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EXECUTIVE SUMMARY

This model "Watershed Action Plan (WAP)", Appendix A of the Report of Waste Discharge (ROWD), was prepared to meet Section XVI of the municipal National Pollutant Discharge Elimination System (NPDES) Stormwater Permit - Order R8-2002-0010 is described in Section 12 of the Drainage Area Management Plan (DAMP). Commitments to watershed planning to address water quality issues are also included in Section 3.0 of the DAMP.

Within Orange County there are both watershed and jurisdictional efforts to improve water quality. The jurisdictional efforts are captured as part of the Local Implementation Plans (LIPs). The WAP was created to capture the regional efforts that are undertaken to provide a watershed-based collaborative effort to address constituents of concern in a specific watershed.

The purpose of this document is to present a planning framework for the Newport Bay Watershed to:

- Identify the most significant water quality issues related to urban runoff sources that can be addressed at a multi-jurisdictional watershed-scale,
- Focus jurisdictional pollution prevention and source control programs on local constituents, of concern, to identify treatment control opportunities,
- Incorporate prior data from planning studies,
- Identify indicators to track progress, and
- Ultimately develop an integrated plan of action for urban sources that results in meaningful water quality improvement in the Newport Bay Watershed.

The document also describes the numerous existing programs related to water quality and the activities conducted by the Watershed Permittees at the watershed scale.

The following sections comprise the Watershed Action Plan:

Section 1.0 describes the environmental setting of the watershed, discusses program coordination between the Watershed Permittees, and outlines the approach taken in plan development.

Section 2.0 provides an assessment of current water quality conditions and identifies issues and data gaps and constituents of concern. The constituents of concern identified for this watershed include fecal coliform, nutrients, sediment, and toxics.

Section 3.0 provides information on the development of existing total maximum daily load (TMDLs) and the schedule for future TMDLs.

Section 4.0 discusses pollution sources and provides an inventory of treatments and enhanced best management practices (BMPs) that have been implemented in the watershed.

Section 5.0 focuses on the recommendations for actions to be taken to address the water quality issues of the watershed and discusses the annual means of assessment of the program effectiveness.

D4-1.0 INTRODUCTION

The designation of "Newport Bay Watershed" refers to the hydrologic watershed that is defined by drainage and only minimally by jurisdictional boundaries. The Newport Bay Watershed drains approximately 154 square miles to the Pacific Ocean within southern Orange County, California. The watershed encompasses all waters draining to Newport Bay. This watershed has been divided into the following four subwatersheds:

- Lower Bay includes all stormwater drains and natural creeks;
- <u>Upper Bay</u> begins at the Hwy 1 bridge and extends across the bay including all drains to the bay as well as Big Canyon Wash, Costa Mesa Channel, and the Santa Isabella Channel;
- <u>Santa Ana Delhi Channel</u> and its tributaries that empty into the far northwestern end of the Upper Newport Bay; and
- <u>San Diego Creek/Peters Canyon Wash</u> and its tributaries that collectively drain into the northeastern end of Upper Newport Bay. San Diego Creek/Peters Canyon Wash is the largest subwatershed within the Newport Bay Watershed.

The Newport Bay Watershed has been impacted by several water quality problems, most of which are from anthropogenic sources or aggravated by human activity. The Watershed Permittees and residents recognized the relationship between water quality and activities within their watershed. In the late 1970s they began collaborating with agencies and landowners to study and implement solutions to the problems in Newport Bay. The Newport Bay Executive Committee was formed in the mid 1980s primarily with a focus on sedimentation issues. An amendment of the cooperative agreement in 1999 broadened its focus to include other water quality impairment of Newport Bay (nutrients, toxics, and pathogens in addition to sediment) and related environmental enhancements. To date there are many organizations and agencies working to enhance Newport Bay and its watershed.

The Watershed Permittees includes nine cities within the watershed (Costa Mesa, Irvine, Laguna Hills, Laguna Woods, Lake Forest, Newport Beach, Orange, Santa Ana and Tustin) and unincorporated County of Orange and the Orange County Flood Control District. Based on their experience, a Watershed Action Plan within the Drainage Area Management Plan (DAMP) has been developed to attain the following multiple objectives:

- To meet the requirement to update Appendix N of the DAMP as contained in the municipal National Pollution Discharge Elimination System (NPDES) stormwater permit (Order R8-2002-0010).
- To identify the most significant water quality issues and constituents of concern on a watershed scale and relate these to urban sources.
- To focus the pollution prevention and source control programs implemented at an
 individual jurisdiction level on the identified constituents of concern and to identify any
 jurisdiction-specific treatment control opportunities.

- To identify the water quality issues that are most appropriately addressed through a multijurisdictional watershed-scale approach.
- To identify information that is relevant to the Newport Bay Watershed that has been developed as part of local, watershed, or regional studies.
- To develop an integrated plan of action that results in meaningful water quality improvement in the Newport Bay Watershed and balances economic, social, and environmental constraints.
- To identify indicators to track progress that lead to improvements in the quality of the receiving waters.

The Watershed Permittees have developed Local Implementation Plans (LIPs) addressing programs and activities that are implemented or being pursued on a jurisdictional basis. Watershed cities and stakeholder groups are also pursuing projects that are intended to have a positive effect on water quality issuing to receiving waters. These include the following major initiatives:

- The Newport Bay Executive Committee and the Newport Bay Watershed Management Committee serve as a forum to address water quality issues in the Newport Bay Watershed. These committees were originally formed in the 1980s to manage sediment issues and were known as the Sediment Control Executive Committee and the Technical Committee. The Newport Bay Executive Committee is largely made up of elected officials while the Newport Bay Watershed Management Committee includes a broader range of watershed stakeholders.
- Since 1990 the Watershed Permittees have developed and implemented common water quality programs within their own jurisdictions in response to the requirements of the municipal NPDES stormwater permit.
- Assembly Bill (AB) 411 went into effect in 1999, posting new requirements for surfzone/beach water testing along the California coastline. The Health Care Agency (OCHCA) performs the required testing and postings of beach closures within Newport Bay.
- In 1999 the Regional Water Quality Control Board (Regional Board) issued a Water Code Section 13267 Letter to determine the status of compliance with the Newport Bay Nutrient and Sediment Total Maximum Daily Load (TMDL). The response to this letter is the *Newport Bay Watershed Urban Nutrient TMDL Technical Report* (September 1999).
- Since 2003, each Watershed Permittee has implemented a Local Implementation Plan (LIP, 2003 DAMP Appendix A). The LIPs are detailed plans that focus on specific areas required by the NPDES permits including the legal authority to detect and eliminate pollutant discharges; public education; enhanced standards for new development/significant redevelopment; implementation of best management practices (BMPs) at municipal facilities, construction sites, and commercial and industrial facilities; and water quality monitoring.

The BMPs can, in most cases, be focused on targeted constituents of concern to be identified through the monitoring program.

The Newport Bay Watershed Action Plan borrows much of its organization, structure, and terminology from the 2003 DAMP of which it is an appendix and also from the TMDLs issued for Newport Bay and San Diego Creek. The following sections are included in the Watershed Action Plan:

- Section 1.0 describes the watershed and environmental setting, the program management coordination between the Watershed Permittees and other stakeholders, and the approach taken to develop the plan.
- **Section 2.0** assesses the water quality information available and identifies the water quality issues and constituents of concern.
- **Section 3.0** provides details on the existing TMDLs in the watershed and provides information on the schedule for future TMDLs.
- **Section 4.0** discusses the urban sources of pollution, the available treatments for pollution control, and an inventory of enhanced BMPs that have been implemented in the watershed that address specific pollutants of concern.
- **Section 5.0** focuses on the recommendations for actions to be taken to address the water quality issues of the watershed and discusses the annual means of assessment of the program effectiveness.

The Newport Bay Watershed Action Plan is intended as a living document, one capable of being modified as new information becomes available and problems are addressed. It identifies the current state of knowledge on the issues facing the Newport Bay. It also identifies the actions to which the Watershed Permittees have made commitments. Annual assessments will be made to identify the progress on these actions and the schedule for continued efforts related to that action. This assessment will be reflected through annual updates to the strategy tables described in **Section 5.0** and included as an Exhibit to the WAP.

D4-1.1 Watershed Setting

For the purposes of organizing water quality improvement efforts for a watershed-based methodology, the Newport Bay Watershed consists of all waters draining into Newport Bay. The Newport Bay Watershed is located in southern Orange County, approximately 40 miles south of Los Angeles and 70 miles north of San Diego. The entire watershed spans 154 square miles (**Figure D4-1**). The Bay itself is made up of two distinct waterbodies – the Upper Bay and the Lower Bay. The Upper Bay is a high quality estuary and contains a State Ecological Reserve. The Lower Bay includes barrier islands and lagoons and was created through sand deposition and then modified through dredging and filling. The largest drainage in the watershed, San Diego Creek, and its many tributaries begin along the western foothills of the Santa Ana Mountains and flow predominantly southwest into Newport Bay. San Diego Creek itself drains approximately 122 square miles of the watershed.

Figure D4-1 Location Map

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The major tributaries to the upper reach of San Diego Creek include Peters Canyon Wash, Rattlesnake Canyon, Hicks Canyon, Bee Canyon, Round Canyon, Agua-Chinon, Borrego Canyon, and Serrano Creek. Other major tributaries to the lower reach of San Diego Creek are Bonita Creek, Sand Canyon, Lane Channel, and San Joaquin Channel. San Diego Creek empties into the Upper Bay at the far northeastern corner of the bay. Other streams or channels that drain directly to Newport Bay include Santa Ana-Delhi Channel, Big Canyon Wash, Santa Isabella Channel, Costa Mesa Channel, East Newport Heights storm drain, and the Bayside storm drain.

Approximately two-thirds of the Newport Bay Watershed is urbanized. Of the remaining land, one-half is un-developable due to mountainous slopes or protected habitat. About 27 square miles of open space area within the watershed are set aside in the Natural Community Conservation Plan & Habitat Conservation Plan (NCCP/HCP) and include Laguna Coast Wilderness Park, Mason Regional Park, Peters Canyon Regional Park, Upper Newport Bay Ecological Reserve, and the University of California Irvine Reserve. Additional habitat areas include the Siphon Reservoir Coastal Sage Scrub Restoration Site, San Joaquin Marsh, the proposed MCAS El Toro Habitat Reserve, and the 17 mitigation sites identified for the Clean Water Act Section 404 by the U.S. Army Corps of Engineers (USACE) Regulatory Branch. The watershed is bound by the Santa Ana River Watershed to the north and east and by three watersheds (Newport Coastal, Aliso Creek and Laguna Canyon Watersheds) to the south and east.

There are currently four major northeast-southwest transportation routes (Hwy 55, Hwy 133, Hwy 241, and Jamboree Road) and four southeast-northwest transportation routes (Interstate 5, Interstate 405, Hwy 1 and Hwy 73) that provide access to the Newport Bay Watershed. The Pacific Coast Highway (Hwy 1) parallels the coast at the Pacific Ocean from the southeast to the northwest of the watershed. Major roadways of the Newport Bay Watershed are shown in **Figure D4-2**. School Districts are shown in **Figure D4-3a**, Cities are shown in **Figure D4-3b**, Water Districts are shown in **Figure D4-3c**, and Parks are shown in **Figure D4-3d**. Existing land use within the watershed is show in **Figure D4-4**.



Figure D4-2 Transportation

| APPENIDX D4 - NEWPORT BAY WATERSHED ACTION PLAN |
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Figure D4-3a Unified School Districts

Figure D4-3bCity Boundaries

Figure D4-3c Water Providers

Figure D4-3d Parks & Open Space

Figure D4-4 Land Use - Existing

D4-1.2 Beneficial Uses

The Newport Bay Watershed is within the jurisdiction of the Santa Ana Regional Water Quality Control Board (Regional Board), within the subunit of the Lower Santa Ana River Basin (designated Hydrologic Unit 801.11). The Water Quality Control Plan for the Santa Ana River Basin (hereafter, Basin Plan) lists Newport Bay both Upper and Lower, as tributaries to the Pacific Ocean and also as receiving waters for San Diego Creek. The following existing beneficial uses are designated in the Basin Plan for the reservoirs, bays, estuaries and tidal prisms, watershed streams, and wetlands within the Newport Bay Watershed:

AGR agricultural supply
BIOL biological significance

COMM commercial and sportfishing

EST estuarine habitat GWR groundwater recharge

MAR marine habitat

MUN municipal and domestic supply

NAV navigation

RARE rare, threatened, or endangered species

REC1 contact water recreation REC2 non-contact water recreation

SHEL shellfish harvesting

SPWN spawning, reproduction, and development

WARM warm freshwater habitat

WILD wildlife habitat

Table D4-1 shows the beneficial uses associated with each waterbody.

Table D4-1 Beneficial Uses - Newport Bay Watershed

| | Table B.T. Beneficial edes Thempore Bay Watershed | | | | | | | | | | | | | | | | | | | | |
|---|---|----------------|-------------|------------------|-------------|-------------|-------------|----------------|-------------|------------------|------------------|------------------|----------|------------------|------------------|------------------|------------------|-------------|------------------|-------------|------------------------|
| | | Beneficial Use | | | | | | | | | | | | | | | | | | | |
| Name | M U N | A G R | I N D | P R O C | G W R | N A V | P O W | R E C | R E C | C O M M | W A R M | L W R M | L | B I O L | W I L D | R A R E | S P W N | M A R | S H E L | E S T | Hydro logic Unit |
| Lakes | | | | | | | | | | | | | | | | | | | | | |
| Laguna, Lambert, Peters Canyon, Rattlesnake, Sand Canyon, and Siphon Reservoirs | + | X | | | | | | X ¹ | X | | X | | | | X | | | | | | 801.11 |
| Bays, Estuaries, and Tidal Prisms | | | l . | 1 | | | I | | | 1 | | | <u> </u> | | | I | | | I | 1 | |
| Lower Newport Bay | + | | | | | X | | X | X | X | | | | | X | X | X | X | X | | 801.11 |
| Upper Newport Bay | + | | | | | | | X | X | X | | | | X | X | X | X | X | X | X | 801.11 |
| Tidal Prisms of Flood Control Channels Discharging to Coastal or Bay Waters | + | | | | | | | X | X | X | | | | | X | | | X | | | 801.11 |
| Inland Surface Streams | | | | | | | | | | | | | | | | | | | | | |
| San Diego Creek: | | | | | | | | | | | | | | | | | | | | | |
| Reach 1- below Jeffrey Road | + | | | | | | | X ² | X | | X | | | | X | | | | | | 801.11 |
| Reach 2- above Jeffrey Road to headwaters | + | | | | • | | | • | • | | • | | | | • | | | | | | 801.11 |

| Name | M U N | A G R | I N D | P R O C | G W R | N A V | P O W | R E C | R E C | Bene C O M M | eficia W A R M | 1 Us L W R M | C O L | B I O L | W I L D | R A R E | S P W N | M A R | S H E L | E S T | Hydro logic Unit |
|--|-------------|-------------|-------------|------------------|-------------|-------------|-------------|-------------|-------------|--------------------------|----------------------------|--------------------------|-------------|------------------|------------------|------------------|------------------|-------------|------------------|-------------|------------------------|
| Other Tributaries: Bonita Creek, Serrano Creek, Peters Canyon Wash, Hicks Canyon Wash, Bee Canyon Wash, Borrego Canyon, Wash, Agua Chinon Wash, Laguna Canyon Wash, Rattlesnake Canyon Wash, and other Tributaries to these Creeks | + | | | | • | | | • | • | | • | | | | • | | | | | | 801.11 |
| Sand Canyon Wash | + | | | | • | | | • | • | | • | | | | • | X | | | | | 801.11 |
| Wetlands | | | | 1 | 1 | | | ı | | ı | 1 | 1 | 1 | 1 | 1 | 1 | ı | | 1 | ı | |
| San Joaquin Freshwater Marsh | + | | | | | | | X | X | | X | | | X | X | X | | | | | 801.11 |

X Present or Potential Beneficial Use

- Intermittent Beneficial Use
- + Excepted from MUN
- Access prohibited by Irvine Ranch Company
 Access prohibited in all or part by Orange County Environmental Management Agency (OCEMA)

The following is a description of the relevant beneficial use designations:

Agricultural Supply (AGR) – Supports uses for farming, horticulture or ranching. Uses may include irrigation, stock watering, and support of vegetation for range grazing.

Biological Significance (BIOL) – Preservation of Biological Habitats of Special Significance. Supports designated areas or habitats, including, but not limited to, established refuges, parks, sanctuaries, ecological reserves or preserves, and Areas of Special Biological Significance (ASBS), where the preservation and enhancement of natural resources requires special protection.

Commercial and Sportfishing (COMM) – Includes uses of water for commercial or recreational collection of fish or other organisms, including those collected for bait. These uses may include, but are not limited to, uses involving organisms intended for human consumption.

Estuarine Habitat (EST) – Include uses of water to support estuarine ecosystems, which are not limited to, preservation and enhancement of estuarine habitats, vegetation, fish and shellfish, and wildlife, such as waterfowl, shorebirds, and marine mammals.

Groundwater Recharge (GWR) – Supports uses for natural or artificial recharge of groundwater for future extraction, water quality maintenance or halting saltwater intrusion into freshwater aquifers.

Marine Habitat (MAR) – Include uses of water to support marine ecosystems that are not limited to, preservation and enhancement of marine habitats, vegetation (e.g., kelp), fish and shellfish, and wildlife (e.g., marine mammals and shorebirds).

Municipal and Domestic Supply (MUN) – Supports use for community, military, municipal or individual water supply systems, including drinking water supply.

Navigation (*NAV*) – Include uses of water for shipping, travel or other transportation by private, commercial or military vessels.

Rare, Threatened, or Endangered Species (RARE) – Includes uses of water that support habitat necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered. Among plants or animal species which were used in the designation of specific water bodies with RARE beneficial uses are: least Bell's vireo (bird), California least tern (bird), light-footed clapper rail (bird), California brown pelican (bird), Belding's savannah sparrow (bird), willowy monardella (plant), humpback and blue whale (mammals), bald eagle (bird), tidewater goby (fish), southwestern willow flycatcher (bird), salt-marsh bird's beak (plant), Pacific green sea turtle (reptile), and western snowy plover (shore bird). The RARE designation is placed on water bodies where the protection of a threatened or endangered species depends on the water either directly or to support its habitat.

Contact Water Recreation (REC1) – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include,

but are not limited to, swimming, wading, water-skiing, skin and scuba diving, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC2) – Includes uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water would be reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Shellfish Harvesting (SHEL) – Includes uses of water to support habitats necessary for shellfish (e.g., clams, oysters, limpets, abalone, shrimp, crab, lobster, sea urchins, and mussels) collected for human consumption, commercial or sports purposes.

Spawning, Reproduction, and Development (SPWN) – Includes uses of water to support high quality aquatic habitats necessary for reproduction and early development of fish and wildlife.

Warm Freshwater Habitat (WARM) – Supports warm water ecosystems that may preserve and enhance aquatic habitats, vegetation, fish, and wildlife, including invertebrates.

Wildlife Habitat (WILD) – Includes uses of water that support terrestrial ecosystems, including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

D4-1.3 Constituents of Concern

As discussed in the Introduction, the focus of the Watershed Action Plan is to address the constituents of concern within the watershed. The constituents of concern in the Newport Bay Watershed are those pollutants for which a TMDL has been developed or is proposed to be developed. These pollutants, which include sediment, nutrients, toxics, and fecal coliform, are discussed in more detail in **Section 3.0**.

D4-1.4 Watershed Program Management

Program management of various water quality improvement programs within the Newport Bay Watershed occurs at two distinct levels: (1) activities conducted by the Watershed Permittees individually in implementing jurisdictional programs in their LIPs based on the model programs in the DAMP and in compliance with the municipal NPDES stormwater permits and (2) activities conducted by the Watershed Permittees and others collectively to address specific water quality issues on a watershed scale identified through the Water Quality Planning Process (see **DAMP Section 3**).

Within the Newport Bay watershed 3 major planning processes are utilized in the management of the watershed. These processes included: (1) DAMP and Jurisdictional Planning, (2) TMDL Planning, and (3) Ecological Enhancement Planning. The overlap of the DAMP/Jurisdictional Planning and the TMDL Planning yields the Watershed Action Plan. The figure (Figure D4-5) below shows the programs that are associated with each planning process and the oversight agencies involved. In some cases the planning process has a direct impact on the program; in other cases the planning process has an indirect impact. Similarly some oversight agencies have

a direct impact or responsibility on a planning process and an indirect impact or responsibility on a planning process. The direct and indirect impacts are identified by the shading of the boxes associated with the program or oversight agency.

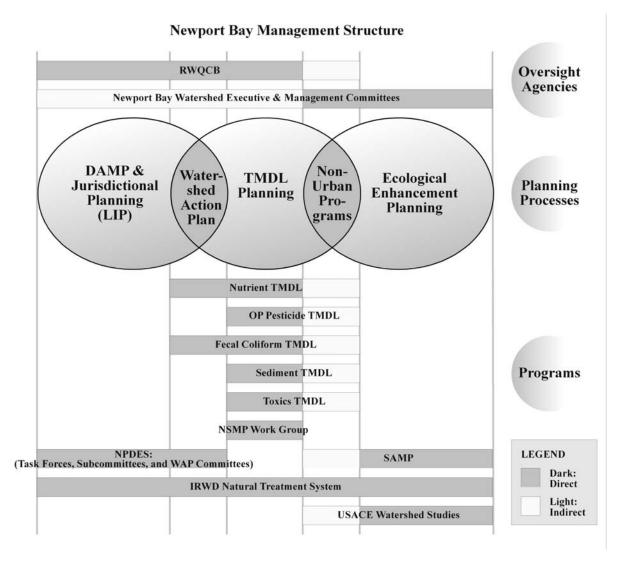


Figure D4-5 Newport Bay Watershed Management Structure

Based upon the annual watershed assessment (discussed in **Section 5.0**), the Watershed Permittees and other participating jurisdictions will work together to address the priority water quality issues identified through the watershed planning processes. It is anticipated that water quality issues that are determined to be specific to a jurisdiction would be referred to that jurisdiction and thereafter be addressed as a jurisdictional program initiative through the LIP. Alternatively, the issue may originate from multiple jurisdictions within the watershed. In this instance, the problem would be addressed as a watershed cooperative effort.

Updates to this program will be the subject of annual reporting each November, which will include a water quality assessment and revisions to the listed water quality improvement initiatives.

D4-2.0 WATER QUALITY ASSESSMENT

The Watershed Action Plans of the DAMP focus on the water quality within particular watersheds and how the water quality is impacted by urban discharges. Urban discharges include surface runoff from residential, commercial, and industrial areas. Pollution sources that are not considered as part of the urban watershed planning responsibilities are atmospheric deposition and agricultural runoff. The following figure (**Figure D4-6**) demonstrates the physical processes involved with generation of pollution and its fate and transport.

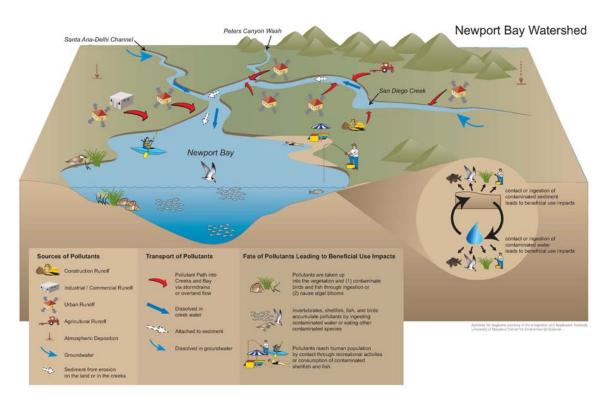


Figure D4-6 Newport Bay Watershed Processes.

Within the Newport Bay Watershed there have been several major initiatives to monitor and assess the water quality:

- The NPDES Program began in 1990 and is anticipated to continue into the foreseeable future.
- The OCHCA (in cooperation with OCSD) has been testing coastal waters in Orange County over the past 40 years for bacteria that indicate the possible presence of disease-

causing organisms. Monitoring within Newport Bay is performed by OCHCA. Monitoring data are compared to the bacteria water quality standards established following the adoption of AB411.

Broad scale special studies have been undertaken within the watershed to better
understand the watershed's water quality. These studies include the Upper Newport
Bay/San Diego Creek Watershed Planning Initiative funded by the U.S. Environmental
Protection Agency (EPA) and the State Water Resources Control Board (SWRCB) under
the 205j granting process, and the Upper Newport Bay Water Quality Enhancement
Project funded by EPA/SWRCB under a 319h Grant.

D4-2.1 Summary of Monitoring Activities

A bibliography was created in 1998 by the County of Orange Resources & Development Management Department (RDMD) to inventory the available studies related to the Newport Bay Watershed. A total of 236 entries were included in the original bibliography, covering studies performed from 1913 to 1998. Arrangements were made with the University of California (UC) Irvine Libraries to act as the Orange County repository for these documents.

The bibliography has been updated in preparing this WAP to include additional information obtained through Web site searches of various agencies and non-profit organizations as well as correspondence with the County of Orange, USACE, and UC's Cooperative Extension. Based on this work additional studies were added to the bibliography, bringing the total number of entries in the database to 317. The data collection is current through December 2004. Sixty-six new studies related to water quality were obtained through the data collection effort. These studies are reflected in the Environmental Matrix which is included as **Exhibit 1** of this WAP. Ongoing study efforts, in particular those through the NSMP program and SCCWRP, will produce additional studies which should be incorporated into the bibliography.

The major monitoring programs in the Newport Bay watershed are described below.

D4-2.1.1 NPDES Monitoring and Assessment Program

NPDES permits are issued for a 5-year term and are issued on an area-wide basis. The first municipal NPDES Stormwater Permit was for the period 1990-1996; the Second Term Permit covered 1996-2002; and the Third Term Permit covers 2002-2007. Each of the permits has required the development and implementation of a monitoring program to support an effective County-wide urban stormwater management program.

D4-2.1.1.1 First Term Permit Monitoring Program 1991 - 1999

The monitoring program for the First Term Permit, which extended through 1998, consisted of four elements – field screening, channel monitoring, harbor/bay monitoring, and sediment sampling.

• Field Screening was performed to detect the presence of illegal discharges or illicit connections. Physical and chemical analyses were conducted in the field. The annual

evaluation of each station included two dry-weather samplings and one storm sampling. Field screening monitoring stations within the Newport Bay Watershed included:

San Diego Creek

- * Santa Ana-Delhi Channel, 3 sites
- * Santa Ana Gardens Channel
- * Paularino Channel
- * Bonita Canyon Channel
- San Diego Creek at Campus Drive
- * Peters Canyon Channel
- * El Modena-Irvine Channel
- Lane Channel
- Armstrong Storm Channel
- * Barranca Channel
- * Santa Ana-Santa Fe Channel
- * South West Tustin Channel
- * North Tustin Channel
- Redhill Channel

- San Joaquin Channel
- * Sand Canyon Channel
- * Bee Canyon Channel
- * Agua Chinon Channel
- * Serrano Creek Channel
- * Borrego Canyon Channel
- * Canada Channel
- * Central Irvine Channel
- Rattlesnake Canyon Wash
- * Hicks Canyon Wash

Upper Newport Bay

- Big Canyon Wash
- * E. Costa Mesa Channel
- Santa Isabella Channel
- Channel monitoring focused on specific watercourses with beneficial uses identified in the Basin Plan. Stations were monitored monthly and during storms. Samples were collected using automatic samplers and analyzed for pH, electrical conductivity, turbidity, nutrients, total suspended solids, volatile suspended solids, and total recoverable metals. Within the Newport Bay Watershed, there were 16 channel monitoring locations.
- Harbor/bay sites were monitored semiannually and during storms for nutrients in the water column and trace metals and organics in the sediment. In addition sediment sampling was conducted semiannually from designated channels and several bays and harbors. Samples were evaluated for metals, pesticides, herbicides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). There were 10 total harbor monitoring locations; six were in the upper bay (at Pacific Coast Highway, Newport Dunes, Shellmaker Island, North Island, ski zone, and near the old salt works) and four sites were in the lower bay (at Harbor Island, Turning Basin, Rhine channel, and the harbor entrance).

D4-2.1.1.2 Second Term Permit Monitoring Program 1999 - 2005

The First Term Permit monitoring program was continued into the second permit term. In 1999 the 99-04 Plan was developed and implemented as a transition program between the second and third term permits. This Plan revised the geographic focus of the monitoring effort by designating "warm spots" (where constituents are substantially above system-wide averages) and "Critical Aquatic Resources" or CARs. The CARs were prioritized and additional

monitoring stations selected to gather data at those sites. In the Newport Bay Watershed there were nine "warm spots" and twelve CAR monitoring locations.

D4-2.1.1.3 Third Term Permit Monitoring Program 2005 - present

The current permit period is the most comprehensive monitoring effort to date. It broadens the array of methods for measuring impacts at the following sites:

- * Santa Ana-Delhi Channel, 3 sites
- * Bonita Canyon Channel
- San Diego Creek at Campus Drive
- * Peters Canyon Channel
- * El Modena-Irvine Channel

- * Lane Channel
- * Bee Canyon Channel
- * Agua Chinon Channel
- * Central Irvine Channel
- * E. Costa Mesa Channel

Three kinds of monitoring are included in this plan.

- Core Monitoring routine and related to small-scale or site-specific problems and processes,
- Regional Monitoring periodic, collaborative, and larger-scale surveys, and
- Special Studies tightly focused and relatively short-term studies.

The following is a list of the seven Program Elements of the Monitoring Plan. Each of the three types of monitoring listed above are considered and incorporated as appropriate into each of the program elements. The monitoring stations associated with each program element is included in **Figure D4-7**.

Long-term mass emissions monitoring – includes measurements of key pollutants, loads, and exceedances to monitor progress. Within the Newport Bay Watershed, there are six established stations. These sites include previously designated sites established in the first and second permit programs and sites integral to the regional monitoring programs for the Nutrient and Toxics TMDLs. In addition, these stations complement the Bight 2003 study by adding to long-term data about pollutant inputs to the Newport Bay. The monitoring sites target the following water bodies in the Newport Bay watershed:

- Santa Ana Delhi Channel
- Peters Canyon Wash
- San Diego Creek at Campus Drive
- Central Irvine Channel
- San Diego Creek at Harvard Avenue
- Costa Mesa Channel

Estuary / wetlands monitoring – includes measurements of key pollutants, loads and biological community parameters to describe impacts of urbanization on estuarine and wetland ecosystems. This program includes the following three channel stations and six estuary/wetland sites within the Newport Bay Watershed:

- San Diego Creek at Campus Drive
- Santa Ana Delhi Channel
- Costa Mesa Channel
- Upper Newport Bay-Unit Basin 1
- Upper Newport Bay-Unit Basin 2

- Upper Newport Bay-PCH Bridge
- Upper Newport Bay-North Star Beach
- Lower Newport Bay-Harbor Island Reach
- Lower Newport Bay-Turning Basin

Bacteriological/ pathogen monitoring – uses a suite of bacterial indicators to determine the impacts of stormwater and non-stormwater runoff and identify spatial and temporal patterns of elevated concentrations to prioritize problem areas. Stations were identified at coastal drains and channels. The following two channel sites are located in the Newport Bay watershed:

- San Diego Creek at Campus Drive
- Santa Ana Delhi Channel

Urban stream bioassessment monitoring – uses a triad of indicators (bioassessment, chemistry, and toxicity) to define the impacts to stream communities and the relationship of the impacts to runoff. The following bioassessment sites have been selected in the Newport Bay watershed:

- Big Canyon Wash u/s Back Bay Drive
- Bonita Canyon Channel
- San Diego Creek at Campus Drive
- Peters Canyon Wash at Barranca Parkway

- San Diego Creek at Harvard Avenue
- San Diego Creek at Highway 133
- Serrano Creek u/s of Bake Parkway

Dry weather reconnaissance – uses measurements of key pollutants to identify illegal discharges and illicit connections. Throughout the County approximately 30 sites will be monitored, with 10 additional sites selected at random. Eighteen of these sites are located in the Newport Bay watershed.

Land use correlations— uses available experimental designs to identify changes in runoff and sediment load associated with the urbanization of previously agricultural land. Two land use sites will represent both a flat and a hillside agricultural plot. Seven monitoring locations that cover three experimental conditions and a reference condition have been selected; all sites are located in the City of Irvine.

Nutrient TMDL monitoring – uses nutrient measurements to track progress in pollutant reduction over time. The nutrient TMDL is further discussed in Chapter 3.0.

D4-2.1.2 OCHCA Bacteria Monitoring

Over the past 40 years the OCHCA and local sanitation agencies (OCSD and SOCWA) have been testing the coastal waters in Orange County for bacteria that indicate possible presence of

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human disease-causing organisms. As of 1999, new requirements for frequent testing of surfzone waters and stringent criteria for beach water closures went into effect as part of AB411. Samples are collected weekly at approximately 150 ocean, bay, and drainage locations throughout coastal Orange County. Within the Newport Bay Watershed, there are approximately 55 sample locations. OCHCA is also conducting monitoring at two inland receiving waters, San Diego Creek at Campus Drive and Santa Ana Delhi Channel, within the Newport Bay Watershed. **Figure D4-7** shows the subwatersheds and the monitoring locations within the Newport Bay Watershed.



D4-2.1.3 Toxics Substances Monitoring Program and State Mussel Watch

The Toxic Substances Monitoring Program (TSMP) and California State Mussel Watch Program (SMWP) were initiated by the SWRCB to provide a uniform statewide approach to the detection and evaluation of the occurrence of toxic substances in fresh, estuarine, and marine waters of the State through the analysis of fish and other aquatic life. The TSMP and SMWP primarily target water bodies with known or suspected impaired water quality and are not intended to give an overall water quality assessment. The California Department of Fish and Game (CDFG) carry out the statewide TSMP and SMWP for the SWRCB by collecting and analyzing samples. In the SMWP this is accomplished through the analysis of resident and transplanted mussels and clams. Sampling stations are selected primarily by the Regional Boards and include stations in the Newport Bay Watershed. Sampling began in 1980 for the SMWP program and 1983 for the TSMP program and has been intermittent in both the years in which sampling has been performed and what analyses (trace element and/or synthetic organic substances) have been performed. The most consistent sample site in the SMWP program is Newport Bay (Crow's Nest) and San Diego Creek and Michelson Drive in the TSMP program.

D4-2.1.4 SCCWRP Bight Study

SCCWRP coordinates regular monitoring efforts of the Southern California Bight from Point Conception to the Mexico border. The most recent Bight '03 Study was divided into three program components—coastal ecology, water quality, and shoreline microbiology. The coastal ecology component includes monitoring and assessment within Newport Bay Watershed. The Sediment Toxicity Report (Volume I) has been published and includes monitoring data for stations in Newport Bay and San Diego Creek. For As part of the Sediment Toxicity work, analyses were performed on samples taken at 10 stations and confirmed that sediment toxicity is prevalent throughout Newport Bay and in San Diego Creek. Ongoing surveys for the Coastal Ecology component of the Bight '03 Study will continue to produce data in Newport Bay and watershed. The planned reports that will include this information are: Sediment Chemistry, Benthic Macrofauna, and Demersal Fish and Megabenthic Invertebrates.

D4-2.1.5 Special Studies

Numerous special studies have been performed in the Newport Bay Watershed. These programs, as well as those described above, are summarized on the Newport Bay Environmental Matrix, which is included as Exhibit 1 to this Watershed Action Plan.

D4-2.2 Assessment of Data and Studies

It is a significant challenge to assemble the studies and programs in the Newport Bay watershed into a meaningful framework that identifies the type of data or results available. To meet the various user needs for this document, data collected in this data collection effort (ending in December 2004) were evaluated for different aspects or perspectives, including program management and policies, study and program type, and study or program details.

Assessment #1: Program Management and Policies

When faced with the abundance of data that exist, it is appropriate to assess whether the data are providing stormwater program coordinators with the information needed to manage the program and make informed decisions for the watershed. The knowledge needed at various stages in the program development must be able to build on previous efforts to attain constantly improving results. The following passage from *Managing Troubled Waters* (National Academy Co, 2003) explains this iterative process.

"The reality of imperfect knowledge about marine systems means that monitoring should be used as an opportunity to increase and refine our knowledge of them. Data and information derived from monitoring programs should be used to check, validate, and refine the assumptions, models, and understandings on which the monitoring was based. This iterative feedback increased predictive ability, reduces uncertainty, and ultimately reduces the monitoring effort needed. As discussed in Chapter 2, risk-free decision making is not achievable, and monitoring must be viewed as a way of reducing uncertainty, not of eliminating it."

The following table (**Table D4-2**) identifies the management categories of a stormwater program that are needed to advance the knowledge of the systems and identifies the number of studies within the data collection effort that are relevant to each category. Each of these categories is considered for specific pollutants of concern or elements of the watershed system. The table shows that the majority of the study effort has been placed in identifying sources, understanding processes, and determining compliance with water quality standards and TMDLs. Less study efforts have been made towards developing new tools and evaluating program and measure effectiveness. This indicates the need to further assess the management needs in these areas and potentially focus efforts on improving the level of knowledge in these areas.

Table D4-2 Assessment #1 - Studies by Program Management Category*.

| | Identify Sources | Understand Processes | Develop New Tools | Determine Compliance with WQS/TMDLs | Evaluate Program/ Measure Effectiveness | Provide Early Warning |
|------------------|---------------------|-------------------------|----------------------|--|--|--------------------------|
| Bacteria | 6 | 3 | 1 | 6 | 2 | 1 |
| Nutrients | 14 | 11 | 3 | 11 | 2 | 1 |
| Inorganics | | | | | | |
| Metals | 10 | 11 | 1 | 12 | 2 | 1 |
| Selenium | 10 | 14 | 3 | 8 | 3 | 1 |
| Organics | | | | | | |
| Pesticides | 13 | 11 | 1 | 8 | 2 | 1 |
| Physicals | | | | | | |
| Dissolved Oxygen | 6 | 6 | 0 | 6 | 0 | 0 |
| Solids | | | | | | |
| Sediment | 10 | 12 | 1 | 8 | 1 | 2 |
| Trash & debris | | | | | | |
| Toxicity | 6 | 8 | 1 | 8 | 2 | 1 |
| Biota | · | | | | | |
| Morphology | 1 | | | | | |

^{*}Note: Each study may fall under one or more management categories

Assessment #2 - Study and Program Type

The 66 water quality studies identified in the Newport Bay Watershed have generated different types of water quality data. The data fall into two broad categories—generation of raw data and assessment of existing data. Raw data studies and programs include specific sampling or monitoring activities and account for most of the 66 studies added to the bibliography. New data were generated with the following two objectives:

- Compliance with NPDES permits, monitoring, and directives for TMDL monitoring.
- Provide an understanding of the concentration levels or processes related to the pollutants, or the impacts of the pollutants, on the ecosystem. Studies targeting pollutant concentrations and processes generally involve direct measurements of the pollutants while studies targeting the impacts of the pollutants generally involve other environmental measurements (e.g., analysis of fish tissue).

Studies that focus on the assessment of existing data are performed with the objective of:

- Understanding the behavior of pollutants within the Newport Bay system through direct measurement of the pollutants, or
- Understanding the impacts of the pollutants by measuring other environmental parameters.

The following figure (**Figure D4-8**) shows the category breakdown of the studies as well as the general objective of the study.

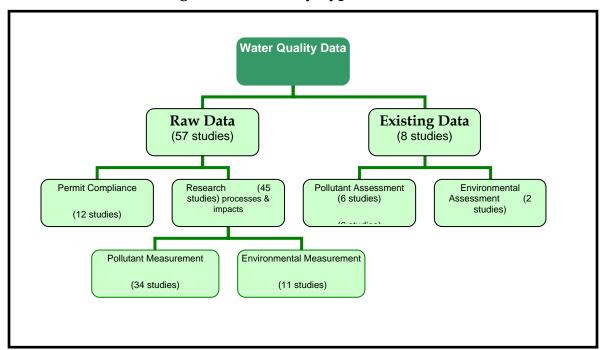


Figure D4-8 Study Type Breakdown

Assessment #3 - Study or Program Details

The final assessment that was made of the studies and programs was to look at basic details such as who performed the study and what pollutants were included in those studies and programs.

Within the Newport Bay Watershed the major generators of water quality data are the County of Orange, SCCWRP, and University of California, Los Angeles (UCLA). The following table (**Table D4-3**) identifies the organizations responsible for each of the 66 studies. For collaborative studies, the primary organization is included in the table.

Table D4-3 Study Sources

| Organization | Number of Studies |
|---|----------------------|
| County of Orange (includes RDMD, OCHCA and | 14 |
| Integrated Waste Management) | |
| SCCWRP | 20 |
| Other Agencies (SWRCB, RWQCB, Coast Guard, Cities, | 7 |
| Caltrans) | |
| Environmental Groups | 3 |
| (Defend the Bay, Coastkeeper) | |
| Irvine Ranch Water District | 5 |
| Universities (UCLA, UCI, UC-Riverside, California State | 13 |
| University - Long Beach, UC Coop Extension) | |
| Private (nurseries, airport) | 4 |

Each of the 66 water quality studies that were identified as part of this data assessment addressed one or more specific pollutants. Ten categories of constituents were identified that encompass nearly all of the specific data that were monitored or assessed. These 10 categories include:

- Bacteria
- Nutrients
- Metals
- Selenium selenium was separated from the metals category because of the high level of attention in the watershed on this contaminant
- Pesticides
- Toxicity various levels of toxicity studies were performed
- Algae
- Dissolved oxygen
- Conventional water chemistry this includes a wide range of variables such as pH, hardness, and temperature
- Sediment this includes both bulk sediment and sediment contamination

The following table (**Table D4-4**) shows the distribution of the studies within each of these categories. Many studies include work related to several constituents.

Table D4-4 Constituent Focus of Studies and Programs

| Constituent | Number of Studies |
|------------------|----------------------|
| Bacteria | 11 |
| Nutrients | 22 |
| Metals | 23 |
| Selenium | 25 |
| Pesticides | 23 |
| Toxicity | 13 |
| Algae | 8 |
| Dissolved oxygen | 10 |
| Water chemistry | 22 |
| Sediment | 15 |

D4-2.3 Water Quality Status

D4-2.3.1 Impaired Waters

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop a list of water quality limited segments—waters that do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that state or local jurisdictions establish priority rankings for water quality impairment on the list and develop action plans, referred to as TMDLs, to improve water quality.

The SWRCB and the Regional Board staff have evaluated each addition, deletion, and change to section 303(d) based on all the data and information available for each water body and pollutant. These recommendations are based upon "all existing and readily available data and information" (40 CFR 130.7(b)(5)). In developing the recommendations, the SWRCB staff used the recommendations and analysis of the Regional Board as the basis of its analysis.

A new listing policy was used to develop the 2006 draft 303(d) list. Based on that policy, some data, for purposes of developing the section 303(d) list, are sufficient by themselves to demonstrate non-attainment of standards. Examples of these listing factors are (1) numeric data exceeding numeric water quality objectives, maximum contaminant levels, or California/National Toxics Rule water quality criteria and (2) use of numeric evaluation values focused on protection of consumption of aquatic species. Other data types require that multiple lines of evidence be used for listing and de-listing. The listing factors that require multiple lines of evidence are (1) toxicity, (2) health advisories, (3) nuisance, (4) beach postings, (5) adverse biological response, and (6) degradation of aquatic life populations or communities. Each of these lines of evidence generally need evidence of the presence of the pollutant(s) that cause or contribute to the adverse condition.

The 2002 303(d) list of impaired waters (approved by the SWRCB) that could potentially be affected by activities occurring within the Newport Bay Watershed is presented in **Table D4-5**. It should be noted that this list is updated every 3 years and will be replaced within this Watershed Action Plan.

Table D4-5 2002 303(d) List and TMDL Priority Schedule - Newport Bay Watershed

| Type | Name | Hydro Unit | Pollutant/Stressor | Source | Priority | Estimated Size Affected | Proposed TMDL Completion |
|------|------------------------|---|--|---|----------|-------------------------------|--------------------------------|
| B Ne | | | Metals | Urban Runoff/Storm Sewers Contaminated Sediments Boatyards | Medium | 767 Acres | |
| | Newport Bay, Lower | 801.14 | Pesticides | Agriculture Contaminated Sediments | High | 767 Acres | 2003 |
| | | | Priority Organics Contaminated Sediments Unknown Nonpoint Source | | Medium | 767 Acres | |
| | Newport Bay, Upper | | Metals | Urban Runoff/Storm Sewers | Medium | 653 Acres | |
| | (Ecological Reserve) | 801.11 | Pesticides | Agriculture Unknown Nonpoint Source | High | 653 Acres | 2003 |
| R | San Diego Creek 801.11 | | Fecal Coliform | Urban Runoff/Storm Sewers Other Urban Runoff | Low | 7.8 Miles | |
| | Reach 1 | | Pesticides | Unknown Nonpoint Source | High | 7.8 Miles | 2003 |
| R | San Diego Creek 801.11 | Urban Runoff/Storm Sewers Other Urban Runoff | Medium | 6.3 Miles | | | |
| | Reach 2 | 001.11 | Unknown Toxicity | Unknown Nonpoint Source | Low | 6.3 Miles | |

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(Note: B - Bay; R - Rivers; E - Estuary; C - Coastal Shoreline/Beaches)

Figure D4-9 includes a map that shows the 303(d) listed receiving waters.

D4-2.3.2 AB411 Summary

The 2005 Annual Ocean and Bay Water Quality Report (OCHCA, 2006) summarizes monitoring activities that took place in Newport Bay. Thirty-one sites are monitored around the 39.5 miles of bay front. In 2005 there were 21 beach postings from April-October, a decrease compared with previous years (since 2000) when postings ranged from 68 to 31. In 2005 there were 41 postings throughout the 2005 calendar year. This is a decrease compared with previous years (since 2000, with the exception of 2004 which had 39 calendar year postings) when the postings ranged from 94 to 39.

D4-2.3.3 Fecal Coliform TMDL Annual Report

Each year a report is submitted on behalf on the watershed Permittees to the Regional Board to summarize the bacteriological data collected in Newport Bay and evaluate compliance with the recreational use bacterial water quality objective established in the Basin Plan. The data used in this evaluation is the data collected by OCHCA. The report discusses the compliance and non-compliance of each station in the wet and dry seasons.

D4-2.3.4 Sediment TMDL Annual Report

Each year a report is submitted on behalf on the watershed Permittees to the Regional Board to summarize the activities related to the sediment TMDL monitoring and maintenance program. The report discusses activities related to the San Diego Creek watershed and the Newport Bay as well as sediment control initiatives that are being undertaken.

D4-2.3.5 Nutrient TMDL Annual Report

Each year a report is submitted on behalf on the watershed Permittees to the Regional Board to summarize the data and results from the Regional Monitoring Program (RMP). The RMP was developed in order to monitor and evaluate the goals of the Nutrient TMDL. The objectives of the RMP are to quantify the endpoints of the TMDL: (1) the seasonal nutrient loading from the watershed, (2) the nutrient concentrations in San Diego Creek Reaches 1 and 2, and (3) the extent, magnitude, and duration of algal blooms in Sand Diego Creek and Newport Bay.

D4-2.4 Priority Water Quality Needs

Managing and improving water quality in an urban environment is a complex issue. The science needed to deal with many of the issues that arise during the management process is evolving and in some cases has not yet developed to the point that important questions can readily be answered in absolute quantifiable terms.



Figure D4-9 Receiving Waters

These and other data gaps have been identified to some extent in the research study reports, the research agenda for the Southern California Stormwater Monitoring Coalition, and the specific requirements of the NPDES permits. However, a thorough listing of data gaps must stem from a thoughtful description of the key management questions related to the watershed. There are two reasons for this. First, there is virtually an infinite array of scientific data that could be gathered in a complex system such as this. It is essential to focus efforts on those data types that are useful in decision making. Second, data gaps sometimes stem, not from the absence of data but, from the inability to adequately integrate existing data. It should be noted that the Newport Bay watershed has more data than almost any other comparatively sized area. Articulating clear questions enables studies to be designed so that disparate data types can be combined as needed to address complex issues.

D4-2.4.1 Pollutant Data Gaps

The list below identifies data gaps related to specific pollutant categories. It should be noted that some of the gaps do not relate to urban sources which is the primary focus of the Watershed Action Plan. A lengthier discussion of each pollutant category follows the summary list below.

- *Nutrients* specifically the macro-nutrients nitrogen and phosphorus and algae related issues
 - o Relationship between low dissolved oxygen levels to algal blooms
 - o Conceptual models to describe important processes that effect the nitrogen concentrations, bioavailability, or cycle within the watershed
 - Beneficial use impairment, potentials of adverse effects, and key linkages between nitrogen, environmental conditions, algal growth, dissolved oxygen, and beneficial uses
 - Spatial and temporal concentrations of nitrogen in groundwater and urban runoff and sites of excessive algal growth (freshwater and marine)
 - o BMP potential effectiveness
- Bacteria
 - Relative magnitude of urban versus natural sources
 - o Sources
 - Rapid bacteriological indicators
 - o MST identification methods
- Bulk Sediment
 - Headland sediment source contribution
- *Sediment Contamination* includes contaminants that are bound to the sediment and transported through the system with the sediment
 - o Functional linkage between sediment flows and pollutant
 - o Pattern of sediment contamination seasonally and in response to storms
- Selenium
 - o A conceptual model to describe important processes of selenium
 - Concentrations and loading estimates
 - o Foodweb and wildlife impacts in the watershed
 - BMP technology and assessment

- *Toxics* metals (other than selenium), pesticides, and organochlorinated compounds are included in this category.
 - o Organochlorine and PCB concentrations
 - o Food web relationships that affect pollutant pathways
 - o Risks to human health, fish and other wildlife
 - o Technology to identify sources of certain pesticides

D4-2.4.1.1 Nutrients

High nutrient loads from the surrounding watershed have resulted in excessive growth of macroalgae in the Bay. Large macroalgal blooms were seen from the 1980s through the middle 1990s. Since that time their occurrence has decreased. The macroalgal blooms can adversely impact the beneficial uses of Newport Bay by fouling beaches and swimming and boating areas. The link between algal blooms and dissolved oxygen needs and the spatial and temporal extent of hypoxic/anoxic events needs to be better understood. This issue is being addressed by the County through a Proposition 13 grant-funded study.

The Nitrogen and Selenium Management Program (NSMP) is a five-year work effort to comply with the requirements of a NPDES permit (Order No. R8-2004-0021) issued by the Regional Board for the Newport Bay watershed. The NSMP will provide focused study to better understand selenium impacts and potential treatment methods. The work plan identified by the NSMP includes development of a conceptual model describing how the pollutant (nitrogen) interacts with the environment, identification of data gaps, collection of data, and recommendations for actions to address the issue.

Nitrogen issues will also be addressed to support re-evaluation of the existing Nutrient TMDL. The NSMP Working Group consists of staff level technical representatives of watershed stakeholders that include state, county, and city agencies, water districts, and private entities that have agreed to fund and implement a work plan to address selenium and nitrogen groundwater-related inflows in the Newport Bay watershed. The NSMP has identified the following data gaps and proposes to address them in their program:

- Develop a conceptual model to describe important nitrogen cycle processes that determine the availability of nitrogen in the watershed and guide data collection and analysis.
- Clarify the link between algal growth and the degree of beneficial use impairment. Determine thresholds related to increased potential for adverse effects and describe key links between nitrogen, environmental conditions, algal growth, dissolved oxygen, and beneficial uses.
- Identify the areas with the highest concentrations of nitrogen in groundwater and urban runoff as well as estimating nitrogen loadings. Identify sites of excessive algal growth in the watershed, nitrogen concentrations in the waters of those habitats, and frequency of exceedances in each habitat. Identify critical seasons when nitrogen concentrations are highest to better understand the pattern and frequency of exceedances and guide BMP development.

• Develop and evaluate effective BMPs and treatment technologies.

D4-2.4.1.2 Bacteria

Identification of the source of bacteria is a difficult question. In the Newport Bay Watershed identifying and quantifying the contribution of urban and natural sources of bacterial impairment in Newport Bay is a data gap. The County is addressing this data gap through the Newport Bay Fecal Coliform Source Identification and Management Plan Project, a Proposition 13 grant-funded project, to identify and quantify the contribution of urban and natural sources of bacterial impairment in Newport Bay. This information will be used to develop a Source Prioritization and Management Plan to address the controllable urban sources of fecal coliform. The Source Management Plan will enable the County and local watershed cities to implement pollution reduction and prevention programs, which will lead to improved water quality at public beaches and to achieving bacteriological standards.

The applicability of current bacteriological indicators for measuring human health risk and for identifying the sources of pathogen contamination needs further refinement. Two projects identified in SCCWRP Technical Report 35B, Stormwater Research Needs in Southern California, identify plans to address these issues. The first project (Project 12. Develop rapid response indicator(s) for microbial contamination) is focused on producing easily used field tests that would provide a reliable measure of bacteriological contamination within a few hours at most. The second project (Project 13. Develop microbial source tracking protocol) will select methods (primarily genetic-based) that provide the most dependable means of identifying and distinguishing among sources. A portion of funding for this project is provided by the Newport Bay watershed Permittees through funding of the broader NPDES program. It is expected that findings from the effort will have application to the Newport Bay watershed.

Considerable resources are being expended to reduce bacterial contamination from watershed sources, but in many cases storm drains continue to discharge large concentrations of bacteria. A study by SCCWRP will examine if bacteria can grow in storm drain sediments. This study, *Storm Drains and Sediments as Reservoirs of Fecal Indicator Bacteria*, is being led by John Griffith. It is expected that the findings from this effort will have application to the Newport Bay watershed.

D4-2.4.1.3 Bulk Sediment

The understanding of the processes associated with the movement of sediment is fairly well understood. Data gaps primarily exist as a result of the changing landscape within the watershed. In particular, the headland areas contain newly cut channels. The sediment source contribution from these channels is not fully understood. Dr. Stan Trimble, Professor, UCLA, is performing field investigations to address this issue.

D4-2.4.1.4 Sediment Contamination

An important goal of the Newport Bay Toxic TMDL is to improve understanding of the functional linkage between sediment flows and pollutant (especially metals) inputs to the bay. As part of the NPDES monitoring, two special studies will be conducted to further this

understanding. The first is a fractionation study that is being designed cooperatively between the County of Orange and the Regional Board. This study will determine the relative distribution of pollutant concentration across particle size categories. This study will enhance the understanding of what sorts of sediment flows transport the largest portion of pollutants, which will assist in the design and evaluation of sediment BMPs. The second study will attempt to develop a quantitative relationship between the characteristics of sediment sampled by the automatic samplers used in the mass emissions program element of the NPDES monitoring program and the vertically integrating samplers used in the Sediment TMDL monitoring. Both of these studies will be performed by the County as part of the Santa Ana Region Water Quality Monitoring Program.

Upper Newport Bay contains sediments contaminated with chlorinated and organophosphorus pesticides. The retail product source of many of these pesticides is unclear. A SCCWRP study will investigate two relatively new analytical methods to help identify the sources and fates of the targeted pesticides.

There are unanswered questions about whether the pattern of sediment contamination changes seasonally and in response to storms that increase loads of contaminated sediment to the bay. A special study will be conducted by SCCWRP to ascertain these relationships.

D4-2.4.1.5 Selenium

The following data gaps were identified by the Nitrogen and Selenium Management Program and are being addressed through that program:

- To make decisions on the data collection and analysis of selenium data, a conceptual
 model is needed to describe important processes that determine cycling and effects of
 selenium in the watershed.
- The existing data do not identify the spatial and temporal extent to which the California Toxics Rule criteria and other guidelines for selenium are exceeded. Areas with the highest concentrations of selenium in groundwater need to be identified and the selenium loadings estimated.
- Selenium is essential for life but toxic at high levels and is unusual in that the difference between essential and toxic levels is relatively small compared to other toxic constituents. Selenium has the potential to bioaccumulate in the food web; however it is not known whether the selenium levels present in the Newport Bay Watershed are causing foodweb and wildlife impacts.
- Efforts are needed to develop and evaluate effective BMPs and treatment technologies.

D4-2.4.1.6 Toxics

Organochlorine and PCB are pollutants that are no longer in use in the Newport Bay watershed but have potential food web impacts due to historical use. The concentrations of these

compounds in the channels discharging to the bay are unknown. A special study will be done to investigate previous sampling of these compounds and potentially perform sampling for these pollutants in the channels that discharge to the bay. This study will be performed by the County as part of the Santa Ana Region Water Quality Monitoring Program under the Mass Emissions Program.

There is a need to improve understanding of the food web relationships that affect toxic pollutant pathways and to understand the risks to human health, fish, and other wildlife that is posed by toxics. Two SCCWRP studies will provide valuable information to begin to fill these data gaps. The first study, *Investigation of Contaminants in Upper Newport Bay Food Web*, is part of the 2004-2005 research plan (Project B4). The second study is Project C1, *Development of Sediment Quality Objectives for Bays and Estuaries*. Newport Bay will be a case study for this project.

D4-2.4.2 Other Data Gaps

Other data gaps that exist are not pollutant specific. These data gaps are related to a broader understanding of pollutants, such as how they travel, how they impact the habitat, how to develop regional stormwater infrastructure. The following describes actions being taken to address these data gaps.

D4-2.4.2.1 Stormwater Infrastructure

Guidance on how to use existing data for further analysis is limited. **Figure D4-8**, which identifies the number of studies in each category, indicates an imbalance between the number of studies/programs generating new data and those drawing conclusions from existing data sets. The Southern California Stormwater Monitoring Coalition has recognized the need to develop projects to (1) integrate and evaluate available data (Project 1); (2) standardize sampling and analysis protocols (Project 2); (3) develop a regional data infrastructure (Project 3); and (4) measure BMP effectiveness (Project 4).

D4-2.4.2.2 Stormwater Mechanisms and Processes

The Stormwater Monitoring Coalition has identified a need to improve fundamental understanding of stormwater mechanisms and processes. To meet this need the following project have been identified: (1) develop a systemwide conceptual model (Project 5); (2) determine appropriate reference conditions (Project 6); (3) develop a regional method for measuring beneficial use condition (Project 7); and (4) identify relative contribution of nonpoint sources to urban runoff loads (Project 8).

Additionally, a study will be performed by the County as part of the Santa Ana Region Water Quality Monitoring Program through the Estuary / Wetlands Monitoring Program to assess the transport modes of pollutants into wetland upland areas. The transport modes include two mechanisms: (1) by floating on the surface of the water and collecting on the land/water interface and (2) through periodic flooding of contaminated stormwater into the upland areas. The design process for the study will be developed in cooperation with the Regional Board and SCCWRP.

D4-2.4.2.3 Receiving Water Impacts

The final data gap identified by the Stormwater Monitoring Coalition is related to identifying receiving water impacts. The following studies were identified to address this need: (1) identify the causes of impact in receiving waters (Project 9); (2) develop bioassessment indicators and protocols (Project 10); (3) develop improved toxicity testing procedures (Project 11); (4) develop raid response indicator(s) for microbial contamination (Project 12); (5) develop microbial source tracking protocol (Project 13); (6) evaluate BMP effects on receiving water impacts (Project 14); and (7) develop improved indicators of peak flow impacts (Project 15).

Several of the identified Stormwater Monitoring Coalition projects have been funded and are underway. Projects that are underway or completed included Projects 2, 5, 8,9, 10, 12, 13, and 15.

D4-3.0 TMDLS IN THE WATERSHED

Section 303(d) of the Clean Water Act requires each state to identify waters that are not meeting the water quality standards for their applicable beneficial uses. This process involves requesting and compiling readily available data and comparing these data to the appropriate water quality objectives (WQOs). The waterbody-pollutant combinations exceeding WQOs at predefined frequencies, which are specified in the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List, are placed on the 303(d) list of impaired waters. Section 303(d) also requires states to establish a priority ranking for waterbody-pollutant combinations on the 303(d) list and to subsequently establish TMDLs for each.

The goal of the TMDL process is to attain water quality standards and protect the beneficial uses of water bodies. It is defined as "the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) and requires that the capacity of the water body to assimilate pollutant loadings (the loading capacity) is not exceeded.

The TMDL process begins with the development of a technical analysis which includes the following seven components: (1) a **Problem Statement** describing which WQOs are not being attained and which beneficial uses are impaired; (2) identification of **Numeric Targets** which will result in attainment of the WQOs and protection of beneficial uses; (3) a **Source Analysis** to identify all of the point and nonpoint sources of the impairing pollutant in the watershed and to estimate the current pollutant loading for each source; (4) a **Linkage Analysis** to calculate the Loading Capacity of the waterbodies for the pollutant; i.e., the maximum amount of the pollutant that may be discharged to the waterbodies without causing exceedances of WQOs and impairment of beneficial uses; (5) a **Margin of Safety** to account for uncertainties in the analyses; (6) the division and **Allocation** of the TMDL among each of the contributing sources in the watersheds, wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint and background sources; and (7) a description of how **Seasonal Variation and Critical Conditions** are accounted for in the TMDL determination. The write-up of the above components is generally referred to as the technical TMDL analysis.

In addition to a technical TMDL analysis, the state is required to incorporate the TMDLs and their appropriate implementation measures into the State Water Quality Management Plan (40 CFR 130.6(c)(1), 130.7), such as the Santa Ana Regional Water Quality Control Plan (Basin Plan). After a TMDL is adopted as an amendment to the Basin Plan (amendments are initially developed by the Regional Board staff, then approved by the Regional Board, State Water Resources Control Board, and State Office of Administrative Law), it is submitted to EPA and reviewed. Approval from EPA is the last step in the TMDL process. The Regional Board has amended four TMDLs to the Basin Plan for Newport Bay and/or San Diego Creek: (1) fecal coliforms, (2) nutrients, (3) sediment, and (4) chlorpyrifos and diazinon. In addition, EPA has developed technical TMDLs for several other toxic pollutants; however, these TMDLs have not been amended to the Santa Ana Basin Plan and final versions have not been approved by EPA. All existing TMDLs, including the technical TMDLs, are described in Section 3.1 and future TMDLs associated with other pollutant-waterbody combinations on the 303(d) list are identified in Section 3.2.

D4-3.1 Existing TMDL Development

The four existing TMDLs in the Newport Bay watershed are described below in detail. These TMDLs do not always apply to the entire length of San Diego Creek and both sections of Newport Bay (Upper and Lower). For example San Diego Creek has been divided into two reaches. Reach 1 refers to the mouth at Newport Bay to Jeffrey Road and Reach 2 is Jeffrey Road to the headwaters. Areas governed by the TMDL pollution reduction allocations are described in each TMDL document. In addition, annual reports, which summarize the data collected and evaluate progress and compliance with the TMDL, are submitted to the Regional Board by the Watershed Permittees.

D4-3.1.1 Newport Bay - Fecal Coliform

Newport Bay was included on California's 1996 section 303(d) list because of high fecal indicator bacteria. A TMDL was completed for the Bay for fecal coliform bacteria, which is a pathogen indicator, to address the pathogen impairment. The fecal coliform bacteria TMDL was developed by the Regional Board and amended to the Santa Ana Basin Plan in April 1999. The TMDL became effective in December 1999.

Data collected by OCHCA for many years has shown the bacteria impairment is most severe in the winter (November through April), primarily due to runoff during rain events. The water quality in the bay generally meets bacteria objectives in the drier summer months. Historically, problem areas indicated by the OCHCA monitoring include the Dunes area in the lower part of the Upper Bay (which is heavily used for water contact recreation) and the channels at the west end of the Lower Bay.

The major sources of fecal coliform bacteria to Newport Bay appear to be the tributaries that discharge to the Bay. These tributaries are composed mostly of urban and agricultural runoff. Wildlife (birds and other animals) in the watershed are considered natural sources of fecal coliform bacteria. Additional sources may include discharges of vessel sanitary waste and bather shedding. There is much uncertainty surrounding the origin of the fecal coliform bacteria in these sources (e.g., what specifically is contributing to fecal coliform bacteria concentrations in urban and agricultural runoff).

Because of the diffuse pollutant sources (urban and agricultural runoff), the uncertainty associated with the bacteria sources, expected difficulties in identifying and implementing appropriate control measures, and uncertainty regarding the nature and attainability of the shellfish harvesting use in the bay, the fecal coliform TMDL developed a prioritized, phased approach to achieving load allocations. This phased TMDL calls for further data collection and analyses concerning the sources and impacts of fecal coliform inputs to the Bay and includes a schedule for compliance with the final TMDL as well as interim numeric targets (Santa Ana RWQCB, 1999a). **Table D4-6** summarizes the phased TMDL.

Based on information currently available, wasteload allocations (WLAs) for the TMDL include the tributaries to the Bay (since the urban and stormwater runoff is regulated under an NPDES permit) and vessel sanitary wastes. The load allocations (LAs) include agricultural runoff (although it is mixed with urban runoff, agricultural runoff is not regulated by the NPDES permit) and natural sources (wildlife).

Table D4-6 TMDLS, WLAs, and LAs for fecal coliform bacteria in Newport Bay

| TMDL for Fecal Coliform Bacteria in Newport Bay | WLAs for Fecal Coliform Bacteria in Urban Runoff, including stormwater, Discharges to Newport Bay | LAs for Fecal Coliform Bacteria in Agricultural Runoff, including stormwater, Discharges to Newport Bay | LAs for Fecal Coliform Bacteria from Natural Sources in all Discharges to Newport Bay | WLAs for Vessel Waste |
|---|--|---|--|-------------------------------|
| As soon as possible, but no later than December 30, 2013 | | | In Effect | In Effect |
| 5-Sample/30-days Geometric Mean less than 200 organisms/100 mL, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period. | 5-Sample/30-days Geometric Mean less than 200 organisms/100 mL, and not more than 10% of the samples exceed 400organisms/100 mL for any 30-day period. | 5-Sample/30-days Geometric Mean less than 200 organisms/100 mL, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period. | 5-Sample/30-days Geometric Mean less than 200 organisms/100 mL, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period. | 0 MPN/100 mL No discharge. |
| As soon as possible, but no | later than December 30, 201 | 9 | | In Effect |
| Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL. | Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL. | Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL. | Monthly Median less than 14 MPN/100 mL, and not more than 10% of the samples exceed 43 MPN/100 mL. | 0 MPN/100 mL No discharge. |

The TMDL was established to ensure protection of the water contact recreation beneficial use through the use of the density-based REC-1 fecal coliform bacteria water quality objectives, with compliance to be achieved no later than 2014. Although the REC-1 objectives are included as a TMDL endpoint, the shellfish harvesting water quality objectives ultimately control the allowable load of fecal coliform bacteria in the Bay because it is more stringent. Therefore, the final TMDL for fecal coliform bacteria in Newport Bay is proposed to be the same as the shellfish harvesting objectives for fecal coliform bacteria. Compliance with the shellfish harvesting objective is to be achieved no later than 2019.

The TMDL's phased approach allows time to conduct further monitoring and assessment, including bacterial dilution and die-off studies relating the shellfish harvesting attainability and activity in the Bay. Required future monitoring and assessment activities are identified through a 13267 letter that was issued to the Permittees.

D4-3.1.1.1 13267 Letter and Progress on Compliance

A 13267 letter from the Santa Ana RWQCB was issued on January 7, 2000 to define the implementation tasks and schedules to support the fecal coliform TMDL. According to the amendment to the Santa Ana RWQCB Basin Plan (Attachment to Resolution No. 99-10), the TMDL is to be adjusted, as appropriate, based on the results of the 10 implementation tasks presented below. The results of these and other studies were intended to provide a basis for modifying the TMDL allocations.

A 13267 letter from the Santa Ana RWQCB was issued on January 7, 2000 to define the implementation tasks and schedules to support the fecal coliform TMDL. According to the amendment to the Santa Ana RWQCB Basin Plan (Attachment to Resolution No. 99-10), the TMDL is to be adjusted, as appropriate, based on the results of the 10 implementation tasks presented below. The results of these and other studies were intended to provide a basis for modifying the TMDL allocations.

Task #1: Submit a Routine Monitoring Program by January 30, 2000. This task requires routine monitoring of bacterial concentrations for total coliforms, fecal coliform bacteria, and *enterococcus*. The OCHCA monitoring program satisfies this requirement. Their routine monitoring includes the collection of five samples per 30-day period at 35 stations throughout Newport Bay. The monitoring data are posted on their website and summarized annually and presented in Annual Data Reports developed by the County, which are available at: http://www.ocwatersheds.com/watersheds/tmdls_fecal_coliform_intro.asp.

Task #2: Submit a Proposed Water Quality Model for Bacterial Indicators Development Plan by January 30, 2000 and submit a Calibrated Model and Model Documentation 13 months after Regional Board approval of plan(s). A plan was submitted to the Regional Board in the January 2000 Fecal Coliform Technical Report and was approved by the Board on November 17, 2000. The calibrated model and model documentation was included in the September 2001 report titled "Public Health Risk Assessment for the Newport Bay Watershed: Recreational Contact and Microbiological Risk".

Task #3: Submit a Proposed Beneficial Use Assessment Plan for (a) REC-1 by January 30, 2000 and for (b) SHEL by March 1, 2001. A REC-1 Beneficial Use Assessment Plan was submitted to the Regional Board in the January 2000 Fecal Coliform Technical Report and was approved by the Board on November 17, 2000. A Beneficial Use Assessment Plan for shellfish harvesting in Newport Bay was recently conducted by the County of Orange, on behalf of the watershed cities. This Plan is described below in Task #4.

Task #4: Submit a Beneficial Use Assessment Report for (a) REC-1 13 months after Regional Board approval of plan(s) and (b) for SHEL 13 months after Regional Board approval of plan(s)

The REC-1 Beneficial Use Assessment was included in the September 2001 report titled "Public Health Risk Assessment for the Newport Bay Watershed: Recreational Contact and Microbiological Risk". The objectives of the REC-1 Beneficial Use Assessment were:

- 1) To characterize the existing relative risk to public health posed by exposure to pathogens derived from human sources via recreational contact in Newport Bay,
- 2) To provide estimates of the relative risk associated with alternative levels of exposure and/or water quality (due to structural or programmatic changes), and to compare those results with the results representing existing conditions, and
- 3) To integrate the results of the health risk assessment with planning level costs for implementing control alternatives that may lead to water quality improvements and reductions in public health risks.

The Newport Bay Shellfish Harvesting Assessment was a multi-year study that focused on the following objectives:

- 1) Identify historic areas of bivalve mollusk shellfishing (shellfishing) in Newport Bay,
- 2) Establish the existing level of the shellfishing resource in Newport Bay,
- 3) Characterize current levels of shellfish collection (for consumption and bait) as a beneficial use in Newport Bay,
- 4) Investigate impediments to, and the possibility of enhancing the potential for, increased levels of shellfish collection in Newport Bay, and
- 5) Document the results of the investigation in a manner that will be useful to the Regional Board for decision-making purposes (Kinnetic Laboratories, Inc. and EOA, Inc., 2004).

A final report has been completed; however, a modeling study to evaluate options to control bacteria loads is pending to fulfill the requirements established by the Regional Board. The final report is available at:

http://www.ocwatersheds.com/watersheds/tmdls_fecal_coliform_intro.asp

Task #5: Submit Proposed Source Identification Plans for (a) The Dunes Resort by March 1, 2000; (b) Urban Runoff (including stormwater) by March 1, 2000; (c) Agriculture (including

stormwater) by April 1, 2000; and (d) Natural Sources by April 1, 2000. The plans to conduct source identification studies for the Dunes Resort and Urban Runoff were submitted in the March 2000 Fecal Coliform TMDL Technical Report, and for Agriculture and Natural Sources in the April 2000 Fecal Colidorm TMDL Technical Report. The plans for the Dunes Resort and Agriculture were approved by the Regional Board on November 17, 2000. The plans for Urban Runoff and Natural Sources were rejected by the Regional Board. Subsequent revised plans for source identification and characterization of Urban Runoff and Natural Sources were developed as a Proposition 13 grant application with input from the Regional Board. The grant application was approved in February 2005. A Source Identification study for the Dunes Resort was recently conducted by Jiang and colleagues. The study findings are described below in Task #6a and can be found on the Santa Ana Regional Control Board web page at http://www.waterboards.ca.gov/santaana/html/tmdls.html.

Task #6: Submit Source Identification and Characterization Reports for (a) The Dunes Resort due 7 months after Regional Board approval of plan(s); (b) Urban Runoff (including stormwater) due 13 months after Regional Board approval of plan(s); (c) Agriculture (including stormwater) due 16 months after Regional Board approval of plan(s); (d) Natural Sources due 16 months after Regional Board approval of plan(s). The Dunes Resort Source Identification study examined the contribution of bacteria from swimmers at Newport Dunes Resort (Jiang et al., 2004). The study found that fecal coliform bacteria concentrations were generally low in the Dunes' water column and that bathing activities do not appear to be the causes of elevated concentrations of fecal coliform bacteria at the beaches. They determined that it is more likely that bacteria sources include ground seepage, small spills from vessel pump-out stations, storm drains, and wildlife. The Urban Runoff and Natural Sources studies are being conducted as part of the Proposition 13 Newport Bay Fecal Coliform Source Identification and Management Plan Project. The source identification and characterization tasks of the project will be completed by March 2007. The Agricultural source identification and characterization was conducted by the University of California Cooperative Extension.

Task #7: (a) Submit a Proposed Plan for Evaluating the Current Vessel Waste Program by April 1, 2000 and (b) Submit a Report on the Evaluation of the Vessel Waste Program 12 months after Regional Board approval of plan. A plan to evaluate the current Vessel Waste Program was approved by the Regional Board on November 17, 2000 and the initial evaluation was included in the September 2001 report titled "Public Health Risk Assessment for the Newport Bay Watershed: Recreational Contact and Microbiological Risk". The report provided an initial estimate of enteric virus loading to Newport Bay from vessels through the water quality modeling component of the investigation. Information was gathered from a variety of sources including the City of Newport Beach Marine Department, representatives from public and private harbors in Newport Bay, Orange County Harbor Master and Sheriff, a survey of boaters and discussions with boat cleaners and holding tank pumpout services in Newport Bay. From this information, an estimate of fecal coliform and viral loading from vessel waste was computed. To further address this task, a study was performed to determine the contribution of marinas to fecal coliform bacteria impairment in Lower Newport Bay (Grant et al., 2004). This study found that the two marinas in the study area (Balboa Yacht Basin and Dunes Marina) are not significant sources of fecal coliform bacteria to the bay and concluded that surface water runoff (during both dry and wet weather) is the major source of fecal coliform bacteria to the

marinas. This study can be found on the Santa Ana Regional Control Board web page at http://www.waterboards.ca.gov/santaana/html/tmdls.html.

Task #8: (a) Submit a Proposed TMDL, WLA, and LA Evaluation and Source Monitoring Program Plan(s) 3 months after completion of Tasks 2, 4a, and 6 and (b) Implement the TMDL, WLA, and LA Evaluation and Source Monitoring Plan(s) Upon Regional Board approval of plan(s). This task is pending the completion of the Proposition 13 Newport Bay Fecal Coliform Source Identification and Management Plan Project, scheduled for completion in March 2008.

Task #9: Submit updated TMDL report for (a) REC-1 - 6 months after completion of Tasks 2, 4a, 6, and 7; (b) SHEL - 6 months after completion of Tasks 2, 4b, 6, and 7. This task is pending the completion of the Proposition 13 Newport Bay Fecal Coliform Source Identification and Management Plan Project, scheduled for completion in March 2008 and the Newport Bay Shellfish Harvesting Assessment modeling study to evaluate options to control bacteria load.

Task #10: Adjust TMDL, if necessary; adopt interim WLAs, LAs, and Compliance Dates (Section 3.a.ii.h) for (a) REC-1 - 12 months after completion of Updated TMDL Report for REC-1 (Task 9.a) and (b) SHEL - 12 months after completion of Updated TMDL Report for SHEL (Task 9.b). This task is pending the completion of tasks 8 and 9.

Annual data reports and other studies that support TMDL implementation are available at: http://www.ocwatersheds.com/watersheds/tmdls_fecal_coliform_intro.aspNewport Bay &

D4-3.1.2 San Diego Creek Watershed - Nutrients

The 1996 California section 303(d) list identified Newport Bay and San Diego Creek as a high priority for nutrient TMDL development. Nutrient loading (nitrogen and phosphorus) from the San Diego Creek watershed contributes to seasonal algal blooms in Newport Bay. The algal blooms are a nuisance for recreational uses of the bay as well as aesthetics. The blooms can also affect wildlife if depressions in dissolved oxygen levels occur.

The TMDLs were developed based on a 15-year phased approach. There are different targets for 5 years, 10 years, and 15 years. According to this TMDL plan, the annual loading of nutrients to the Bay will be reduced by 50 percent by 2012. Allowable nitrogen loads in San Diego Creek were based on the numeric water quality objectives in the Basin Plan of 13 mg/L (Reach 1) and 5 mg/L (Reach 2). Allowable nitrogen and phosphorus loads for Newport Bay were based on existing loads in the early 1970s prior to the widespread presence of algae and macrophytes in the watershed. **Table D4-7** presents a summary of the TMDL loads for the watershed. The nutrient TMDL allocates allowable loads among identified nutrient sources, including nurseries, groundwater dewatering facilities, urban runoff, agricultural discharges, as well as undefined sources (open spaces, atmospheric deposition, groundwater).

Table D4-7 Summary of nutrient TMDLs for Newport Bay watershed

| | Phased TMDL (lbs/yr) | | | | | | |
|-----------------------------|-------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|--|--|
| Waterbody | | December 31, 2002 ⁵ | December 31, 2007 ⁵ | December 31, 2012 ⁵ | | | |
| Newport Bay Watershed | Wasteload Allocation | 113,800 | 104,885 | | | | |
| Total Nitrogen | Load Allocation | 86,297 | 48,976 | | | | |
| (summer load) ¹ | TMDL | 200,097 | 153, 861 | | | | |
| Newport Bay Watershed | Wasteload Allocation | | | 92,142 | | | |
| Total Nitrogen (winter | Load Allocation | | | 52,222 | | | |
| load) ² | TMDL | | | 144,364 | | | |
| Newport Bay Watershed | Wasteload Allocation | 22,076 | 15,770 | | | | |
| Total Phosphorus | Load Allocation | 64,836 | 46,310 | | | | |
| (annual load) ³ | TMDL | 86,912 | 62,080 | | | | |
| San Diego Creek, Reach 2 | Wasteload Allocation | | | 5.5 lbs/day | | | |
| Total Nitrogen (daily | Load Allocation | | | 8.5 lbs/day | | | |
| load) ⁴ | TMDL | | | 14 lbs/day | | | |

¹Total nitrogen summer TMDL applies between April 1 and September 30.

⁴Total nitrogen TMDL applies when the mean daily flow in San Diego Creek at Culver Drive is below 25 cfs, and when the mean daily flow in San Diego Creek at Culver Drive is above 25 cfs, but not as the result of precipitation.

⁵Compliance to be achieved no later than this date. The RWQCB may require earlier compliance with these targets when it is feasible and reasonable.

As part of TMDL implementation, the County of Orange initiated a Regional Monitoring Program for nutrients on behalf of the Watershed Permittees and others (Resolution 99-77; Santa Ana RWQCB, 1999b). The Regional Monitoring Program has two components: a routine monitoring component and a special monitoring component.

The routine monitoring is separated into three sections — watershed monitoring, in-bay monitoring, and algae monitoring. The data collected are used to assess individual TMDL allocation compliance, overall TMDL compliance, and TMDL endpoint monitoring for seasonal loading. The current nutrient loadings are meeting interim TMDL targets and the results of the

²Total nitrogen winter TMDL applies between October 1 and March 31 when the mean daily flow in San Diego Creek at Campus Drive is below 50 cubic feet per second (cfs), and when the mean daily flow in San Diego Creek at Campus Drive is above 50 cfs, but not as the result of precipitation.

³Total phosphorus TMDL is the sum of summer and winter loading during all daily flow rates.

routine monitoring are provided in the reports found at http://www.ocwatersheds.com/watersheds/tmdls_nutrient_intro.asp.

The special monitoring component includes intensive studies to better understand the nature of nutrient sources and watershed dynamics. The studies range from focused investigations of nutrient loading from open space to complex investigations of nutrient concentrations in bay and creek sediments.

D4-3.1.2.1 Nutrient TMDL Regional Monitoring Program and Progress on Compliance

Following adoption of the nutrient TMDL, a 13267 letter was issued on May 18, 1999 by the Regional Board to the watershed Permittees to request additional information to support ongoing compliance with the TMDL. The requested information and the responses to the request are identified below.

Task #1: An analysis of whether the DAMP should be revised to prevent continuing or recurring beneficial use impairments and exceedances of water quality objectives related to nutrients, and if a revision is recommended, a work plan and schedule to revise the DAMP. This was addressed through the September 1999 report "Newport Bay Watershed Urban Nutrient TMDL Technical Report". The conclusion of the report was that the DAMP is achieving its goal of reducing pollutants. However, additional studies were recommended to further investigate the effectiveness of BMPs for nutrient control. These studies were performed in 2000 and included in the report "2000 Peters Canyon Wash / San Diego Creek Nutrient Study".

Task #2: A plan and schedule for achieving the 2002 and 2008 [note: letter says 2008, but the target is 2007] summer total nitrogen targets, the 2012 winter total nitrogen target and the 2012 San Diego Creek, Reach 2 total nitrogen target.

Task #3: A plan and schedule for achieving the 2007 and 2012 total phosphorus target.

Task #4: A plan and schedule for evaluating the effectiveness of urban runoff nutrient control actions implemented in the Newport Bay watershed.

Task #5: A plan and schedule for evaluating and determining compliance with the total nitrogen and total phosphorus load allocations for urban runoff.

The Nutrient TMDL for the Newport Bay Watershed requires that a regional monitoring program (RMP) be established to coordinate assessment of the attainment of the goals of the nutrient TMDL. In support of this assessment 8 areas of study were identified as follows:

- 1. Aerial mapping of algae distribution this study is currently being performed as part of a Proposition 13 Grant Study.
- 2. Open space nutrient loading this study has not been initiated.

- 3. Shallow groundwater contribution to the creek system this study was completed under management of the NSMP and is title "Sources of Selenium, Arsenic, and Nutrients in the Newport Bay Watershed" (Meixner 2004)
- 4. Algae survey of the creek system this study is currently underway as part of the NSMP.
- 5. Nutrient concentrations in bay and creek sediments this study has been completed by SCCWRP ("Sediments as an internal source of nutrients to Upper Newport Bay, California, Sutula 2006) on behalf of the Regional Board.
- 6. Quantifications of beneficial use impairment of the bay this study has not been initiated.
- 7. Nutrient fluxes from bay sediments and algae this study has been completed by SCCWRP (("Sediments as an internal source of nutrients to Upper Newport Bay, California, Sutula 2006) on behalf of the Regional Board.
- 8. Quantification of precipitation loading this study has not been completed.

D4-3.1.3 Newport Bay & San Diego Creek Watershed - Sediment

Newport Bay and San Diego Creek were included on California's 1996 section 303(d) list because of sediment loading. A TMDL for sediment was subsequently developed for San Diego Creek and Newport Bay.

Significant modifications to the Newport Bay watershed's drainage system over the past 150 years have resulted in an increase in the amount of sediment loading to the Bay. The ACOE estimates that sedimentation in Upper Newport Bay prior to 1900 might have been as low as 1 inch in 35-40 years (approximately 500-1,000 tons/year). Loading data at the time of TMDL adoption indicated approximately 7 feet of sediment had been deposited in Upper Newport Bay in a 12 year period(approximately 7 inches/year or 125,000-250,000 tons/year).

Under Section 208 of the 1972 Federal Clean Water Act, the watershed cities and principal landowners developed a comprehensive plan to address the erosion and siltation issues in Newport Bay Watershed. The 1983 plan known as the *San Diego Creek Comprehensive Stormwater Sedimentation Control Plan* (Boyle Engineering, Inc., 1983) identified several strategies to systematically reduce sediment loading into San Diego Creek and Newport Bay. These strategies include BMPs for controlling sediment erosion from construction sites and agricultural land, the construction of numerous sediment retention basins in the watershed, and the construction and use of two areas as sediment traps in Upper Newport Bay. This plan serves as the basis for the sediment TMDLs.

The TMDL was developed as a phased TMDL that can be revised based on future monitoring and review over a 10-year period. The TMDLs are intended to be implemented as 10-year

running averages because sediment loadings vary substantially over long periods of time and different watershed areas.

The portion of the sediment load coming from urban areas and construction areas are subject to NPDES permits and were, therefore, included as point sources and received wasteload allocations (WLAs). All other sources (open space and agriculture) were considered nonpoint sources and received load allocations (LAs). **Table D4-8** presents the sediment TMDLs for San Diego Creek and Newport Bay (both waterbodies have the same allocations).

Table D4-8 Sediment TMDLs for San Diego Creek and Newport Bay

| | Source/Land Use | Tons/year (as 10-year running average) | | |
|------|-----------------|--|--|--|
| WLA | Construction | 13,000 | | |
| *** | Urban | 2,500 | | |
| LA | Open Space | 28,000 | | |
| LA | Agriculture | 19,000 | | |
| TMDL | Total Area | 62,500 | | |

D4-3.1.3.1 13267 Letters and Progress on Compliance

Following adoption of the sediment TMDL, 13267 letters were issued (January 13, 1999 and August 13, 1999) by the Regional Board to the watershed Permittees to request additional information to support ongoing compliance with the TMDL. The requested information and the responses to the request for the January 13, 1999 letter are identified below.

Item #1: A plan and schedule for the completion (by June 1, 1999) of a comprehensive delineation of all wetlands with the Newport Bay/San Diego Creek Watershed. A plan and schedule was submitted to the Board and the delineation was completed and submitted to the Regional Board on X. A commitment has been made by the County to update the wetland delineation.

Item #2-a: A sediment monitoring plan that includes compliance with the requirements to establish Santa Ana-Delhi and Bonita Canyon Creek sediment monitoring stations; evaluation of BMP effectiveness; establishment of sediment monitoring station for evaluation compliance with load allocations for land use types.

Item #2-b: A sediment monitoring plan that includes compliance with the requirement to conduct annual scour studies for the drainages in the watershed and demonstrates whether the sediment basins have at least 50% capacity prior to November 15 of each year.

Item #2-c: A sediment monitoring plan that includes compliance with the requirement to conduct topographic and vegetation surveys in the Upper Newport Bay.

Item #2-d: A sediment monitoring plan that includes compliance with the requirement to submittal an annual report by December 31 of each year providing results of monitoring efforts.

The County and watershed Permittees developed a Monitoring and Reporting Program to address Items 2a, 2b, 2c, and 2d. On November 19, 1999, the Regional Board adopted Monitoring and Reporting Program No. 99-74 (the Monitoring and Reporting Program; Santa Ana RWQCB, 1999c). The Monitoring and Reporting Program consists of two elements—the Upstream Monitoring Element (associated with activities performed in the San Diego Creek watershed upstream of Jamboree Road Bridge and in the Santa Ana Delhi Channel) and the Newport Bay Monitoring Element (associated with activities in Upper and Lower Newport Bay). Annual reports are submitted to the Santa Ana RWQCB and are available at http://www.ocwatersheds.com/watersheds/tmdls_sediment_intro.asp.

The continued monitoring has been used to evaluate the accuracy of the source analysis and allocations in the original TMDL.

Item #3: A plan and schedule for compliance with maintaining the minimum depth target of the Sediment Basins in Newport Bay.

Item #4: A plan and schedule for compliance of reducing the annual average sediment load in the watershed by 50% in 10 years, the load allocations, and implementation of sediment control measures such that Upper Newport Bay need not be dredged more frequently than about once every 10 years.

The requested technical information and responses in the August 19, 1999 letter are described below.

Item #1. A plan and schedule for evaluation of the design capacities of the in-channel and foothill sediment control basins, including their design volume and trapping efficiency.

Item #2. A plan and schedule for maintenance of each of the basins as necessary to assure at least 50% design capacity.

D4-3.1.4 Newport Bay & San Diego Creek Watershed - Toxics

On June 14, 2002, EPA Region 9 established Toxics TMDLs for San Diego Creek and Newport Bay (USEPA, 2002). These TMDLs are referred to as technical TMDLs since they do not include a discussion of the implementation measures that will be used to address the TMDL. The Santa Ana Regional Board is dividing the EPA promulgated Toxics TMDLs into five separate TMDLs based on constituent type and geography. The five resulting TMDLs will include (1) diazinon and chlorpyrifos, (2) organochlorine compounds, (3) selenium, (4) metals, and (5) Rhine Channel. Each of these individual TMDLs must be independently approved and an implementation plan must be developed before they are officially adopted and incorporated into the Basin Plan. Currently, the only TMDL to complete the approval process is the diazinon and chlorpyrifos TMDL, which was approved by the Santa Ana Regional Board in April 2003 (Santa Ana RWQCB, 2003) and by EPA in April 2004.

Fourteen individual pollutants were addressed in EPA's technical TMDLs and they were grouped according to their chemical characteristics (for the final TMDLs under consideration by the Regional Board, the Rhine Channel pollutants will be considered separately):

Organophosphate Pesticides – diazinon and chlorpyrifos; can cause acute and chronic toxicity; not known to bioaccumulate; elevated concentrations primarily limited to San Diego Creek.

Selenium – a toxic bioaccumulative metal, with significant groundwater sources.

Metals – cadmium, copper, lead and zinc originate from non-point sources and behave similarly in water.

Organochlorinated Compounds – PCBs, DDT, chlordane, dieldrin and toxaphene have similar fate (bioaccumulation) and transport mechanisms, and are usually adsorbed to sediment. These are considered legacy pollutants and while they have not been used for many years, they may still persist in the sediment.

Mercury and Chromium – These metals are only listed for TMDL development for Rhine Channel. The Santa Ana Regional Board will develop a TMDL specifically for Rhine Channel, which will include Mercury and Chromium, Copper, Lead, Selenium, Zinc, Chlordane, Dieldrin, DDT and PCBs.

This section presents a summary of the toxicity TMDLs that have been or will be developed for the Newport Bay Watershed. All information was summarized from Santa Ana RWQCB (2000) and USEPA Region 9 (2002). **Table D4-9** presents the specific waterbodies and associated pollutants in the Newport Bay watershed that were addressed by these TMDLs.

Table D4-9 Waterbodies and Associated Pollutants in the Newport Bay and San Diego Creek Toxicity TMDLs

| Waterbody (type) | Pollutants | | | |
|---|---|--|--|--|
| San Diego Creek (freshwater) | Cd, Cu, Pb, Se, Zn, chlorpyrifos, diazinon, | | | |
| | chlordane, dieldrin, DDT, PCBs, toxaphene | | | |
| Upper Newport Bay (saltwater) | Cd, Cu, Pb, Se, Zn, chlorpyrifos, chlordane, DDT, | | | |
| | PCBs | | | |
| Lower Newport Bay (saltwater) | Cu, Pb, Se, Zn, chlordane, dieldrin, DDT, PCBs | | | |
| Rhine Channel, within Lower Newport Bay | Cu, Pb, Se, Zn, Cr, Hg, chlordane, dieldrin, DDT, | | | |
| (saltwater) | PCBs | | | |

The TMDLs associated with each chemical category are described below and documents associated with the TMDL are available for download at the following websites:

EPA Established TMDLs: http://www.epa.gov/region9/water/tmdl/final.html

Adopted TMDLs: http://www.waterboards.ca.gov/santaana/html/tmdls.html

Organophosphate Pesticide TMDL

The organophosphate pesticide TMDL applies concentration-based loading capacities and allocations for chlorpyrifos and diazinon. The concentration-based loading capacity values are the same as the selected numeric targets. The organophosphate pesticide TMDL includes a 10 percent margin of safety, therefore, the concentration-based allocations are calculated as 90

percent of the numeric TMDL target for each pollutant under acute and chronic conditions. The organophosphate pesticide TMDL applies all year, regardless of season or flow. The TMDLs for chlorpyrifos and diazinon in San Diego Creek and chlorpyrifos in Upper Newport Bay are presented in **Tables D4-10** and **D4-11**, respectively.

Table D4-10 Chlorpyrifos and diazinon TMDLs for San Diego Creek

| | Diazinon (ng/l) | | Chlorpyrifos (ng/l) | |
|----------------------------|-----------------|----------|---------------------|----------|
| | Acute | Chronic* | Acute | Chronic* |
| TMDL Baseline Conditions** | 960 | 848 | 580 | 120 |
| Wasteload Allocation | 72 | 45 | 18 | 12.6 |
| Load Allocation | 72 | 45 | 18 | 12.6 |
| MOS | 8 | 5 | 2 | 1.4 |
| TMDL | 80 | 50 | 20 | 14 |
| Percent Reduction (%) | 93 | 95 | 97 | 90 |

^{*}Chronic = 4 consecutive day average

Table D4-11 Chlorpyrifos TMDL for Upper Newport Bay

| | Acute (ng/l) | Chronic* (ng/l) |
|----------------------|--------------|-----------------|
| Wasteload Allocation | 18 | 8.1 |
| Load Allocation | 18 | 8.1 |
| MOS | 2.0 | 0.9 |
| TMDL | 20 | 9 |

^{*}Chronic = 4-consecutive day average

It should be noted that no 13267 letters have been issued or are anticipated for organophosphate pesticides. Attainment of the TMDLs is expected through the phase out of many uses on these compounds.

Selenium TMDL

A TMDL for selenium were developed for San Diego Creek, Upper Newport Bay, Lower Newport Bay and Rhine Channel. Monitoring data have shown that dissolved selenium concentrations in San Diego Creek and its tributaries consistently exceed the chronic (4-day average) criterion for freshwater and occasionally exceed the acute criterion (Hibbs and Lee, 1999; IRWD, 1999; and Lee and Taylor, 2001). Dissolved selenium concentrations in Newport Bay do not exceed the saltwater criterion. However, fish tissue data indicate that selenium loadings to the bay might be causing toxicity or threatening conditions to wildlife in the Upper and Lower Newport Bay. The selenium TMDLs were developed based on the existing numeric

^{**}Based on multiple samples from 5 different storm events between 1997-2000; Acute = storm average, Chronic = storm max

water quality objectives for fresh and saltwater found in the California Toxics Rule (CTR) (USEPA, 2000).

Shallow groundwater is the most significant source of selenium to San Diego Creek. Groundwater seeps into the Creek naturally (nonpoint source) or it may be pumped as part of groundwater cleanup or dewatering operations that discharge into the creek (point source). Runoff from urban areas, nurseries, agriculture, open space and hillsides, as well as atmospheric deposition, represent additional minor sources. San Diego Creek is the largest source of selenium to Newport Bay.

The selenium TMDL is expressed as mass-based annual loads and are presented in **Table D4-12**. The wasteload allocation (WLA) applies to groundwater cleanup, groundwater dewatering, and urban runoff. The load allocation (LA) applies to groundwater (background conditions), nurseries and agricultural runoff, open space and hillside runoff, and atmospheric deposition. The existing load was calculated based on IRWD (1999) monitoring data in San Diego Creek. Since San Diego Creek is the major sources of selenium to the Bay it is assumed that achieving the TMDLs for the Creek will result in meeting the water quality targets for the impaired waterbodies in the Bay (Upper and Lower Bay and Rhine Channel).

Table D4-12 Selenium TMDLs for San Diego Creek

| | Table 21 12 Selemani 11/12 25 101 San 21030 Creek | | | | | | | | |
|----------|---|----------------------|--------------------------|--|--|--|--|--|--|
| Source | Annual Loading Capacity (lbs/yr) | Existing Load | Estimated Reductions (%) | | | | | | |
| WLA | 149.7 | | | | | | | | |
| LA | 652.6 | | | | | | | | |
| WLA + LA | 802.3 | 2,443 | 67 | | | | | | |
| MOS* | 89.1 | | | | | | | | |
| TMDL | 891.4 | | | | | | | | |

^{*}MOS = 10 percent of the TMDL

Metals TMDLs

TMDLs for dissolved copper, lead, and zinc were developed for San Diego Creek, Upper Newport Bay, Lower Newport Bay, and Rhine Channel. TMDLs for cadmium were also developed for San Diego Creek and the Upper Newport Bay. Available dissolved metals data for cadmium, copper and lead (OCPFRD, 2000) exceed the chronic CTR criteria (USEPA, 2000) for San Diego Creek and its tributaries and the copper and zinc data exceed the applicable acute CTR criteria. Sediment metal concentrations tend to increase along the gradient from freshwater to saltwater and sediment toxicity has often been observed in sediment and porewaters of the Upper and Lower Bay and Rhine Channel (BPTCP, 1997; Bay et al., 2000; SCCWRP, 2001).

Urban runoff appears to be the largest source of metals to San Diego Creek. Some additional sources include runoff from open spaces, nurseries and agriculture, groundwater dewatering and cleanup, and atmospheric deposition. The largest source of metals to Newport Bay is San Diego Creek. Santa Ana-Delhi Channel, other drainages, and surface seawater represent minor sources to Newport Bay. Passive leaching from recreational boats and underwater hull cleaning

are also estimated to make up a significant portion of the dissolved copper loading to the Lower Bay, Rhine Channels, and to a lesser extent, the Upper Bay.

The TMDLs were developed based on concentration for San Diego Creek and for both concentration and mass loads for Newport Bay. The loading capacity for San Diego Creek is equivalent to the applicable numeric water quality targets. The loading capacities for the saltwater waterbodies (Upper and Lower Newport bay and Rhine Channel) were based on the chronic and acute saltwater numeric targets (concentration-based TMDL) as well as the chronic numeric target and the volume of the bay (mass-based TMDL).

The allocations for San Diego Creek are based on the concentration-based targets for the four flow tiers and are reduced by 20 percent to account for the margin of safety. The allocations apply to San Diego Creek as well as all freshwater discharges to the Creek. The allocations apply at all times of the year. **Table D4-13** presents the TMDLs for San Diego Creek.

Table D4-13 Concentration-based metals TMDLs for San Diego Creek

| Dissolved Metal | red Base Flows (<20 cfs) | | | Small Flows (21-181 cfs) | | Medium Flows (182-815 cfs) | |
|--------------------|-----------------------------|-------------------|-----------------|-----------------------------|-----------------|-------------------------------|-----------------|
| | Acute (μg/l) | Chronic (µg/l) | Acute (μg/l) | Chronic (μg/l) | Acute (µg/l) | Chronic (µg/l) | Acute (μg/l) |
| Cadmium | | I | I | - | l | l | |
| WLA&LA | 15.3 | 5.0 | 12.1 | 4.2 | 8.6 | 3.4 | 7.1 |
| MOS | 3.8 | 1.2 | 3.0 | 1.1 | 2.2 | 0.8 | 1.8 |
| TMDL | 19.1 | 6.2 | 15.1 | 5.3 | 10.8 | 4.2 | 8.9 |
| Copper | l | l | I | - 1 | | l | |
| WLA&LA | 40 | 23.4 | 32 | 19.4 | 24.2 | 15.0 | 20.4 |
| MOS | 10 | 5.9 | 8 | 4.9 | 6.0 | 3.7 | 5.1 |
| TMDL | 50 | 29.3 | 40 | 24.3 | 30.2 | 18.7 | 25.5 |
| Lead | l | l | I | - 1 | | | |
| WLA&LA | 225 | 8.7 | 179 | 7.0 | 130 | 5.0 | 107 |
| MOS | 56 | 2.2 | 45 | 1.8 | 32 | 1.3 | 27 |
| TMDL | 281 | 10.9 | 224 | 8.8 | 162 | 6.3 | 134 |
| Zinc | l | ı | I | - 1 | _ I | I | I |
| WLA&LA | 303 | 306 | 253 | 254 | 194 | 195 | 166 |
| MOS | 76 | 76 | 63 | 64 | 49 | 49 | 42 |
| TMDL | 379 | 382 | 316 | 318 | 243 | 244 | 208 |

The mass-based allocations for Newport Bay are presented in **Table D4-14** and the concentration-based allocations are presented in **Table D4-15**.

Table D4-14 Mass-based metals TMDLs for Newport Bay

| | Copper | Zinc | Lead | Cadmium* | |
|------|------------|------------|------------|------------|--|
| | (lbs/year) | (lbs/year) | (lbs/year) | (lbs/year) | |
| WLA | 3,656 | 214,083 | 20,963 | 11,370 | |
| LA | 5,661 | 13,189 | 746 | 431 | |
| MOS | 2,329 | 57,068 | 5,427 | 2,951 | |
| TMDL | 11,646 | 285,340 | 27,136 | 14,753 | |

^{*}Applies to Upper Newport Bay only

Table D4-15 Concentration-based metals TMDLs for Newport Bay

| Dissolved Metal | | Chronic (µg/l) |
|-----------------|------|----------------|
| Cadmium | | |
| WLA&LA | 33.6 | 7.44 |
| MOS | 8.4 | 1.86 |
| TMDL | 42 | 9.3 |
| Copper | | |
| WLA&LA | 3.8 | 2.5 |
| MOS | 1.0 | 0.6 |
| TMDL | 4.8 | 3.1 |
| Lead | | |
| WLA&LA | 168 | 6.5 |
| MOS | 42 | 1.6 |
| TMDL | 210 | 8.1 |
| Zinc | | |
| WLA&LA | 72 | 65 |
| MOS | 18 | 16 |
| TMDL | 90 | 81 |

^{*}Applies to Upper Newport Bay only

Organochlorine TMDLs

The organochlorine technical TMDLs established by USEPA in 2002 include TMDLs for chlordane, total DDT, total PCBs, dieldrin and toxaphene. Specifically, chlordane, total DDT and total PCBs TMDLs were developed for San Diego Creek and Newport Bay (Upper and

Lower Bay and Rhine Channel), dieldrin TMDLs were developed for San Diego Creek, Lower Newport Bay and Rhine Channel, and a TMDL for toxaphene was developed for San Diego Creek (USEPA, 2002). None of these TMDLs are currently adopted.

Although all of the pollutants addressed by these TMDLs have been banned, they are still a concern because of their ability to persist for long periods of time in water, soil, and biological tissue. The available monitoring data show exceedances of EPA and California fish tissue screening values. Based on these monitoring data, sediment quality guidelines were prioritized over tissue screening values and water quality criteria as the TMDL targets because the pollutants are directly associated with the sediments.

Most of the pollutants addressed in these TMDLs are no longer utilized in the watershed and enter the waterbodies mostly through the erosion of sediments to which the pollutants have historically adhered. Watershed data suggest that there is an existing reservoir of historically deposited organochlorine pollutants in the Newport Bay sediments, which may lead to resuspension of the pollutants from the contaminated sediments. Groundwater may also be a minor source due to percolation.

The TMDLs are expressed as mass-based allocations (grams per year) for each waterbody. There were some situations in which existing loads were less than the calculated loading capacity. In these cases, to ensure the greatest protection of beneficial uses and to prevent future degradation, the TMDLs were set equal to the lower value (the existing load), which ensures that pollutant loads do not increase above existing levels. Where existing loads were more than the loading capacity, the TMDLs were set equal to the loading capacity and reductions were required (USEPA, 2002). **Tables D4-16** through **D4-19** present the TMDLs for each waterbody including a 10 percent MOS, which was subtracted from the loading capacity or existing load (whichever was smaller).

Table D4-16 San Diego Creek organochlorine TMDLs

| Pollutant | Existing Load (g/year) | Loading Capacity (g/year) | WLA (g/year) | LA (g/year) | MOS (g/year) | TMDL* (g/year) | Percent Reduction (%) |
|-----------|------------------------------|---------------------------------|-----------------|----------------|-----------------|-------------------|-----------------------------|
| Chlordane | 615.7 | 314.7 | 251.8 | 31.4 | 31.5 | 314.7 | 49 |
| DDT | 3,733.8 | 432.6 | 346.1 | 43.2 | 43.3 | 432.6 | 88 |
| Dieldrin | 381.8 | 261.5 | 209.6 | 26.2 | 26.2 | 261.5 | 32 |
| PCBs | 282.1 | 2,226 | 225.6 | 28.2 | 28.2 | 282.1 | 0 |
| Toxaphene | 582.1 | 8.9 | 7.1 | 0.9 | 0.9 | 8.9 | 98 |

^{*}TMDL = lesser value of existing load or loading capacity

Table D4-17 Upper Newport Bay organochlorine TMDLs

| | Table D4 17 Opper New port Day organocinornie 1141DES | | | | | | | |
|------------|---|----------|----------|----------|----------|----------|-----------|--|
| Dollsstant | Existing | Loading | WLA | LA | MOS | TMDL* | Percent | |
| Pollutant | Load | Capacity | (g/year) | (g/year) | (g/year) | (g/year) | Reduction | |

| | (g/year) | (g/year) | | | | | (%) |
|-----------|----------|----------|-------|-------|------|-------|-----|
| Chlordane | 290.7 | 160.6 | 123.7 | 20.9 | 16.1 | 160.6 | 45 |
| DDT | 1,080.2 | 276.5 | 212.9 | 35.9 | 27.7 | 276.5 | 74 |
| PCBs | 858.7 | 1,528.2 | 626.9 | 146.0 | 85.9 | 858.7 | 0 |

^{*}TMDL = lesser value of existing load or loading capacity

Table D4-18 Lower Newport Bay organochlorine TMDLs

| Pollutant | Existing Load (g/year) | Loading Capacity (g/year) | WLA (g/year) | LA (g/year) | MOS (g/year) | TMDL* (g/year) | Percent Reduction (%) |
|-----------|------------------------------|---------------------------------|-----------------|----------------|-----------------|-------------------|-----------------------------|
| Chlordane | 50.2 | 59.2 | 12.6 | 32.6 | 5.0 | 50.2 | 0 |
| DDT | 438.4 | 101.85 | 76.3 | 15.3 | 10.2 | 101.8 | 77 |
| Dieldrin | 5.9 | 18.6 | 4.45 | 0.89 | 0.59 | 5.9 | 0 |
| PCBs | 409.8 | 562.95 | 304.7 | 73.8 | 41.0 | 409.8 | 0 |

^{*}TMDL = lesser value of existing load or loading capacity

Table D4-19 Rhine Channel organochlorine TMDLs

| Pollutant | Existing Load (g/year) | Loading Capacity (g/year) | WLA (g/year) | LA (g/year) | MOS (g/year) | TMDL* (g/year) | Percent Reduction (%) |
|-----------|------------------------------|---------------------------------|-----------------|----------------|-----------------|-------------------|-----------------------------|
| Chlordane | 0.33 | 1.70 | 0.1 | 0.21 | 0.03 | 0.33 | 0 |
| DDT | 5.60 | 2.92 | 0.7 | 1.9 | 0.23 | 2.92 | 48 |
| Dieldrin | 3.76 | 0.53 | 0.13 | 0.34 | 0.05 | 0.53 | 86 |
| PCBs | 70.0 | 16.2 | 4.1 | 10.5 | 1.6 | 16.2 | 77 |

^{*}TMDL = lesser value of existing load or loading capacity

Chromium and Mercury TMDLs

TMDLs for chromium and mercury were developed for the Rhine Channel area of Newport Bay. Sources of chromium to the channel include historically contaminated sediments, previous discharges by nearby metal plating facilities and atmospheric deposition. There have been no studies done to explain the elevated mercury concentrations in Rhine Channel, but it is assumed that historically contaminated sediments are the major source of mercury to the waterbody. Atmospheric deposition is considered to be a minor source of mercury to Rhine Channel.

The chromium and mercury TMDLs for Rhine Channel are expressed as mass loadings (kilograms per year). Pollutant loadings from historically contaminated sediments and atmospheric deposition are included in the LA. The WLA consists of the sediment deposition from San Diego Creek into Rhine Channel because this source is subject to coverage under the

existing NPDES stormwater permit. The existing mercury load in the Rhine Channel exceeds the loading capacity; therefore, the TMDL is equal to the loading capacity. The existing chromium load; however, is lower than the loading capacity. Therefore, the TMDL for chromium is equal to the existing load. The chromium and mercury TMDLs (including a 10 percent MOS) for Rhine Channel are presented in **Table D4-20**.

Table D4-20 Chromium and mercury TMDLs for Rhine Channel

| Pollutant | Existing Load (kg/year) | Loading Capacity (kg/year) | WLA (kg/year) | LA (kg/year) | MOS (kg/year) | TMDL* (kg/year) | Percent Reduction (%) |
|-----------|-------------------------------|----------------------------------|------------------|-----------------|------------------|--------------------|-----------------------------|
| Chromium | 33.1 | 39.1 | 7.44 | 22.34 | 3.3 | 33.1 | 0 |
| Mercury | 4.36 | 0.10 | 0.0225 | 0.0675 | 0.01 | 0.1 | 98 |

^{*}TMDL = lesser value of existing load or loading capacity

D4-3.1.4.1 Completed Toxic TMDL Studies

Several recent studies have been performed to further characterize toxicity in Newport Bay and San Diego Creek, including two SCCWRP studies, Newport Bay Sediment Toxicity Studies (Bay et al., 2004) and Investigation of Metals Toxicity in San Diego Creek (Bay et al., 2003). The Newport Bay study was conducted over three years and investigated the extent and characteristics of sediment contamination. This investigation concluded that sediment toxicity was present at 70 percent of the stations sampled in both September 2000 and May 2001. Sediment toxicity was determined with the amphipod survival test using the test species Eohaustorius estuarius. Sediment chemistry concentrations frequently exceeded the sediment quality guidelines used for TMDL development and the exceedances were often due to elevated concentrations of copper, mercury, zinc, and DDT. In addition, there was evidence to indicate a linkage between sediment contamination and impaired water quality (surface water samples also exhibited toxicity). Toxicity Identification Studies were performed at two locations in Newport Bay (Rhine Channel and Upper Newport Bay Sedimentation Basin) and it was concluded that additional studies are needed to identify specific toxicants, but the results indicate that multiple toxicants of concern are present at each site and that the effects are not due to naturally occurring factors such as sediment grain size and ammonia (Bay et al., 2004).

The metals toxicity study in San Diego Creek investigated the contribution of selenium and other trace metals to toxicity in San Diego Creek and evaluated the relationship between selenium exposure and its impacts on fish populations. Similar to the Newport Bay study, water samples were frequently toxic; however, trace metals were not believed to contribute to toxicity due to their low concentrations in the water samples (it is anticipated that unidentified organics were present in the samples). Prolonged exposure to selenium in food was found to cause a reduction in body weight and fork length for the fish studied, when compared to control samples (Bay et al., 2003).

Additional toxicity investigations include the Upper Newport Bay 205(j) Water Quality Planning Study, Upper Newport Bay 319(h) Water Quality Enhancement Project, "Recommended Aquatic Life Toxicity Testing Program for Urban Stormwater Runoff" (Lee 1999) and other studies performed as part of the NSMP. These studies, along with other toxicity

investigations, will help focus TMDL implementation efforts on the pollutants and sources of concern.

D4-3.2 Status of Future TMDL Development

TMDLs will be developed in the future for all waterbody-pollutant combinations on the current 303(d) list. The 2002 303(d) list is the active, approved list. A draft 2006 list has been prepared for public review, but has not been finalized.

Table D4-6 identifies the waterbodies in the Newport Bay watershed that are on the 2002 303d list. TMDLs have been completed and approved (including implementation plans) for many of these listings; however, some of the metals, fecal coliforms and organics listings have not yet been addressed, although for several of the waterbodies specific metals (to replace the general listing for metals) have been proposed in the draft 2006 list.

D4-4.0 BMP INVENTORY

In developing a plan to address water quality within the Newport Bay Watershed, it is important to (1) understand the sources of pollution within the watershed and (2) know the specific source and treatment controls that have been implemented (or proposed to be implemented) within the watershed to deal with the watershed constituents of concern. This section provides the available information for these two areas and identifies the related knowledge gaps that exist.

D4-4.1 Watershed Pollution Sources

Pollution sources in the Newport Bay Watershed include urban runoff, open space runoff, groundwater, permitted discharges, atmospheric deposition, agriculture, and wildlife. Because the mandate of the Orange County Stormwater Program is to address urban runoff, this Watershed Action Plan and planning effort will focus mainly on the urban sources although it is inherently recognized that in many cases, such as sediment control, the Watershed Permittees have taken on a broader role as responsible stakeholders even though the urban contribution is limited.

The urban sources in the watershed include runoff generated during storm events and non-storm related runoff from municipal facilities, residential, commercial, and industrial areas and parks.

D4-4.2 Existing Enhanced Non-Structural BMPs

Non-structural BMPs include many activities that are performed by the individual jurisdictions pursuant to their LIP (DAMP Appendix A). These activities include, but are not limited to, good housekeeping practices, street sweeping, catch basin stenciling, public outreach and education. Enhanced non-structural BMPs include activities in which a specific pollutant of concern for that watershed is addressed.

D4-4.2.1 Sediment

Construction requirements?

D4-4.2.2 Nutrient

During 2004-2005 a telephone survey was conducted by UC Cooperative Extension with random residences in the watershed to determine the landscaping services that were used. Contact was made with landscape service providers in order to determine appropriate information aimed at reduction of fertilizer runoff. Educational materials were developed (in English and Spanish) to provide information on proper fertilization application and lawn care methods. These materials were provided to retail lawncare outlet centers as well as independent gardeners. UC Cooperative Extension continues to stock the educational materials at cooperating independent nurseries and provide this information to professional groups, such as the Orange County Gardeners' Association, and at garden shows throughout the County.

D4-4.2.3 Toxics

Ban certain substances?

D4-4.3 Existing Structural Enhanced BMPs

Structural BMPs include engineered facilities that are designed to remove pollutants. These facilities can include, but are not limited to, wetlands, bioswales, extended detention basins, and proprietary separator units. Enhanced structural BMPs include facilities in which a specific pollutant of concern for that watershed is addressed. Enhanced BMPs are considered to be regional and treat runoff from more than a single developed area, such as a single residential tract. **Table D4-21** identifies the enhanced structural BMPs that have been implemented in the Newport Bay Watershed and a description of each BMP is included following the table.

Table D4-21 Enhanced Structural BMPs

| Project | Location | Constituent of Concern |
|--------------------------------|------------------------------------|---------------------------|
| Sediment Trapping Basins | Hicks Canyon, East Hicks Canyon, | Sediment |
| | Round Canyon, Agua Chinon, Bee | |
| | Canyon, Marshburn, Orchard | |
| | Estates | |
| In-Channel Sediment Basins | San Diego Creek; Jamboree Road - | Sediment |
| | Michelson Drive | |
| In-Bay Sediment Basins | Upper Newport Bay | Sediment |
| Serrano Creek Rehabilitation | Lake Forest | sediment |
| San Joaquin Marsh | San Diego Creek; near IRWD WTP | Nutrients - primary |
| Sewer Diversion Projects | Newport Dunes | Bacteria – primary |
| Santa Ana Delhi Channel Trash | At Mesa Drive In Newport Beach | Trash |
| Boom | - | |
| El Modena-Irvine Channel Trash | Near ETC | Trash |
| Booms | | |
| San Diego Creek Trash Boom | Near IRWD treatment plant facility | Trash |

D4-4.3.1 <u>Sediment</u>

D4-4.3.1.1 Foothill Basins

Hicks Canyon, East Hicks Canyon, Round Canyon, Agua Chinon, Bee Canyon, Marshburn Channel, and Orchard Estates include foothill basins that attenuate large floods as well as trap sediment from the watershed. These were developed as part of the Sediment Control Master Plan. The operation and maintenance of these basins are reported as part of the Sediment TMDL Annual Report.

D4-4.3.1.2 In-Channel Sediment Basins

Three in-channel sediment basins are located in San Diego Creek between Jamboree Road and Michelson Drive. These were developed as part of the Sediment Control Master Plan. The

operation and maintenance of these basins are reported as part of the Sediment TMDL Annual Report. Modifications to increase the depth of in-channel basin 2 were completed in 2004-2005 to improve sediment trapping during large storm events to the lower basin weir are being considered to improve the efficiency of the basin system.

D4-4.3.1.3 In-Bay Sediment Basins

Two sediment trapping basins were constructed in Upper Newport Bay in the 1980's, predominantly to capture fine sediment not removed by the in-channel basins.

D4-4.3.1.4 Serrano Creek Rehabilitation

Following significant erosion of Serrano Creek, phased projects were implemented to stabilize the banks of the creek and improve the riparian habitat.

D4-4.3.2 Nutrients

D4-4.3.2.1 San Joaquin Marsh

The San Joaquin Marsh Project was completed by IRWD to restore and enhance the water quality cleansing of the marsh. Monitoring results have demonstrated that this project has significantly reduced the nitrogen levels and sediment content of water that is discharged to the creek. Water is diverted from San Diego Creek, routed through the marsh, and then returned to the creek.

D4-4.3.2.2 Warner Channel Nutrient BMP

This open storm channel contains vegetated swales, which were not originally intended in the design. An evaluation of BMP effectiveness in 2005 identified it as having nutrient removal potential. Recommendations were proposed to enhance the channel's treatment capabilities.

D4-4.3.3 Fecal Coliform

D4-4.3.3.1 Newport Dunes Sewer Diversion Project

Phase 1 of this project funded the diversion of urban runoff from the storm drain system into the sanitary sewer system. This diversion is within the OCSD service area. Phase 2 of this project includes an investigation of the feasibility of the installation of aerators in Newport Bay to improve the circulation to decrease the fecal bacteria contamination.

D4-4.3.4 Trash and Debris

D4-4.3.4.1 Santa Ana Delhi Channel Trash Boom

The County of Orange deployed a trash boom in the Santa Ana Delhi Channel near Mesa Drive. This boom has been in operation for a number of years. The system consists of an 18 inch wide

suspended net; its limitation is that heavier trash and debris can pass under the net or turbulence can push the trash and debris over the net.

D4-4.3.4.2 El Modena Irvine Channel-Peters Canyon Channel Trash Booms

The El Modena Irvine Channel (Facility F07) was selected location for installation of a trash boom. The site is associated with improvements to the Eastern Transportation Corridor (ETC), serves a watershed that is virtually 100 percent urbanized with mixed land uses, has a rectangular cross section with subcritical flow, has perennial flow, and has very good maintenance access. A second trash boom is located in the F06 (Peters Canyon Channel) location. It is in close proximity to the El Modena location.

D4-4.3.4.3 San Diego Creek Trash Boom

IRWD installed and maintained a temporary trash boom, adjacent to its Michelson Facility, to intercept and collect floating debris as part of a pilot trash boom project. The trash that was intercepted and collected was characterized over the course of two yeas (2004 through 2006).

D4-4.4 Proposed Structural Enhanced BMPs

The following structural enhanced BMPs have been proposed in the watershed and are at some stage of planning (**Table D4-22**).

Table D4-22 Proposed Enhanced Structural BMPs.

| Project | Location | Performance Measures |
|--|--|-------------------------|
| Natural Treatment System | 31 proposed wetlands throughout watershed. | Nutrients |
| Proposed Storm Drain to Sewer Diversions Projects | City of Newport Beach - 4 locations | Bacteria |
| IRWD Cienega Filtration Project | Irvine Unified School District site | Toxics (selenium) |

D4-4.4.1 Nutrients

D4-4.4.1.1 Natural Treatment System

Following the success of the San Joaquin Marsh Project, IRWD has proposed a Natural Treatment System (NTS) that includes 31 wetlands throughout the IRWD service area. In many locations, the NTS has been incorporated into flood control facilities operated by the Watershed Permittees. The EIR for the NTS was approved on April 26, 2004. By mi2006, 4 of the projects had been constructed. It is expected that the long-term monitoring program for the 4 initial projects will begin in April 2007.

Most of the NTS sites are located in the City of Irvine and have been established to treat runoff from new development within the City. The NTS constitutes the only approved 'regional program' in Orange County. More information of this project and its status can be found at http://www.naturaltreatmentsystem.org.

D4-4.4.2 Fecal Coliform

D4-4.4.2.1 Newport Beach storm drain diversion projects

Four locations have been selected within the City of Newport Beach for diversion of urban runoff in storm drains into the sanitary sewer system. The goal of these projects is to reduce the bacteria levels in the bay and ocean that lead to beach postings and closures. These diversions will be located within the OCSD service area.

D4-4.4.3 Toxics

D4-4.4.3.1 IRWD Cienega Filtration Project

IRWD is pursuing a anaerobic bioreactor demonstration project. This project will consist of an underground chamber filled with crushed rock through which surface water from Peters Canyon Channel will be directed. Materials will be introduced into the chamber to promote selenium reducing. It is anticipated that a report will be prepared in 2008 to document the results of the demonstration project operation.

D4-4.5 Estimates of Load Reductions of Existing BMPs

Understanding the load reduction of implemented BMPs is important in assessing whether or not those BMPs are improving the quality of the receiving waters. Guidelines available through the DAMP (Appendix E-1, BMP Effectiveness and Applicability for Orange County) as well as California Stormwater Quality Association (CASQA) (CASQA BMP Handbook) associate wide ranges of estimates for the reduction in pollutants with various types of BMPs. Because the pollutant reductions are highly variable, actual monitoring data is often collected to assess the load reduction of the existing BMPs. The following table (**Table D4-23**) presents that information as available.

Table D4-23 Pollutant Removal for Existing Enhanced Structural BMPs

| Project | Constituent | Pollutant Reduction |
|-----------------------------------|----------------------|---------------------|
| Sediment Trapping Basins | Sediment | unknown |
| In-Channel Sediment Basins | Sediment | unknown |
| San Joaquin Marsh | Nutrients (Nitrogen) | 65% - 70% |
| Sewer Diversion Projects | Bacteria | 100% |
| Serrano Creek Rehabilitation | Sediment | unknown |
| El Modena Irvine Channel & Peters | Trash | unknown |
| Canyon Trash Booms | | |
| Santa Ana Delhi Channel Trash | trash | unknown |
| Boom | | |

D4-4.6 Recommendations for BMPs in the Watershed

New candidate BMPs can be prevention or removal oriented and can be considered either for updating baseline BMPs or for incorporation as watershebased BMPs. New BMPs are generally identified from one or more of the following:

- A review of technical literature (such as the ASCE/EPA database);
- A review of existing control programs;
- Demonstration or research projects;
- Input from consulting firms and municipalities already involved in new BMP implementation; or
- Other sources.

Consistent with DAMP Section 3.0, the process for BMP selection and implementation at the watershed scale involves consideration of a candidate BMP with respect to:

- The Watershed Permittees' needs, goals, and objectives
- Consistency with federal and state programs
- Economies from streamlined analysis and implementation procedures
- Opportunities for flexibility in the development of management alternatives
- Decision-making based on environmental and local considerations
- Effective Capital Improvement Program planning and budgeting

The following table (**Table D4-24**) has been modified from that presented in DAMP Section 7.0 referencing the effectiveness of BMPs for specific pollutants. Specifically the types of BMPs have been reduced to reflect those that are more effective in reducing the pollutants of concern within the Newport Bay Watershed. In particular the infiltration BMPs (shaded in the table) have high removal efficiencies for all pollutants of concern in this watershed.

Table D4-24 BMPs that target Newport Bay Watershed pollutants of concern.

| | II. | NFILTRATION | (2) | WET PONDS AND WETLANDS | | BIOF | ILTERS | FILTRATION | |
|----------------------------|---------------------------------|--------------------------------|-----------------------------------|---------------------------|---------------------------------|---------------------------------------|-----------------------|-----------------------|------------------------------|
| Pollutant of Concern | TC-10 Infiltration Trench | TC-11 Infiltration Basin | TC-12 Retention/ Irrigation | TC-20 Wet Pond | TC-21 Constructed Wetland | TC-31 Vegetated Buffer Strip | TC-32 Bioretention | TC-40 Media Filter | TC-60 Multiple Systems |
| Sediment | Н | Н | Н | Н | Н | Н | н | Н | Н |
| Nutrients | Н | Н | Н | М | M | L | М | L | L |
| Trash & Debris | Н | Н | Н | Н | Н | Н | Н | Н | Н |
| Metals | Н | Н | Н | Н | Н | L | Н | М | М |
| Bacteria & Viruses | Н | Н | Н | Н | Н | Н | Н | Н | Н |

Cooperative periodic performance assessment may be necessary. This Treatment Control BMP table will be updated as needed and as knowledge of stormwater treatment BMPs improves.

- Including trenches and porous pavement.
- (3) Also known as hydrodynamic separators/devices. Include swirl concentrators, cyclone separators, and baffle boxes.
- L Low removal efficiency
- M Medium removal efficiency
- H High removal efficiency
- U Unknown removal efficiency

Sources: International Stormwater Best Management Practices Database (2001), including Analysis of treatment system performance (1999 - 2005), dated February 2006

California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook – New Development and Redevelopment (January 2003 with September 2004 Errata)

Guide for BMP Selection in Urban Developed Areas (2001)

Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (1993)

D4-5.0 PLAN IMPLEMENTATION AND ASSESSMENT

D4-5.1 Plan Implementation

Strategy Tables have been developed for the Newport Bay Watershed that identifies the specific actions that are being undertaken to improve urban water quality within the watershed. These strategy tables are specific to the constituents of concern for the watershed and include information on past progress as well as the scheduled tasks to support this action. On an annual basis these tables will be updated to identify the progress made in that year as well as the schedule for the subsequent year. The Newport Bay Watershed Strategy Tables are included as **Exhibit 2** to this Watershed Action Plan.

D4-5.2 Plan Assessment

Effectiveness Assessment is the process that managers use to evaluate whether their programs are resulting in desired outcomes, and whether these outcomes are being achieved efficiently and cost-effectively (CASQA, 2003). A principle objective of the Watershed Action Plan is to present an integrated plan of action that will result in meaningful water quality improvements in the Newport Bay Watershed while balancing economic, social and environmental constraints. This plan of action is laid out in the strategy tables which are referenced in **Section 5.1** and included herein as **Exhibit 2**. The program effectiveness assessment strategy requires the identification and thereafter annual consideration of measures that indicate whether progress is being made toward attainment of this objective and the other program objectives discussed in **Section 1.0**.

Assessment measures that are pertinent to the Watershed Action Plan are related to the confirmation of progress on the actions identified in the strategy table. The assessment of progress is integrated in the strategy tables through the annual update to the tables that require documentation on the progress that has been made on that specific action. Reasonable progress on these action items indicates that the Watershed Action Plan is effective.

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Nomenclature (Abbreviations)

Table D4-25 Abbreviation Definitions

| Abbreviation | Definition |
|--------------|---|
| NPDES | National Pollutant Discharge Elimination System |
| OCHCA | Orange County Health Care Agency |
| SCCWRP | Southern California Coastal Water Research Project |
| SWAMP | Surface Water Ambient Monitoring Program |
| TMDL | Total Maximum Daily Load |
| BMP | Best Management Practice |
| USEPA / EPA | United States Environmental Protection Agency |
| DAMP | Drainage Area Management Plan |
| LIP | Local Implementation Plan |
| OCSD | Orange County Sanitation District |
| RWQCB | Regional Water Quality Control Board |
| GIS | Geographic Information System/Science |
| NCCP/HCP | Natural Community Conservation Plan & Habitat Conservation Plan |
| USACE, ACOE | United States Army Corps of Engineers |
| ASBS | Areas of Special Biological Significance |
| SOCWA | South Orange County Wastewater Authority |
| SWRCB | State Water Resources Control Board |
| RDMD | Resources & Development management Dapartment |
| PCB | Polychlorinated Biphenyls |
| PAH | Polycyclic Aromatic Hydrocarbons |
| CARs | Critical Aquatic Resources |
| TSMP | Toxic Substances Monitoring Program |
| SMWP | California Sate Mussel Watch Program |
| CDFG | California Department Of Fish and Game |
| DO | Dissolved Oxygen |
| UCLA/UCI | University of California Los Angeles / Irvine |
| IBI | Index of Biotic Integrity |
| | |

APPENIDX D4 - NEWPORT BAY WATERSHED ACTION PLAN

| IRWD | Irvine Ranch Water District |
|----------|---|
| MPN | Most Probable Number |
| WLA / LA | Waste Load Allocation / Load Allocation |
| CTR | California Toxics Rule |
| RMA | Resource Management Associates |
| NTS | Natural Treatment System |
| CASQA | California Stormwater Quality Association |

EXHIBIT D4-1 ENVIRONMENTAL MATRIX

EXHIBIT D4-2 STRATEGY TABLES