 5-1) determined that the allowable total nitrogen mass load in Rainbow Creek is 1,658 kg N/year.

In determining the load allocations for the total nitrogen TMDL, the allowable pollutant load of 1,658 kg N/yr is divided between the MOS, background, point and nonpoint source discharges. As described above, an explicit MOS of 5% is reserved to account for uncertainties. The MOS is 83 kg N for the year.

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. The background load was determined in Section 4.1.1 to be 779 kg N/yr and is based on the San Diego reference stream concentration and Rainbow Creek annual flow.

Based on available information, highway runoff is the only identified point source of total nitrogen to Rainbow Creek. Using the same method as used in Section 4.1.1 to calculate the load from highway runoff, the wasteload allocation is determined to be 49 kg N/yr if Caltrans' discharge is at the water quality standard of 1.0 mg N/L. In addition, 2% of the TMDL, or 33 kg N/L, will be set aside as a placeholder for unknown or future point sources. The total wasteload allocation (WLA) for the creek is 82 kg N/yr. The remaining allocation for nonpoint sources (LAs) is therefore:

Total Maximum Daily Load – Margin of Safety – Background Load – Point Source Allocation = Remaining Allocation for Nonpoint Sources

1,658 kg N/yr – 83 kg N/yr – 779 kg N/yr – 82 kg N/yr = 714 kg N/yr

In summary, the nitrogen TMDL equation is:

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

∑ WLA	82 kg N/yr
∑ LA	714 kg N/yr
Background	779 kg N/yr
MOS	83 kg N/yr
TMDL	1,658 kg N/yr

The total LAs do not include an allocation for undeveloped land or preserve, because they are considered as part of background loads.

The allocations to the various sources are shown in Table 6-1, below. Appendix F provides additional information, which is summarized here:

1. The largest contributors to the current load are required to make the largest reductions. Commercial nurseries, agricultural fields, orchards, residential, and septic tanks are required to make a 77 percent reduction

2. Parks and urban areas are required to make a 50 percent reduction since their relative contribution is very small, less than 2 percent of the current load.

3. The Caltrans allocation, as discussed above, is based on multiplying their estimated discharge times the numeric target of 1.0 mg N/L.

4. Air deposition on the water surface receives no reduction because it is least practical to achieve.

5. Future point sources are allocated 33 kg N per year.

Table 6-1 lists the load allocations for the identified point and nonpoint nitrogen sources. For convenience to the reader, the allocations are provided in the units of kilograms per year and pounds per year.

Table 6-1. Total Nitrogen Wasteload and Load Allocations for Rainbow Creek Nitrogen TMDL

Source	Current Annual Load kg N/yr	Reduction %	Annual Load Allocations	
			kg N/yr	lbs. N/yr
Caltrans highway runoff	187	74	49	108
Unidentified and future point source discharge			33	72
Point Source (WLA) Subtotal			**82**	**180**
Commercial nurseries	507	77	116	255
Agricultural fields	655	77	151	332
Orchards	790	77	182	400
Park	7	50	3	7
Residential areas	650	77	149	328
Urban areas	53	50	27	60
Septic tank disposal systems	200	77	46	101
Air deposition	40	0	40	88
Non-Point Source (LA) Subtotal			**714**	**1,571**
Total	**3,089**	**74**	**796**	**1,751**

6.3 Total Phosphorus Load Allocations

The Linkage Analysis (Table 5-1) determined that the total phosphorus mass loading capacity of Rainbow Creek required to attain the biostimulatory numeric target is 165 kg P/yr.

In determining the load allocations for the total phosphorus TMDL, the allowable pollutant load of 165 kg P/yr is divided between MOS, background, point and nonpoint source discharges. As described above, a 5% MOS is set aside to account for uncertainties. The MOS is 8 kg P/yr.

For the purposes of this TMDL, background total phosphorus sources are subtracted separately from the load allocations. The background load was determined in Section 4.2.1 to be 116 kg P/yr and is based on San Diego reference stream concentration for total phosphorus and Rainbow Creek annual flow.

Based on available information, highway runoff is the only identified total phosphorus point sources to Rainbow Creek. Using the same method as used in Section 4.2.1 to

calculate the load from highway runoff, the wasteload allocation is determined to be 5 kg P/yr if Caltrans' discharge is at the water quality standard of 0.1 mg P/L. In addition, 2% of the TMDL, or 3 kg P/L, will be set aside as a placeholder for unknown or future point sources. The total wasteload allocation (WLA) for the creek 8 kg P/yr. The remaining allocations for nonpoint sources (LAs) are therefore:

Total Maximum Daily Load – Margin of Safety – Background Load – Point Source Allocation = Remaining Allocation for Nonpoint Sources

165 kg P/yr – 8 kg P/yr – 116 kg P/yr – 8 kg P/yr = 33 kg P/yr

These total LAs do not include an allocation for undeveloped land or preserve, since they are considered as part of background loads.

In summary, the phosphorus TMDL equation is:

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

∑ WLA	8 kg P/yr
∑ LA	33 kg P/yr
Background	116 kg P/yr
MOS	8 kg P/yr
TMDL	165 kg P/yr

The allocation to the various sources are presented in Table 6-2 and are based on the following (Appendix F provides additional information):

1. The largest contributors to the current load are required to make the largest reductions. Commercial nurseries, agricultural fields, orchards, and residential are required to make a 90 percent reduction.

2. Parks and urban areas are required to make a 50 percent reduction since their relative contribution is very small, less than 3 percent of the current load.

3. The Caltrans allocation, as discussed above, is based on multiplying their estimated discharge times the numeric target of 0.1 mg P/L.

4. Air deposition on the water surface receives no reduction because it is least practical to achieve.

5. Future point sources are allocated 3 kg P per year.

Table 6-2 lists the load allocations for the identified point and nonpoint total phosphorus sources. For convenience to the reader, the allocations are provided in the units of kilograms per year and pounds per year.

Table 6-2. Total Phosphorus Wasteload and Load Allocations for Rainbow Creek Phosphorus TMDL

Source	Current Annual Load Kg P/yr	Reduction %	Annual Load Allocations	
			Kg P/yr	lbs. P/yr
Caltrans highway runoff	12	58	5	11
Unidentified and future point source discharge			3	7
Point Source (WLA) Subtotal			**8**	**18**
Commercial nurseries	27.4	90	3	7
Agricultural fields	35.4	90	4	9
Orchards	63	90	6	13
Park	0.2	50	0.1	0.2
Residential areas	125	90	12	26
Urban areas	11	50	6	13
Air deposition	2	0	2	4
Non-Point Source (LA) Subtotal			**33.1**	**73**
Total	**277**	**85**	**41.1**	**91**

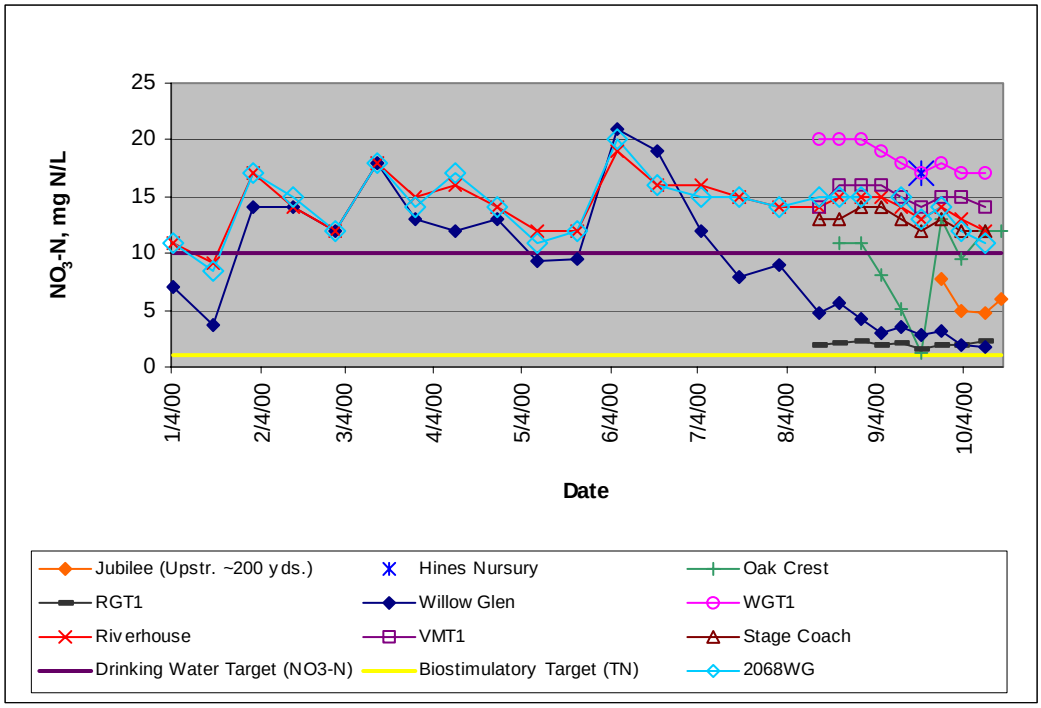
7.0 Seasonal Variations and Critical Conditions

Defining and calculating the TMDLs using site-specific flow data addresses seasonal variation. Stream flow data includes the variability of discharge rates and receiving water flows. It assumes that the higher flows during the winter months will provide a shorter residence time. Summer is the critical time period for eutrophic conditions because of available nutrients, low flows, warmer temperatures, and longer daylight hours. The loads are expected to be protective of beneficial uses because the TMDLs are based on the water quality objective.

There are essentially two weather seasons in Southern California, a dry season, which makes up most of the year and intermittent wet weather events that primarily occur between November and March, and averaging about 16 inches annually for inland North County (Escondido)(WRCC 2003). 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. Winter is the least critical time of year for algal growth because its 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.

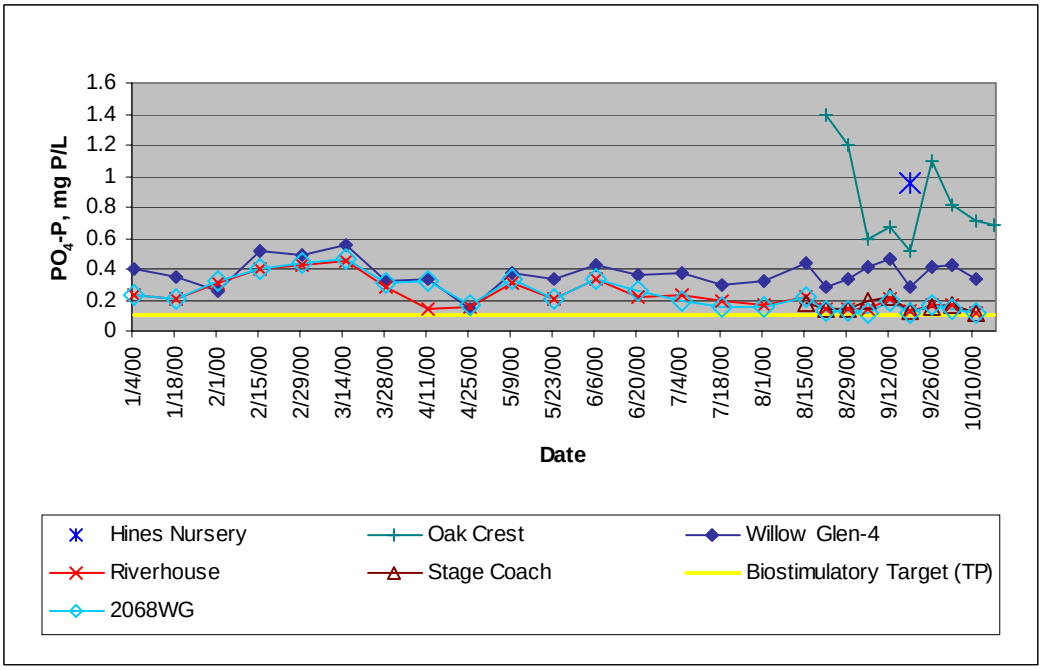
Although late summer is the critical time period for the development of eutrophic conditions, the critical time period for algal growth begins much earlier. Algal growth, illustrated in a sample of photographs presented in Appendix C (additional photographs are available in the Administrative Record), begins flourishing in February, is well established by May, and is present through the summer months. Emergent plants and additional localized algal blooms were found to be present in June, and continue to grow into October. When optimum conditions of adequate light, stream flow, water temperature and substrate exist, adequate nutrient quantities are needed for algal growth. Figure 7-1 shows the nitrate concentrations (Appendix B, Table B-2) at monitoring locations on Rainbow Creek and its tributaries (see Appendix A, Figure 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 heavily impacted 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 to 1.4 mg PO_4-P/L). Creek concentrations (Appendix B, Table B-2) are illustrated in Figure 7-2. Levels in all tributaries and the most upstream location (Jubilee) 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 to 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 2002 wet season and with field observations that found an increase in algal biomass.

Figure 7-2. Rainbow Creek Orthophosphate Phosphorus Concentrations During 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 (Section 10).

8.0 Legal Authority and Regulatory Framework

This Section presents the legal authority and regulatory framework used as a basis for assigning specific responsibilities to implement and monitor the Rainbow Creek TMDL. The laws and policies governing point source[21] and nonpoint source[22] discharges are described. Discharger accountability for attaining nutrient wasteload and load reductions is established. An approach for providing the necessary regulatory oversight of the nonpoint source nutrient load reduction is proposed. The legal authority and regulatory framework is described in terms of the following:

- Controllable Water Quality Factors
- Point Source Discharges
- Nonpoint Source Discharges
- Third Party Regulatory Based Approach

8.1 Controllable Water Quality Factors

The Rainbow Creek watershed lies within an unincorporated portion of the County of San Diego. Sources of nutrients to Rainbow Creek that result from human habitation and land use practices include wet and dry weather runoff, agricultural, orchard, and nursery irrigation return flows, septic wastewater discharges, and atmospheric deposition. Construction, maintenance, and operation of State-owned highways are also sources of nutrient discharges to Rainbow Creek.

These nutrient discharges result from controllable water quality factors which are defined as those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the State and that may be reasonably controlled. This TMDL establishes wasteload and load allocations for these controllable discharges. This TMDL does not require reduction of uncontrollable discharges of nutrients such as those resulting from wildlife and natural sources.

[21] The term ''point source'' is defined in Clean Water Act section 502(6) to mean any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

[22] The term ''nonpoint source'' refers to diffuse, widespread sources of pollution. The major sources of nonpoint source pollution in California are related to land use activities that occur throughout watersheds and include: (1) agriculture, (2) forestry (silviculture), (3) urban runoff, (e.g., from construction sites, roads and highways, septic systems), (4) marinas and boats, (5) hydromodification activities, and (6) resource extraction. As rainfall, snowmelt, irrigation water or any other type of water moves over or through the ground, it picks up and transports natural pollutants and pollutants resulting from human activity, ultimately depositing them into rivers, lakes, wetlands, coastal waters, and groundwater.

8.2 Point Source Discharges

Dischargers responsible for actual or potential point source discharges of nutrients to Rainbow Creek are discussed in this subsection. These dischargers have specific roles and responsibilities assigned to them for achieving compliance with the total nitrogen and total phosphorus wasteload described in Section 10.0 Implementation Action Plan.

8.2.1 Regulatory Background

Clean Water Act § 402 establishes the National Pollutant Discharge Elimination System (NPDES Program) to regulate the ‘‘discharge of a pollutant,’’ other than dredged or fill materials, from a ‘‘point source’’ into ‘‘waters of the United States[23].’’ Under Clean Water Act § 402, discharges of pollutants to waters of the United States are authorized by obtaining and complying with the terms of an NPDES permit. NPDES permits commonly contain numerical discharge limits for specified pollutants and required best management practices[24] (BMPs) designed to minimize water quality impacts. These numerical effluent limitations and BMPs (or other non-numerical effluent limitations) implement both technology-based and water quality based requirements of the Clean Water Act. Technology-based limitations represent the degree of control that can be achieved by point sources using various levels of pollution control technology. If necessary to achieve compliance with applicable water quality standards, NPDES permits must contain water quality-based limitations more stringent than the applicable technology-based standards.

Within each TMDL a “wasteload allocation[25]” is determined which is the maximum amount of a pollutant that may be contributed to a waterbody by “point source” discharges of the pollutant in order to attain and maintain water quality objectives. NPDES permits must include water quality-based effluent limits or conditions that are consistent with the assumptions and requirements of the wasteload allocation. The principle regulatory means of implementing TMDLs for point source discharges regulated under NPDES permit are:

1. Allocate the total wasteload allocation calculated for point source facilities regulated under NPDES permits among each individual NPDES point source facility that is

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[23] See 40 CFR §122.2(c)(e). The USEPA has interpreted “waters of the United States” to include “intrastate lakes, rivers, streams (including intermittent streams) . . . the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce,” and “tributaries of [those] waters”. Rainbow Creek, a tributary of the Santa Margarita River, is a water of the United States.

[24] See 40 CFR §122.2 Best management practices (“BMPs”) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of “waters of the United States.” BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. The term BMP is extensively used in the point source program in connection with NPDES permits where implementation of BMPs is enforceable.

[25] See 40 CFR 130.2(h). A wasteload allocation is the portion of the receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution.

discharging the pollutant that needs to be controlled;

2. Evaluate whether the effluent limitations or conditions within the NPDES permit are consistent with the wasteload allocation. If not, incorporate effluent limitations that are consistent with the wasteload allocation into the NPDES permit[26] or otherwise revise the NPDES permit to make it consistent with the assumptions and requirements of the TMDL wasteload allocation.[27] A time schedule to achieve compliance should also be incorporated into the NPDES permit in instances where the discharger is unable to immediately comply with the required wasteload reduction;

3. Mandate discharger compliance with the wasteload allocation in accordance with the terms and conditions of the revised NPDES permit;

4. Implement a monitoring and/or modeling plan designed to measure the effectiveness of the controls implementing the wasteload allocations and the progress the waterbody is making toward attaining water quality objectives; and

5. Establish criteria to determine that substantial progress toward attaining water quality standards is being made and if not, the criteria for determining whether the TMDL or wasteload allocation needs to be revised.

8.2.2 California Department of Transportation

The California Department of Transportation (Caltrans) is responsible for the design, construction, maintenance, and operation of the California State Highway System, including the portion of the Interstate Highway System within the State's boundaries. The roads and highways operated by Caltrans are legally defined as municipal separate storm sewer systems (MS4s) and discharges of pollutants from Caltrans MS4s to waters of the United States, such as Rainbow Creek, constitute a point source discharge that is subject to regulation under an NPDES permit.

Discharges of storm water from the Caltrans owned right-of-ways, properties, facilities, and activities, including storm water management activities in construction, maintenance, and operation of State-owned highways are regulated under Order No. 99-06-DWQ, *National Pollutant Discharge Elimination System Permit, Statewide Storm Water Permit, and Waste Discharge Requirements for the State of California, Department of*

[26] In the case of NPDES storm water permits, effluent limitations may include best management practices that evidence shows are consistent with the wasteload allocation.

[27] See 40 CFR §122.44(d)(1)(vii)(B). NPDES water quality-based limits must be consistent with the assumptions and requirements of any available TMDL wasteload allocation. The regulations do not require the effluent limits to be identical to the wasteload allocation. The regulations leave open the possibility that the Regional Board could determine that fact-specific circumstances render something other than literal incorporation of the wasteload allocation to be consistent with the TMDL assumptions and requirements. The rationale for such a finding could include a trade amongst dischargers of portions of their load or wasteload allocations, performance of an offset program that is approved by the Regional Board, or any number of other considerations bearing on facts applicable to the circumstances of the specific discharger.

Transportation (Caltrans) (Caltrans MS4 NPDES Storm Water Permit). Caltrans is responsible, under the terms and conditions of the MS4 NPDES Storm Water Permit for ensuring that their operations do not contribute to violations of water quality objectives in Rainbow Creek.

Caltrans is a point source discharger of nutrients to Rainbow Creek. Caltrans discharges storm water runoff containing nutrients from both Interstate-15 freeway surfaces and adjacent land areas via a storm drain system with outfalls discharging from both the north and south at the Rainbow Creek Bridge. Storm water runoff from highways can contain pollutants, including nutrients, from vehicle exhaust and atmospheric deposition. These discharges are contributing to the exceedances of the nitrate and biostimulatory substances water quality objectives in Rainbow Creek.

8.2.3 CA Department of Forestry and Fire Protection

The California Department of Forestry and Fire Protection (CDFFP) owns and operates a wastewater treatment plant (septic tank and percolation ponds) that receives sewage wastewater flows from the Rainbow Conservation Camp. The treatment system consists of a 15,000-gallon septic tank. The septic tank effluent is transferred to one of three evaporation/percolation ponds for disposal. The ponds have earthen fill side-slopes, bottoms and containment berms. Evaporation and percolation from the ponds is the primary means of effluent disposal; however, for several days during the year, effluent from the ponds may be pumped to a spray irrigation field covering approximately 2 acres of the facility. The nutrients in the wastewater are introduced directly into the groundwater as the result of the percolation ponds discharge.

CDFFP's discharge from the treatment plant is regulated under Order No. 95-20, *Waste Discharge Requirements for the California Department of Forestry and Fire Protection, Rainbow Conservation Camp*. Order No. 95-20 requires that CDFFP prevent surfacing of wastes on their property. Order No. 95-20 also requires that surface runoff of any wastes that surfaces on property not owned or controlled by the CDFFP must be prevented. The CDFFP is required to evaluate, monitor, and take measures necessary to ensure that their current and future waste water disposal operations do not contribute to the impairment of Rainbow Creek.

The percolation ponds are suspected of not having the proper separation from groundwater and/or bedrock and the percolated effluent appears to be surfacing down gradient of the ponds and flowing into Rainbow Creek[28]. Surfacing groundwater that is recognizable as sewage from the Rainbow Conservation Camp facility constitutes a potential point source discharge of nutrients to Rainbow Creek. The Regional Board has directed CDDF, pursuant to Water Code section 13267, to conduct an investigation of the possible impacts from the Camp's wastewater discharge: to the Creek and the results of the investigation are currently under review by the Regional Board for additional follow-up action.

[28] Further details are contained in Regional Board letters to CDDF dated March 8, 2002 and June 4, 2002. Regional Board observations of these conditions during a January 28, 2003 inspection of the facility are described in a February 26, 2993 memorandum (Dorsey 2003b).

8.2.4 County of San Diego

The County of San Diego's discharge of urban runoff from Municipal Separate Storm Sewer Systems (MS4) is 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. Under the terms and conditions of Order No. 2001-01 the County is responsible for controlling all storm and non-storm water flows (i.e., urban runoff) that is transported through an MS4 conveyance system to surface waters.

Nutrients are present in runoff from commercial nurseries, orchards, parks, residential areas, urban areas, and septic tank disposal system land use activities[29] in the Rainbow Creek watershed. Discharges from these land use activities to an MS4 operated by the County of San Diego are regulated under the NPDES Storm Water Permit. The County's NPDES Storm Water Permit prohibits discharges from municipal storm water MS4s that cause or contribute to violations of water quality objectives. To the extent that there is an MS4 discharge in the Rainbow Creek watershed from these land use activities, it is contributing to the exceedance of the nutrient water quality objective in Rainbow Creek waters.

8.3 Nonpoint Source Discharges

Nonpoint source discharges of nutrients to Rainbow Creek are discussed in this subsection. Specific roles and responsibilities assigned to nonpoint source dischargers for achieving compliance with the total nitrogen and total phosphorus load allocations are described in Section 10.0 Implementation Action Plan.

8.3.1 Regulatory Background

While point source discharges are controlled directly by the federal Clean Water Act's NPDES permit program, direct control of nonpoint source pollution is left to state programs developed under state law. Within each TMDL a " load allocation[30]" is determined which is the maximum amount of a pollutant that may be contributed to a waterbody by "nonpoint source" discharges of the pollutant in order to attain and maintain water quality objectives. Load allocations for nonpoint sources are not directly enforceable under the Clean Water Act and are only enforceable to the extent they are made so by state laws and regulations. California's Porter-Cologne Water Quality

[29] Agricultural storm water discharges and return flows from irrigated agriculture in the Rainbow Creek watershed are exempt form NPDES Permit regulation under Clean Water Act §402(k)(1)(1).

[30] See 40 CFR 130.2(g). A load allocation is the portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources.

Control Act[31] applies to both point and nonpoint sources of pollution and serves as the principle legal authority in California for the application and enforcement of TMDL load allocations for nonpoint sources.

California's Nonpoint Source Pollution Control Program

In December 1999, the State Water Resources Control Board (SWRCB), in its continuing efforts to control nonpoint source (NPS) pollution in California, adopted the Plan for California's Nonpoint Source Pollution Control Program (NPS Program Plan) (SWRCB, 1999). The NPS Program Plan upgraded the State's first Nonpoint Source Management Plan adopted by the SWRCB in 1988 (1988 Plan). The primary objective of the NPS Program Plan is to reduce and prevent NPS pollution so that the waters of California support a diversity of biological, educational, recreational, and other beneficial uses. Towards this end, the NPS Program Plan focuses on implementation of 61 management measures[32] (MMs) and related management practices[33] (MPs) in six land use categories by the year 2013 [34].

The success of the NPS Program Plan depends upon individual discharger implementation of MPs. Pollutants can be effectively reduced in NPS discharges by the application of a combination of pollution prevention[35] source control, and treatment control MPs. Source control MPs (both structural and non-structural) minimize the contact between pollutants and flows (e.g., rerouting run-on around pollutant sources or keeping pollutants on-site and out of receiving waters). Treatment control (or structural) MPs remove pollutants from NPS discharges. MPs can be applied before, during, and after pollution producing activities to reduce or eliminate the introduction of pollutants into receiving waters.

California's NPS Implementation and Enforcement Policy

[31] CWC §13000 et seq.

[32] MMs serve as general goals for the control and prevention of nonpoint source polluted runoff.

[33] MPs are the implementation actions taken by nonpoint source dischargers to achieve the management measure goals. USEPA and the SWRCB have dropped the word 'best' when describing the implementation actions taken by nonpoint source dischargers to control NPS pollution because "best" is considered too subjective. The "best" management practice in one area or situation might be entirely inappropriate in another area or situation. In this document the term "best management practices (BMPs)" is used exclusively in reference to schedules of activities, prohibitions of practices, maintenance procedures, and other management practices taken by NPDES permit dischargers.

[34] MMs are identified in Volume II of the *Plan for California's Nonpoint Source Pollution Control Program* (NPS Program Plan) 1999 Program Plan: *California's Management Measures for Polluted Runoff* (CAMMPR) (http://www.swrcb.ca.gov/nps/docs/cammpr-agr.doc). The State Water Resources Control Board's California Nonpoint Source Encyclopedia (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html) also contains extensive information on nutrient reduction MMs and MPs applicable to the NPS land use activities in the Rainbow Creek watershed.

[35] Pollution prevention, the initial reduction/elimination of pollutant generation at its source should be used in conjunction with source control and treatment control MPs. Pollutants that are never generated do not have to be controlled or treated.

In May 2004, pursuant to CWC §13369 the State Water Resources Control Board (SWRCB) adopted the *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Implementation and Enforcement Policy), setting forth how the NPS Program Plan should be implemented and enforced to control NPS pollution. The NPS Implementation and Enforcement Policy provides guidance on the statutory and regulatory authorities of the SWRCB and the Regional Water Quality Control Board's (RWQCBs) to prevent and control NPS pollution. The policy also provides guidance on the structure of NPS source control implementation programs, including third-party implementation programs, and the mandatory five key elements applicable to all NPS implementation programs.

The NPS Implementation and Enforcement Policy emphasizes the fact that the RWQCBs have primary responsibility for ensuring that appropriate NPS control implementation programs are in place throughout the State. RWQCB responsibilities include, but are not limited to regulating all current and proposed NPS discharges under Waste Discharge Requirements (WDRs), waivers of WDRs, or a basin plan prohibition, or some combination of these administrative tools.

Third-party NPS Implementation Programs

Under the NPS Implementation and Enforcement Policy, RWQCBs continue to have primary responsibility for ensuring that there are appropriate NPS control implementation programs in place to meet water quality objectives and to protect the beneficial uses of the waters of the State. An NPS pollution control implementation program is a program developed to comply with SWRCB or RWQCB Waste Discharge Requirements (WDRs), waivers of WDRs, or basin plan prohibitions. Implementation programs for NPS pollution control may be developed by a RWQCB, the SWRCB, an individual discharger or by or for a coalition of dischargers in cooperation with a third-party representative, organization, or government agency. The latter programs are collectively known as "third-party" programs and the third-party role is restricted to entities that are not actual dischargers under RWQCB/SWRCB permitting and enforcement jurisdiction. These may include NGOs, citizen groups, industry groups (including discharger groups represented by entities that are not dischargers), watershed coalitions, government agencies (e.g. cites or counties), or any mix of the above.

Under existing law, there are various ways in which the RWQCBs can use third-party programs in their NPS pollution control programs. For example, the RWQCBs can conditionally waive regulation of a particular nonpoint pollution source based on the existence of an adequate third-party program that addresses this source. Similarly, the RWQCBs can adopt individual or general WDRs for NPS discharges that build upon third-party programs. These WDRs can, for example, require that the dischargers either participate in an acceptable third party NPS program or, alternatively, submit individual pollution prevention plans that detail how they will comply with the WDRs. Likewise, the RWQCBs can adopt discharge prohibitions, which include exceptions based on third-party programs. For example, a RWQCB can except from the discharge prohibition those discharges that are adequately addressed in an acceptable third-party NPS pollution control program.

Given the extent and diversity of NPS pollution discharges, the Regional Board needs to be as creative and efficient as possible in devising approaches to prevent or control NPS pollution. Third-party programs can enhance the Regional Board's ability to reach multiple numbers of NPS dischargers who individually may be unknown to the Regional Board. Under this approach, oversight of discharger NPS pollution control efforts can be achieved more efficiently and with less impact on the Regional Board's limited NPS program staffing and financial resources.

Key Elements of an NPS Implementation Programs
Under the NPS Implementation and Enforcement Policy the Regional Board is required to ensure that NPS implementation programs developed by dischargers or third-parties meets the requirements of the five key structural elements described below:

Key Element 1: The objectives of an NPS control implementation program shall be explicitly stated and must, at a minimum, address NPS pollution in a manner designed to achieve State and regional water quality standards, including whatever higher level of water quality the RWQCB determines is appropriate in accordance with antidegradation principles.

Key Element 2: The NPS control implementation program shall include a discussion of the MPs that are expected to be implemented to ensure attainment of program objectives, and a discussion of the process to be used to verify proper MP implementation.

Key Element 3: Where a RWQCB determines it is necessary to allow time to achieve water quality standards, the NPS control implementation program shall include a specific time schedule and corresponding quantifiable milestones designed to measure progress toward reaching the program's objectives.

Key Element 4: The NPS control implementation program shall include sufficient feedback mechanisms so that the RWQCB, dischargers, and the public can determine if the program is achieving its stated objectives or if further MPs or other measures are needed.

Key Element 5: The Regional Board shall make clear, in advance, the potential consequences for failure to achieve an NPS control implementation program's stated purposes.

8.3.2 Rainbow Creek Nonpoint Source Discharges

The major nonpoint source (NPS) nutrient discharges in the Rainbow Creek watershed result from (1) commercial nursery, (2) agricultural field, (3) orchard, (4) park, (5) residential area, (6) urban area, and (7) septic tank disposal system land use activities, as described below. Some of these discharges are regulated under the terms and conditions of the Regional Board's Basin Plan waiver policy[36]. Individual landowners and other

[36] The Regional Board may waive issuance of waste discharge requirements for a specific discharge or types of discharge pursuant to CWC §13269 if such waiver is determined to be in the public interest.

persons (e.g. homeowners, nurseries, businesses) engaged in these land use activities are required to be held accountable for attaining nutrient load reductions in Rainbow Creek.

Commercial Nurseries

Greenhouses and container crop industries apply nutrients in the form of chemical fertilizers (e.g., liquid or time release) to optimize production. When fertilizer applications exceed plant needs, the excess can wash into Rainbow Creek during rain events or through irrigation runoff. Excessive irrigation can affect water quality by causing erosion, and transporting nutrients, pesticides, and heavy metals to nearby waterways and groundwater. Commercial nursery impacts on surface water and groundwater can be minimized by properly managing nutrient applications and irrigation practices, and by controlling sediment erosion and runoff.

Nursery Irrigation Return Water Waiver

Discharges of irrigation return water from nurseries[37] in the San Diego Region currently are regulated under the terms and conditions of the Regional Board's Basin Plan waiver policy.[38] Under the terms of this policy the Regional Board waives the obligation of nursery owners and operators to obtain waste discharge requirements for discharges of irrigation return water from nurseries subject to the following conditions:

- There is no discharge to waters of the United States;
- Management practices are implemented for the discharge as described in the NPS Program Plan (SWRCB, 1999);
- The discharge shall not create a nuisance as defined in the California Water Code;
- The discharge shall not cause a violation of any applicable water quality standard; and
- The discharge of any substance in concentrations toxic to animal or plant life is prohibited.

Agricultural Fields

Agricultural activities that cause nonpoint source pollution include plowing, fertilizing, irrigation, pesticide spraying, planting, and harvesting. The major agricultural nonpoint source pollutants that result from these activities are nutrients, sediment, pathogens,

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The waiver of waste discharge requirements is conditional and may be terminated at any time by the Regional Board for any specific discharge or any specific type of discharge.

[37] For the purposes of the waiver, a "nursery" is defined as a facility engaged in growing plants (shrubs, trees, vines, etc.) for sale.

[38] The Regional Board may waive issuance of waste discharge requirements for a specific discharge or types of discharge pursuant to California Water Code §13269 if such waiver is determined to be in the public interest. The waiver of waste discharge requirements is conditional and may be terminated at any time by the Regional Board for any specific discharge or any specific type of discharge.

pesticides, and salts. Agricultural producers apply nutrients in the form of chemical fertilizers, manure, or sludge to optimize production. Excess fertilizers and irrigation runoff, as well as rainfall runoff, can wash nutrients and sediments off of properties into nearby waterways. Agricultural impacts on surface water and groundwater can be minimized by properly managing nutrient applications and irrigation practices, and by controlling sediment erosion and runoff.

Agricultural Irrigation Return Water Discharge Waiver
Discharges of irrigation return water from agriculture [39] fields in the San Diego Region are regulated under terms and conditions of the Regional Board's Basin Plan waiver policy. Under the terms of this policy the Regional Board waives the obligation of agricultural field owners and operators to obtain waste discharge requirements for agricultural irrigation return water discharges to waters of the state subject to the following conditions:

- Management practices are implemented for the discharge as described in the NPS Program Plan (SWRCB, 1999);
- The discharge shall not create a nuisance as defined in the California Water Code;
- The discharge shall not cause a violation of any applicable water quality standard; and
- The discharge of any substance in concentrations toxic to animal or plant life is prohibited.

Orchards
Agricultural activities that cause nonpoint source pollution include fertilizing, irrigation, pesticide spraying, planting, and harvesting. The major agricultural nonpoint source pollutants that result from these activities are nutrients, sediment, pathogens, pesticides, and salts. Agricultural producers apply nutrients in the form of chemical fertilizers and irrigate to optimize production. Excess fertilizers and irrigation runoff, as well as rainfall runoff, can wash or leach nutrients and sediments off of properties into nearby waterways and groundwater. Agricultural impacts on surface water and groundwater can be minimized by properly managing nutrient applications and irrigation practices, and by controlling sediment erosion and runoff.

Agricultural Orchard Irrigation Return Water Discharge Waiver
Discharges of irrigation return water from orchards in the San Diego Region are regulated under terms and conditions of the Regional Board's Basin Plan waiver policy for agricultural irrigation return water. (See above discussion on *Agricultural Irrigation Return Water Discharge Waiver*.)

[39] For the purposes of the waiver , "agriculture" is defined as the production of fiber and/or food (including food for animal consumption, e.g., alfalfa).

Park
The San Diego County Parks and Recreation Department perform landscape maintenance of the community park (Rainbow Park). The park includes a children's playground, restroom facilities, a parking lot and a large grassy area with some landscaped areas. Sources of nutrients are organic matter such as fertilizer usage, leaves, lawn clippings, pet wastes, street dirt, and automobile exhaust. The restroom facilities utilize an on-site holding tank that is regularly pumped for disposal at a wastewater treatment facility outside of the watershed rather than a septic tank disposal system.

Residential Areas
In residential areas, sources of nutrients are organic matter such as leaves, lawn clippings, pet and domestic livestock wastes, and faulty septic tank disposal systems (see discussion below), as well as, fertilizer usage, street dirt, and automobile exhaust.

Urban Areas
In the Rainbow Creek watershed, the urban land use category includes commercial and public establishments (e.g., market, restaurant, gas station, school, and fire station). Sources of nutrients from these areas can be organic matter (lawn clippings and leaves) as well as street dirt, automobile exhaust, and excessive use of fertilizers.

Septic Tank Disposal Systems
All properties in the Rainbow Creek Watershed utilize septic tank disposal systems for sewage disposal. By design, septic tank disposal systems use bacteria to digest organic matter and chemically break down ammonia and organic nitrogen into nitrate, and organic phosphorus into orthophosphate (Huntley 1987). Septic tank disposal systems can contaminate groundwater with nitrate. Since orthophosphate tends to bind to soils, its mobility is considered to be minimal (Huntley 1987). These systems can potentially impact Rainbow Creek when contaminated groundwater surfaces in the Creek (i.e., Rainbow Creek is a gaining stream).

Additionally, landowners in Rainbow Valley have been prohibited by the County of San Diego from installing or replacing septic tank disposal systems since 1970 because of a high groundwater table (Whitman 1970). Septic tank disposal systems in the Rainbow Creek watershed do not have the required separation to provide adequate treatment to wastewater. The high groundwater condition can cause septic tank disposal systems to malfunction and release bacteria, pathogens, and nutrients into the environment, contaminating groundwater and nearby streams.

Conventional Septic Tank Discharges / Subsurface Disposal Systems for Residential Units Waivers
Discharges of wastewater from conventional septic tank/subsurface disposal systems for residential units in the San Diego Region are regulated under the terms and conditions of the Regional Board's Basin Plan waiver policy. Under the terms[40] of this policy the

[40] This waiver is applicable until six months after the State Water Resources Control Board adopts statewide criteria for on-site disposal systems pursuant to the CWC §13291 regulations for onsite sewage treatment systems.

Regional Board waives the obligation of residential septic tank owners and operators to obtain waste discharge requirements for discharges to groundwater subject to the following conditions:

- The design of the system is approved by the county health agency having jurisdiction where the system is located to the conditions set forth in the *Basin Plan, Chapter 4, (Implementation)* section entitled *Guidelines for New Community and Individual Sewerage Facilities*, and where systems are not constructed within areas designated as Zone A as defined by the California Department of Health Services' *Drinking Water Source Assessment and Protection Program*.

- The discharge shall not create a nuisance as defined in the California Water Code;

- The discharge shall not cause a violation of any applicable water quality standard; and

- The discharge of any substance in concentrations toxic to animal or plant life is prohibited.

Proposed Regulations for Onsite Wastewater Treatment Systems

California Water Code §13291 requires the State Water Resources Control Board to develop and adopt regulations for the permitting and operation of onsite sewage treatment systems[41] (OWTS) in the State and further directs the Regional Board to incorporate the regulations into the Basin Plan. These regulations are currently under development and will include mandated nitrogen reduction performance requirements for OWTS, including septic tanks that are identified as contributing to the impairment of surface water bodies listed as impaired pursuant to Section 303(d) of the Clean Water Act. As currently drafted, the new regulations would also require the Regional Board to issue waste discharge requirements for all OWTS beginning in January 1, 2009, unless the County of San Diego assumes responsibility for enforcement of the regulations through a Memorandum of Understanding (MOU) with the Regional Board. The implementation of these new regulations on septic tank disposal systems in the Rainbow Creek watershed will be an important vehicle for attaining the required nutrient load reductions for septic tank disposal systems.

8.4 Third Party Regulatory Based Approach

The Regional Board supports a Third-Party regulatory-based approach[42] to implement the nutrient load reductions assigned to nonpoint sources in the Rainbow Creek watershed.

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[41] "Onsite wastewater treatment system(s)" (OWTS) is any individual or community onsite wastewater treatment, pretreatment and dispersal system including, but not limited to, a conventional, alternative, or experimental sewage dispersal system such a septic tanks having a subsurface discharge.

[42] The term "third party regulatory based approach" refers to an approach where a local governmental agency can oversee and enforce a NPS implementation program in the Rainbow Creek watershed.

The purpose of this section is to provide the rationale for that recommendation and to present some additional features of this approach that would be beneficial to implementing this TMDL.

As previously discussed, the State Water Board has adopted a *Plan for California's Nonpoint Source Pollution Control Program* (NPS Program Plan) (1999) and a *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (2004). These documents describe alternative strategies that can be employed to control NPS pollution. In general, the approach that is used depends on four key factors:

- Discharger compliance in implementing MPs and other strategies that effectively prevent or control NPS discharges;
- The progress being made toward reducing NPS polluted runoff;
- The complexity and persistence of the water quality problem; and
- The need for increased regulatory oversight to attain water quality objectives.

8.4.1 Persistence and Complexity of Water Quality Problem

Excessive nutrient concentrations in Rainbow Creek have persisted since the 1980s, when agricultural practices used in Rainbow Valley resulted in significant increases of nitrate concentrations in Rainbow Creek. Although voluntary implementation of MP in the watershed resulted in significant reductions of nutrient concentrations in Rainbow creek since 1996, nutrient concentrations in the creek still exceed the applicable nutrient water quality objectives[43].

Controlling and reducing nutrient discharges in the Rainbow Creek watershed to meet the TMDL nutrient load reductions for nonpoint sources will be a long term and complicated undertaking. There are multiple sources of nutrients in the watershed in seven different land use categories with an array of agencies and dischargers whose actions need to be coordinated. MMs and MPs need to be identified and implementation tracked and monitored. Water quality levels in Rainbow Creek need to be monitored and accessed to determine the effectiveness of the nutrient load reduction efforts, water quality trends, and success in attaining water quality objectives. A responsible regulatory agency is needed to lead and coordinate the effort.

8.4.2 Management Agency Agreement (MAA) with Local Land Use Agency

In light of the persistence of the nutrient water quality impairment conditions and the need for increased regulatory oversight, the Regional Board proposes to use a Third Party regulatory based approach to mandate compliance with the nonpoint source (NPS) nutrient load reductions of this TMDL. The Regional Board will accomplish this under

[43] The term nutrient water quality objectives as used in this document refers to both the inorganic nitrate and biostimulatory nutrient water quality objectives described in Chapter 3 of the Water Quality Control Plan for the San Diego Basin (9) (Basin Plan) September 8, 1994.

the authority of CWC §13225[44] by negotiating a Management Agency Agreement (MAA)[45] between the Regional Board and the County of San Diego setting forth the commitments of both parties to undertake various implementation responsibilities for the NPS nutrient load reductions of this TMDL.

Under the terms of the proposed MAA, the County of San Diego will take the lead in establishing MMs and overseeing MPs implementation by NPS dischargers to attain TMDL nutrient load reductions in the Rainbow Creek watershed. The County of San Diego's actions to implement the MAA will be taken under the County's own legal authority and using the County's own regulatory processes. The fundamental purpose in applying the MAA approach is to employ the capabilities of the County of San Diego to achieve at least the same degree of control over NPS pollution in the Rainbow Creek watershed as could be attained through direct regulation under Regional Board authority. Under this approach, regulatory oversight of the Rainbow Creek TMDL implementation can be achieved more efficiently and with less impact on the Regional Board's limited NPS program staffing and financial resources. While a cooperative partnership between the Regional Board and the County of San Diego is possible without a formal agreement, an MAA will enhance the effectiveness of the partnership by documenting commitments and clarifying roles and responsibilities of each party over the next 20 years until compliance with the nutrient water quality objectives is attained.

The Regional Board cannot delegate its NPS authorities and responsibilities to the County of San Diego. The Regional Board will not defer taking necessary action if the County of San Diego does not properly implement the MAA or if the nutrient water quality problem persists. Any Regional Board enforcement action taken will be against individual dischargers and not the County of San Diego. The Regional Board will also provide assistance to the County of San Diego as necessary to enforce implementation of MPs and the nutrient load reductions specified in this TMDL.

8.4.3 County of San Diego Legal Authority

The success of the MAA approach is contingent on the County of San Diego's willingness to undertake the role of a lead NPS management agency for the Rainbow Creek watershed and its ability to act effectively in that role. The County of San Diego's

[44] CWC §13225 provides authority for the Regional Board to enter into a Management Agency Agreement (MAA) with local agencies to encourage development of appropriate planning or regulatory programs to control nonpoint source pollution. CWC §13225 also provides authority for the Regional Board to require local agencies such as the County of San Diego to submit technical reports on water quality control, even though those entities may not be waste dischargers. Local agencies can be required to investigate the scope, causes, and sources of nonpoint source pollution, and potential practices or control measures to prevent it. The only restriction is that the burden of preparing the reports bear a reasonable relationship to the need for and the benefits to be obtained from the reports.

[45] Management Agency Agreement (MAA) refers to an agreement between the Regional Board and federal or state agencies or local land use agencies having either 1) enforcement authority over nonpoint sources or 2) management responsibility for publicly owned or controlled land and the ability to control NPS discharges from activities on that land. The actions taken by these agencies under the MAA are taken under their own authorities and using their own regulatory processes.

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capability of acting effectively as a lead NPS control agency stems from its role as the principal land use planning authority governing land use practices in the Rainbow Creek watershed.

The legal framework within which the County exercises local planning and land use functions plays a critical pivotal role in controlling NPS nutrient pollution in the Rainbow Creek watershed. The County of San Diego performs land use planning in order to identify important community issues (such as new growth, housing needs, and environmental protection), project future demand for services (such as sewer, water, roads, etc.), anticipate potential problems (such as overloaded sewer facilities or crowded roads), and establish goals and policies for directing and managing growth. The County uses a variety of tools in the planning process including the general plan, specific plans, zoning, and the subdivision ordinance. Following is a review of the County of San Diego's local planning and land use functions which could be used to support implementation of NPS load reductions in this TMDL.

State Law And Local Planning

State law is the foundation for local planning in California. The California Government Code (Sections 65000 et seq.) contains many of the laws pertaining to the regulation of land uses by local governments including: the general plan requirement, specific plans, subdivisions, and zoning. This framework is provided in California Planning Law (Government Code §§ 65000 et seq.), the California Zoning Law (Government Code §§ 68000 et seq.), the Subdivision Map Act (Government Code §§ 66410 et seq.), and the California Environmental Quality Act (Public Resources Code §§ 21000 et seq.).

The County of San Diego General Plan

Under California's Planning Law (Government Code §§65000 et seq.), the County of San Diego must adopt a comprehensive, long-term general plan for the physical development of the county and any land outside its jurisdiction that bears relation to its planning. This general plan is the official County policy regarding the location of housing, business, industry, roads, parks, and other land uses, protection of the public from noise and other environmental hazards, and for the conservation of natural resources.

The general plan is the County's basic planning document and serves as the blue print for future development throughout the County including the Rainbow Creek watershed. It represents the County's view of its future; a constitution made up of the goals and policies upon which the County Board of Supervisors bases their land use decisions. The general plan and its diagrams have a long-term outlook, identifying the types of development that will be allowed, the spatial relationships among land uses, and the general pattern of future development. Following adoption of a general plan, the County may also prepare specific plans and community plans that have a finer level of detail than that provided by the general plan for particular geographic areas.

State law establishes a set of basic issues for consideration in local general plans and the County of San Diego determines the relative importance of each issue to local planning and decides how they are to be addressed in its general plan. Pursuant to Government Code § 65302, general plans must contain seven elements: (1) land use, (2) circulation,

(3) housing, (4) conservation, (5) open space, (6) noise, and (7) safety[46]. The County of San Diego is free to adopt a wide variety of additional elements as necessary covering subjects of particular interest to local jurisdictions, such as the need to control NPS nutrient discharges in the Rainbow Creek watershed.

All subdivisions, public works projects, and zoning decisions must be consistent with the general plan. The County's corporate and police powers, and zoning and subdivision ordinances (see below) are the primary tools used to implement the general plan.

Zoning

Government Code §§65800 et seq. provides that San Diego County can adopt and administer zoning laws, ordinances (including pollution control ordinances), and rules and regulations to implement the general plan. A zoning ordinance is the local law that spells out the immediate, allowable uses for each piece of property within the community. The purpose of zoning is to implement the policies of the general plan. 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 is basically a "permit" type of land use control. Land may be put only to those uses listed in the zone assigned to it. The 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 or other applicable authorities.

Subdivision Map Act

In general, land cannot be divided in California without local government approval. Dividing land for sale, lease, or financing is regulated by local ordinances based on the State Subdivision Map Act (commencing with Government Code § 66410). This Act vests in the County of San Diego the power to regulate and control the design of subdivisions within its jurisdiction.

There are basically two types of subdivisions: (1) parcel maps, which are limited to divisions resulting in fewer than five lots (with certain exceptions), and (2) final map subdivisions (also called tract maps), which apply to divisions resulting in five or more lots.

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[46] Land use, conservation, open space and circulation are the elements most relevant to NPS pollution prevention and control: The conservation element addresses the identification, conservation, development and use of natural resources including water, forests, soils, waterways, wildlife and mineral deposits. The conservation element of the County's general plan may establish controls to deal with water pollution issues such as the nutrient impairment of Rainbow Creek.

Applications for both types of subdivisions must be submitted to the County of San Diego for consideration in accordance with the its subdivision ordinance and the Subdivision Map Act. Subdivision regulation, like zoning, is another enforcement tool that the County uses for implementing its general plan. The County can deny a subdivision if it finds that the design of the subdivision or the proposed improvements will likely cause substantial environmental damage or substantially injure fish, wildlife, or their habitats.

Other Ordinances and Regulations

The County of San Diego adopts other ordinances besides zoning and subdivision to protect the general health, safety, and welfare of their inhabitants. Common types include flood protection, historic preservation, design review, hillside development control, growth management, impact fees, traffic management, and sign control.

Local ordinances may also be adopted in response to state requirements. Examples include local coastal programs (California Coastal Act), surface mining regulations (Surface Mining and Reclamation Act), earthquake hazard standards (Alquist-Priolo Special Studies Zone Act), and hazardous material disclosure requirements. These regulations are generally based on the applicable state law.

California Environmental Quality Act

The California Environmental Quality Act (CEQA) (Public Resources Code §§21000 et seq.) requires local and state governments to consider the potential environmental effects of a project before deciding whether to approve it or not. CEQA's purpose is to disclose the potential impacts of a project, suggest methods to minimize those impacts, and discuss alternatives to the project so that decision makers will have full information upon which to base their decision. CEQA is a complex law with a great deal of subtlety and local variation.

The County of San Diego serves as the lead agency[47] in practically all local planning matters (such as rezoning, conditional use permits, and specific plans) for lands within its jurisdiction. CEQA also provides that the County of San Diego, in its role as lead agency, prepare an Environmental Impact Report (EIR)[48] before it approves a public or private project[49] having a significant effect[50] on the environment if the County has the

[47] CEQA provides for the assignment of a "lead agency" responsible for seeing that environmental review of projects is done in accordance with CEQA and that environmental analyses are prepared when necessary. The agency with the principal responsibility for issuing permits to a project (or for carrying out the project) is deemed to be the "lead agency". As lead agency, it may prepare the environmental analysis itself or it may contract for the work to be done under its direction.

[48] An EIR discusses the proposed project, its environmental setting, its probable impacts, realistic means of reducing or eliminating those impacts, its cumulative effects, and alternatives to the project.

[49] See Public Resources Code § 21065. The term “project” is defined as any activity undertaken, supported or authorized by a public agency which may cause a direct physical change, or reasonably foreseeable indirect physical change in the environment, including activities involving the issuance of permits and entitlements.

discretion to approve or disapprove the project. The EIR must describe feasible mitigation measures to minimize the project's significant environmental impacts. The County can impose conditions to mitigate significant environmental impacts. The County can also impose a reporting or monitoring program to ensure that mitigation measures are implemented.

8.4.4 Memorandum of Understanding (MOU) with Assistance Agencies

Another proposed action of the Third Party regulatory based approach is for the Regional Board to seek less formal agreements with federal, state, and local agencies, and special districts that can provide technical or financial assistance to support implementation of MPs. These agreements are referred to as memoranda of understanding (MOUs).[51] Agencies and organizations such as Natural Resources Conservation Service, Mission Resource Conservation District (MCRD), and the University Of California Cooperative Extension can provide valuable assistance in defining appropriate management measures (MMs) and helping NPS dischargers implement MPs. Formalizing these arrangements in a MOU with the Regional Board would assist the various agencies and districts in targeting technical and financial resources for Rainbow Creek nutrient NPS problems.

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[50] See Public Resources Code § 21068. A " significant effect" is an effect that has a substantial or potentially substantial adverse effect on the environment.

[51] There are two general types of MOUs: (1) cooperative agreements made with other agencies or organizations that are able to provide information or technical or financial assistance to further the State's goal of preventing or controlling NPSs of pollution; and (2) cooperative agreements made with land management agencies with authority to control NPS discharges through inclusion of MPs in their land lease agreements.

9.0 Implementation Action Plan

This Chapter describes the actions necessary to implement the TMDL to attain and maintain nutrient water quality objectives[52] in Rainbow Creek. The plan describes implementation responsibilities assigned to cooperating agencies and dischargers and describes the schedule and key milestones for the actions to be taken. A monitoring strategy to assess the success of this implementation action plan is presented in Section 10 Implementation Monitoring Plan.

9.1 Regulatory Authority

Basin Plans must have a program of implementation to achieve water quality objectives[53]. The implementation program must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the water quality objectives[54]. State law requires that a TMDL include an implementation action plan because the TMDL normally is, in essence, an interpretation or refinement of an existing water quality objective. The TMDL must be incorporated into the Basin Plan[55], and, because the TMDL supplements, interprets, or refines an existing water quality objective, state law requires a program of implementation.

9.2 Implementation Action Plan Objectives

The specific objectives of this Implementation Action Plan are as follows:

1. Mandate nutrient wasteload reductions in NPDES permits in the Rainbow Creek watershed for the point source component of this TMDL;

2. Mandate nutrient load reductions for seven critical Rainbow Creek watershed land use areas[56] for the non point source component of this TMDL;

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[52] The term nutrient water quality objectives as used in this document refers to both the inorganic nitrate and biostimulatory nutrient water quality objectives described in Chapter 3 of the Water Quality Control Plan for the San Diego Basin (9) (Basin Plan) dated September 8, 1994.

[53] See CWC § 13050(j). A "Water quality control plan" or "Basin Plan" consists of a designation or establishment for the waters within a specified area of all of the following: (1) Beneficial uses to be protected, (2) Water quality objectives and (3) A program of implementation needed for achieving water quality objectives.

[54] See CWC § 13242

[55] See Clean Water Act § 303(e).

[56] These land use activities are commercial nurseries; agricultural fields; orchards; parks; residential areas; urban areas, and septic tank disposal systems.

3. Promote establishment of a Management Agency Agreement (MAA) between the Regional Board and the County of San Diego setting forth each party's commitment to undertake various implementation oversight responsibilities for the nonpoint source component of this TMDL;

4. Promote establishment of a Memorandum of Understanding (MOU) to document cooperative agreements between the Regional Board and other agencies or organizations (e.g. Natural Resources Conservation Service, Mission Resource Conservation District [MCRD], and the University of California Cooperative Extension) that are able to provide technical or financial assistance to dischargers in the Rainbow Creek watershed; and

5. Establish mechanisms to track management measures (MMs), and management practices (MPs) / best management practices (BMPs) implementation, monitor MM/MP/BMP effectiveness in controlling nutrient pollution, assess success in achieving TMDL objectives and milestones, and report on TMDL program effectiveness in attaining the nitrate and nutrient water quality objectives.

9.3 Phased Nutrient Load Reduction Approach

The nutrient TMDLs shall be implemented in a phased approach with a monitoring component to determine the effectiveness of each phase and guide the selection of MPs / BMPs. Load allocations shall be reduced by approximately 20% every four years until the TMDLs have been achieved. Table 9-1 provides the schedule for total nitrogen and total phosphorus reductions. The initial reductions will achieve the nitrate target of 10 mg NO_3-N/L and begin the first phase of reductions for the total phosphorus target. The subsequent phases target loading reductions in incremental steps towards the ultimate goal of attaining and maintaining compliance with nutrient water quality objectives.

Table 9-1. Total Nitrogen and Total Phosphorus Phased Load Reduction Schedule

Compliance Date	Total Nitrogen		Total Phosphorus	
	Target Annual Loads (LA + WLA) kg N/yr	Cumulative % Reduction	Target Annual Loads (LA + WLA) kg P/yr	Cumulative % Reduction
2005[1]	3,089[2]		276[2]	
2009	2,471	20	222	20
2013	1,853	40	166	40
2017	1,236	60	111	60
2021	796	74	41	85

[1] Estimated effective date begins upon approval by USEPA. Compliance dates follow every fourth year until TMDL is achieved.

[2] Current annual nutrient load from identified point and nonpoint sources (See Tables 4-2 and 4-4). This value does not include the contribution for background.

The target load and wasteload allocations for total nitrogen and total phosphorus are presented in Table 9-2 and 9-3.

Table 9-2. Total Nitrogen Wasteload and Load Allocations

Source	Total Nitrogen Allocations			
	2009 kg N/yr[1]	2013 kg N/yr[1]	2017 kg N/yr[1]	2021 kg N/yr[1]
Caltrans highway runoff	122	49	49	49
Unidentified and future point source discharge	33	33	33	33
Point Source (WLA) Subtotal	**155**	**82**	**82**	**82**
Commercial nurseries	396	315	202	116
Agricultural fields	511	405	261	151
Orchards	617	480	315	182
Park	5	3	3	3
Residential areas	507	401	260	149
Urban areas	40	27	27	27
Septic tank disposal systems	200	100	46	46
Air deposition	40	40	40	40
Non-Point Source (LA) Subtotal	**2,316**	**1,771**	**1,154**	**714**
Total WLA & LA[2]	**2,471**	**1,853**	**1,236**	**796**
Background	**779**	**779**	**779**	**779**
Margin of Safety	**83**	**83**	**83**	**83**
Total Allocations for Total Nitrogen TMDL	**3,333**	**2,715**	**2,098**	**1,658**

[1] To calculate pounds per year, multiply by 2.2.
[2] From Table 9-1

Table 9-3. Total Phosphorus Wasteload and Load Allocations

Source	Total Phosphorus Allocations			
	2009 kg P/yr[1]	2013 kg P/yr[1]	2017 kg P/yr[1]	2021 kg P/yr[1]
Caltrans highway runoff	8	5	5	5
Unidentified and future point source discharge	3	3	3	3
Point Source (WLA) Subtotal	**11**	**8**	**8**	**8**
Commercial nurseries	20	15	10	3
Agricultural fields	30	20	15	4
Orchards	50	40	25	6
Park	0.15	0.10	0.10	0.10
Residential areas	100	75	45	12
Urban areas	9	6	6	6
Air deposition	2	2	2	2
Non-Point Source (LA) Subtotal	**211**	**158**	**103**	**33**
Total WLA & LA[2]	**222**	**166**	**111**	**41**
Background	**116**	**116**	**116**	**116**
Margin of Safety	**8**	**8**	**8**	**8**
Total Allocations for Total Phosphorus TMDL	**346**	**290**	**235**	**165**

[1] To calculate pounds per year, multiply by 2.2
[2] From Table 11-1

9.4 Milestone Dates For Attainment Of Nutrient Water Quality Objective

Tables 9-1, 9-2, and 9-3 describe the general time schedule for nutrient sources to achieve compliance with wasteload and load reductions and allocations. Point source discharges in the Rainbow Creek watershed are projected to achieve compliance with wasteload reductions by the December 31, 2013. Nonpoint sources are projected to implement nutrient reduction strategies by the December 31, 2009 with all resultant nutrient load reductions being achieved by December 31, 2021. Regardless of what actions are taken to achieve load and wasteload reductions, there may not be an immediate response in the water quality or biological condition of Rainbow Creek. For example, there may be significant time lags between when actions are taken to reduce nutrient loads and resulting changes in nutrient concentrations in Rainbow Creek. This is especially likely if nutrients from past activities are tightly bound to sediments or if nutrient-contaminated groundwater has a long residence time before its release to Rainbow Creek waters. A

three-year response time is projected for Rainbow Creek to attain compliance with nutrient water quality objectives after reaching the desired nutrient wasteload and load reductions in 2021. Accordingly the projected date when Rainbow Creek will attain and maintain compliance with nutrient water quality objectives is December 31, 2024.

9.5 Regional Board Actions

This section describes the actions the Regional Board shall take to mandate compliance with the nutrient wasteload and load reductions specified in this TMDL.

12. **Caltrans – Incorporate Wasteload Allocations in NPDES Storm Water Permit**
    The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment request that the State Water Resources Control Board to amend Caltrans statewide NPDES storm water permit[57] to include the following requirements:

    a. MS4 discharges to Rainbow Creek shall not exceed the following wasteloads for nitrogen and phosphorus:

Nitrogen Wasteload	Phosphorus Wasteload	Compliance Due Date
122 kg N/yr[1]	8 kg P/yr[1]	December 31, 2009
49 kg N/yr[1]	5 kg P/yr[1]	December 31, 20013

[1] To calculate pounds per year, multiply by 2.2

    b. A directive to submit annual progress reports to the Regional Board on the progress on attaining the nutrient wasteload reductions in Rainbow Creek. The report shall be due on April1 of each year shall be incorporated within Section 2, Program Management of Caltrans MS4 Order No. 99-06-DWQ, NPDES No. CAS000003. Reporting shall continue on an annual basis until the nutrient water quality objective is attained in Rainbow Creek.

2. **County of San Diego – Issue Water Code Section 13225 Order for Nutrient Reduction and Management Plan**
    The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment, issue a CWC §13225 Order directing the County of San Diego to prepare and submit a Nutrient Reduction and Management Plan (NRMP) for the Rainbow Creek watershed containing the elements described below in Section 9.7 County of San Diego Nutrient Reduction Management Plan Elements. The County

[57] The term "statewide NPDES storm water permit "refers to Order No. 99-06-DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System Permit, Statewide Storm Water Permit, and Waste Discharge Requirements for the State of California, Department of Transportation (Caltrans).

may submit alternative or additional elements equivalent to those described in Section 9.7 that would result in equivalent protection from, or prevention of, nutrient discharges to Rainbow Creek

3. **County of San Diego – Establish Management Agency Agreement (MAA)**
   The Regional Board shall consider, following concurrence with the County of San Diego's Nutrient Reduction and Management Plan (NRMP) for Rainbow Creek, entering into a Management Agency Agreement (MAA) with the County of San Diego. The MAA shall set forth the commitment of both parties to undertake various oversight responsibilities for the nonpoint source nutrient load reduction component of this TMDL, and the County's commitments to implement the NRMP.

4. **County of San Diego – Issue Water Code Section 13225 Order for Groundwater Investigation and Characterization Report**
   The Regional Board shall within 90 days of USEPA approval of the Basin Plan Amendment, issue a CWC §13225 Order directing the County of San Diego to prepare and submit a workplan containing the elements described below in Section 9.6 County of San Diego Actions, Items 3, Submit Groundwater Investigation and Characterization Workplan and Item 4, Groundwater Investigation and Characterization Report.

5. **CA Dept. of Forestry and Fire Protection – Issue Water Code Section 13267 Order**
   The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment, issue a CWC §13267[58] order directing the California Department of Forestry and Fire Protection, Rainbow Conservation Camp (CDFFP) to submit any additional technical information needed to 1) evaluate whether CDFFP's discharge is surfacing and/or contributing to the impairment of Rainbow Creek; and 2) estimate the actual nutrient load originating from the septic tank and percolation ponds to Rainbow Creek via groundwater flow. Based on the review of this information the Regional Board may further direct the CDFFP to implement an alternate means of wastewater disposal or additional treatment necessary to attain and maintain nutrient water quality objectives in Rainbow Creek.

6. **Establish Memorandum of Understanding (MOU) with Agencies or Organizations**
   The Regional Board shall consider entering into a memorandum of understanding (MOU) to document cooperative agreements with other agencies or organizations that are able to provide information, technical assistance, or financial assistance to dischargers to support the Regional Board's goals of attaining the nutrient load reductions required under this TMDL and compliance with the nutrient water quality

[58] CWC §13267 provides that the Regional Board can require any person who has discharged, discharges, proposes to discharge or is suspected of discharging waste to investigate, monitor, and report information. The only restriction is that the burden of preparing the reports bear a reasonable relationship to the need for and the benefits to be obtained from the reports.

objective. These agencies and organizations include, but are not limited to, the United States Department of Agriculture, Natural Resources Conservation Service (NRCD), Mission Resource Conservation District (MRCD), and the University Of California Cooperative Extension (UCCE).

7. **Adopt Waste Discharge Requirements (WDRs), Waivers, and Discharge Prohibitions**
   In conjunction with an MAA or MOU with another third-party representative, organization, or government agency describing an adequate NPS pollution control implementation program, the Regional Board shall adopt individual or general waivers or waste discharge requirements (WDRs) for NPS discharges in the Rainbow Creek watershed. The waivers or WDRs shall require NPS dischargers to either participate in the third party NPS program or, alternatively, submit individual pollution prevention plans that detail how they will comply with the waivers and WDRs. Alternatively, the Regional Board may adopt a discharge prohibition, which includes exceptions for those discharges that are adequately addressed in an acceptable third-party MAA or MOU NPS pollution control implementation program.

8. **Take Enforcement Actions**
   The Regional Board shall consider enforcement action[59], as necessary, against any discharger failing to comply with applicable waiver conditions, waste discharge requirements (WDRs), discharge prohibitions, or take enforcement action, as necessary, to control the discharge of nutrients to Rainbow Creek, attain compliance with the nutrient wasteload and load reductions specified in this TMDL, or attain compliance with the nutrient water quality objectives. The Regional Board may also terminate the applicability of waivers and issue waste discharge requirements or take other appropriate action against any discharger(s) failing to comply with the waiver conditions.

9. **Review and Revise Existing Waste Discharge Requirements**
   The Regional Board shall, within two years of USEPA approval of the Basin Plan Amendment, review and, if necessary, update existing waste discharge requirements for discharges to land as well as groundwater in the Rainbow Creek watershed to incorporate effluent limitations for nutrients consistent with applicable nutrient groundwater quality objectives and surface water quality objectives[60].

[59] An enforcement action is any formal or informal action taken to address an incidence of actual or threatened noncompliance with existing regulations or provisions designed to protect water quality. Potential enforcement actions include a notice of violation (NOV), notices to comply (NTC), imposition of time schedules (TSO), issuance of cease and desist orders (CDOs) and cleanup and abatement orders (CAOs), administrative civil liability (ACL), and referral to the attorney general (AG) or district attorney (DA). The Regional Board generally implements enforcement through an escalating series of actions to: (1) assist cooperative dischargers in achieving compliance; (2) compel compliance for repeat violations and recalcitrant violators; and (3) provide a disincentive for noncompliance.

[60] There are currently three dischargers in the Rainbow Creek watershed currently regulated under waste discharge requirements for the discharge of waste to land or groundwaters: Oak Crest Mobile Estates (Order No. 1993-69), Rainbow Conservation Camp (Order No. 1995-20), and Temecula Truck

10. **Recommend High Priority for Grant Funds**
The Regional Board shall recommend that the State Board assign a high priority to awarding grant funding[61] for projects to implement the Rainbow Creek nutrient TMDLs. Special emphasis will be given to projects that can achieve quantifiable nutrient load reductions consistent with the specific nutrient TMDL load allocations.

11. **Incorporate Water Code Section 13291 Regulations in Basin Plan**
The Regional Board shall incorporate regulations currently under development by the State Water Resources Control Board pertaining to onsite wastewater treatment systems[62] into the Water Quality Control Plan for the San Diego Basin (Basin Plan) as soon as practicable upon their adoption by the State Board.[63]

9.6 County Of San Diego Actions

1. **Control MS4 Discharges to Rainbow Creek**
For nutrient discharges in the Rainbow Creek watershed subject to the County of San Diego's MS4 NPDES Storm Water Permit[64], the County shall require increasingly stringent best management practices, pursuant to the iterative process described in Receiving Water Limitation C.2.a.[65] of the permit, to reduce nutrients discharges in the Rainbow Creek watershed to the maximum extent practicable and restore compliance with the nutrient water quality objective.

Inspection Facility (Order No. 1992-56). The Rainbow Truck Weigh and Inspection Facility, discharges under the terms of a waiver of waste discharge requirements (Order No. 2000-235)

[61] The State Water Resources Control Board administers the awarding of grants funded from Proposition 13, Proposition 50, Clean Water Act 319(h) and other federal appropriations to projects that can result in measurable improvements in water quality, watershed condition, and/or capacity for effective watershed management. Many of these grant fund programs have specific set-asides for expenditures in the areas of watershed management and TMDL implementation for NPS pollution.

[62] "Onsite wastewater treatment system(s)" (OWTS) is any individual or community onsite wastewater treatment, pretreatment and dispersal system including, but not limited to, a conventional, alternative, or experimental sewage dispersal system such a septic tanks having a subsurface discharge.

[63] CWC §13291 directs the Regional Board to incorporate the regulations in the Basin Plan upon their adoption by the State Water Resources Control Board.

[64] The term "MS4 NPDES Storm Water Permit" refers to Order No.2001-001, NPDES No. CAS0108758, *Waste Discharge Requirements For Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities Of San Diego County, and the San Diego Unified Port District.*

[65] Receiving Water Limitation C.2.a provides that... "Upon a determination by either the Copermittee or the SDRWQCB that MS4 discharges are causing or contributing to an exceedance of an applicable water quality standard, the Copermittee shall promptly notify and thereafter submit a report to the SDRWQCB that describes BMPs that are currently being implemented and additional BMPs that will be implemented to prevent or reduce any pollutants that are causing or contributing to the exceedance of water quality standards…"

2. **Submit and Implement Nutrient Reduction and Management Plan (NRMP)**
The County of San Diego shall, upon direction by the Regional Board pursuant to a CWC §13225 Order, prepare and submit a NRMP for the Rainbow Creek watershed, consistent with the SWRCB NPS Implementation and Enforcement Policy and containing the elements described in Section 9.7, County of San Diego Nutrient Reduction and Management Plan. The County may submit alternative or additional elements equivalent to those described in Section 9.7 that would result in equivalent protection from, or prevention of, nutrient discharges to Rainbow Creek.

3. **Submit and Implement Groundwater Investigation and Characterization Workplan**
The County of San Diego shall, upon direction by the Regional Board pursuant to a CWC §13225 Order, prepare and submit a workplan designed to guide the collection of information to produce the technical report described in Item 4, Groundwater Investigation and Characterization report below.

    a. The workplan shall include a schedule for completion of all activities and submission of a final Groundwater Investigation and Characterization Report.
    b. The workplan shall include a description of proposed actions including field methodologies, chemical analyses methods, sampling locations, and proposed monitoring well installations. Contingencies for collection of additional samples shall be proposed in the work plan.
    c. The County of San Diego shall modify the workplan as requested by the Regional Board.
    d. The County of San Diego shall implement the workplan sixty (60) days after submission of the workplan, unless otherwise directed in writing by the Regional Board. Before beginning these activities the County shall:
        i. Notify the Regional Board of the intent to initiate the proposed actions included in the workplan submitted; and
        ii. Comply with any conditions set by the Regional Board.

4. **Submit Groundwater Investigation and Characterization Report**
The County of San Diego shall, on a schedule agreed to in writing by the Regional Board, submit a Groundwater Investigation and Characterization Report containing a technical analysis of the following elements. The report shall also present recommendations to refine assumptions, resolve uncertainties, and improve the scientific foundation of the TMDL with regard to quantifying groundwater nutrient loading to Rainbow Creek.

    a. Nutrient loading to groundwater from Rainbow Creek watershed land use activities;
    b. Nutrient mass loading to groundwater in the fractured rock aquifer and the alluvial deposits aquifer[66] from septic systems, deep percolation of applied irrigation water, and any other sources;
    c. Base flow contribution to Rainbow Creek from the fractured rock aquifer and the alluvial deposits aquifer;

[66] Groundwater beneath the Rainbow Creek watershed is interpreted to occur in both the alluvial deposits where present and in the fractured rock. The groundwater investigation report shall assess the relative contribution from each aquifer.

d. Concentration of nutrients in base flow discharged to Rainbow Creek from the fractured rock aquifer and alluvial deposits aquifer;
e. Fate and transport characteristics of nutrients in the fractured rock aquifer and alluvial deposits aquifer;
f. Mass balance of nutrients in the fractured rock aquifer and alluvial deposits aquifer (nutrient mass loading to groundwater, removals from the groundwater system including denitrification, plant uptake, and groundwater discharge, and change in the load and concentration of nutrients in groundwater;
g. The location of existing monitoring wells and the proposed location of additional monitoring wells needed to characterize nutrient concentrations and their lateral and vertical extent in groundwater during the course of TMDL implementation. Methods for purging and sampling monitoring wells to provide representative samples for nutrients should be described; and
h. Field methodologies used for drilling, soil sampling, groundwater and surface water sampling, and SWCS sampling, well and peizometer construction, geophysical surveys, and other activities.

5. **Establish Management Agency Agreement (MAA)**
The County of San Diego is requested to enter into a MAA with the Regional Board setting forth the commitment of both parties to undertake various implementation oversight responsibilities for the nonpoint source nutrient load reduction component of this TMDL and the County's commitments to implement the NRMP.

9.7 County Of San Diego Nutrient Reduction And Management Plan

1. **NPS Nutrient Reduction and Management Plan (NRMP)**
The NRMP shall describe the activities the County of San Diego will undertake to oversee discharger efforts to reduce nutrients in the runoff or groundwater discharges from new and existing (1) commercial nurseries; (2) agricultural fields; (3) orchards; (4) parks; (5) residential area; (6) urban areas; and; (7) septic tank disposal system land uses (hereinafter referred to as key nutrient sources). The NRMP shall include the following elements as provided in items 2 through 17 below or alternative or additional elements equivalent to those described that would result in equivalent protection from, or prevention of, nutrient discharges to Rainbow Creek.

a. Legal authority
b. General Plan modification
c. Development project approval process
d. CEQA reviews
e. Pollution prevention
f. Source identification
g. Management Practice (MP) implementation
h. Inspection of nutrient sources
i. Enforcement of nutrient load reductions required under this TMDL

j. Reporting of non-compliant sites
k. Monitoring to assess compliance with nutrient load reductions
l. Groundwater investigation and characterization
m. Community education and outreach
n. Seek financial assistance
o. NRMP effectiveness
p. NRMP Annual Report

13. **Legal Authority**

The County of San Diego shall review its legal authority to ensure that it is adequate to mandate compliance with the nutrient load reductions specified in this TMDL through ordinance, statue, permit, contract or similar means. This legal authority must, at a minimum, authorize the County to:

a. Control the discharge of nutrients from nonpoint sources; and
b. Prohibit discharges of nutrients which cause or contribute to exceedances of the nutrient load reductions specified in this TMDL or nutrient water quality objectives.

Alternatively the County of San Diego shall certify that its existing legal authority is adequate to mandate compliance with the nutrient load reductions specified in this TMDL and prevent increases in nutrient loading to Rainbow Creek.

14. **General Plan Modification**

The County of San Diego shall modify its General Plan as necessary to ensure that future land use and zoning decisions do not result in an increase in the nutrient loading to Rainbow Creek. Alternatively the County of San Diego shall certify that its existing General Plan is adequate to prevent an increase in nutrient loading to Rainbow Creek.

15. **Modify Development Project Approval Process**

The County of San Diego shall modify its development project approval / permitting process as necessary to ensure that discharges from proposed developments in the Rainbow Creek watershed will comply with the nutrients load reductions specified in this TMDL and ensure that nutrient water quality objectives are not exceeded. The County shall ensure that all development in Rainbow Creek watershed will be in compliance with County storm water ordinances, permits, and all other applicable ordinances and requirements. . Alternatively the County of San Diego existing General Plan is adequate to prevent an increase in nutrient loading to Rainbow Creek. Alternatively the County of San Diego shall certify that its project approval / permitting process is adequate to ensure that discharges from proposed developments in the Rainbow Creek watershed will comply with the nutrients load reductions specified in this TMDL and ensure that nutrient water quality objectives are not exceeded.

16. **CEQA Reviews**

The County of San Diego shall review and revise as necessary 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 specified in this TMDL or violations of the nutrient water quality objective. 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 require appropriate mitigation. Alternatively the County of San Diego shall certify that its environmental review process pursuant to CEQA is adequate to ensure that new development in the Rainbow

Creek watershed does not contribute to exceedances of the nutrient load allocations specified in this TMDL or violations of the nutrient water quality objective.

17. **Pollution Prevention (Nutrients)**
The County of San Diego shall implement pollution prevention[67] methods for nutrients at sites owned by the County and shall require its use by owners or operators of nutrient sources, where appropriate.

18. **Source Identification (Nutrients)**
The County of San Diego shall develop and update annually an inventory of the individual nutrient sources within the residential, urban, commercial nurseries; agricultural fields; orchards; parks; septic tank disposal system category of land uses. The use of an automated database system, such as Geographical Information System (GIS) is highly recommended.

19. **Threat to Water Quality Prioritization (Nutrients)**
To establish priorities for inspection and oversight activities, the County of San Diego shall prioritize each inventory in item 7 above by threat to water quality and update it annually. Each individual nutrient source in each nonpoint source category should be classified as high, medium, or low threat to water quality. The inventory should include the following minimum information for each site: name; address; SIC codes as appropriate which best reflects the type of site, a narrative description characterizing the nutrient waste generated and the potential for nutrient discharges to Rainbow Creek.

20. **MP Implementation (Nutrients)**
The County of San Diego shall:
    a. Designate a set of minimum MMs / MPs [68] for the high, medium, and low threat to water quality nutrient sources identified in item 7 above. The designated minimum MPs for the high threat to water quality nutrient sources should be site and source specific as appropriate.
    b. Establish a time line for installation of the designated minimum MPs at each nutrient source within its jurisdiction. If particular minimum MPs are infeasible for any specific site/source the county of San Diego shall require the implementation of other equivalent MPs.

21. **Inspection of Sites and Sources (Nutrients)**
The County of San Diego shall inspect high priority sites and sources. The County shall conduct site inspections for compliance with its ordinances and permits as well as nutrient load reductions required under this TMDL. Inspections should include review of MP implementation plans and effectiveness. Based upon site inspection findings, the County shall implement all follow-up actions necessary to obtain discharger compliance in implementing MPs. The County shall follow-up with appropriate enforcement action as necessary.

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[67] Pollution Prevention is defined as practices and processes that reduce or eliminate the generation of pollutants, in contrast to source control, treatment, or disposal.

[68] In determining appropriate MPs the County of San Diego is encouraged to consult the State Water Resources Control Board's California Nonpoint Source Encyclopedia (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html). This publication contains extensive information on nutrient reduction management measures (MMs) and management practices (MPs) applicable to the NPS land use activities in the Rainbow Creek watershed. The County is also encouraged to consult the Regional Board's Watershed Management Approach for the San Diego Region, Nonpoint Source (http://www.swrcb.ca.gov/rwqcb9/programs/wmc.html) for additional information on management measures.

22. **Enforcement of Sites and Sources (Nutrients)**
The County of San Diego shall enforce its ordinances, statues, permits, and contracts as necessary to attain compliance with the nutrient load reductions specified in this TMDL.

23. **Reporting of Non-compliant Sites (Nutrients)**
The County of San Diego shall provide oral notification to the Regional Board of non-compliant sites that are determined to be recalcitrant in implementing MPs or attaining compliance with nutrient load reductions required under this TMDL within 24 hours of the discovery of noncompliance. This notification shall be followed up by a written report to be submitted to the Regional Board within 5 days of the incidence of non-compliance.

24. **Monitoring to Assess Compliance With Nutrient Load Reductions**
The County of San Diego shall conduct, or require nutrient sites or sources to conduct, a monitoring program to assess compliance of runoff or groundwater discahrges with the load reductions from each of the land use categories assigned a load reduction. This can be accomplished by placing sampling stations at strategic nodes that would monitor nutrient discharges from individual sources of a common land use category.

25. **Community Education and Outreach**
The County of San Diego shall develop a focused educational programs to raise community awareness of the nutrient impairment problem, promote pollution prevention, and increase the use of applicable management measures and practices where needed to control and reduce nutrient discharges to Rainbow Creek. Public education, outreach, and training programs should involve applicable user groups and the community[69].

26. **Seek Financial Assistance**
The County of San Diego is encouraged to seek grant funding[70] for projects to implement the Rainbow Creek nutrient TMDLs, particularly those that can achieve quantifiable nutrient load reductions consistent with the specific nutrient TMDL load allocations.

27. **Nutrient Reduction and Management Plan (NRMP) Effectiveness**
The County of San Diego shall, as part of the NRMP, to develop a long-term strategy for assessing the effectiveness of the NRMP. The long-term assessment strategy should identify specific direct and indirect measurements that the County will use to track the long-term progress towards achieving the nutrient load reductions required under this TMDL. Methods used for assessing effectiveness should include the following or their equivalent: surveys, pollutant loading estimations, and receiving water quality monitoring. The long-term strategy shall also discuss the role of monitoring data in substantiating or refining the assessment.

28. **Nutrient Reduction and Management Plan (NRMP) Annual Report**
The County of San Diego shall submit an annual NRMP report to the Regional Board by January 31 of each year following USEPA approval of this TMDL. The reporting period for this annual report shall be the previous fiscal year. For example, the report submitted January 31, 2006 shall cover the reporting period July 1, 2004 to June 30, 2005. The Report shall be incorporated in the annual Jurisdictional URMP Annual Report and the Watershed Specific URMP Annual Reports

[69] Consideration should be given to expanding the County of San Diego's ongoing community and education outreach program under the County's MS4 NPDES Storm Water Permit to address the Rainbow Creek nutrient impairment problem. Additional suggestions for the information to be included in pollution prevention and education programs is contained in the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html).

[70] Information on available grant funds is contained in the in the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html).

under the County's MS4 NPDES Permit. The report shall include the following information:

a. Comprehensive description of all activities conducted by the County of San Diego to oversee implementation of the NRMP.
b. An accounting of all: inspections conducted; enforcement actions taken; and education efforts conducted.
c. An assessment of whether actions to implement designated minimum MPs at each nutrient source were actually carried out by dischargers.
d. An assessment of the compliance of runoff or groundwater discharges with the load reductions from each of the land use categories assigned a load reduction.
e. Identification of water quality improvements or degradation in Rainbow Creek with regard to attainment of the nutrient water quality objectives.
f. An evaluation of the effectiveness of the NRMP in achieving the nutrient load reductions required under this TMDL.

9.8 Discharger Actions

State of California, Department of Transportation (Caltrans) Actions
Caltrans shall take all actions necessary to meet the nutrient wasteload reductions assigned to Caltrans. These nutrient wasteload reductions will eventually be incorporated into Caltrans statewide NPDES storm water permit. It is assumed that compliance with the nutrient wasteload reductions will be accomplished through the development and implementation of best management practices (BMPs). Caltrans shall also prepare and submit progress reports in accordance with the Caltrans statewide NPDES storm water permit or as otherwise directed by the Regional Board in a CWC §13383[71] order.

State of California Department of Forestry and Fire Protection (CDFFP) Actions
CDFFP shall, upon direction by the Regional Board in a CWC §13267 order, undertake an investigation to 1) evaluate whether CDFFP's discharge is surfacing and/or contributing to the impairment of Rainbow Creek; and 2) estimate the actual nutrient load to Rainbow Creek from groundwater flow originating from the septic tank and percolation ponds.

Nonpoint Source Dischargers (NPS Dischargers) Actions
NPS discharges of nutrients in the Rainbow Creek watershed result from (1) commercial nursery; (2) agricultural field; (3) orchard; (4) park; (5) residential area; (6) urban area; and; (7) septic tank disposal system land use activities. Individual landowners and other persons (NPS Dischargers) engaged in these land use activities shall implement pollution prevention[72] methods and increase the use of applicable management measures and

[71] CWC §13383 provides that the Regional Board may establish monitoring, requirements for any person who discharges, pollutants or dredged or fill material or proposes to discharge pollutants to navigable waters of the United States.

[72] Pollution Prevention is defined as practices and processes that reduce or eliminate the generation of pollutants, in contrast to source control, treatment, or disposal.

practices[73] where needed to control and reduce nutrient discharges to Rainbow Creek and attain nutrient load reductions. Individual landowners and other persons are encouraged to seek grant funding[74] for projects to implement the Rainbow Creek nutrient TMDLs, particularly those that can achieve quantifiable nutrient load reductions consistent with the specific nutrient TMDL load allocations. NPS dischargers will be subject to Regional Board enforcement action for failing to: comply with applicable waiver conditions, waste discharge requirements (WDRs), or discharge prohibitions; attain compliance with the nutrient load reductions specified in this TMDL; or attain compliance with the nutrient water quality objectives. The Regional Board may also terminate the applicability of waivers and issue waste discharge requirements to any NPS dischargers failing to comply with waiver conditions.

9.9 Implementation Action Plan Summary

The following is provided to summarize the County of San Diego and discharger's implementation of the TMDLs.

[73] In determining appropriate management methods and practices to control nutrient discharges interested persons should are encouraged to consult the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html. This publication contains extensive information on nutrient reduction management measures (MMs) and management practices (MPs) applicable to the NPS land use activities in the Rainbow Creek watershed. Interested persons are also encouraged to consult the Regional Board's Watershed Management Approach for the San Diego Region, Nonpoint Source (http://www.swrcb.ca.gov/rwqcb9/programs/wmc.html) for additional information on management measures.

[74] Information on available grant funds is contained in the in the State Water Resources Control Board's *California Nonpoint Source Encyclopedia* (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html).

Table 9-4 Summary of Implementation

Action	Description	Regional Board Authority
County of San Diego Actions		
1. Control MS4 Discharges to Rainbow Creek	• Implement the requirements of Order No. 2001-01 where the permit applies	San Diego RWQCB Order No. 2001-01
2. Submit and Implement Nutrient Reduction and Management Plan	• Develop and implement an NRMP • Review Legal Authority • Review and revise Land Use and Planning policies and practices • Review and revise environmental review process (CEQA) • Implement pollution prevention • Inventory and prioritize nutrient sources • Designate MMs and MPs for nutrient sources • Inspect priority nutrient sites and sources • Enforce existing ordinances and adopt new ordinances as necessary • Report non-compliant sites • Monitor to Assess Compliance with Load Reductions • Provide community outreach and assistance • Seek financial assistance • Assess Effectiveness of NRMP • Review and/or revise plan annually • Submit plan and subsequent revisions to Regional Board • Develop and implement a monitoring program • Submit a monitoring and reporting program plan to Regional Board • Submit monitoring reports annually to the Regional Board	CWC § 13225
3. Submit and Implement Groundwater Investigation and Characterization Workplan	• Submit investigative workplan to Regional Board • Investigate nutrient loads to groundwater and the groundwater contribution to Rainbow Creek • Implement investigative workplan within 60 days after submission to Regional Board	CWC § 13225
4. Submit Groundwater Investigation and Characterization Report	• Submit Report to Regional Board on a schedule to be agreed to in writing by the Regional Board.	CWC § 13225
5. Establish MAA	• Enter into MAA with the Regional Board	CWC § 13225
State of California, Department of Transportation (Caltrans) Actions		
1. Meet Wasteload Allocations	• Implement the requirements of Order No. 99-06-DWQ • Submit a report on the determination of water quality exceedances and BMP implementation within 6 months of USEPA approval • Meet wasteload allocations by 2012	CWC § 13383
2. Perform Water Quality Monitoring	• Perform water quality monitoring • Submit reports annually to Regional Board	CWC § 13267
State of California, Department of Forestry and Fire Protection (CDFFP) Actions		
1. Investigate Impact of Percolation Ponds and Remediate if necessary	• Comply with the requirements of Order No. 95-20 • Investigate, monitor, and take necessary measures to ensure operations do not contribute to impairment • Submit technical report to Regional Board	CWC § 13267

Action	Description	Regional Board Authority
Nonpoint Source Dischargers (NPS Dischargers) Actions		
1. Meet Load Allocations with MAA oversight	• Participate in load reductions with MAA direction and oversight • Iterative evaluation and implementation of MPs • Meet load allocations in compliance with schedule in Table 9-1	CWC § 13260 & § 13269 & § 13243

10.0 Implementation Monitoring Plan

This section describes an Implementation Monitoring Plan to assess the success of the implementation action plan presented in Section 9 in 1) achieving the nutrient wasteload and load reductions and 2) attaining nutrient water quality objectives in Rainbow Creek. The plan assigns monitoring responsibilities and describes a schedule and key milestones.

10.1 Regulatory Authority

10.1.1 Implementation Monitoring Plan as Part of a TMDL Basin Plan Amendment

Basin Plans must have a program of implementation to achieve water quality objectives[75]. The implementation program must include a description of actions that are necessary to achieve water quality objectives, a time schedule for these actions, and a description of "surveillance" to determine compliance with the water quality objectives[76]. The term "surveillance " in a TMDL context refers to an implementation monitoring plan designed to measure the effectiveness of the TMDL point and nonpoint source control measures and the progress the waterbody is making toward attaining water quality objectives. Such a plan would necessarily include collection of water quality data. State law requires that a TMDL include an implementation monitoring plan because the TMDL normally is, in essence, an interpretation or refinement of an existing water quality objective. The TMDL must be incorporated into the Basin Plan[77], and, because the TMDL supplements, interprets, or refines an existing water quality objective, state law requires an implementation monitoring plan be included to determine the success of the implementation action plan measures.

10.1.2 Local Agency Monitoring

CWC §13225 provides authority for the Regional Board to require local agencies such as the County of San Diego to submit technical reports on water quality control, even though those entities may not be waste dischargers. The only restriction is that the burden of preparing the reports bears a reasonable relationship to the need for and the benefits to be obtained from the reports.

10.1.3 Discharger Monitoring

[75] See CWC § 13050(j) A "Water Quality Control Plan" or "Basin Plan" consists of a designation or establishment for the waters within a specified area of all of the following: (1) Beneficial uses to be protected, (2) Water quality objectives and (3) A program of implementation needed for achieving water quality objectives.

[76] See CWC § 13242.

[77] See Clean Water Act § 303(e)

CWC §13267 provides that the Regional Board can require any person who has discharged, discharges, proposes to discharge or is suspected of discharging waste to investigate, monitor, and report information The only restriction is that the burden of preparing the reports bear a reasonable relationship to the need for and the benefits to be obtained from the reports.

CWC § 13283 provides that the Regional Board may establish monitoring, requirements for any person who discharges, pollutants or dredged or fill material or proposes to discharge pollutants to navigable waters of the United States.

10.2 Monitoring Objectives

The specific objectives of this Implementation Monitoring Plan are as follows:

1. Establish a monitoring program for Rainbow Creek and its tributaries using monitoring, sampling and analytical methods consistent with the SWRCB Surface Water Ambient Monitoring Program (SWAMP); SWAMP data quality assurance protocols; and SWAMP data management;

2. Characterize baseline conditions in Rainbow Creek and its tributaries with respect to nutrients to place future monitoring data into perspective and document progress towards cleaner water;

3. Establish a groundwater monitoring network in the Rainbow Creek watershed to define nutrient concentration trends. Results from the network will be used to document whether implementation of MPs /BMPs by dischargers translate to decreased nutrient concentrations in groundwater and reduced nutrient loading to Rainbow Creek from groundwater.

4. Track changes in water quality over time in Rainbow Creek and its tributaries with respect to nutrients and enable comparison of baseline data and TMDL target values with conditions. Determine whether the "trajectory" of the measured water quality values points toward attainment of the nutrient water quality objectives;

5. Evaluate the effectiveness of the TMDL implementation actions over time and determine the need for revisions to improve the implementation action plan;

6. Provide the monitoring data needed to verify or refine assumptions, resolve uncertainties, and improve the scientific foundation of the TMDL; and

7. Provide the monitoring data needed to evaluate the overall TMDL implementation effectiveness and success in attaining nutrient water quality objectives in Rainbow Creek and its tributaries.

10.3 Regional Board Actions

1. **Issue Order to Submit Monitoring Plan to Caltrans and County of San Diego**
   The Regional Board shall, within 90 days of USEPA approval of the Basin Plan Amendment, issue an Order to Caltrans under CWC §13383 and a Order to the County of San Diego under CWC §13225, to prepare and submit an Implementation Monitoring Plan containing the elements described in **Section 10.5 Implementation Monitoring Plan Elements** below. The Regional Board may amend this order at any time to include other nutrient dischargers in the Rainbow Creek watershed on a case-by case basis.

2. **Issue Order to Implement Monitoring Plan to Caltrans and County of San Diego**
   Upon concurrence with the County of San Diego's and Caltrans' Implementation Monitoring Plan the Regional Board shall issue an Order to Caltrans under CWC § 13383 and an Order to the County of San Diego under CWC § 13225, to implement monitoring. The Regional Board may amend this order at any time to include other nutrient dischargers in the Rainbow Creek watershed on a case-by case basis.

10.4 County of San Diego and Caltrans Actions

1. **Prepare and Submit Monitoring Plan**
   The County of San Diego and Caltrans shall collaborate to prepare and submit an Implementation Monitoring Plan for the Rainbow Creek watershed containing the elements described in **Section 10.5 Implementation Monitoring Plan Elements** below, upon direction by the Regional Board in a CWC §13225 / CWC §13383 Order. The Implementation Monitoring Plan shall be modified as requested by the Regional Board.

2. **Implement Monitoring Plan**
   The County of San Diego and Caltrans shall implement the Implementation Monitoring Plan upon direction by the Regional Board pursuant to a CWC §13225 / §13383 Order. The Regional Board may amend this order at any time to include other nutrient dischargers in the Rainbow Creek watershed on a case-by case basis.

10.5 Implementation Monitoring Plan Elements

The Implementation Monitoring Plan shall contain the following elements:

1. **Surface Water Monitoring Stations**
   Monitoring stations shall be proposed that best serve the monitoring objectives described above in Section 10.2 Monitoring Objectives. Previously monitored

locations that shall be considered include 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, in Appendix A). An additional sampling location between Oak Crest and Willow Glen-4 should also be considered. For instance, a monitoring location might be placed downstream of Oak Crest Mobile Estates to assess nutrient loading from this property. Monitoring stations shall also be considered at strategic nodes in Rainbow Creek and its tributaries that would monitor nutrient discharges from individual sources of a common land use category.

2. **Groundwater Monitoring Stations**
   The location of existing wells and the proposed location of additional monitoring wells needed to define nutrient concentration trends in groundwater. Methods for purging and sampling monitoring wells to provide representative samples for the waste constituents of interest should be described.

3. **Surface Water Monitoring Frequency**.
   Monitoring frequencies of the various monitoring parameters shall be proposed that best serve the monitoring objectives described above in Section 10.2 Monitoring Objectives. The frequencies should be adequate to evaluate ambient conditions and address any impact from low dissolved oxygen concentrations and algal growth.

4. **Groundwater Monitoring Frequency**
   Monitoring frequencies of the various monitoring parameters shall be proposed that best serve the monitoring objectives described above Section 10.2 Monitoring Objectives. The magnitude and timing of nutrient variability may vary significantly in monitoring wells that are located varying distances from nutrient sources. Sampling these wells will likely obtain water from varying depths in the aquifer. To define the nitrate variability at each well, the network will be sampled quarterly for two years. The observed variability will serve as a basis for determining the long-term sampling frequency for the network.

5. **Surface Water Quality Parameters**
   Surface Water Quality Parameters shall include nitrogen (including nitrate, nitrite, ammonia and total Kjeldahl nitrogen (TKN)), phosphorus (including orthophosphate and total), dissolved oxygen, pH, turbidity, and temperature.

6. **Groundwater Quality Parameters**
   Groundwater Quality Parameters shall include total nitrogen, nitrate, ammonia, nitrites, TKN, orthophosphate, total phosphorus, pH, dissolved Oxygen and TDS.

7. **Hydrology**
   Flow rate measurements shall be taken to calculate nutrient loading, to provide additional information about the hydrology of the watershed, and to identify patterns in algal growth.

8. **Algal Biomass**
   Characterization of algal species composition is needed to provide a more reliable indicator of trophic status and evidence of nutrient condition (USEPA 2000a). 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 factors 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. Algal biomass should be quantified by mass and/or by % cover of bottom (USEPA 2000a). Collection and measurement of algal biomass should be performed uniformly or by a standardized method (see USEPA 2000a).

9. **Biological Assessment Monitoring**
   It is recommended that biological assessment monitoring of benthic microinvertebrates 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). Changes in the stream's biological integrity (e.g., an increase or decrease in diversity and abundance of sensitive species) could 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 (CDFG 2000a) 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).

10. **Monitoring Reports**
    Monitoring reports shall be submitted in both electronic and paper formats and include the following information:

    a) An executive summary addressing all sections of the monitoring report, comprehensive interpretations and conclusions, and recommendations for future actions;
    b) A description of monitoring station locations by latitude and longitude coordinates, frequency of sampling, quality assurance/quality control procedures and sampling and analysis protocols;
    c) The data/results, methods of evaluating the data, graphical summaries of the data, and an explanation/discussion of the data;
    d) An assessment of the compliance of runoff characteristics with the required load reductions from each of the land use categories assigned a load reduction;
    e) Identification and analysis of trends in surface and groundwater quality and assessment of compliance with nutrient water quality objectives; and
    f) An evaluation of the effectiveness of the TMDL implementation actions and the need for revisions to improve the implementation action plan.

Table 10-1. Required Monitoring Parameters

Parameter	Type of sample[1]
Surface Water Monitoring	
Total nitrogen, nitrate, ammonia[2], 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	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 (recommended)	Grab
Groundwater Monitoring	
Total nitrogen, nitrate, ammonia[2], nitrites, TKN, orthophosphate, and total phosphorus concentrations	Grab
pH	Grab or In Situ
Dissolved Oxygen	Grab or In Situ
TDS	Grab or In Situ

[1] A California certified laboratory should be used with an approved QA/QC plan.
[2] All laboratory detection limits should be sufficient to determine compliance with the water quality objective. For example, un-ionized ammonia in surface waters (25 µg/L).

11. Quality Assurance / Quality Control Plan

The monitoring program shall develop and implement a QA/QC plan for field and laboratory operations to ensure that data collected are of adequate quality given the

monitoring objectives[78]. The QA/QC plan for field operations shall cover the following, at a minimum:

a. Quality assurance objectives;
b. Sample container preparation, labeling and storage;
c. Chain-of-custody tracking;
d. Field setup;
e. Sampler equipment check and setup;
f. Sample collection;
g. Use of field blanks to assess field contamination;
h. Use of field duplicate samples;
i. Transportation to the laboratory;
j. Training of field personnel; and
k. Evaluation, and enhancement if needed of the QA/QC plan.

The QA/QC plan for laboratory operations shall cover the following, at a minimum:

i. Quality assurance objectives;
j. Organization of laboratory personnel, their education, experience, and duties;
k. Sample procedures;
l. Sample custody;
m. Calibration procedures and frequency;
n. Analytical procedures;
o. Data reduction, validation, and reporting;
p. Internal quality control procedures;
q. Performance and system audits;
r. Preventive maintenance;
s. Assessment of accuracy and precision;
t. Correction actions; and
u. Quality assurance report.

12. **Reporting Period**

Annual reports should cover the period of October 1 through September 30. The reports should be submitted to the Regional Board by January 31 of the following year and should be incorporated within the annual receiving water monitoring reports required under the County of San Diego's MS4 NPDES Permit Receiving Waters Monitoring and Reporting Program.[79]

[78] For more information on QA/QC activities, including guidelines and example QA/QC documents, refer to http://www.swrcb.ca.gov/swamp/qapp.html

[79] The term "MS4 NPDES Storm Water Permit" currently refers to Order No.2001-001, NPDES No. CAS0108758, Waste Discharge Requirements For Discharges Of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities Of San Diego County, and the San Diego Unified Port District. Attachment B to this Order contains the Receiving Waters Monitoring and Reporting Program for Order No. 2001-01. The annual receiving water monitoring report is described in Table 6, Item 28, page 51 of Order No. 2001-01.

13. **Reporting Frequency**

The first report shall be due in the first January following initiation of the monitoring program. Reporting shall continue on an annual basis until the nutrient water quality objective has been attained and maintained in Rainbow Creek.

11.0 Environmental Review

This Section presents the Regional Board's environmental analysis of the amendment to the "Water Quality Control Plan for the San Diego Basin (9)" (Basin Plan) to incorporate a Total Maximum Daily Loads for Total Nitrogen and Total Phosphorus in Rainbow Creek.

11.1 Legal Authority

The Regional Board must comply with the California Environmental Quality Act (CEQA) when the Board amends the Basin Plan[80]. The CEQA process requires the Regional Board to analyze and disclose the potential adverse environmental impacts of a Basin Plan amendment it is initiating or approving. The Regional Board's Basin Plan amendment process must consider alternatives, develop proposals to mitigate or avoid environmental impacts to the extent feasible, and involve the public and other public agencies in the evaluation process.

11.1.1 CEQA Requirements Exemption

CEQA authorizes the Secretary of the Resources Agency to certify state regulatory programs, designed to meet the goals of CEQA, as exempt from CEQA's requirements to prepare an Environmental Impact Report (EIR), Negative Declaration, or Initial Study. These programs are often referred to as being "functionally equivalent" to the CEQA process

The State Resources Agency has certified the Regional Board's basin plan amendment process as "functionally equivalent" to the CEQA process. [81] State Water Resources Control Board (SWRCB) regulations[82] describe the environmental documents required for Basin Plan Amendment actions. These documents are: a written report, an initial draft of the Basin Plan Amendment and an Environmental Checklist Form[83]. This report, *Basin Plan Amendment and Technical Report for Total Nitrogen and Total Phosphorus, Total Maximum Daily Loads For Rainbow Creek,* fulfills the requirements of CEQA for preparation of an environmental document for this Basin Plan amendment.

11.1.2 Scope of Environmental Analysis

TMDL Basin Plan amendments typically include "performance standards"[84]. TMDLs normally contain a quantifiable numeric target that interprets the applicable water quality

[80] See Public Resources Code § 21080

[81] See CCR, Title 14, § 15251(g).

[82] See 23 CCR 3720 et seq, "Implementation of the Environmental Quality Act of 1970"

[83] See 23 CCR 3776

[84] The term "performance standard" is defined in the rulemaking provisions of the Administrative Procedure Act (Government Code §§ 11340-l 1359). A "performance standard" is a regulation that describes an objective with the criteria stated for achieving the objective. (Government Code

objective. TMDLs also include wasteload allocations for point sources, load allocations for nonpoint sources and natural background. The quantifiable target together with the allocations may be considered a performance standard.

CEQA has specific provisions governing the Regional Board's adoption of regulations such as the regulatory provisions of Basin Plans that establish "performance standards" or treatment requirements[85]. These provisions require that the Regional Board perform an environmental analysis of the reasonably foreseeable methods of compliance with the wasteload and load allocations prior to the adoption of the TMDL Basin Plan amendment. Specifically the Regional Board must provide an environmental analysis including at least the following:

1. A summary of the proposed TMDL Basin Plan amendment including an analysis of issues voiced by the public during the course of the TMDL Basin Plan development;

2. An analysis of the reasonably foreseeable environmental impacts of the implementation methods that may be employed to comply with the TMDL Basin Plan Amendment. The Environmental Checklist Form[86] should be used to identify any environmental impacts;

3. An analysis of the reasonably foreseeable feasible mitigation measures relating to those environmental impacts; and

4. An analysis of reasonably foreseeable alternatives to the proposed TMDL Basin Plan amendment.

The Regional Board's method of analysis to identify environmental impacts associated with the Rainbow Creek TMDLs is based on a "tiering"[87] approach to provide increased efficiency in the CEQA process. Tiering allows the Regional Board to limit its analysis in this document to the broad environmental issues at the Basin Plan amendment "performance standard" adoption stage which are ripe for decision. The Regional Board is not required, at the Basin Plan amendment adoption stage, to evaluate environmental issues associated with specific projects to be undertaken later to comply with the performance standard[88]. CEQA provisions allow for project level environmental considerations to be deferred so that more detailed examination of the effects of these

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§11342(d)).

[85] See Public Resources Code §§ 21159 and 21159.4

[86] 23 CCR § 3777

[87] See Public Resources Code § 21068.5

[88] See Public Resources Code (PRC) §§ 21159 through 21159.4 and CCR 14 § 15187. See also the legislative intent in PRC § 21156, and the statutes regarding "tiered" environmental review in PRC §§ 21068.5, and 21093-21094.

projects in subsequent second tier CEQA environmental documents can be made by the appropriate lead agency[89].

11.2 Project Description

The purpose of this project is to amend the Basin Plan to incorporate total maximum daily loads (TMDLs) for nitrogen and phosphorus and to assign wasteload and load allocations in order to attain and maintain water quality objectives in Rainbow Creek. A wasteload allocation is assigned to a point source discharger (Caltrans) and load allocations are assigned to commercial nursery, agricultural field, orchard, park, residential area, urban area, and septic tank disposal system land use activities to reduce nutrient loading to Rainbow Creek.

The Basin Plan amendment contains an Implementation Action Plan describing:

1. Actions that are specific to the pollutant and waterbody for which the TMDLs are being established;
2. Persons responsible for implementing specified control actions;
3. A timeline description of when activities necessary to implement the TMDL will occur;
4. A description of the legal authorities under which implementation will occur;
5. A description of milestones that will be used to measure progress and
6. The time required to attain water quality objectives.

The Basin Plan amendment also contains an Implementation Monitoring Plan to evaluate the overall TMDL implementation effectiveness and success in attaining nutrient water quality objectives in Rainbow Creek and its tributaries.

The Basin Plan amendment establishes nutrient wasteload and load reductions over a 16-year period. During the first four years, nutrient wasteload and load reductions are projected to attain the nitrates water quality objective and reduced phosphorus concentrations in Rainbow Creek. Additional incremental nutrient wasteload and load reductions are required throughout the subsequent 12-year reduction period until December 31, 2021. A three-year response time is projected for Rainbow Creek to attain compliance with nutrient water quality objectives after reaching the desired nutrient wasteload and load reductions in 2021. Accordingly, the projected date when Rainbow Creek will attain and maintain compliance with nutrient water quality objectives is December 31, 2024.

[89] See Public Resources Code § 21067. Lead Agency" means the public agency which has the principal responsibility for carrying out or approving a project. The Lead Agency will decide whether an EIR or Negative Declaration will be required for the project and will cause the document to be prepared.

11.3 Analysis of Public Comment on Technical Issues

This section summarizes the Regional Board's analysis of issues associated with the project that were identified by commenters in meetings with the Regional Board during the development of the Rainbow Creek TMDLs. This section also summarizes the Regional Board's analysis of issues presented at a Board public hearing on May 8, 2002 to consider the adoption of an earlier version draft nutrient TMDLs for Rainbow Creek.

11.3.1 Issue: Are the Rainbow Creek Nutrient TMDLs Necessary?

Comment Summary: Over the course of the development of the TMDL, some commenters noted that current nutrient concentrations in Rainbow Creek are substantially less than the concentrations observed in the mid-1980s, and that evidence regarding actual beneficial use impairment is lacking. These commenters suggested that no TMDLs are necessary for Rainbow Creek.

Analysis: The Regional Board carefully considered these comments but is proceeding with amending the Basin Plan to establish nutrient TMDLs for Rainbow Creek. Clean Water Act § 303(d) requires the states to identify waters within their borders that are not attaining water quality standards and to establish the total maximum daily load (TMDL) for pollutants impairing those waters. Amendment of the Basin Plan to establish and implement Total Maximum Daily Loads (TMDLs) for Rainbow Creek is necessary because the existing water quality does not meet applicable numeric water quality objectives for nitrate, total nitrogen, and total phosphorus. Applicable state and federal laws require the adoption of this Basin Plan amendment. The discussion in the problem statement section of this report provides additional detailed information on the need for TMDLs to address the nutrient water quality impairment conditions in Rainbow Creek.

11.3.2 Issue: Are the TMDL Targets and Load Reductions Feasible?

Comment Summary: Over the course of the development of the TMDL, some commenters expressed concern that it will not be technically feasible to attain the TMDL biostimulatory targets or reduce loading to the levels required to meet the proposed TMDLs. These commenters indicated that the Rainbow Creek watershed agricultural community would not be able to completely reduce nutrient loads to the very low quantities necessary to attain the load allocations for irrigated agriculture and nurseries.

Analysis: The Regional Board recognizes that it is difficult to ensure with precision that agricultural operations implementing nonpoint source management practices (MPs) controls will achieve the required nutrient load reductions. Nutrient MPs for agricultural operations may not perform according to expectations to achieve expected pollutant load reductions despite best efforts. The TMDL Implementation Action Plan provides for interim, measurable, milestones for determining whether nutrient MPs are being implemented, and a process for implementing stronger and more effective management measures if necessary. This type of approach might involve very long time frames before the nutrient water quality objectives are attained. The Regional Board is currently projecting that attainment of the nutrient water quality objectives may not occur until

December 2024.

There is extensive information available to the agricultural community in the Rainbow Creek watershed to assist them in identifying and implementing proven practices to reduce nutrient discharges and restore the impaired waters of Rainbow Creek. One such source of information is the SWRCB's California Nonpoint Source Encyclopedia (2004) (http://www.swrcb.ca.gov/nps/encyclopedia.html). This publication contains extensive information on seven management measures designed to address agricultural nonpoint source (NPS) pollution of state waters.

The management measures referenced in California Nonpoint Source Encyclopedia were developed by the SWRCB, California Coastal Commission (CCC), and other state agencies and consist of a suite of plans, practices, technologies, operating methods, or other alternatives that may be used in combination to control NPS pollution. Associated with each management measure are management practices designed to reduce the quantities of pollutants entering receiving waters. Many of the agricultural management practices listed under each management measure were approved for use on agricultural lands by the California Natural Resources Conservation Service (NRCS). Some practices are recommended by the U.S. Department of Agriculture (USDA) NRCS as components of Resource Management Systems (RMSs). RMSs, also known as conservation planning, are whole-farm plans that incorporate economic, social, and ecological considerations to meet the demands of crop and animal production and long-term environmental sustainability. RMSs contain pollution control criteria for soil, air, water, plant, animal, and human resources, which are described in the USDA NRCS *Field Office Technical Guide*. These organizations can also provide technical assistance to increase the ability of agricultural professionals and landowners in making sustainable nutrient management decisions to minimize or eliminate NPS pollution attributable to nutrient discharges.

Management Measure 1C in the California Nonpoint Source Encyclopedia addresses the development and implementation of comprehensive nutrient management plans for areas where nutrient runoff is a problem affecting coastal waters and/or water bodies listed as impaired by nutrients. The purpose of this management measure is to reduce the nutrient loss from agricultural lands, which occurs through edge-of-field runoff or leaching from the root zone.

Nutrients can be effectively managed to markedly reduce the potential for NPS pollution through development of a nutrient management plan (NMP) in accordance with USDA NRCS Standard 590. NMPs should be updated at least once every 5 years or once per crop rotation period. Such plans would include a plant tissue analysis to determine crop nutrient needs; crop nutrient budget; identification of the types, amounts, and timing of nutrients necessary to produce a crop based on realistic crop yield expectations; identification of hazards to the site and adjacent environment; soil sampling and tests to determine crop nutrient needs; and proper calibration of nutrient equipment. When manure from confined animal facilities that are not confined animal feeding operation (CAFOs) is to be used as a soil amendment and/or is disposed of on land, the plan should

discuss steps to ensure that subsequent irrigation of that land does not leach excess nutrients to surface or groundwater. Components of an NMP include the following:

1. Farm and field maps showing acreage, crops, soils, and water bodies;

2. Realistic yield expectations for the crop(s) to be grown based primarily on the producer's yield history, State Land Grant University yield expectations for the soil series, or USDA NRCS Soils-5 information for the soil series;

3. A summary of the nutrient resources available to the producer, which at a minimum include (a) soil test results for pH, phosphorus, nitrogen, and potassium; (b) nutrient analysis of manure, sludge, mortality compost (birds, pigs, etc.), or effluent (if applicable); (c) nitrogen contribution to the soil from legumes grown in rotation (if applicable); and (d) other significant nutrient sources (e.g., irrigation water);

4. An evaluation of the field limitations based on environmental hazards or concerns such as (a) sinkholes, shallow soils over fractured bedrock, and soils with high leaching potential; (b) lands near surface water; (c) highly erodible soils; and (d) shallow aquifers;

5. Use of the limiting nutrient concept to establish a mix of nutrient sources and requirements for the crop based on realistic yield expectations;

6. Identification of timing and application methods for nutrients to (a) provide nutrients at rates necessary to achieve realistic yields, (b) reduce losses to the environment, and (c) avoid applications as much as possible to frozen soil and during periods of leaching or runoff;

7. Provisions for the proper calibration and operation of nutrient application equipment; and

8. Provisions to ensure that, when manure from confined animal facilities (excluding CAFOs) is to be used as a soil amendment or is disposed of on land, subsequent irrigation of the land does not leach excess nutrient to surface or groundwater.

11.3.3 Issue: Is the Methodology for Estimating Nutrient Loading from Land Use Activities Accurate?

Comment Summary: Commenters expressed concerns that the nutrient export coefficients the Regional Board used to estimate nutrient loading from various land use activities are not site-specific or tailored to the local topography, soil and vegetation types. The use of the export coefficients could introduce unacceptable errors in the loading estimates and overestimate load reduction

***Analysis*:** The calculation methodology is reasonable and consistent with approaches used in scientific literature and EPA guidance documents for estimating NPS loading

rates for use in TMDLs. The current nutrient loadings were estimated using peer reviewed literature values of nutrient export rates for particular land use types. The Regional Board recognizes it is difficult to calculate nutrient loading from nonpoint sources with precision and acknowledges that the development of the nutrient loads from NPS discharges is characterized by uncertainties. The Regional Board has structured an adaptive implementation action plan that simultaneously makes progress toward achieving nutrient water quality objectives while relying on monitoring data to reduce uncertainty and fill data as time progresses. This monitoring data can be used to revise and improve the initial TMDL forecast for nutrient loading from non point sources over time if necessary.

11.3.4 Issue: Are the Nutrient TMDLs Consistent With the Clean Water Act § 303(d) List?

Comment Summary: Commenters objected at the May 8, 2002 public hearing to establishing total nitrogen and total phosphorus TMDLs because the proposed TMDLs did not explicitly match the "eutrophic conditions" impairment condition for Rainbow Creek contained in the Clean Water Act (CWA) § 303(d) listing that was in effect at that time.

***Analysis*:** The Regional Board's consideration of Nutrient TMDLs for Rainbow Creek in 2002 was entirely appropriate even though Rainbow Creek waters were not at that time explicitly listed as impaired due to nitrogen and phosphorus concentrations. Clean Water Act (CWA) § 303(d)(1)(A) requires each state to identify the waters within its jurisdiction that are not attaining water quality standards. The result of that process is commonly known as the CWA § 303(d) list. The federal regulations additionally require the 303(d) list to include an identification of the pollutants causing or expected to cause violations of standards[90].

For the waters on the CWA § 303(d) list, CWA § 303(d) (1)(C), requires the state to develop TMDLs for the pollutants that are impairing those waters. In many instances waters on the CWA § 303(d) list are not identified as impaired by a specific pollutant, but by conditions that are caused in whole or in part by pollutants. Examples of these stressors include accelerated eutrophication (typically associated with excessive nutrients), toxicity (miscellaneous toxic constituents), and temperature (thermal discharges and sediment). CWA § 303(d)(1)(A) does not prohibit identifying waters as impaired by such conditions, and the United States Environmental Protection Agency (USEPA) has approved this approach, for example, by approving the 1998 and 2002 303(d) lists. Such listings, however, do not impact the state's obligation under CWA § 303(d) (1)(C) to develop TMDLs for the pollutants impairing those waters. Accordingly, where waters are listed as impaired for conditions commonly associated with pollutants, the Regional Board must identify the pollutants underlying or contributing to the conditions, and either establish TMDLs for those pollutants, or establish TMDLs that otherwise correct the conditions leading to the impairment.

[90] See 40 C.F.R. § 130.7(b)(1)(4)

In any event the latest listing of impaired waters in the CWA § 303(d) List for 2002 renders the issue moot. During the public comment period on the CWA § 303(d) List for 2002, the Regional Board recommended that the SWRCB and USEPA change the Rainbow Creek impairment listing from "eutrophic conditions" to a pollutant-based listing based on exceedances of nitrogen and phosphorus water quality objectives. The SWRCB and USEPA concurred with this recommendation and the current CWA § 303(d) List for 2002 describes Rainbow Creek's pollutant impairment as "nitrogen and phosphorus".

11.3.5 Issue: Do Eutrophic Conditions Exist in Rainbow Creek?

Comment Summary: Some commenters at the May 8, 2002 public hearing also expressed the view that the Regional Board did not observe severe eutrophic conditions during the TMDLs development, and therefore, no impairment existed in Rainbow Creek.

Regional Board Analysis: As documented in Section 2.4 and 2.5 of this technical report, Rainbow Creek monitoring performed by the Regional Board in January through October 2000 found nitrogen and phosphorus enrichment, localized excessive filamentous algae, and exceedance of the Biostimulatory Substances water quality objective numeric values, strongly indicating impairment of the waterbody.

11.3.6 Issue: Is the Regional Board Interpreting the Biostimulatory Substances Water Quality Objective Properly?

Comment Summary: Several commenters asserted at the May 8, 2002 public hearing that the Regional Board is misinterpreting the Biostimulatory Substances water quality objective and that the water quality objective does not contain numeric values.

Analysis: The Biostimulatory Substances water quality objective is stated in its entirety in Section 3.2 of this report. The Regional Board has relied on, interpreted and used the 0.1 mg/l goal for phosphorus stated in the Biostimulatory Substances water quality objective as a phosphorus water quality objective for approximately 30 years since its orginal incorporation in the Baisn Plan in 1975. The Regional Board's use of the N:P ratio of 10:1 in the Biostimulatory Substances water quality objective to determine the applicable nitrogen water quality objecitve of 1.0 mg/l is also well established. The Regional Board most recently reaffrmed its use of the the Biostimulatory Substances water quality objective to control nitrogen and phosphorus levels in San Diego Region inland surface waters by readopting it in 1994 as part of a major revamping of the Basin Plan.

The 0.1 mg/l goal for phosphorus stated in the Biostimulatory Substances water quality objective is the phosphorus water quality objective applicable to Rainbow Creek. Simarly the N:P ratio of 10:1 stated in the Biostimulatory Substances water quality objective serves as the basis for determining allowable concentrations of nitorgen in Rainbow Creek. Applying the the N:P ratio of 10:1 to a phosphorus water quality

objective of 0.1 mg/l yields 1.0 mg/l total nitorgen as the applicable nitrogen water quality objecitve for Rainbow Creek

The Biostimulatory Substances water quality objective requires the use of 0.1 mg/l phosphorus and 1.0 mg/l nitorgen as water quality oibjectives unless scientific studies show that altenrative site specifc water quality objectives (SSOs) for nitorgen and phosphorus are appropriate for Rainbow Creek. The SSOs would need to (1) be based on sound scientific rationale; (2) protect the designated beneficial uses of Rainbow Creek waters; and (3) be adopted by the Regional Board in a Basin Plan amendment. Dischargers or other interested parties would need to fund and initiate the scientific studies to develop the SSO. It is possible the studies could reveal the need for more stringent nutrient water quality objectives

In Section 2.4, an expanded discussion of academic literature and currently USEPA proposed numeric nutrient criteria is presented to support the reasonableness of the Biostimulatory Substances water quality objective numeric values. This issue is also addressed in Appendix M – Response to Public Comments, Public Hearing on May 8, 2002 under comments related to Water Quality Standards. It should be noted that USEPA's recommended water quality criteria for the subecoregion that includes Rainbow Creek are 0.5 mg N/L for total nitrogen and 0.03 mg P/L for total phosphorus which is even more stingent than the Regional Board's 0.1 mg/l phosphorus and 1.0 mg/l nitrogen that the Regional Board is using as the basis for the Rainbow Creek TMDL.

The Regional Board is currently participating in the development of new numeric nutrient water qua;ity objecitves in an effort underway in California by the USEPA Region IX Regional Technical Advisory Group (RTAG). The RTAG group is currently working on developing alternative regional nutrient water quality criteria for the Southern and Central California due to the number of nutrient TMDLs being completed in this region. Basin Plan resources are assigned to continue participation in the RTAG effort over the next three years. Information on the National Nutrient Strategy, the status of the RTAG effort, and technical guidance can be found at http://www.epa.gov/ost/standards/nutrient.html.

11.3.7 Issue: Is the TMDL Overburdened with Data Gaps?

***Comment Summary*:** Several commenters asserted at the May 8, 2002 public hearing that the technical basis of the Rainbow Creek TMDLs being considered at that time was overburdened with data gaps and numerous mentions of having a lack of data, filling data gaps, re-evaluating the TMDLs, and adjusting allocations

***Analysis*:** The Regional Board acknowledges that the technical basis of the Rainbow Creek TMDL is characterized by data gaps and uncertainties. Scientific uncertainty is a reality within all water quality programs, including the TMDL program, and it cannot be entirely eliminated. The TMDL program must move forward in the face of these uncertainties if progress in establishing TMDLs and attaining water quality objectives in

impaired waters is to be made.

The National Research Council addressed this issue in their report for the US Congress entitled *Assessing the TMDL Approach to Water Quality Management* (2000) and concluded that

> "… the ultimate way to improve the scientific foundation of TMDLs is to incorporate the scientific method, and not simply the results from analysis of particular data sets or models, into TMDL planning. The scientific method starts with limited data and information from which a tentatively held hypothesis about cause and effect is formed. The hypothesis is tested, and new understanding and new hypotheses can be stated and tested. By definition, science is this process of continuing inquiry. Thus, calls to make policy decisions based on the "the science," or calls to wait until "the science is complete," reflect a misunderstanding of science. Decisions to pursue some actions must be made, based on a preponderance of evidence, but there may be a need to continue to apply science as a process (data collection and tools of analysis) in order to minimize the likelihood of future errors".

In accordance with this approach the Regional Board has structured an adaptive implementation action plan in the revised Rainbow Creek TMDL that simultaneously makes progress towards achieving nutrient water quality objectives while relying on monitoring data to reduce uncertainty and fill data gaps as time progresses. This monitoring data can be used to revise and improve the initial TMDL forecast over time. This type of approach will help ensure that the Rainbow Creek TMDL program is not halted because of a lack of data and information, but rather progresses while better data are collected to verify or refine assumptions, resolve uncertainties, and improve the scientific foundation of the TMDL.

The Regional Board has extensively revamped the Rainbow Creek TMDL to improve the scientific basis and validity of the wasteload and load allocations. The revised Rainbow Creek TMDL report now includes eight years of site-specific flow data to calculate the TMDLs, and City of San Diego water quality data from 12 minimally impacted streams within the County to calculate the background load. (See Sections 4.1.1, and 5 and Appendix D).

11.3.8 Issue: Is the Nutrient Load Defining Background Conditions Calculated Properly?

***Comment Summary*:** Several commenters expressed the view at the May 8, 2002 public hearing that it was unreasonable and unobtainable to achieve a TMDL below background conditions, and that the TMDL proposed at that time was scientifically flawed. These comments were directed towards the Regional Board's March 22, 2002 report on Rainbow Creek TMDLs where the background nutrient load to Rainbow Creek was estimated by multiplying the export coefficient for open space and the acreage of undeveloped land. This method resulted in a background load estimate that was higher

than the total nitrogen TMDL. Using this methodology, Rainbow Creek would have no assimilative capacity for additional nutrient loading from anthropogenic sources.

***Analysis*:** The Regional Board agreed with these commenters and has recalculated the background nutrient loading from natural sources. The Regional Board reviewed and considered additional data from minimally impacted streams in the San Diego region to better define background nutrient concentrations from natural sources and eight years of site-specific Rainbow Creek flow data to calculate a background load for Rainbow Creek (See Section 4.1.1 and Appendix D of this report). The revised background loads for total nitrogen and total phosphorus in the revised TMDL described in this report are less than the nutrient water quality objective. Using this methodology, Rainbow Creek does have some limited assimilative capacity for additional nutrient loading from anthropogenic sources.

This issue was also addressed in Appendix M – Response to Public Comments, Public Hearing on May 8, 2002 under comments related to Technical Issues.

11.3.9 Issue: Should Site Specific Flow Data be Used?

Comment Summary: USEPA commented that the Regional Board should use site-specific stream flow records from the USGS Gauging Station located on Rainbow Creek fur use in determining the nutrient loading capacity.

***Analysis*:** The TMDLs are now based on the site-specific flow records from the USGS Gauging Station located on Rainbow Creek. (Section 5.0 and Appendix E).

11.3.9 Issue: Did the Regional Board Properly Address Economic Considerations?

Comment Summary: Several commenters raised the issue at the May 8, 2002 public hearing that the Regional Board did not did not adequately address implementation costs and effectiveness of MPs to landowners and land users.

***Analysis*:** Section 12.0 and Appendix H now provides a more expanded analysis of MPs as they may be utilized by various land uses. Irrigation MPs, nutrient reduction MPs, and runoff/erosion control management MPs are evaluated at low, medium, and high levels of effort for each land use.

11.4 Analysis of Reasonably Foreseeable Environmental Impacts

This section identifies the reasonably foreseeable methods of compliance with the Rainbow Creek TMDL Basin Plan amendment and describes the environmental impacts of those methods.

Point source discharges of nutrients in the Rainbow Creek watershed result from storm water runoff of nutrients from both Interstate-15 freeway surfaces and adjacent land areas. Nonpoint source discharges occur from commercial nursery, agricultural field,

orchard, park, residential area, urban area, and septic tank disposal system land use activities. Attainment of the nutrient wasteload and load reductions to comply with the requirements of the Rainbow Creek TMDL Basin Plan amendment depends upon discharger implementation of best management practices (BMPs) for point source discharges and management practices (MPs) for nonpoint source discharges to control these nutrient sources.

Controlling and reducing nutrient discharges in the Rainbow Creek watershed to meet the TMDL nutrient load reductions for nonpoint sources will be a long term and complicated undertaking. The Regional Board proposes to use a Third Party regulatory-based approach to mandate compliance with the nonpoint source (NPS) nutrient load reductions of this TMDL.

Reasonably foreseeable compliance methods for implementing the third party agreement and the BMPs and MPs that may be employed by dischargers to comply with the nutrient wasteload and load reductions of the Rainbow Creek TMDL are summarized below.

11.4.1 Reasonably Foreseeable Compliance Methods

County Of San Diego
The Regional Board proposes to use a Third Party regulatory based approach to mandate compliance with the nonpoint source (NPS) nutrient load reductions of this TMDL. The Regional Board will accomplish this by negotiating a Management Agency Agreement (MAA) between the Regional Board and the County of San Diego setting forth the commitments of both parties to undertake various implementation responsibilities for the NPS nutrient load reductions of this TMDL.

Under the terms of the proposed MAA, the County of San Diego will take the lead in establishing management measures (MMs) and management practices (MPs) and overseeing MP implementation by NPS dischargers to attain TMDL nutrient load reductions in the Rainbow Creek watershed. This will be accomplished through the County of San Diego's development and implementation of a Nutrient Reduction and Management Program (NRMP) for the watershed that incorporates nutrient management measures and a public outreach program to achieve the reductions. Additionally, the County of San Diego will be directed to investigate ground water quality and contribution to the creek to fill data gaps. Findings from the investigations will be used in the development of further implementation measures to attain subsequent nutrient load reductions.

In conjunction with an MAA or MOU with another third-party representative, organization, or government agency describing an adequate NPS pollution control implementation program, the Regional Board shall adopt individual or general waivers or waste discharge requirements (WDRs) for NPS discharges in the Rainbow Creek watershed. The waivers or WDRs shall require NPS dischargers to either participate in the third party NPS program or, alternatively, submit individual pollution prevention plans that detail how they will comply with the waivers and WDRs. Alternatively, the

Regional Board may adopt a discharge prohibition, which includes exceptions for those discharges that are adequately addressed in an acceptable third-party MAA or MOU NPS pollution control implementation program.

Agricultural, Parks and Commercial Nursery Sources

Nutrient reduction management measures for agricultural sources are directed towards reducing the nutrient loss from agricultural lands, which occurs through edge-of-field runoff or leaching from the root zone. Management practices to achieve this goal might include:

- Developing, implementing, and periodically updating a nutrient management plan to (1) apply nutrients at rates necessary to achieve realistic crop yields, (2) improve the timing of nutrient application, and (3) use agronomic crop production technology to increase nutrient use efficiency.

- Operating irrigation systems so that the timing and amount of irrigation water applied match crop water needs. This requires, as a minimum, (a) the accurate measurement of soil-water depletion volume and the volume of irrigation water applied, and (b) uniform application of water.

- Controlling the manner and application of water to minimize water runoff and soil erosion. USDA NRCS-recommended irrigation systems include microirrigation, sprinklers, surface and subsurface systems, and tailwater recovery.

- Managing the drainage water from the irrigation system to control deep percolation, to move tailwater to the reuse system, and to control erosion and adverse impacts on surface and ground

- Preventing or reducing the amount of soil entering surface water by installing filter strips, field borders, fiber mats, and buffers to filter and trap sediment. Grassed waterways can be installed to prevent gullies and to filter and trap sediment, and sediment ponds, basins, and traps can be used to treat sediment-laden runoff.

- Maintaining soil quality through crop rotation which involves planting crops in a recurring sequence on the same field, and by using conservation tillage to improve soil properties and improve water infiltration.

- Reducing or prevented soil erosion by leaving crop residues on the field, planting cover crops or other vegetative cover, and applying mulch to bare fields. In addition, fields can be graded to reduce slope length, steepness, or unsheltered distance (i.e., contour farming), and terraces and diversions can be used to reduce slope length. Finally, cross-wind strips can be installed and hedgerows, trees, and shrubs can be maintained along edges of fields or against prevailing winds to prevent wind erosion.

Septic Tank Sources

Management measures for septic tanks are directed towards ensuring that existing septic tank systems prevent the discharge of pollutants to the surface of the ground and, to the extent practicable, reduce the discharge of pollutants into ground water. Meeting these objectives may involve the reduced use of garbage disposals, the use of low-volume plumbing fixtures, use of low-level phosphate detergents, and establishment and implementation of policies that require a septic tank system to be repaired, replaced, or modified when the septic tank system fails or threatens or impairs surface waters.

Management practices may entail development of an effective operation and maintenance program for septic tanks that can be directed by regulatory agencies, wastewater utilities or districts, or voluntary programs. Operation and maintenance programs might include system inventories; management, operation, and maintenance policies; inspection and monitoring requirements; guidelines for the disposal or reuse of residuals; and public education. Public education and outreach are important to improve homeowner and industry awareness of the importance of operation and maintenance procedures. Typical public outreach and education programs address the benefits of the onsite management program, water conservation, and household and commercial/industrial hazardous waste discharge prevention.

Management practices may also entail retrofitting existing septic tank systems to provide for denitrification to reduce nitrogen loadings. For instance, whereas conventional septic systems remove 10 to 45 percent of total nitrogen, anaerobic up-flow filters remove 40 to 75 percent, and recirculating sand filters remove 60 to 85 percent. These options typically involve circulation loop or tanks in series, and it is possible to retrofit conventional, systems to improve denitrification performance. Other factors that affect the degree of nitrogen removal include temperature and the density of the soil in the septic tank fields.

State Highway Sources

Caltrans is the agency responsible for managing California's highway system. Caltrans implements a storm water management program pursuant to its MS4 NPDES storm water permit to reduce the discharge of pollutants such as nutrients to receiving waters through implementation of BMPs such as:

- Runoff treatment facilities located within existing rights-of-way, medians, or interchange loops, or on adjacent lands. Where no additional land is available, underground runoff storage and treatment (e.g., sand filters) can be used.

- Vegetative filter strips along roadsides and in medians to slow runoff velocities and increase storm water infiltration.

- Elimination of curbs to allow highway and road runoff to be filtered through vegetated shoulders and medians. Eliminating curbs also increases infiltration to ground water.

- Designing curbs with breaks and energy dissipaters to direct sheet flow to vegetated surfaces. These infiltration areas require periodic inspection for damage, rilling,

ponding, and trash accumulation, and will also require mowing or cropping of vegetation to prevent nuisance.

Residential Area Sources

Management measures to reduce or eliminate nutrient discharges from residential areas typically involves implementation of educational programs to provide greater understanding of watersheds and to raise awareness and increase the use of applicable urban management practices where needed to control and prevent adverse impacts on surface and ground waters. Outreach campaigns would inform both commercial lawn care specialists and residents of the importance of proper application of lawn fertilizers and timing of fertilizer application to provide citizens with the tools to use these fertilizers efficiently and reduce overall fertilizer use.

11.4.2 Environmental Impacts of Reasonably Foreseeable Compliance Methods

The environmental checklist, found in Appendix G, describes the potential for environmental impacts associated with the reasonably foreseeable compliance methods discussed above. The environmental checklist indicates that the TMDL Basin Plan amendment 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.

The environmental checklist does indicate potential, or indirect, environmental impacts could arise from BMP or MP projects implemented to comply with the Rainbow Creek TMDL. However these projects and their impacts are speculative at this time. The precise nature, location, and significance of the environmental impacts cannot be determined at this time, since the TMDL implementation action plan establishes a process for identifying subsequent projects rather than specifying particular remedial projects at specific locations. Accordingly an analysis of the reasonably foreseeable feasible mitigation measures relating to those speculative environmental impacts is not presented. Future CEQA documents prepared for specific BMP or MP implementation projects will identify site-specific environmental impacts and the need for feasible mitigation measures.

11.5 Reasonable Alternatives to the TMDL Basin Plan Amendment

This section describes the Regional Board's analysis of reasonable alternatives to the proposed project. The purpose of this analysis is to determine if the alternatives would feasibly attain the basic objective of the TMDL Basin Plan amendment but would avoid or substantially lessen any potential significant effects of the proposed amendment. The four alternatives include taking "no action", using a regulatory approach to TMDL implementation, and deferring adoption of the TMDLs until either site-specific water quality objectives are developed or new nutrient criteria are established.

11.5.1 No Action Alternative

Under the "no action" alternative the Regional Board would not adopt the proposed TMDL Basin Plan amendment and nutrient loading would likely continue at current levels. The no action alternative 1) does not comply with the Clean Water Act (CWA); 2) is inconsistent with the mission of the Regional Board; and 3) does not meet the purpose of the proposed TMDL Basin Plan Amendment. Under CWA § 303(d), the Regional Board is obligated to adopt a TMDL for waters such as Rainbow Creek that are not meeting water quality standards[91]. The mission of the Regional Board is to ensure the protection of receiving water beneficial uses through attainment of applicable water quality objectives. Consistent with the Regional Board's mission, the purpose of the proposed TMDL Basin Plan Amendment is to attain water quality objectives for biostimulatory substance and to restore and protect the wildlife and aquatic habitat beneficial uses of Rainbow Creek.

The proposed Basin Plan Amendment mandates an overall 74 percent reduction of total nitrogen loading and 85 percent reduction of total phosphorus loading from current levels to Rainbow Creek in order to attain water quality standards. Implementation of MPs 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 in the absence of the TMDL wasteload and load allocations needed to achieve the steep nutrient load reductions, violations of the biostimulatory substances water quality objective and impairment of beneficial uses will continue in Rainbow Creek.

Ultimately, the USEPA is required to develop and adopt TMDLs pursuant to CWA § 303(d) if the State does not adopt the proposed TMDLs and implementation plan. It is possible that the USEPA would adopt TMDLs based on their recommended nutrient criteria of 0.5 mg/L total nitrogen and 0.03 mg/L total phosphorus for streams in the subecoregion 6, Xeric West Ecoregion (USEPA 2000b). The use of this nutrient criteria as the TMDL Numeric Targets would result in wasteload and load allocations in the Rainbow Creek watershed that are more onerous than those proposed by the Regional Board.

11.5.2 Develop Site Specific Nutrient Water Quality Objectives

It may be appropriate to develop a modified biostimulatory substances water quality objective for Rainbow Creek based on site-specific environmental conditions in Rainbow Creek. A modified water quality objective is referred to as a site-specific water quality objective (SSO).

The legally applicable water quality objective for biostimulatory substances in Rainbow Creek is 1.0 mg N/L of total nitrogen and 0.1 mg P/L of total phosphorus. Scientific studies could be conducted to examine the appropriateness of establishing a less stringent biostimulatory substances (i.e. nutrients) water quality objective (i.e., an SSO). A

[91] Water quality standards are comprised of designated beneficial uses, the applicable numeric and/or narrative water quality objectives to protect those uses, and the SWRCB's anti-degradation policy provisions (Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California).

TMDL based on an SSO that is less stringent than 1.0 mg N/L and 0.1 mg P/L, would require a smaller reduction in nutrient loading than the 74 percent point source wasteload and 85 percent nonpoint source load reduction required under the proposed Basin Plan Amendment. An SSO for nutrients in Rainbow Creek could potentially eliminate the need for a TMDL, if the SSO is currently attained in the receiving waters. The SSO would need to (1) be based on sound scientific rationale; (2) protect the designated beneficial uses of Rainbow Creek waters; and (3) be adopted by the Regional Board in a Basin Plan amendment.

The language for the Biostimulatory Substances (nutrients) water quality objective for total phosphorus in the Basin Plan originates from the rationale for phosphate phosphorus included in USEPA's Quality Criteria for Water (USEPA 1976). A total phosphorus criterion to control nuisance aquatic growths was not presented; however, a rationale to support such a criterion was included for consideration. The rationale included limits for the entry point of streams into a standing body of water and for standing bodies of water, as well as a desired goal of 0.1 mg P/L in flowing waters for the prevention of plant nuisance. While the scientific data appear to be more specific with regard to lakes and reservoirs, the rationale indicated that establishing a phosphorus criterion for flowing waters is important to protect downstream receiving waters, such as lakes and estuaries. The rationale also provides that streams and rivers exist that may need either more stringent or less stringent nutrient limits and that other factors (i.e., turbidity, other limiting nutrient) may influence whether phosphorus is a contributor to eutrophy. Thus the Basin Plan's current nutrients objective may be over protective or under protective for Rainbow Creek.

If scientific studies demonstrate that the ambient water chemistry and/or biological communities at Rainbow Creek are significantly different from the chemistry and biological communities upon which the current limits were based, an SSO for nutrients may be appropriate. However, the development of a nutrient SSO for Rainbow Creek waters, including the scientific studies necessary to support it, would be costly, time consuming and resource intensive. Dischargers or other interested parties would need to fund and initiate the scientific studies to develop the SSO. It is possible the studies could reveal the need for more stringent nutrient water quality objectives.

There is no effort currently underway or planned by interested persons to fund the scientific studies needed to develop SSOs for nutrients in Rainbow Creek. Even in the event that scientific studies were initiated and SSOs for nutrients were developed and adopted by the Regional Board, it would likely not obviate the need for a TMDL. Accordingly, the appropriate strategy for addressing the nutrient water quality problem in Rainbow Creek is for the Regional Board to proceed with adoption of the proposed TMDL Basin Plan amendment at this time. If SSOs for nutrients are developed in the future and adopted by the Regional Board, this TMDL Basin Plan Amendment would be modified accordingly. If interested parties are willing to fund and oversee development of scientific studies to investigate SSOs, the most effective and expeditious means to improve water quality would be to conduct these studies concurrent with actions necessary to achieve compliance with the current TMDL.

11.5.3 Develop Region-Wide Nutrient Water Quality Objectives

The Regional Board is currently participating in a statewide joint U.S. EPA Regional Technical Advisory Group (RTAG) that is overseeing nutrient water quality objective development for California. This group is currently working on developing proposed regional nutrient water quality criteria for the Southern and Central California as a priority target due to the number of nutrient TMDLs being completed in this region of the state. Under this alternative the adoption of the nutrient TMDLs for Rainbow Creek would be delayed until after the RTAG effort has run its course and an updated nutrient water quality objective is incorporated into the Basin Plan.

U.S. EPA has developed stringent new nutrient water quality criteria under Clean Water Act § 304 of 0.5 mg/L total nitrogen and 0.03 mg/L total phosphorus for streams in the subecoregion 6, Xeric West Ecoregion (USEPA 2000b). Rainbow Creek is located in the Xeric West Ecoregion defined by USEPA and would be subject to this nutrient water quality criteria if it is promulgated as water quality standards. In addition, USEPA guidance documents are available that detail methods for developing alternative site specific criteria for nutrients. California currently has three options: 1) employ methods outlined in USEPAs guidance documents to develop nutrient water quality objectives; 2) directly adopt USEPAs CWA §304(a) criteria of 0.5 mg/L total nitrogen and 0.03 mg/L total phosphorus into Basin Plans as water quality objectives or 3) use other scientifically defensible methods to develop nutrient water quality objectives.

It is not known at this time with any definition when or if an updated nutrient water quality objective will come out of the RTAG effort. If a nutrient water quality objective does emerge from the RTAG effort it will probably be more stringent than the Regional Board's current Biostimulatory Substances (nutrient) water quality objectives. If California fails to adopt an updated water quality objective for nutrients, USEPA will eventually begin to promulgate its nutrient criteria of 0.5 mg/L total nitrogen and 0.03 mg/L total phosphorus as water quality standards that would be applicable to Rainbow Creek waters. Based on these considerations a delay in the adoption of the TMDL until after the RTAG effort has run its course is not warranted.

11.5.4 Regional Board Adoption of a Nutrient Discharge Prohibition

California Water Code § 13243 provides that the Regional Board, in a water quality control plan or in waste discharge requirements, may specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted. Accordingly the Regional Board could elect to amend the Basin Plan to prohibit the discharge of waste of nutrients at any concentration or load into Rainbow Creek waters. Under this alternative, nutrient dischargers in the Rainbow Creek watershed (i.e. Caltrans and commercial nurseries, agricultural field, orchard, park, residential area, urban area, and septic tank disposal system land use activities) would need to take immediate action to eliminate all nutrient discharges to Rainbow Creek waters.

Compliance with the prohibition would require the dischargers to achieve an immediate 100% nutrient load reduction. In contrast the proposed TMDL Basin Plan Amendment requires a the 74 percent point source wasteload and 85 percent nonpoint source load reduction nutrient load reduction over a 21 year time frame. Both the nutrient discharge prohibition and the proposed TMDL Basin Plan Amendment would result in attainment of the nutrient water quality objectives and protection of beneficial uses in Rainbow Creek. Both alternatives would require the same types of nutrient reduction management practices (MP) activities. However implementation of an outright prohibition on nutrient discharges to Rainbow Creek would be unwarranted, cost prohibitive and extremely disruptive to the community. For these reasons, establishment of a nutrient discharge prohibition in lieu of a TMDL is not an acceptable alternative.

12.0 Economic Considerations

This Section presents the Regional Board's analysis of the amendment to the "Water Quality Control Plan for the San Diego Basin (9)" (Basin Plan) to incorporate a Total Maximum Daily Loads for Total Nitrogen and Total Phosphorus in Rainbow Creek.

12.1 Legal Authority

Under state law, there are two triggers that require Regional Board consideration of economics or costs when considering adoption of a TMDL Basin Plan amendment. These triggers are:

- Adoption of a treatment requirement or performance standard (CEQA)
- Adoption of an agricultural water quality control program

Each of these categories is briefly discussed below.

12.1.1 CEQA Requirement for Consideration of Economic Analysis

The Regional Board must comply with the California Environmental Quality Act (CEQA) when the Board amends the Basin Plan[92]. The CEQA process requires the Regional Board to analyze and disclose the potential adverse environmental impacts of a Basin Plan amendment that it is initiating or approving. The Regional Board's Basin Plan amendment process must consider alternatives, develop proposals to mitigate or avoid environmental impacts to the extent feasible, and involve the public and other public agencies in the evaluation process.

TMDL Basin Plan amendments typically include "performance standards"[93]. TMDLs normally contain a quantifiable numeric target that interprets the applicable water quality objective. TMDLs also include wasteload allocations for point sources and load allocations for nonpoint sources and natural background. The quantifiable target together with the allocations may be considered a performance standard.

CEQA has specific provisions governing the Regional Board's adoption of regulations such as the regulatory provisions of Basin Plans that establish "performance standards" or treatment requirements[94]. These provisions require that the Regional Board perform an environmental analysis of the reasonably foreseeable methods of compliance with the wasteload and load allocations prior to the adoption of the TMDL Basin Plan

[92] See Public Resources Code § 21080

[93] The term "performance standard" is defined in the rulemaking provisions of the Administrative Procedure Act (Government Code §§ 11340-l 1359). A "performance standard" is a regulation that describes an objective with the criteria stated for achieving the objective. (Government Code §11342(d)).

[94] See Public Resources Code §§ 21159 and 21159.4

amendment. The Regional Board must consider the economic costs of the methods of compliance in this analysis[95]. The Regional Board is not required to do a formal cost-benefit analysis.

12.1.2 Agricultural Water Quality Control Program

Agricultural activities are significant sources of nutrient pollution in the Rainbow Creek watershed. As a result, the Rainbow Creek TMDL Basin Plan amendment includes nutrient load allocations applicable to agricultural activities and mandates nutrient load reductions from these activities as part of the TMDL implementation action plan. Under the Porter-Cologne Water Quality Control Act[96], before a Regional Board implements an agricultural water quality control program, it must identify the total cost of the program and potential sources of financing[97]. This information must be included in the basin plan. The statute does not require the Regional Boards to do, for example, a cost-benefit analysis or an economic analysis.

12.2 TMDL Implementation Costs

The Rainbow Creek TMDLs specify an overall 74 percent reduction of total nitrogen loading and 85 percent reduction of total phosphorus loading from current levels to Rainbow Creek in order to attain water quality standards. The most reasonably foreseeable method of compliance involves reducing nutrient use and controlling the discharge of nutrients to surface or groundwater by applying best management practices (BMPs) for nutrient point source discharges and management practices (MPs) for nutrient nonpoint source discharges.

Section 12.2.1 below provides the estimated costs for the County of San Diego to develop a Nutrient Reduction Management Plan (NRMP) and to implement the monitoring, investigation, and outreach elements. The estimated implementation costs for potential MPs that may be implemented by landowners and land users are provided in Section 12.2.2. Potential sources of funding are listed in Section 12.3.

12.2.1 Investigation, Monitoring, and NRMP Costs

Under the terms of the TMDL Implementation Action Plan and Implementation Monitoring Plan, the County of San Diego will develop a NRMP, investigate groundwater nutrient contributions to Rainbow Creek, regularly monitor ground and surface water quality and act as program coordinator to work with the community and provide assistance in accordance with a Management Agency Agreement (MAA) entered into with the Regional Board for nonpoint source discharges. The County has provided preliminary cost estimates for monitoring and program elements expected to be included in this program. These costs are estimates and the actual costs may be lower depending upon the actual scope of the work. A summary of these estimated costs is provided in Table 12-1.

[95] See Public Resources Code § 21159(c)
[96] See Water Code §§ 13000 et seq.
[97] See Water Code § 13141 et seq.

Table 12-1. Summary of First Year and Subsequent Annual Cost for Conducting Rainbow Creek TMDL Studies

Item	First Year Cost[1]	Subsequent Annual Cost[1]
Develop/Revise NRMP	$10,000 - $50,000	$2,000 - $10,000
Surface Water Monitoring Program[2]	$70,600 - $125,000	$70,600 - $125,000
Groundwater Investigation Program[3]	$54,000 - $104,400	$31,400 - $59,400
Equipment and Outreach[4]	$45,500 - $66,000	$9,000 - $20,000
Total	$180,100 - $345,400	$113,000 - $214,400

1. Estimates provided by the County and ranges added by the Regional Board. Actual costs may be lower. For example annual costs for sampling may be significantly lower if the initial results indicate that a reduction in number of samples and analyses are appropriate.
2. See Table 12-2
3. See Table 12-3
4. See Table 12-4

Costs to Develop Nutrient Reduction and Management Plan (NRMP)

The estimated cost to prepare the initial Draft and Final NRMP is $10,000 to $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 MP effectiveness and community responsiveness. The revisions to the NRMP in subsequent years may cost $2,000 to $10,000 per year. The costs to develop and implement the NRMP are presented in Table 12-1.

Surface Water Monitoring Program Costs

Consistent with the Implementation Monitoring Plan described in Section 10.5, the surface water monitoring program could 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 could 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 12-2 presents the estimated annual costs associated with a surface water monitoring program.

Table 12-2. Total Annual Cost Estimates for Surface Water Monitoring Program

Monitoring Parameters	Total Number of Samples	Cost per sample	Total Estimated Annual Cost
Nutrients	132 - 264	$140	$18,480 - $36,960
Physical	132 - 264	$30	$3,960 - $7,920
Chlorophyll a	66 - 132	$50	$3,300 - $6,600
Algal Biomass	33 - 66	$15	$495 - $990
Bioassessment	18 - 30	$500	$9,000 - $15,000
Staff Time	**Hours**	**Rate**	
Field Staff Time (field preparation, equip. maintenance, water sampling, field measurements, sample submission, etc.)	240 - 480	$50	$12,000 - $24,000
Data Management	120 - 160	$60	$7,200 - $9,600
Data Analysis	90 - 120	$60	$5,400 - $7,200
Report Preparation	120 - 160	$60	$7,200 - $9,600
Other	60 - 120	$60	$3,600 - $7,200
Total			**$70,635 - $125,070**

Groundwater Investigation Program Costs

The groundwater investigations could likely include the quarterly monitoring of 6 to 10 wells or hydropunch locations. Other costs may include soil characterization, well drilling and hydropunch, and tracer studies. County of San Diego staff time to perform such monitoring, data management, and report preparation has 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 could be up to $58,000 per year in subsequent years. The Groundwater Investigations should be concluded at the end of the first two years Table 12-3 presents the estimated annual costs associated with groundwater monitoring.

Table 12-3. Total Annual Cost Estimates for Groundwater Investigation Program

Monitoring Parameters	Total Number of Samples	Cost per sample	Total Estimated Annual Cost	
			First Year	Subsequent Years
Nutrients	12 - 30	$140	$1,680 - $4,200	$1,680 - $4,200
Physical	12 - 30	$30	$360 - $900	$360 - $900
General Mineral	12 - 30	$150	$1,800 - $4,500	$1,800 - $4,500
Other Costs				
Well Drilling/Hydropunch			$10,000 - $20,000	N/A
Consultant Services			$10,000 - $20,000	N/A
Soil Characterizations			$2,500 - $5,000	N/A
Special Studies (tracer, other)			$10,000 - $20,000	$10,000 - $20,000
Additional Sampling Equipment (steel tape, chalk, gloves, disposable bailers, buckets, 55-gallon drums, disposal, etc.)			$1,000 - $5,000	$1,000 - $5,000
Staff Time	**Hours**	**Rate**		
Field Staff Time (transportation time, manual well purging, sampling, equipment, etc.)	80 - 160	$50	$4,000 - $8,000	$4,000 - $8,000
Data Management	30 - 40	$60	$1,800 - $2,400	$1,800 - $2,400
Data Analysis	90 - 120	$60	$5,400 - $7,200	$5,400 - $7,200
Report Preparation	60 - 80	$60	$3,600 - $4,800	$3,600 - $4,800
Other	30 - 40	$60	$1,800 - $2,400	$1,800 - $2,400
		Total	**$53,940 - $104400**	**$31,440 – 59,400**

Equipment and Outreach Costs

The majority of equipment and installation costs are expected to be incurred in the first year. Costs between $9,000 to $20,000 per year for rain gauge maintenance, follow-up rainfall chemistry, miscellaneous field equipment, and public outreach is anticipated in subsequent years. Potential equipment and outreach costs were identified and are presented in Table 12-4.

Table 12-4. Estimated Equipment and Outreach Costs

Item	Total Estimated Costs	
	First Year	Subsequent Years
Flow monitoring equipment and installation	$25,000 - $30,000	N/A
Multi-parameter probe	$4,000 - $5,000	N/A
Rain gauge installation and maintenance	$5,000 - $6,000	$1,000 - $2,500
Rainfall Chemistry	$5,000 - $10,000	$2,000 - $5,000
Miscellaneous field equipment	$2,500 - $5,000	$1,000 - $2,500
Public Outreach	$5,000 - $10,000	$5,000 - $10,000
Total	$45,500 - $66,000	$9,000 - $20,000

12.2.2 Management Practices and Other Implementation Costs

Nonpoint source discharges occur from commercial nurseries, agricultural field, orchard, park, residential area, urban area, and septic tank disposal system land use activities. Persons conducting these land use activities (e.g. landowners, homeowners, nursery operators, framers, etc) are responsible for implementing management practices (MPs) to reduce and/or control nutrient discharges (e.g., surface runoff, or septic tank discharge) from their properties to assure compliance with the TMDLs described in this report. It is expected that management practices (MPs) 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 MPs the responsible parties select to meet the load allocations.

Table 12-5 summarizes the range of costs for implementing potential MPs for each land use category. For each land use category, three scenarios were evaluated corresponding to low, medium, and high levels of effort. Within each scenario a low to high range of costs are presented. The MPs considered fall into three general categories: Nutrient, Irrigation, and Runoff/Erosion Management. A low level of effort consists solely of Nutrient Management MPs, a medium level of effort consists of Nutrient and Irrigation Management MPs, and a high level of effort includes all three MP categories. Caltrans is the exception because Irrigation Management MPs are less likely along the Interstate 15 corridor than Nutrient and Runoff/Erosion Management. The capital costs are the initial costs of implementing a BMP, assuming that the BMP does not currently exist on the property. The annual operation and maintenance costs are assumed to be 10 percent of the capital cost. Additional details regarding the MPs are provided in Appendix H.

Table 12-5 provides estimated costs for selected MPs.

Table 12-5. Estimated Management Practice Costs[1]

Land Use Category	BMP Level of Effort	Capital Costs		Annual Operation and Maintenance[2]	
		Range		Range	
Commercial Nurseries	Low	$26	$10,105	$3	$1,011
	Medium	$4,926	$39,455	$493	$3,946
	High	$5,508	$41,075	$551	$4,108
Agriculture	Low	$26	$10,105	$3	$1,011
	Medium	$4,926	$39,455	$493	$3,946
	High	$9,296	$57,705	$930	$5,771
Orchard	Low	$26	$10,105	$3	$1,011
	Medium	$4,926	$39,455	$493	$3,946
	High	$9,296	$57,705	$930	$5,771
Park	Low	$0	$0	$0	$0
	Medium	$50	$750	$5	$75
	High	$950	$27,250	$95	$2,725
Residential	Low	$0	$0	$0	$0
	Medium	$50	$750	$5	$75
	High	$833	$14,186	$83	$1,419
Urban	Low	$0	$0	$0	$0
	Medium	$50	$750	$5	$75
	High	$3,369	$26,175	$337	$2,618
Septic Tank Disposal Systems	Low	$18,000	$46,000	$1,800	$4,600
	Medium	$22,500	$57,500	$2,250	$5,750
	High	$3,490,000	$7,030,000	$349,000	$703,000
Caltrans	Low	$105	$10,150	$11	$1,015
	Medium	$77,880	$401,850	$7,788	$40,185
	High	$78,768	$1,408,100	$7,877	$140,810

[1] This table is a summary. See Appendix H for more detail.
[2] Operation and Maintenance cost assumed to be 10% of total cost estimate

Centralized Sewer Treatment Disposal Facility

The high groundwater table in Rainbow Valley has resulted in septic tank disposal systems that no longer function properly. Table H-7 (Appendix H) includes costs for replacing these conventional systems with enhanced systems that are designed to provide for nitirification/denitirfication to reduce nitrogen loadings.

Another potential solution is to construct a centralized sewage treatment disposal facility for the community that would replace failing septic tank systems in the area defined by the County of San Diego's moratorium and reduce the nutrient loading to the groundwater. A preliminary cost estimate for a secondary treatment facility that might be considered for Rainbow Valley is approximately $11 million. This cost estimate is based on a facility that provides secondary treatment and utilizes land disposal to an irrigated crop (e.g., alfalfa) that is harvested and removed from the watershed to eliminate the

nutrient loading. This cost estimate includes a secondary sewage treatment facility with the design capacity to treat wastewater from 170 to 306 connections, the purchase of 40 acres of land for the facility and spray irrigation area, construction of 8.5 miles of sewage collection system pipe, and administrative costs. The lower number (170) of connections is the number of septic tank disposal systems in the moratorium area that would be replaced by the sewer treatment facility. The higher number (306) is the number of systems that generate a total nitrogen load that is equal to the amount of source load reduction identified to achieve the load allocation in Table 6-1 (Honma 2004).

Table 12-6 presents the assumptions and calculations that were used to make the estimates. The potential monthly costs to the community, including operation and maintenance (O & M), and connection to the system are also presented. This estimate assumes that the community will bear the complete cost of the facility. Grant funding may offset some of the community's cost.

Table 12-6. Cost Estimates Associated with Construction of a Sewer Treatment Disposal Facility

Facility Costs	Description[1]	Cost Estimate
Facility	170 connections * 250 gal/con. * $20/gal = 306 connections * 250 gal/con. * $20/gal =	$850,000 – $1,530,000
Facility Land Acquisition	40 acres * $75,000/acre =	$3,000,000
Sewer Main Pipe Construction	57,200 feet (10.8 miles) * $100/foot =	$5,720,000
Administrative Costs	Engineering, Environmental Impact Review, Construction Administration, etc.	$1,000,000
	Total Cost of Facility Construction	**$10,570,000 - $11,250,000**
Potential Monthly Costs		
Cost of Facility per connection over 20 years	$10.6 E +6 * 170^{-1} connections * 20^{-1} $years^{-1}$ * 12^{-1} year/month = $11 E +6 * 306^{-1} connections * 20^{-1} $years^{-1}$ * 12^{-1} year/month =	$150 - $259/month
O & M	Operation and Maintenance Cost	$30/month
	Total Monthly Cost to Property Owner	**$180 - $289/month**
Connection Fee		
Connection Fee	One-time fee for each connection to system (i.e., lateral).	**$10,000 - $15,000**

[1] Supporting information for assumptions (Honma 2004)

12.3 Potential Sources of Funding

Potential sources of funding include:

1. Federal Clean Water Action Section 319(h) grants.
2. Federal Clean Water Action Section 205(j) grants.
3. State of California Proposition 13 funded grants.
4. Small Communities Grants for Water Reclamation and Wastewater Treatment Facilities
5. 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
6. Various secured and unsecured loans, including home equity loans and business loans.

13.0 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 EPA in April 2000) and drafts of the technical sections of this TMDL staff report. Participants on the TAC included representatives from: Camp Pendleton, Mission Resource Conservation District, 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 Appendix I.

14.0 Necessity of Regulatory Provisions

The Office of Administrative Law (OAL) is responsible for reviewing administrative regulations proposed by state agencies for compliance with standards set forth in California's Administrative Procedure Act, Government Code §11340 et seq., for transmitting these regulations to the Secretary of State and for publishing regulations in the California Code of Regulations. Following State Water Resources Control Board approval of this TMDL basin plan amendment any regulatory portions of the amendment must be approved by OAL (Government Code §11352). The State Water Resources Control Board must include in its submittal to OAL a summary of the necessity[98] for the regulatory provision.

This TMDL Basin Plan Amendment for Rainbow Creek meets the "necessity standard" of Government Code §11353(b). Amendment of the Basin Plan to establish and implement TMDL for Rainbow Creek is necessary because the existing water quality does not meet applicable numeric water quality objectives for nitrate, total nitrogen, and total phosphorus. Applicable state and federal laws require the adoption of this Basin Plan amendment and regulations as provided below.

The State Water Resources Control Board (State Board) and Regional Water Quality Control Boards (Regional Boards) are delegated the responsibility for implementing California's Porter Cologne Water Quality Control Act and the federal Clean Water Act (CWA). Pursuant to relevant provisions of both of those Acts the State and Regional Boards establish water quality standards, including designated (beneficial) uses and criteria or objectives to protect those uses.

Section 303(d) of the CWA (33 USC § 1313(d)) requires the states to identify certain waters within their borders that are not attaining water quality standards and to establish the TMDL for certain pollutants impairing those waters. USEPA regulations in 40 CFR 130.2 provide that a TMDL is a numerical calculation of the amount of a pollutant that a water body can assimilate and still meet standards. A TMDL includes one or more numerical targets that represent attainment of the applicable standards, considering seasonal variations and a margin of safety, in addition to the allocation of the target or load among the various sources of the pollutant. These include wasteload allocations (WLAs) for point sources, and load allocations (LAs) for nonpoint sources and natural background. TMDLs established for impaired waters must be submitted to the USEPA for approval.

CWA § 303(e) requires that TMDLs, upon USEPA approval, be incorporated into the state's water quality management plans (Basin Plan). State law in turn, CWC §§ 13050(j) and 13242 require that basin plans have a program of implementation to achieve water

[98] "Necessity" means the record of the rulemaking proceeding demonstrates by substantial evidence the need for a regulation to effectuate the purpose of the statute, court decision, provision of law that the regulation implements, interprets, or makes, taking into account the totality of the record. For purposes of this standard, evidence includes, but is not limited to, facts, studies, and expert opinion. (Government Code §11349(a)).

quality objectives. The implementation program must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the objectives. State law requires that a TMDL include an implementation plan because the TMDL normally is, in essence, an interpretation or refinement of an existing water quality objective. The TMDL has to be incorporated into the basin plan under CWA § 303(e), and, because the TMDL supplements, interprets, or refines an existing objective, state law requires a program of implementation.

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