# APPENDIX I

## Citywide Urban Runoff Management Program

# City of Huntington Beach

## Citywide Urban Runoff Management Plan

January 2005 - Section 3 Updated May 2015

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# Drainage Area Management Plan
# Section 1
# Executive Summary

## 1.1 Background

The City of Huntington Beach (City) is approximately 28.2 square miles of land and is located adjacent to the Pacific Ocean within a heavily urbanized region of Orange County, California. Bordering cities include Seal Beach, Westminster, Fountain Valley, Newport Beach, Costa Mesa, and a portion of unincorporated Orange County. From a water quality planning context, the northern portion of the county and the entire City reside within what is broadly referred to as the Lower Santa Ana River Basin under the Water Quality Control Plan (Basin Plan) adopted by the California Regional Water Quality Control Board, Santa Ana Region (SARWQCB). The drainage area within the Lower Santa Ana River Basin and Orange County contains approximately 2.9 million residents, occupying an area of approximately 789 square miles (including unincorporated areas and the limits of 34 cities, 26 of which are within the SARWQCB's jurisdiction). Section 2 of the Basin Plan presents a brief background summary of urban runoff characteristics, the existing drainage system and watershed setting.

Storm water discharges from the urbanized areas in Orange County consist mainly of surface runoff from residential, commercial, and industrial developments. In addition, there are storm water discharges from agricultural land uses, including farming and animal operations. Discharges from various areas within the City drain directly or indirectly into urban streams, lakes, bays, wetlands, estuaries, Huntington Harbour, and the Pacific Ocean. The City owns, operates, and maintains a storm drainage system for the purpose of conveying storm runoff so as to reduce or eliminate flooding under peak storm flow conditions. The storm drainage system begins with the streets and roads, and includes inlets, storm drains, open channels, pump stations, detention basins, and other appurtenances. The system carries both dry and wet weather urban runoff and the pollutants associated with runoff from urban land use and activities.

Several major channels owned and maintained by Orange County are also located within the City. These channels receive runoff from areas within the City as well as substantial drainage areas in other upstream jurisdictions. It is estimated that runoff from the City makes up about 35-40 percent of the total dry and wet weather flows in the channels.

As urban runoff (both dry and wet weather) discharges into the urban waterways, lakes, bays, Huntington Harbour, and the Pacific Ocean, it can be a source of pollution. Extensive studies have indicated that sources such as possible exfiltration from sewers are not a contributor to high bacterial counts in coastal waters. Additional studies conducted by the City and others are continuing to identify sources and work toward the specific objective of minimizing posting and closure of coastal waters.

Over the past few years, the general public, the City Council, and staff have become increasingly aware of environmental concerns and the importance of water quality and the potential impacts from urban runoff within the City. Because clean water is essential to support human and aquatic life, and recreation and tourism are major elements of the fabric and economy of the City, impairments to the local coastal waters have a major detrimental impact on the City. At the same time, regulatory requirements are increasingly focusing on non-point source pollution impacts from a wide variety of pollutants, particularly in urban runoff from developed areas discharged from municipal storm drainage systems and industrial and construction sites.

The Citywide Urban Runoff Management Plan (CURMP) provides a broad framework for managing the quantity and quality of all urban runoff[1] that reaches receiving waters from the land surfaces and through the storm drain system within the City. The Water Quality Element of the CURMP focuses primarily on managing runoff quality, while the Drainage Element addresses flood hazards and inconveniences. The CURMP identifies potential common solutions that can address both water quality and quantity concerns.

This update provides a detailed discussion of runoff quantity and quality for the Water Quality Element (Section 3) designed to meet or exceed the following requirements of the National Pollutant Discharge and Elimination System (NPDES) Permit for the Water Quality Element of the CURMP:

- Regulatory environmental updates.
- Revisions to citywide source control programs.

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[1] The term urban runoff as used in this Plan is defined as all flows in the storm drain system under both dry and wet weather conditions. In this context, the drainage system includes yard drains, swales, streets, curbs and gutters, storm drain inlets, catch basins, underground pipes, pump stations, open channels, lakes, detention basins, storm drain outfalls, and other designated water quality features such as vegetated swales, ravines, vegetated filter areas and wetlands.

- Revisions for major projects, and applicable NPDES requirements for those developments.
- Revisions to phasing/program implementation/monitoring of program elements as necessary.
- Revisions to funding opportunities.

No updates to the CURMP beyond Section 3 and associated cost estimates for water quality projects have been completed at this time.

A summary of the hydrologic modeling and a detailed description of the drainage system capacity analysis and system improvement plan are found in the Drainage Element in Section 4.

## 1.2 Plan Development and Objectives

Recognizing the importance of managing both the quantity and quality of runoff conveyed by the storm drain system, the City adopted an integrated CURMP in 2005. The CURMP contains the Water Quality Element and Drainage Element to take advantage of information developed under both efforts and identifies integrated solutions that address both water quality and flood hazard protection goals. Figure 1-1 illustrates how the CURMP includes both the Water Quality Element and Drainage Element. Section 1.3 provides a summary of the Water Quality Element, while Section 1.4 summarizes the Drainage Element.

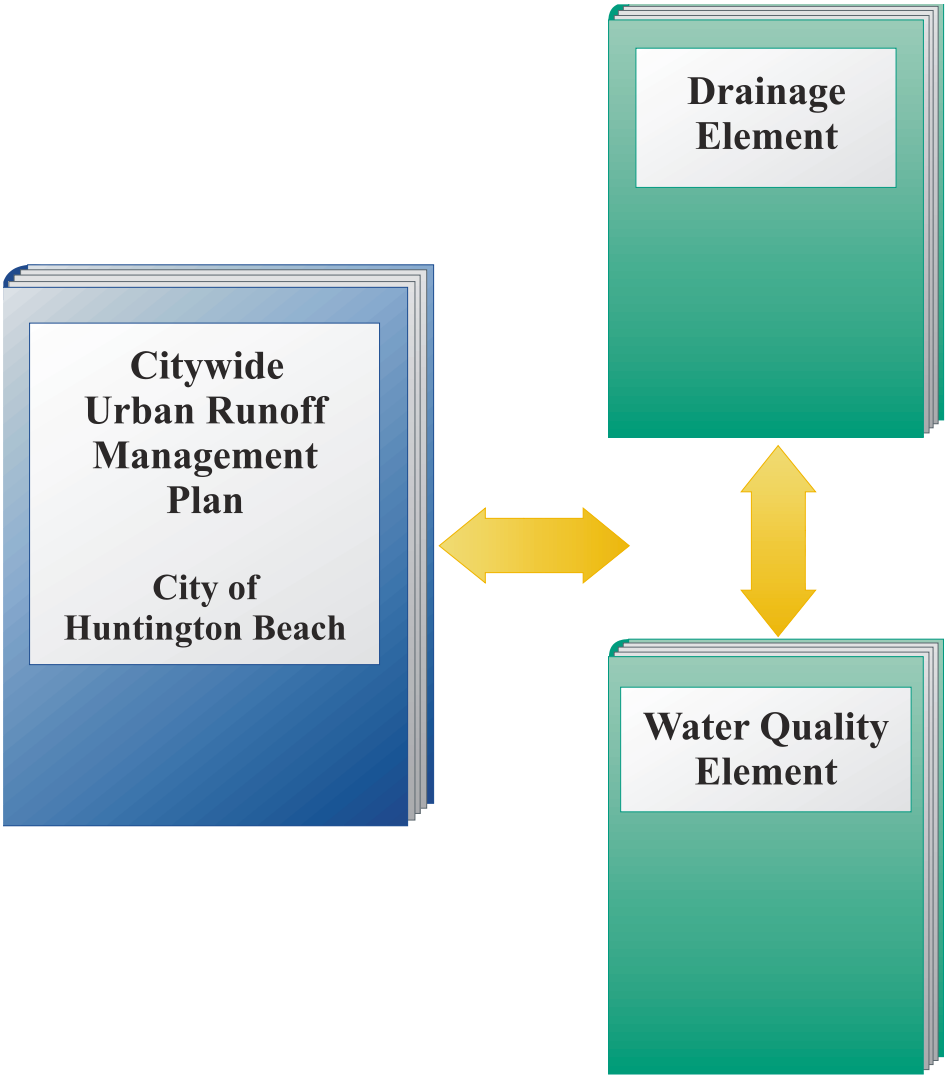



**Figure 1-1**
**Citywide Urban Runoff Management Plan**

The 2005 CURMP was developed through the cooperative efforts of City Staff, led by the Public Works Department, a consultant team, and a Focus Group that consisted of representatives from the City Council, City Staff, community and business leaders, and environmental interest groups. The Focus Group members included:

City Council

Ralph Bauer (former)
Debbie Cook (former)
Shirley Dettloff (former)
Cathy Green (former)
Dave Sullivan (former)

City Staff
Todd Broussard, Principal Civil Engineer
Steve Krieger, Civil Engineering Assistant (former)
Geraldine Lucas, Environmental Engineer (former)
David Webb, City Engineer (former)
Mary Beth Broeren, Principal Planner (former)

Community Members
Garry Brown, Orange County Coastkeeper
Richard Harlow, Public Works Commission (former)
Victor Leipzig, Orange Coast Watch
George Mason, Public Works Commission (former)

Through the efforts of the Focus Group and City's Team, the following objectives were developed for the CURMP.

The CURMP will guide the City's Storm Water Quality program to improve the quality of local coastal waters, harbors, lakes and other urban waterways in order to:

- Comply with state and federal regulations;
- Protect public health and safety;
- Protect and enhance the beneficial uses such as recreation, aesthetics, economics, and habitat value of the local aquatic systems;
- Reduce pollutants and urban runoff flows;
- Increase public awareness and education;
- Integrate water quality and drainage planning activities;
- Efficiently use resources within the City;
- Pursue grant funding; and
- Achieve improved regional approaches.

The CURMP will also guide the City's Drainage program to manage the quantity of storm runoff.

While the CURMP provides a basis for managing the runoff generated from within the City, it is also important to recognize that full protection and enhancement of the water bodies requires a comprehensive regional effort on the part of numerous other public entities, private interests, and regulatory agencies that are not under the City's jurisdiction. Urban runoff in the major urban waterways and coastal waters in Huntington Beach originates from many other upstream jurisdictions. Furthermore, pollutant discharges and receiving water impacts can result from sources other than

urban runoff. Therefore, adoption and implementation of a CURMP provides the City with a basis for proactive participation in regional solutions.

## 1.3 Water Quality Element

The Water Quality Element provides a basis for implementing a comprehensive program for improving water quality through a combination of methods to reduce the level of urban runoff and pollutants emanating from private as well as public properties and thus enhancing the quality of water discharged from the municipal storm drain system within the City. Implementation of the Water Quality Element will continue to strengthen efforts by the City to meet or exceed the requirements of the City's municipal storm water permit and the related Orange County Drainage Area Management Plan, anticipate other future regulatory requirements, and address water quality and other related environmental goals of the City and its residents, businesses, staff and City Council.

Figure 1-2 illustrates how the Water Quality Element provides the basis for implementing a comprehensive program as described in detail in Section 3 of this document.

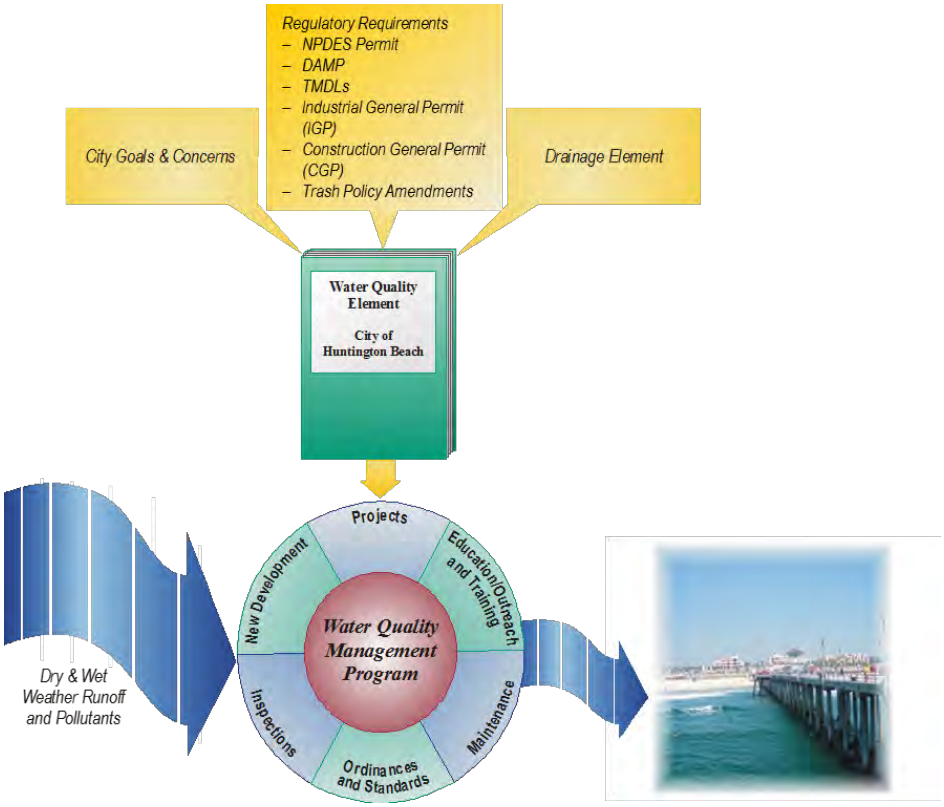



**Figure 1-2**
**Water Quality Element**

Unlike traditional water or wastewater utility services that are designed and operated to manage well-defined source waters through a single infrastructure system, urban runoff and the pollutants associated with the runoff originate from widely dispersed and highly varied sources, and wet weather runoff is extremely variable and episodic. Therefore, the Water Quality Element establishes a Program that includes a broad combination of approaches to reduce the level of urban runoff and pollutants and enhance the quality of water discharged from the municipal storm drain system within the City. These approaches have been organized in three distinct major program components:

- Citywide Source Control Programs
- Program for New Development/Significant Redevelopment
- Water Quality Planning Area-Based Programs

A brief overview of each of these three components is illustrated below in Figure 1-3 including a summary of the key elements, the participants or affected parties, and the types of "tools" needed to implement the elements. Table 1-1 presents a summary of the program components under the Water Quality Element.

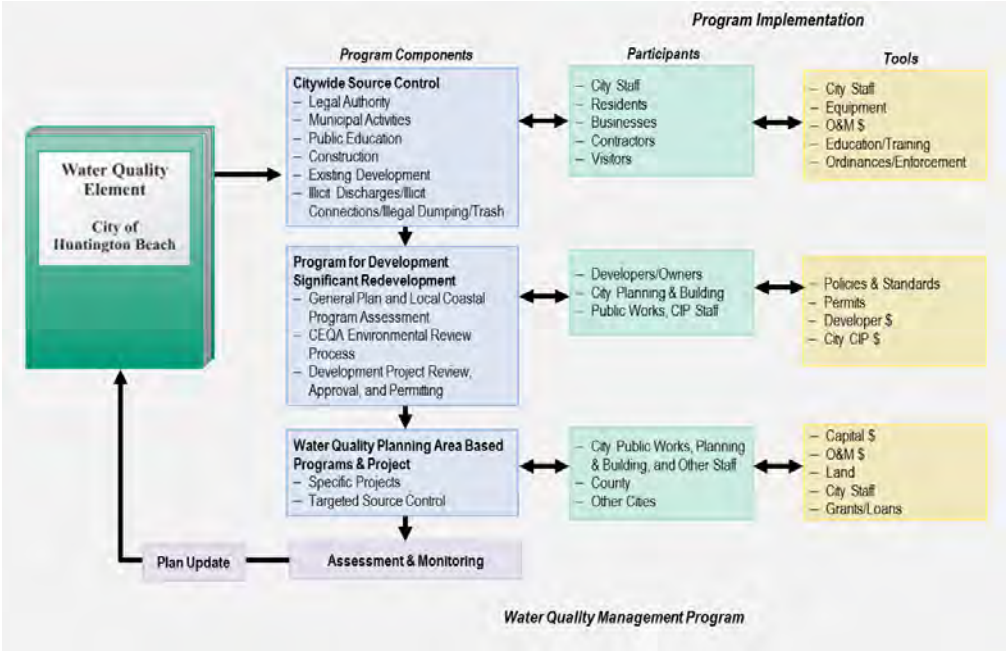



**Figure 1-3**
**Water Quality Program**

**Table 1-1**
**Summary of Water Quality Element Programs**

| **PROGRAM ELEMENTS** | Mandatory Elements | Discretionary Elements |
|---|---|---|
| Citywide Source Control Program | | |
| Legal Authority | Continue to maintain legal authority and review and update ordinances as necessary | |
| Municipal Activities | Continue procedures, activities, and training to comply with Municipal Activities Program | ■ Increased/enhanced program specific training of Citywide field program staff<br>■ Increased pump station wet well cleaning for planning areas<br>■ Increased sweeping of public parking lots and alleys and litter control<br>■ Increased program to install gross pollutant separators in high priority areas<br>■ Increased/enhanced fertilizer and pesticide management guidelines and training<br>■ Enhanced catch basin stenciling to include more permanent and discharge specific markers<br>■ Target increased maintenance in channels<br>■ Obtain additional equipment (e.g., vac truck) for maintenance activities<br>■ Target increased maintenance in high trash/debris accumulation areas |
| Public Education | Support and continue participating with other Permittees to make 10 million annual impressions on the general audience through multiple media platforms | ■ New local education programs for target groups (e.g. Landscape/Concrete Construction Contractors, boaters/boat owners, local schools)<br>■ Increased outreach programs/events<br>■ Enhanced outreach through special programs/events |
| Construction | Continue procedure, activities, and training to comply with Model Construction Program | ■ Support implementation of new BMP technology<br>■ Enhanced training of inspection staff |
| Existing Development | Continue procedures, activities, and training to comply with the Industrial and Commercial Components of the Existing Development Program | ■ Enhanced restaurant inspections/implementation of FOG (Fats, Oils & Grease) Ordinance<br>■ Consider requiring mandatory sweeping of all parking lots |
| Illicit Discharges/Illicit Connections | Continue existing detention, response, investigation, elimination and enforcement components of program | ■ Enhanced training of staff<br>■ Provide dedicated information line for public regarding ID/IC |
| Trash | Continue procedures, activities, and training to comply with the Public Education, Industrial and Commercial Components of the Municipal Program | ■ Enhanced staff training<br>■ Provide dedicated information line for public regarding trash |

**Table 1-1**
**Summary of Water Quality Element Programs**

| **PROGRAM ELEMENTS** | Mandatory Elements | Discretionary Elements |
|---|---|---|
| New Development/Significant Redevelopment Program | | |
| General Plan and Local Coastal Program Assessment | General Plan was amended to include watershed protection in the Land Use, Environmental Resources/Conservation, Circulation, Utilities and Growth Management elements | ■ Local Coastal Program NPDES enhancement<br>■ Review General Plan to ensure compliance with renewed NPDES Permits |
| CEQA Environmental Review Process | Continue to review and revise City's Project Application Form and Initial Study Checklist to identify water quality impacts | ■ Provide additional planning staff training on NPDES requirements<br>■ Update City's CEQA Procedures Handbook as necessary |
| Development Project Review, Approval & Permitting | Continue to require project-specific WQMP's, as applicable, and standard conditions of approval | ■ Incorporate water quality in the Zoning and Subdivision Ordinance, Municipal Code, and/or other planning documents, as well as public works standard drawings and specifications |
| Water Quality Planning Area-Based Program | | |
| Santa Ana River | | ■ Continue current dry weather flow diversions from pump stations to OCSD system<br>■ Evaluate opportunities to reduce dry weather flow and reduce diversions<br>■ Continue to work with OC River Park Project and incorporate water quality enhancement where feasible<br>■ Identify and construct improvements to pump stations |
| Talbert Channel | | ■ Continue existing dry weather flow diversions from pump stations to OCSD system<br>■ Support the County's Talbert Channel low flow diversion project<br>■ Evaluate opportunities to reduce/reuse dry weather flow at Bartlett Park<br>■ Continue to participate in feasibility studies and implementation of HB Wetlands Restoration Plan<br>■ Identify and construct improvements to pump stations |
| Coastal | | ■ Develop expanded education and enforcement programs<br>■ Continue dry weather flow sand infiltration practice where feasible; construct flow diversion where not feasible<br>■ Operate and maintain hydrodynamic separator (CDS) treatment units at beach outfalls<br>■ Evaluate opportunities to reduce/reuse dry weather flow<br>■ Enhanced street sweeping and alley cleaning |
| Bolsa Chica Wetlands | | ■ Continue to operate and maintain hydrodynamic separator (CDS) treatment unit at wetland outfall<br>■ Conduct feasibility study and implement recommendations to enhance natural treatment areas at Seapoint Avenue, Garfield Avenue and system at Bolsa Chica Pump Station discharges<br>■ Evaluate opportunities for water quality features in future development/redevelopment on the AERA property |

**Table 1-1**
**Summary of Water Quality Element Programs**

| **PROGRAM ELEMENTS** | Mandatory Elements | Discretionary Elements |
|---|---|---|
| Slater Channel | | ■ Optimize direction of runoff to Sully-Miller Lake for treatment and/or recharge<br>■ Operate and maintain hydrodynamic separator unit for dry weather treatment at Central Park<br>■ Optimize water quality benefits of detention area south of Sully-Miller Lake<br>■ Evaluate opportunities for water quality features in future development/redevelopment<br>■ Identify and construct improvements to Slater Pump Station<br>■ Implement and coordinate improvements in Huntington Lake drainage area |
| East Garden Grove Wintersburg Channel | | ■ Construct, operate, and maintain CDS unit (2) at Warner<br>■ Evaluate opportunities to reduce/reuse dry weather flow<br>■ Identify and construct improvements to pump stations<br>■ Coordinate with Orange County on maintenance to reduce sediment build-up in the East Garden Grove Wintersburg Channel |
| Bolsa Chica Channel | | ■ Coordinate with Orange County to clean-up and protect channel in vicinity of Marina HS<br>■ Evaluate opportunities to reduce/reuse dry weather flow in future development/redevelopment including Boeing property<br>■ Cooperate with Orange County on projects to improve/restore channels for aesthetics and treatment potential |
| Harbour Area | | ■ Continue to work with Orange County to monitor, maintain and improve trash boom collection system<br>■ Develop and implement expanded education, incentive and enforcement programs<br>■ Continue to work with Community Services to initiate better response to storm events and conducting maintenance/inspection of new vessel pump-out stations<br>■ Support a fair and equitable means to upgrade, monitor and inspect existing pump-out facilities and install new pump-out facilities at appropriate locations in Huntington Harbour<br>■ Evaluate and implement drain inlet retrofit opportunities<br>■ Continue dry weather flow diversion from Scenario Pump Station to OCSD system<br>■ Implement Memorandum of Understandings (MOUs) with HOAs, OC Sherriff and Peter's Landing for the maintenance of Marina Trash Skimmers.<br>■ Evaluate the effectiveness of the Marina Trash Skimmers and install additional through grant opportunities. |

**Table 1-1**
**Summary of Water Quality Element Programs**

| **PROGRAM ELEMENTS** | Mandatory Elements | Discretionary Elements |
|---|---|---|
| Additional Citywide Opportunities | | ■ Continue the implementation of full scale state-of-the-art irrigation controllers<br>■ Conduct feasibility study and implement recommendations for constructing trash/gross solids removal device at direct outlets to channels not described above in specific water quality areas<br>■ Continue working with OCWD on the possibility of using dry weather urban runoff for future seawater barrier injection.<br>■ Work with local school districts to incorporate retention/detention within applicable areas (e.g., soccer and baseball fields) |

### 1.3.1 Citywide Source Control Programs

This component of the Water Quality Element includes a wide variety of activities and programs whose primary purpose is to prevent the pollutants to enter the storm drain system or receiving waters through control at the source. Pollutant sources can originate from virtually all existing land uses and activities within the City and these programs generally are applicable city-wide. Source control programs may include focused or customized elements applicable to certain planning areas. Many of the source control programs are existing core elements of the City's National Pollutant Discharge Elimination System (NPDES) stormwater permit compliance program and are already being effectively implemented. Details of these source control programs are included in Section 3.2.1 of this document. Program areas include:

- Legal Authority
- Municipal Activities including:
  - Litter Control
  - Solid Waste Collection/Recycling
  - Drainage Facility Maintenance
  - Catch Basin Stenciling
  - Street Sweeping
  - Household Hazardous Waste Collection
  - Emergency Spill Response
  - Fertilizer and Pesticide Management
  - Fixed Facility Inspections
  - Field Programs
  - Sewer System Operation and Maintenance
- Public Education
- Construction
- Existing Development
  - Industrial/Commercial Program
  - Food Service Facility Program
  - Mobile Business Program
- Illicit Discharges/Illicit Connections Elimination
- Trash

The combination of these source control programs require actions and/or are effectively implemented by almost every segment of the City including residents, visitors, businesses, contractors and staff from many different City Departments.

Implementation "tools" for conducting source control programs include staff time, equipment, operation and maintenance, budget, ordinance adoptions and enforcement, and education and training.

### 1.3.2 Program for New Development/ Significant Redevelopment

New development and significant redevelopment of property and changes of land use within the City present unique challenges and opportunities relative to urban runoff quality management. Development or significant redevelopment of a property typically creates or adds impervious surface area, which results in increased runoff and increased pollutant load. Development also creates an opportunity to incorporate design features into a project based on current storm water management principles to fully mitigate the increased runoff and water quality impact of development of that property. This can be done at relatively low incremental cost compared to potentially much higher costs to construct or retrofit facilities to manage runoff from existing developed areas. Furthermore, management of new development/significant redevelopment is another core element of the City's NPDES Permit compliance program. The new development/significant redevelopment component of the Program applies to both private development projects and equivalent City capital improvement projects.

Implementation of this program component is primarily the responsibility of property owners/developers and the City staff that oversee the planning and construction permit programs, as well as City Departments that undertake major new capital projects.

Successful execution of the program requires tools that include general plan policies and CEQA review guidelines, development standards, permit requirements and enforcement, and incremental project cost additions borne by developers or City capital improvement programs/projects. In addition, certain storm water measures that would be constructed with new projects will have long-term operation and maintenance requirements. Details of the new development/significant redevelopment program are included in Section 3.2.2 of this document.

### 1.3.3 Water Quality Planning Area-Based Programs

This category includes structural measures or localized source control programs that are targeted in one particular drainage area that will reduce runoff and/or provide enhanced water quality benefits beyond what can be achieved through

implementation of the typical citywide measures implemented to meet NPDES Permit requirements. Many of these are "opportunistic" projects that take advantage of available land or natural features, potentially serve dual benefits, or have already been identified and are under study as possible programs.

City staff will generally implement watershed programs and projects, although some may be more appropriately implemented as a regional program jointly with the County of Orange and/or other upstream cities or agencies.

Specific projects or programs will typically require capital and/or operation and maintenance funding with potential for grant and loan funding, City staff time for implementation, and significant land for construction that would be either City-owned land or be acquired from private ownership. Details of the water quality planning area-based programs are included in Section 3.2.3 of this document.

### 1.3.4 Program Implementation

Section 3.2.1 through Section 3.2.3 of this document identifies a comprehensive set of elements to be included in a long-range Water Quality Management Program for the City. Many of the elements require additional planning, study and substantial funding of capital or operating costs that are not currently budgeted. Therefore, phasing program elements is important to provide direction for resource commitment and scheduling of implementation steps. Phasing program elements (including criteria and categories used in determining phasing) are described in Section 3.3. Section 3.4 presents an implementation schedule, a summary table of all of the plan elements and respective priorities, estimated cost associated with plan elements, a listing of possible funding options, a summary of potential ordinance and policy development needs, a framework for program monitoring and assessment, and an organizational plan of responsibilities for maintaining and implementing the components of the CURMP. Potential costs and funding associated with implementation of the various elements is discussed in Section 3.5

Implementation of some of the program elements depends upon adoption of new or revised City policies, standards, and ordinances. Section 3.4.1 described the key items to be reviewed and revised as necessary to support program implementation and preliminary target dates for action.

### 1.3.5 Monitoring and Program Assessment

The Water Quality Element includes a plan to provide monitoring and program assessment that can be used to periodically review and update this plan. Monitoring can take a number of forms from actual field water quality monitoring to gathering and assessing program performance data so as to verify planning assumptions with actual observations. The framework for monitoring is described in Section 3.4.2 and includes five principal components:

- Program implementation assessment
- NPDES Permit required monitoring and reporting
- BMP effectiveness evaluations
- Water quality monitoring
- Information management using GIS

### 1.3.6 Responsibilities

The City Council holds the overall responsibility for adopting the CURMP and overseeing the implementation of the Program elements. However, implementation of the Program also requires active involvement by most City Departments, as discussed in Section 3.6. While program responsibilities are distributed throughout the City organization, the Public Works Department has the responsibility to maintain, review, and update the CURMP and Program elements, training and report annually to City Council and coordinate implementation of the Plan with other City Departments. Public Works also coordinates compliance and reporting activities under the NPDES Permit and Drainage Area Management Plan, as well as those activities with other City Departments. The Public Works Commission acts as liaison between the City Council and City Administration and staff on the water quality program.

## 1.4 Drainage Element

The 2015 CURMP Update  does not include revisions to the Drainage Element, which was last updated in 2005. The Drainage Element addresses flood hazards and inconveniences. The Master Plan of Drainage (MPD) is a comprehensive drainage study of the watersheds within the City which identifies and creates an inventory of existing storm drain facilities, identifies those areas where system elements do not meet the latest goals established by the City, ranks and prepares planning level cost opinions for system upgrades, and recommends an inventory of system improvements through which to initiate the corrections. The City can then implement the individual drainage projects within its budgetary, political and discretionary restraints.

A community's watershed area is defined as the total land area contributing non-absorbed, excess rainfall (or runoff) to the community and its flood control facilities. For hydrologic modeling purposes, the City was divided into 5 distinct regions, or sub-drainage areas, based upon topographic and computer modeling features. These regions were further subdivided into watershed areas numbered 1-27, 29-32, 40, and 41 as shown on the Drainage Maps (Appendix C). The regions (see Section 4 for a detailed description of the regions) correspond with one or more Water Quality Planning areas described in Section 3.

In order to analyze the City's drainage system, hydrologic and hydraulic analyses were performed. The hydrologic analysis determined the peak flow to which each element in the system will be subjected under a particular design storm. The hydrologic analysis was performed using the Advanced Engineering Software program Stormwater Information Management System (SIMS), a software program which estimates runoff from small subareas, then integrates and routes the flows throughout the system. Hydrology was developed for multiple design storms to allow assessment of the existing system for different levels of flood protection.

The hydraulic analysis assesses the conveyance capacity of the existing system (streets, pipes, and box structures) to drain the runoff determined during the hydrologic analyses. A 'balanced' Hydraulic Grade Line (HGL) analysis was used to determine the conveyance capacity of each element in the system, and the factors needed to upgrade particular system elements were identified by comparing the existing capacity of an element with the peak flow rate determined for that element in the hydrologic analysis. Mitigation elements or improvements needed to meet the goals were also sized using the 'balanced' HGL analysis for inclusion in a program of system improvements.

A detailed description of development of the hydrologic model and assumptions used (such as existing facilities, soil characteristics, land use, data collected, etc.) for a variety of drainage schemes can be found in Section 4.2 and Section 4.3. The methodology and components of the conveyance capacity analyses prepared for the MPD is detailed in Section 4.4.

The hydrologic and hydraulic analyses resulted in identification of system recommended improvements for all reaches in the drainage system needed to fully meet all of the City target goals for flood protection. The inventory of improvements serves as a tool to facilitate future project planning, annual budgeting, multi-year capital improvement program preparation, and preparation of grants applications. Section 4.5 describes the procedures and assumptions that were followed in preparing the listing of upgrade target correction improvement projects.

In summary, based on the modeling results, there are approximately 46 miles of a total of 131 miles of mainline storm drain facilities that are targeted for improvement through replacement or parallel systems, and an additional 39 miles of potential new systems in locations where storm drain systems currently do not exist. Section 4.5 presents a listing of the upgrade target improvement projects developed from the system-wide computerized modeling effort. These improvements are also graphically depicted in the Drainage Maps (Appendix C). The quantitative listing of projects in Section 4.5 serves as an inventory list of candidate improvements. This list can serve as a starting point for further analysis by City staff and formulation of proposed projects for annual budgeting and programming purposes based on such considerations as:

- Downstream reaches may take precedence over upstream ones, since upstream improvements may require adequate downstream capacity.
- Main storm drain lines, which are collectors for multiple tributary reaches, should be considered for higher priority over more localized systems.
- Developed land use areas should be considered for protection prior to undeveloped areas.
- Storm drain improvements should be considered for coordination with other capital projects in the same area. This condition would be especially prevalent in the case of street reconstruction projects.
- Integration of related links comprised of high benefit as well as lower benefit links should be considered in order to complete the system improvements in a localized area.

## 1.5 Program Costs and Funding

This CURMP's implementation is dependent on costs and funding of programs and projects.

### 1.5.1 Program Costs

**WATER QUALITY ELEMENT**

Implementation of the various water quality program elements will require a number of resource commitments including capital funding, staff efforts, and operation and maintenance costs. The City currently commits significant funding toward implementation of the existing Drainage Area Management Plan program implementation and other water quality related activities. Planning level capital costs and/or additional operation and maintenance costs were estimated and updated for many of the additional proposed program elements based on the information developed under the CURMP, while others will require additional information and investigations before the potential projects or programs can be defined sufficiently to develop cost estimates. In addition, most of the proposed program elements will require some level of additional staff time, including initial efforts, and in many cases, continuing efforts. General target levels of potential staffing have been estimated recognizing that these can vary greatly depending upon how responsibilities are assigned, and integrated with other staff activities, as well as the timing and scheduling of the efforts.

In Section 3.5, estimates of capital costs, operation and maintenance costs and staffing requirements for all of the potential additional water quality program elements are presented. A total of $15,816,000 is estimated for potential capital costs for identifiable

water quality programs and projects, including estimates of full purchase cost of land where BMP opportunities have been identified on privately-owned sites. In addition, a total of $656,000 in additional operation and maintenance costs, and approximately 4.7 person-years have been estimated for the implementation and on-going support of these additional efforts. These estimates are in addition to the existing estimated budget for all NPDES and Drainage Area Management Plan related activities by the City as given in the City's November 2004 Fiscal Analysis Report under the Drainage Area Management Plan for projected FY 04/05 costs of $915,000 in capital costs and $5,761,900 in operation and maintenance costs (which includes $2,000,000 for operation of the Materials Recovery Facility).

**DRAINAGE ELEMENT**

Section 4.5 presents an estimate of the capital costs of the drainage system improvements described above based on unit cost opinions applied to each of the upgrade target improvement projects. In summary, the estimated cost (in 2004 dollars) of upgrading and improving these facilities to meet City drainage standards including upgrading existing "half-rounds" is approximately $209 million and to meet 100-year storm event requirements is only $120 million. The estimated cost for pump station rehabilitation and replacement, based on the Integrated Infrastructure Management Program Committee Report adopted in 1997, adjusted for completed upgrades and inflation, is $32.5 million. The combined estimated cost for upgrades and improvements to the City's drainage system and pump stations is approximately $241.5 million.

## 1.5.2 Funding

While the City has allocated a great deal of resources to building and maintaining its infrastructure, many maintenance issues remain deferred while the City finds new ways to fund or allocate resources to deal with these issues. Approximately 15.2 percent of General Fund revenues go toward maintenance, rehabilitation, and the building of all City infrastructure. Special funds, such as the Water and Sewer funds, contribute over $30 million toward infrastructure maintenance and rehabilitation. Additionally, the FOG (Fats, Oils & Grease) Ordinance is expected to bring in approximately $70,000 a year in new revenue. Section 3.5 of this Plan summarizes the funding issues related to the CURMP.

To fund new capital projects and increased operation and maintenance costs associated with both mandatory and discretionary water quality and drainage program elements sources of funding in addition to General Funds may be necessary. Potential additional sources include:

- Fees
  - Storm Water Utility Fee - fee based on stormwater and pollutant discharge using impervious area and pollutant loading factors to determine the fee. As required by Proposition 218, any utility fee may require a 2/3 majority vote of City residents.
  - Redevelopment Fee - fee equivalent to the drainage fee for new development tied into certain redevelopment activities.
- Grants and Loans
  - Integrated Waste Management Grant Program
  - State and Federal Grants and loans including:
    - Congressionally-directed Federal Grants
    - State legislative bills
    - Proposition 40 funding
    - Proposition 50 funding
    - Proposition 1 funding
    - Cal-fed funding
    - State revolving loan fund
    - Coastal Non-Point Source Control Program (under Proposition 13 funding)
    - Wetlands Recovery Projects Program
    - Boating and waterway grants for harbor projects
- Increased program funding from Adopt – A – Waterway Program
- Cost sharing arrangements with other agencies for regional/joint projects

With the exception of project-specific grants or loans, securing funding should be considered on a city-wide basis versus funding for discrete zones. Improved water quality and drainage capacity can have a positive impact at the beaches, Huntington Harbour, and lakes which provide benefits to all residents and businesses in Huntington Beach. In addition, many of the improvements are synergistic in their benefits to the City. Improvements in downstream drainage systems improve the service to the surrounding customers as well as upstream customers. Implementation of regional water quality projects can enhance drainage system capacity as well as improve water quality. A number of the water quality practices recommended herein can have a positive impact on drainage management requirements. For instance, reducing impervious surfaces and providing increased opportunities for storm water infiltration in new or existing developments could reduce the need for increased storm water carrying capacity in the drainage system.

# Section 2
# General Background

As urban runoff (both dry and wet weather) discharges into the urban waterways, lakes, bays, and the ocean, it can be a source of pollution. Prior to the development and adoption of this 2015 Citywide Urban Runoff Management Plan (CURMP) update, the City of Huntington Beach (City) has already taken many proactive steps for controlling runoff quality and quantity. Examples of such steps include:

- Eleven dry weather runoff diversion permits with Orange County Sanitation District received for the Santa Ana River, Talbert, Huntington Beach and East Garden Grove Wintersburg channel areas to minimize any impact of dry weather runoff on coastal water quality.
- Source and treatment control BMPs incorporated in new development and significant redevelopment projects.
- Implementing a number of source control measures and public education programs that meet or exceed requirements of the NPDES stormwater permit.
- Grant funding received for water quality control programs including the installation of treatment systems at a number of storm drain outfalls, catch basins, and drainage system maintenance and cleaning.
- Rebuilt the Meredith storm drain pump station to increase the output of the station by 75,000 gpm, or almost 80 percent. Project cost was $2,600,000.
- Constructed Continuous Deflective Separators and low flow bypasses at eight outfalls and other locations within the city.

Extensive studies have indicated that sources such as possible exfiltration from sewers are not a contributor to recent high bacterial counts in the City's coastal waters. Additional studies conducted by the City and others are continuing to identify possible sources and work toward specific solutions for minimizing posting and closure of coastal waters.

The CURMP will provide a broad framework for managing the quantity and quality of all urban runoff that reaches receiving waters from the land surfaces and through the storm drain system within the City. The Water Quality Element focuses primarily on managing runoff quality, while the Drainage Element addresses flood hazard reduction. The CURMP also identifies potential common solutions that can address both water quality and quantity concerns.

## 2.1 Urban Runoff Overview

The term urban runoff as used in this Plan is defined as all flows in the storm drain system under both dry and wet weather conditions. In this context, the drainage system includes swales, streets, curbs and gutters, storm drain inlets, catch basins, underground pipes, pump stations, open channels, lakes, detention basins, storm drain outfalls, and other designated water quality features such as vegetated swales, ravines, vegetated filter areas and wetlands. For management purposes, urban runoff has been divided into three categories summarized as follows:

- ***Dry weather urban runoff*** occurs throughout the year when there is no precipitation-generated runoff. Typical sources include landscape irrigation runoff; driveway and sidewalk washing; non-commercial vehicle washing; groundwater seepage; fire flow; potable water line operations and maintenance discharges; and permitted or illegal non-storm water discharges. Dry weather runoff is principally a water quality concern. It can be a significant source of bacteria and other constituents that can be introduced through day-to-day urban activities as well as illicit discharges, dumping, or spills. Flow quantities can represent a substantial year-round volume of water discharged with associated pollutants. Furthermore, dry weather runoff quantity is an important factor that influences the ability to implement control measures such as diversion to the sanitary sewer, treatment and discharge, or reuse. Dry weather flow quantities are estimated from monitoring data and cannot be predicted using normal hydrologic projections. Drainage system capacity and condition are typically not a concern for conveying dry weather flows.

- ***Small storm runoff*** is typically the source of a high percentage of both overall wet weather runoff volume and pollutant loads on an average annual basis. Typical design storm events used as targets for water quality management strategies are typically less than the volume generated from a one-year frequency storm event, or 10 percent of the peak flow rate of a 50-year peak storm event. Water quality design storms are not those that produce significant flooding potential or cause drainage system capacity deficiencies. However, planning and design of any water quality measures or Best Management Practices (BMPs) should effectively target the removal of pollutants during the more frequent small storm events as well as safely convey the peak flows.

- ***Large storm peak runoff*** is of greatest concern for drainage system capacity analysis. It is not typically considered in water quality management except where natural or unlined channels have the potential for erosion under peak flows or increasing flows resulting from development; or where flood flows can cause the release of pollutants into the drainage system such as from surcharging sanitary sewer facilities.

For a detailed discussion of dry weather and low flow runoff quantity and quality, refer to Section 3. The detailed discussion of peak storm flows is presented in Section 4.

## 2.2 Existing Drainage System Overview

The City is approximately 28.2 square miles in area and located adjacent to the Pacific Ocean within a heavily urbanized region of Orange County, California. Bordering cities include Seal Beach, Westminster, Fountain Valley, Newport Beach, Costa Mesa, and a portion of unincorporated Orange County. Storm water discharges from the urbanized areas in Orange County consist mainly of surface runoff from residential, commercial, and industrial developments. In addition, there are storm water discharges from agricultural land uses, including farming and animal operations. Discharges from various areas within the City drain directly or indirectly into County flood control channels, urban streams, lakes, bays, wetlands, estuaries, harbor, and the Pacific Ocean.

From a water quality planning context, the northern portion of the county and the entire City reside within what is broadly referred to as the Lower Santa Ana River Basin under the Water Quality Control Plan (Basin Plan) adopted by the California Regional Water Quality Control Board, Santa Ana Region (SARWQCB). The drainage area within the Lower Santa Ana River Basin and Orange County contains approximately 2.9 million residents, occupying an area of approximately 789 square miles.

The City resides within the following three regional watersheds as designated by the Orange County Public Facilities and Resource Department Watershed and Coastal Resources Division and shown in Figure 2-1:

- Lower Santa Ana River Watershed
- Talbert/Greenville Banning Channel Watershed
- Westminster Watershed

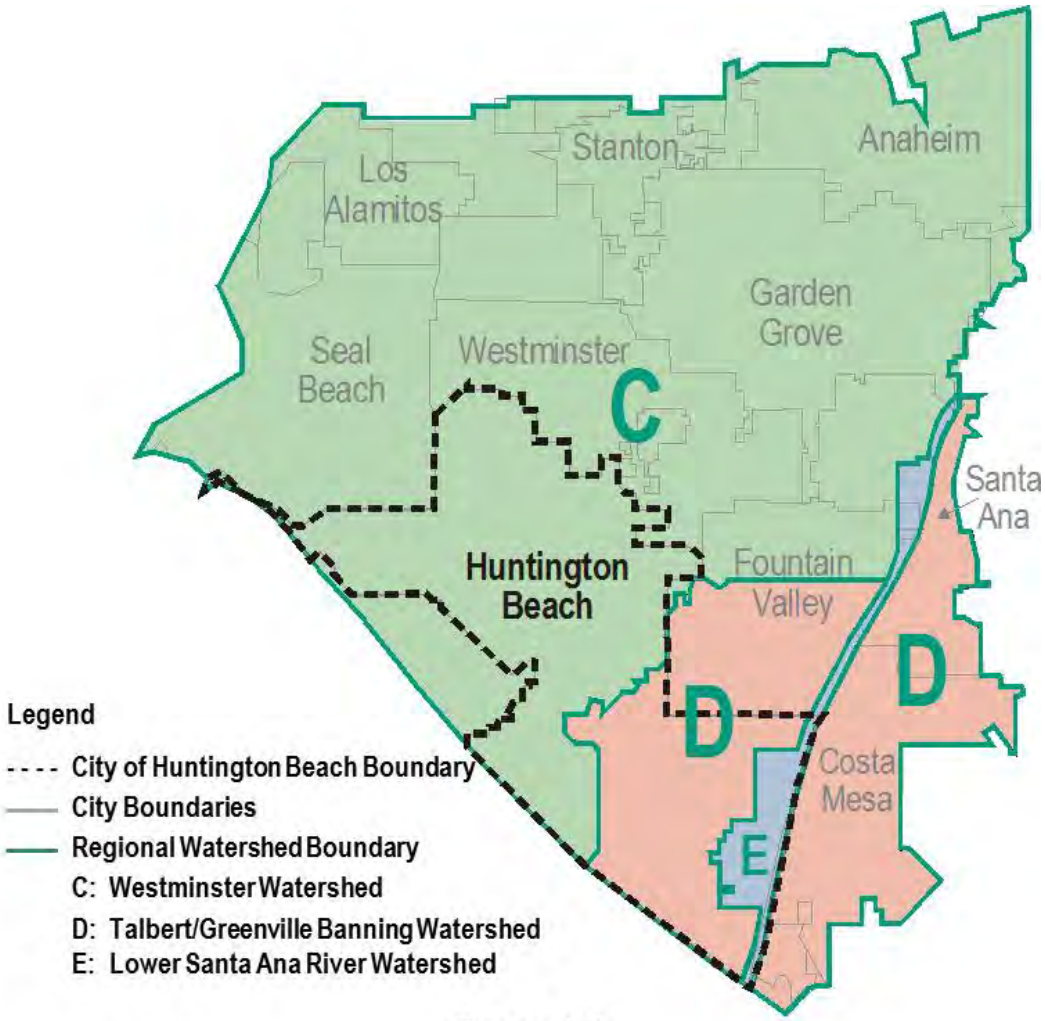



**Figure 2-1**
**Regional Watershed Map**

The Santa Ana River begins approximately 75 miles away in the San Bernardino Mountains before crossing Orange County then ultimately emptying into the Pacific Ocean adjacent to the City as shown in Figure 2-2. A small portion (slightly over one square mile) of the City drains directly to the Santa Ana River. By contrast, the overall Santa Ana River watershed collects surface flows from approximately 1,675 square miles and can therefore have substantial influence on the local coastal waters. The Orange County portion of the Santa Ana River watershed includes portions of other cities such as Anaheim, Brea, Costa Mesa, Garden Grove, Fountain Valley, Orange, Placentia, Santa Ana, Villa Park, and Yorba Linda.

**Figure 2-2**
**Santa Ana River Watershed**

The Talbert/Greenville Banning Watershed covers 21.4 square miles and straddles the mouth of the Santa Ana River. Two main tributaries drain this watershed. On the western side, the Talbert Channel and Huntington Beach Channel drain through the Talbert Marsh prior to emptying into the Pacific Ocean. On the eastern side of the watershed, the Greenville-Banning Channel empties into the Santa Ana River.

The Westminster Watershed covers 74.1 square miles in the southwestern corner of Orange County. Three main tributaries drain this watershed. The Los Alamitos Channel drains into the San Gabriel River while the Bolsa Chica Channel and Westminster Channel empty into Huntington Harbour and then to Anaheim Bay. The East Garden Grove Wintersburg Channel and Slater Channel drain past the Bolsa Chica Wetlands and then into Huntington Harbour.

Topography within the City ranges from just below sea level to over 100 feet mean sea level with surface water flows ultimately discharging to the Pacific Ocean. The most prominent topographical features within the City are the Huntington and Bolsa Chica Mesas. The Bolsa Chica Mesa is located near the coast at the western end of the City, north of the East Garden Grove Wintersburg Channel and south and east of

Huntington Harbour. The maximum elevation of the Bolsa Chica Mesa is approximately 65 feet mean sea level. The Huntington Mesa extends northeasterly inland from the coast through the central portion of the City. Elevations on the Huntington Mesa exceed 100 feet mean sea level. The areas surrounding the mesas within the City have surface elevations ranging from below sea level to over 25 feet mean sea level.

Drainage from within the City is conveyed through streets and gutters to a City storm drain system consisting of underground pipes, pump stations, and open channels as well as several Orange County channels. For water quality planning purposes, drainage areas within the City have been consolidated into 8 planning areas as shown in Table 2-1 and Figure 3-7 in Section 3. The planning area names are based on the water body or other surface features to which they discharge. For a detailed discussion of the drainage program, refer to Section 4.

**Table 2-1**
**City of Huntington Beach Water Quality Planning Areas**

| Water Quality Planning Areas | Approximate Drainage Area (Miles) | Discharge Point | Regional Watershed |
|---|---|---|---|
| Santa Ana River | 1.2 | Santa Ana River | Santa Ana River |
| Talbert Channel | 7.3 | Talbert Marsh | Lower Santa Ana River |
| Coastal | 1.2 | Huntington City Beach | Westminster |
| Bolsa Chica Wetlands | 1.5 | Bolsa Chica Wetlands | Westminster |
| Slater Channel | 3.9 | Huntington Harbour | Westminster |
| East Garden Grove Wintersburg Channel | 5.3 | Huntington Harbour | Westminster |
| Harbor | 4.5 | Huntington Harbour | Westminster |
| Bolsa Chica Channel | 2.5 | Mouth of Huntington Harbour, Anaheim Bay | Westminster |
| Total | 27.4 | | |

An overview of each planning area is presented below:

- **Santa Ana River Planning Area**–Approximately 1.2 square miles of Huntington Beach drains to the Santa Ana River. Surface flows observed in the Santa Ana River are intermittent or are the result of storm water runoff immediately following a precipitation event or dry weather discharges. Most base flow in the River is captured for recharge well upstream of the City. Two storm water pump stations collect surface flows from within the City and discharge the water to the River. Currently, all dry weather flow within this area is diverted at the pump stations to the sanitary sewer system. Predominant land use in this planning area is single family residential with some multi-family residential and commercial areas as well.

- **Talbert Channel Planning Area –** The Talbert Marsh is a wetland roughly paralleling the inland side of Pacific Coast Highway. The marsh receives surface flows from the Huntington Beach Channel and the Talbert Channel. Flow from the adjacent city of Fountain Valley contributes to Talbert Channel through the East Valley Fountain Valley Channel, which is a tributary to the Talbert Channel. This watershed drains an approximate 7.3 square mile area and contains eight storm water pump stations (Seven City-operated/ One Orange County-operated) that collects the runoff and conveys it into the two channels. Currently, all dry weather flow collected at these pump stations is diverted to the sanitary sewer system. The predominant land uses in this planning area are single- and multi-family residential and commercial business.

- **Coastal Planning Area –** This planning area has a drainage area of approximately 1.2 square miles, which is entirely within the City and does not contain any City or county channels. The area consists of several smaller storm drains that discharge onto the beach with wet weather runoff flowing to the Pacific Ocean. Predominant land use in this planning area is multi-family residential and commercial businesses.

- **Bolsa Chica Wetlands Planning Area –** This planning area has a drainage area of approximately 1.5 square miles, which is entirely within the City and does not contain any channels. The area consists of local storm drains from the Seacliff area and one pump station that discharges through a natural channel and a fresh water pond system to the Bolsa Chica Wetlands. Land use in this planning area is predominantly newer single family residential developments and multi-family residential areas

- **Slater Channel Planning Area –** This planning area is located within the western portion of Huntington Central Park and surface runoff drains towards Huntington Lake,

which has a drainage area of approximately 3.9 square miles. The Slater Channel Planning Area lies wholly within the city and does not receive flow from other jurisdictions. A large portion of surface runoff within this planning watershed flows through Talbert and Huntington Lakes or to Sully-Miller Lake. Sully-Miller Lake is a former quarry that has a permanent pool of water and no outlet. It receives runoff from a drainage area primarily to the south of approximately 600 acres. Runoff that reaches the quarry either infiltrates or evaporates, so the system provides water quality improvements to essentially all runoff that is discharged to the quarry. In addition, a large detention basin located upstream of the quarry on the south side of Ellis Avenue in Baca Park provides water quality enhancement prior to discharge to the quarry. Sully-Miller Lake typically holds water throughout the year while Talbert Lake generally does not. This Central Park lake system is an integral part of the City's drainage infrastructure acting as retention. The lakes are also significant from a water quality standpoint as Talbert and Huntington Lakes act as terminal lakes (no surface water exit) under small to moderate storm events and Sully-Miller Lake has no discharge except through groundwater recharge. During moderate to large storm events, stormwater discharges from Huntington and Talbert Lakes into Slater Channel. At the Slater pump station, the discharges are then pumped into East Garden Grove Wintersburg Channel. The predominant land uses within this planning area include a mixture of single and multi-family residential, parks, commercial, and industrial areas.

- **East Garden Grove Wintersburg Channel Planning Area –** This planning area has a drainage area of approximately 5.3 square miles, which receives upstream flow from the East Garden Grove Channel, Murdy Channel, Ocean View Channel, and Slater Channel. East Garden Grove Channel collects upstream flow from the cities of Westminster, Santa Ana, Garden Grove, Orange, and Anaheim. The Ocean View Channel collects upstream flow from the city of Fountain Valley. Within the City itself, these channels join to form the East Garden Grove Wintersburg Channel. Further downstream, Slater Channel enters into East Garden Grove Wintersburg Channel, which then discharges into the Outer Bolsa Bay and then into Huntington Harbour, Anaheim Bay, and the Pacific Ocean. Surface waters in the Outer Bolsa Bay, Huntington Harbour, and Anaheim Bays are all under tidal influence. The predominant land uses for this planning area are a mixture of single and multi-family residential, commercial, and industrial areas.

- **Huntington Harbour Planning Area –** This planning area has a drainage area of approximately 4.5 square miles, which includes surface flows discharged from within the City via a network of smaller storm drains within the areas immediately adjacent to the Harbour and from a relatively small area to the east. Predominant land use areas within this planning area include single and multi-family residential and commercial areas. Huntington Harbour also receives substantial flows from the East Garden Grove Wintersburg Channel, Westminster Channel, Sunset Channel, and Bolsa Chica Channel.

- **Bolsa Chica Channel Planning Area –** Surface flows from the northwestern portion of the City discharge to the Anaheim Barber City Channel, the Bolsa Chica Channel, Sunset Channel, and the Westminster Channel. These channels define the western boundary of the City and receive flow from upstream cities except for Sunset Channel. The Anaheim Barber City Channel receives surface flows from the cities of Westminster, Garden Grove, Stanton, and Anaheim and joins the Bolsa Chica Channel at Bolsa Chica Road between Bolsa Avenue and Westminster Boulevard. The Bolsa Chica Channel has a drainage area of approximately 2.5 square miles, which receives surface flows from the Seal Beach Naval Weapons Station, Westminster, Seal Beach, Garden Grove, the Armed Forces Reserve Center (Los Alamitos), Cypress, and Stanton. These combined surface flows then eventually discharge at the mouth of Huntington Harbour and then into Anaheim Bay. The predominant land uses in this planning area are commercial, industrial, and single-family residential areas.

# Section 3
# Water Quality Element

## 3.1 Water Quality Setting

For runoff management planning, it is important to develop estimates of runoff quantities that need to be managed and understand the water quality of dry and wet weather runoff. Detailed estimates of runoff peak flows and volumes were developed under the Drainage Element (Section 4) of the Citywide Urban Runoff Management Plan (CURMP). Estimates of overall runoff volumes were derived for this Water Quality Element, and general characterization of runoff quality was derived from regional water monitoring programs and a dry weather sampling program conducted during the development of the CURMP.

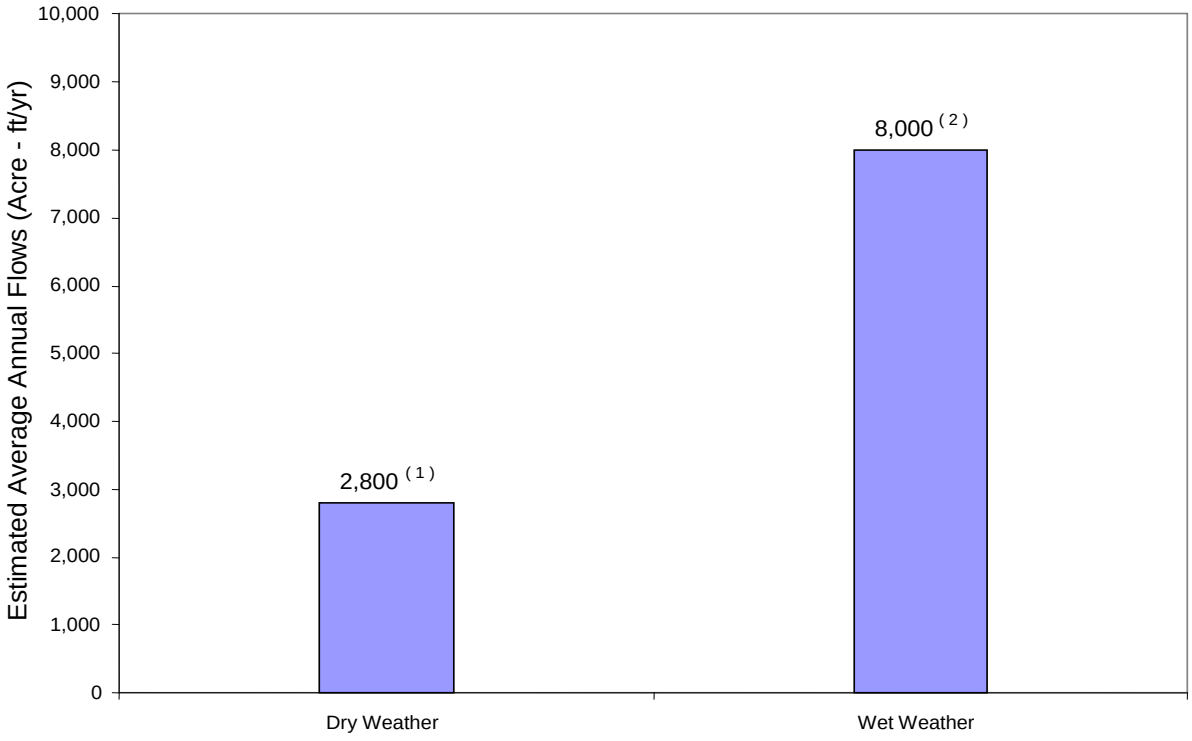
### 3.1.1 Runoff Quantity

To help understand and illustrate the relative quantity of annual runoff within the City of Huntington Beach (City), Figure 3-1 Estimated Average Annual Flows, compares the estimated annual runoff volumes (acre-feet) within the City from both dry and wet weather runoff.

Using a combination of dry weather monitoring data collected from several channel sites during the development of the Water Quality Element (Appendix A), previous analysis by the City of dry weather pump station operating data, and data compiled from other similar jurisdictions, an average dry weather flow factor of approximately 150 gallons per day (gpd) per acre was established for planning purposes. Using this factor the annual dry weather runoff from the roughly 28.2 square miles of drainage area within the City is approximately 2,800 acre-feet.

Based on an 11-inch average annual rainfall and typical runoff coefficients for a mixed, relatively urbanized watershed, total long term average annual wet weather runoff from the same City drainage areas is estimated to be approximately 8,000 acre-feet. The amount of runoff varies annually depending upon seasonal rainfall patterns.

Figure 3-1 illustrates how dry weather runoff, often perceived as isolated and inconsequential nuisance flows, actually can contribute as much as one-third of total annual wet weather runoff, on an annual basis.

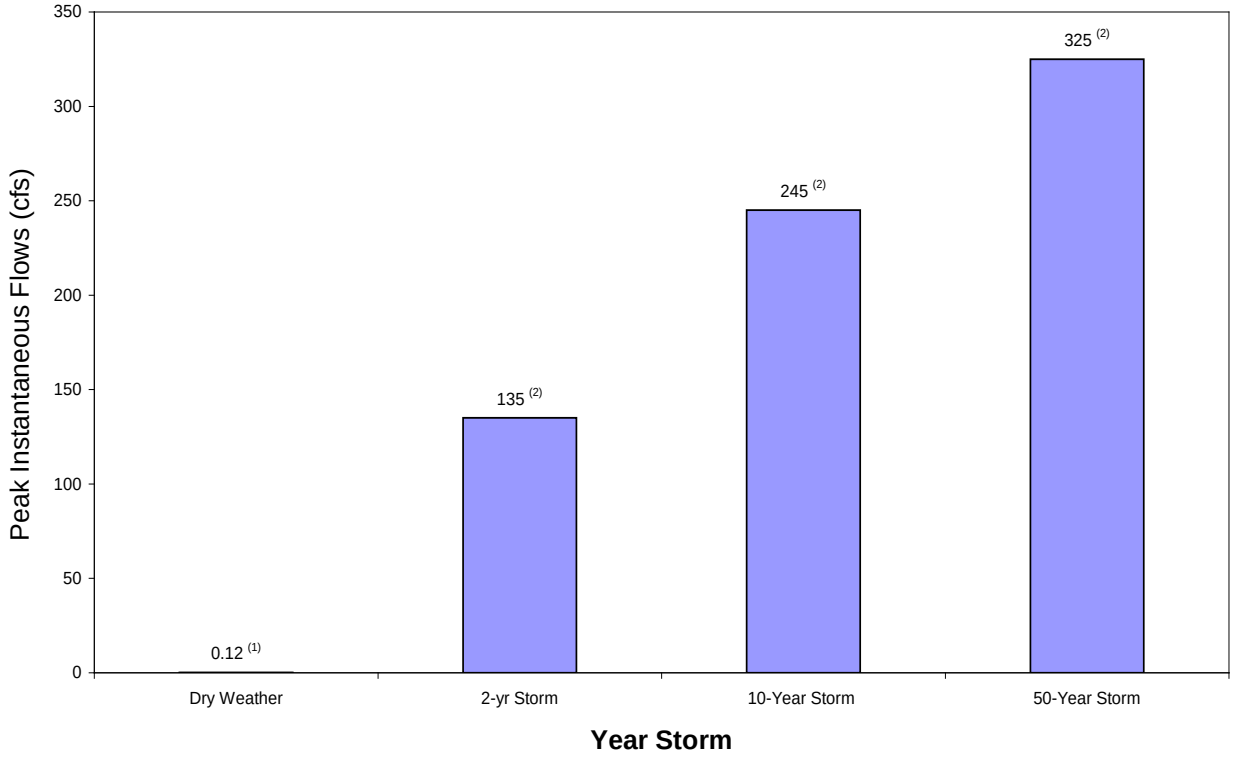



(1) Based on 150 gal/day/acre
(2) Based on 11" annual rainfall and 0.5 runoff coefficient

**Figure 3-1**
**Estimated Average Annual Flows, acre-ft/yr**

Dry and wet weather runoff may also be compared on the basis of peak instantaneous flows. Based upon historical rainfall data in Orange County and assuming a 500-acre drainage area for comparative purposes, peak instantaneous wet weather flows can be calculated for a 2-year storm, 10-year, and 50-year storm. Figure 3-2 shows that there are orders of magnitude differences in flow magnitudes between dry weather and wet weather runoff. While dry weather flow does not have a significant peak value, it remains an important design concern because it contributes a substantial percentage of total annual volume to the drainage system and receiving waters.

Because a number of the County flood control channels (e.g., Talbert, East Garden Grove Wintersburg, Westminster, Anaheim-Barber, Ocean View, East Valley – Fountain Valley, Bolsa Chica) that accept runoff from the City also drain a number of other cities in North Orange County, there is substantially more flow in these channels than just that which originates only within Huntington Beach. Based on analyzing dry weather flow monitoring results and comparing tributary areas within and outside of the City, it is estimated that the runoff from Huntington Beach represents about 35-40 percent of all dry and wet weather flow discharged to the receiving waters through these watersheds (excluding the Santa Ana River).




(1) Based on 150 gal/day/acre
(2) Source of rainfall intensity data: Orange County Hydrology Manual

**Figure 3-2**
**Peak Instantaneous Flows, cfs**

### 3.1.2 Runoff Quality Monitoring

There are pollutants of concern in both dry and wet weather runoff. A countywide monitoring program is conducted on behalf of the Orange County Stormwater Permittees by the County (Principal Permittee). The City participates financially through the annual cost-share agreement with the County ID/IC investigations for exceedances. The County monitoring program consists of the following monitoring programs:

- MASS EMISSIONS MONITORING:

  The purpose of mass emission monitoring is to identify pollutant loads to the ocean and identify long-term trends in pollutant concentrations. Currently the County monitors 11 mass emissions stations as described in the Local Implementation Plan (LIP). Samples are collected from the first storm event and two more storm events during the rainy season. A minimum of three dry-weather samples are also collected.

- ESTUARY/WETLANDS MONITORING:

  The County monitors 20 sites in Upper Newport estuary, Talbert Marsh, and Bolsa Chica wetlands areas as described in the LIP. This monitoring enables the determination of storm water and non-storm water effects on sediment chemistry, toxicity, benthic communities, nutrient status, and spatial extent of sediment fate within the estuarine environment.

- BACTERIOLOGICAL/PATHOGEN MONITORING:

  The County currently monitors nine representative areas, as described in the LIP, along the Orange County coastline and six inland water bodies/channels, for total coliform, fecal coliform, and enterococcus in order to determine the impacts of storm water and non-storm water runoff on loss of beneficial uses to receiving waters.

  As required by AB 411, local health officers began in 1999 to conduct weekly bacterial (i.e., coliform, fecal coliform, enterococci) testing between April 1 and October 31 of waters adjacent to public beaches which have more than 50,000 visitors annually and are near storm drains that flow in summer. If any one of these indicator organisms exceeds the AB 411 standards, the County health officer is required to post warning signs at the beach and make a determination whether to close that beach in the case of extended exceedances.

- BIO ASSESSMENT MONITORING:

  The County currently monitors 12 stations in cooperation with the Southern California Coastal Water Research Project (SCCWRP) in efforts to evaluate the biological index approach for Southern California and to design a research project for developing an Index of Biological Integrity (IBI) for the region.

- RECONNAISSANCE MONITORING:

  The County performs reconnaissance monitoring to identify potential illegal discharges and illicit connections, based on comparison with historical data and available estimates of background levels.

- WATER COLUMN TOXICITY MONITORING:

  The County's monitoring program analyzes for toxicity to freshwater and marine species on mass emissions samples to determine the impacts of storm water and non-storm water runoff on toxicity of receiving waters.

- SEDIMENT MONITORING:

  The County currently monitors sediment toxicity at seven stations along Huntington Harbour/Talbert Marsh areas.

- LAND USE CORRELATIONS MONITORING:

  Using an experimental, "before-after," design, the County identifies changes in runoff associated with the urbanization of previously agricultural land.

For the mass emissions monitoring, bio assessment and receiving waters monitoring programs described above, associated follow-up special investigations, as described in the LIP are generally conducted by the County, with City financial or logistic support as needed. Follow-up investigation findings are used to inform the prioritization and implementation of City and/or County management actions to reduce/eliminate sources.

In addition to the monitoring conducted by the County, the City performs supplemental water quality monitoring activities, as described in the LIP, as part of the City's Urban Runoff Diversion Program.

The following monitoring and follow-up activities are carried out by the City, with technical assistance from the County as needed:

- FOLLOW-UP INVESTIGATIONS AND ENFORCEMENT FOR THE ILLICIT CONNECTION/ILLEGAL DISCHARGE PROGRAM:

  The City may conduct water quality sampling as a component of follow-up investigations and/or enforcement actions to help determine the source(s) of significant pollution identified via hotline reports and the dry weather monitoring program.

- BMP EFFECTIVENESS EVALUATION:

  The City may conduct and/or cooperate with water quality sampling to verify whether Best Management Practices (BMPs) proposed or implemented in response to the IC/ID Program or other programs are effective in reducing the constituent(s) of concern at a specific problem location, at Municipal Separate Storm Sewer System (MS4) outfalls, in receiving waters, or at research site(s); or whether another iteration of BMPs should be considered to make progress toward attaining water quality objectives. The City may also conduct water quality sampling to verify the effectiveness of its Municipal, Existing Development, and Construction BMP programs described later in this section.

- DRY-WEATHER DIVERSION MONITORING:

  The City performs supplemental water quality monitoring activities as part of the City's Urban Runoff Diversion program. This program diverts dry weather runoff from the City's storm drain system to the sanitary sewer system. Dry weather diversion takes place from the First Street watershed and in 10 of the City's storm drain pump stations. This program is administered by the Orange County Sanitation District (OCSD) and an annual average of over 250,000,000 gallons of

urban run-off is diverted from discharging to receiving waters to the sanitary sewer system.

The monitoring programs consisted of 11 monitoring locations which are sampled in June and December every year. Sampling constituents are included in Table 3-1.

**Table 3-1**
**OCSD Water Quality Monitoring Sampling**

| Constituents | Measurement Frequency | Sample Type |
|---|---|---|
| Metals | | |
| Cadmium | Semi Annual | Grab |
| Chromium | Semi Annual | Grab |
| Copper | Semi Annual | Grab |
| Lead | Semi Annual | Grab |
| Molybdenum | Semi Annual | Grab |
| Nickel | Semi Annual | Grab |
| Selenium | Semi Annual | Grab |
| Zinc | Semi Annual | Grab |
| **Organics and Pesticides:** | | |
| Diazinon | Semi Annual | Grab |
| Chlorpyrifos | Semi Annual | Grab |
| Malathion | Semi Annual | Grab |
| Other: | | |
| TSS | Semi Annual | Grab |
| Oil and Grease Min | Semi Annual | Grab |
| Ammonia N | Semi Annual | Grab |
| Total Sulfides | Semi Annual | Grab |
| Dissolved Sulfides | Semi Annual | Grab |
| BOD | Semi Annual | Grab |

#### 3.1.2.1 Urban Dry Weather Runoff Monitoring

The City is a cost-sharing partner in the Countywide Dry Weather Monitoring Program (DWMP). Non-Stormwater Dry Weather monitoring has been conducted every dry season (May – September) since 2006. The program involves monthly sampling (5 times total) at targeted sites which are strategically selected by the City. Sites that were selected randomly throughout the MS4 at the inception of the program are sampled every month and a half (3 times total). The objectives of the DWMP are to:

- Assess compliance with the NPDES Permit.
- Detect and eliminate illicit discharges and illegal connections to the MS4 (by identifying sites that will be the subject of follow-up source identification investigations).
- Characterize urban runoff within the MS4 system with respect to water quality constituents that may cause or contribute to exceedances of receiving water quality objectives when discharged to receiving waters.

The water quality monitoring results were found to be typical of dry weather urban runoff, and no unusual "hot-spots" were identified. Figure 3-3a depicts the sampling locations, and Figure 3-3b shows the discharge flow rate at each location. There were 26 stations where flow could be measured or estimated from pump station records.

During the DWMP season, County staff notifies the City of any tolerance interval exceedances or any other condition that would suggest an illegal discharge or illicit connection impacting a storm drain outfall.

During the 2012-13 reporting period, the following drains within the City were monitored as part of the dry weather program:

- Random Sites
  - HBMC@C05 (Anaheim Bay-Huntington Harbour)
- Targeted Sites
  - HBC05S04@BRG (Anaheim Bay-Huntington Harbour)
  - HBMC@C05 (Anaheim Bay-Huntington Harbour)

#### 3.1.2.2 Water Quality Monitoring Program Modifications

As the last step in the water quality monitoring program, the City and the County of Orange evaluate the results of the program and determine if any program modifications are necessary in order to comply with Clean Water Act requirements to reduce the discharge of pollutants to the maximum extent practicable. The details of the evaluation are found in City's "Program Effectiveness Assessment – Orange County Stormwater Program DAMP Appendices C-1 thru C-11", dated November 15, 2014.

The City has not identified any modifications to be made to the City's Water Quality Monitoring Program in the next reporting period.

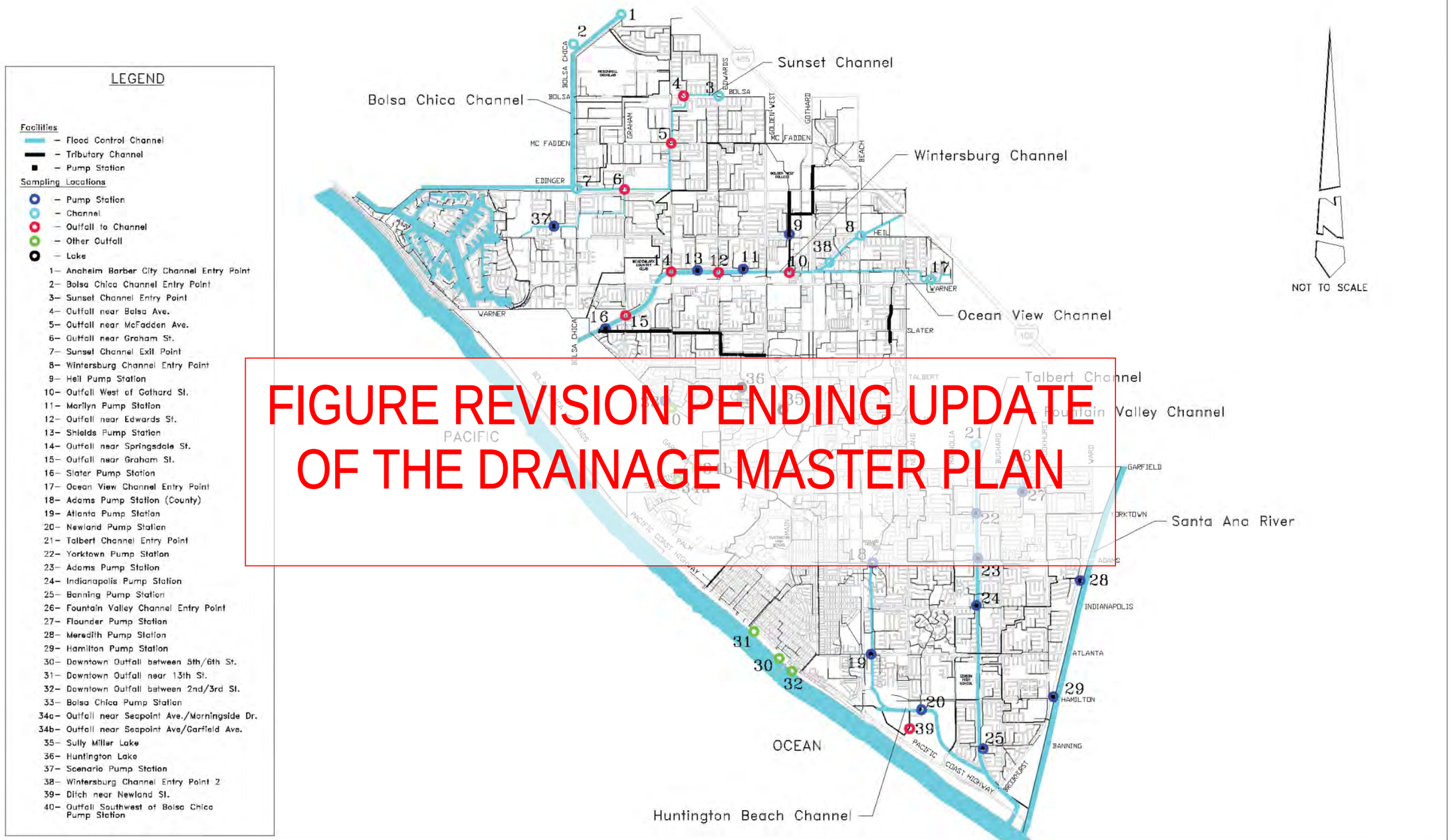



Figure No. 3–3a
Proposed Sampling Locations

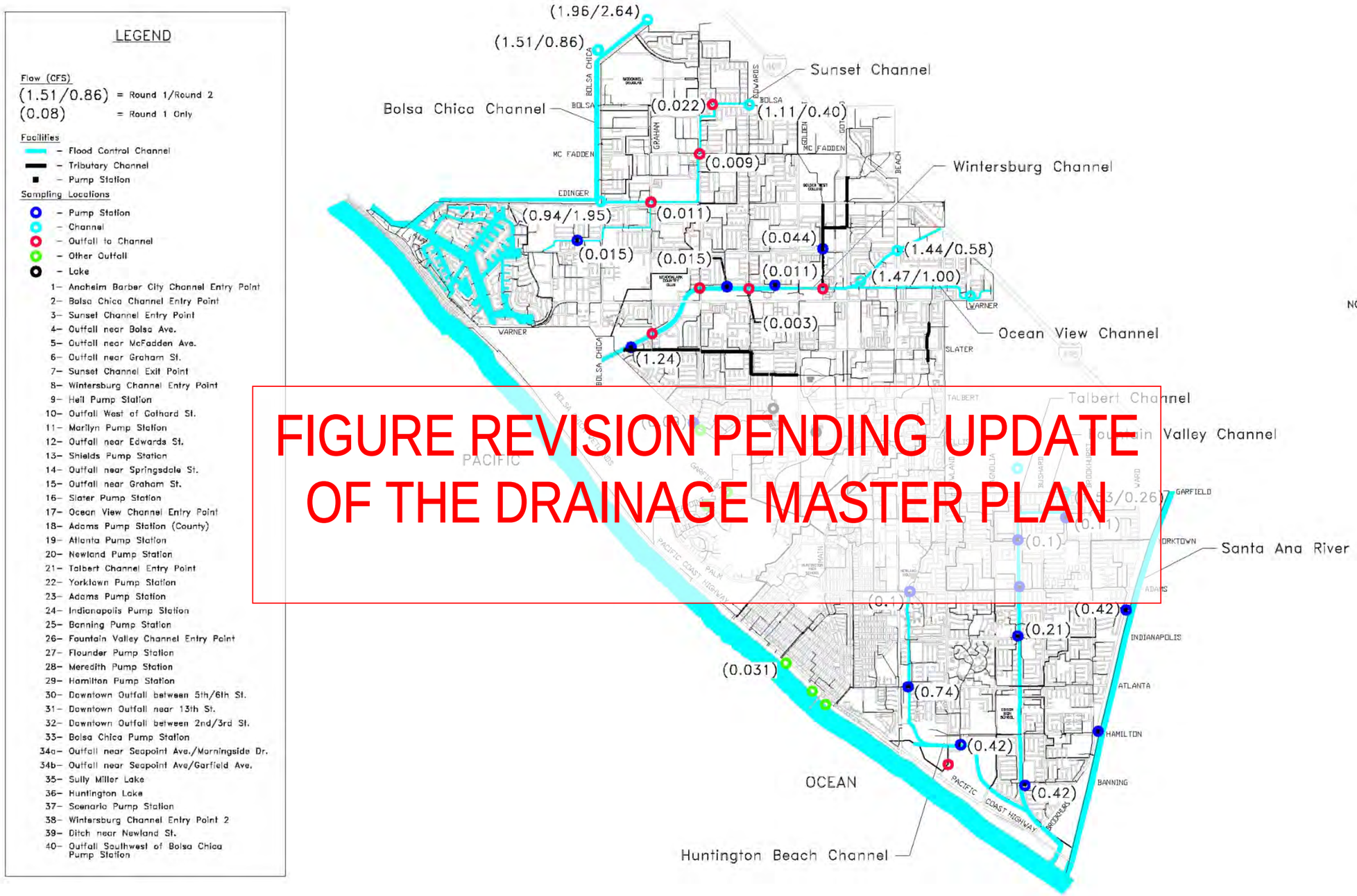



Figure No. 3–3b
Discharge at Sampling Locations

### 3.1.3 Regulatory Framework

Under the Federal Clean Water Act (CWA), the state of California was originally required to develop comprehensive drainage basin plans, as a prerequisite to receiving federal funding for the construction of municipal wastewater treatment plants. Within California, the State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (RWQCBs) are responsible for the protection of California's waters. The SWRCB sets policy statewide and the RWQCB implements the federal and state laws and regulations.

The Santa Ana Regional Water Quality Control Board (SARWQCB) developed the Water Quality Control Plan (Basin Plan) for the Santa Ana Region in 1975, with subsequent updates in 1983, 1995, 2008, and 2011 and periodic amendments. The Basin Plan guides conservation and enhancement of water resources and establishes beneficial uses of inland surface waters, tidal prisms, harbors, and groundwater basins within the Santa Ana Region.

The beneficial uses designated in the Basin Plan for the City's relevant receiving waters are summarized in Table 3-3.

The Basin Plan contains both numerical and narrative water quality objectives that are intended to allow beneficial uses to be protected. The Basin Plan also contains an Implementation Plan that is intended to achieve the overall objectives of the Basin Plan. Two primary implementation mechanisms that affect management of urban runoff from the City include the NPDES Permit system for storm water and the Total Maximum Daily Load process.

In accordance with the CWA, an NPDES permit is required for certain municipal separate storm sewer discharges to surface waters. The City is within the region covered by Order No. R8-2009-0030 (NPDES Permit No. CAS618030) issued by the SARWQCB on May 22, 2009. A new 2014 permit update is on hold. The update history of the NPDES Permits is shown below:

**Table 3-2**
**Update History of the NPDES Permits**

| Permit Term | Order No. | NPDES No. | Date Adopted |
|---|---|---|---|
| First (1990 – 1996) | 90-71 | CA 8000180 | July 1990 |
| Second (1996 – 2002) | 96-31 | CAS618030 | March 1996 |
| Third (2002 – 2009) | R8-2002-0010 | CAS618030 | January 2002 |
| Fourth (2009 - ) | R8-2009-0030 | CAS618030 | May 2009 |
| Fifth (in process) | R8-2015-0001 | CAS618030 | On hold |

The County of Orange is the principal Permittee, with Orange County Flood Control District and 26 incorporated cities (Anaheim, Brea, Buena Park, Costa Mesa, Cypress, Fountain Valley, Fullerton, Garden Grove, Huntington Beach, Irvine, Laguna Hills,

Laguna Woods, La Habra, La Palma, Lake Forest, Los Alamitos, Newport Beach, Orange, Placentia, Santa Ana, Seal Beach, Stanton, Tustin, Villa Park, Westminster, and Yorba Linda) within Orange County as Co-Permittees.

Under the permit, Permittees are required to continue implementation of the Drainage Area Management Plan. The Drainage Area Management Plan is the principal policy and guidance document for the countywide NPDES Stormwater Program that is implemented within each Permittee's jurisdiction. Individual permittee programs are described in each Permittees' Local Implementation Plan. The objective of the Drainage Area Management Plan is to fulfill the commitment of the Permittees in presenting a plan satisfying the NPDES permit requirements and evaluating the impacts of urban storm water quality on the beneficial uses.

The Drainage Area Management Plan contains requirements in seven general categories:

- Public Agency (Municipal) Activities
- Public Information/Education
- New Development/Significant Redevelopment
- Construction
- Industrial Discharger Identification (Existing Development)
- Detection/Elimination of Illegal Discharges and Illicit Connections
- Water Quality Monitoring

The current specific water pollutant control program elements are documented in the 2003 Drainage Area Management Plan and corresponding City of Huntington Beach Urban Stormwater Runoff NPDES Permit Local Implementation Plan of 2011 (City of Huntington Beach LIP). The City has developed the City of Huntington Beach LIP utilizing as its foundation the 2003 Drainage Area Management Plan. The City of Huntington Beach LIP provides a written account of activities that the City has undertaken, or is undertaking, to meet the requirements of the Fourth Term NPDES Permit and a means of displaying a meaningful improvement in water quality. As with the 2003 Drainage Area Management Plan, the City of Huntington Beach LIP proposes a wide range of continuing and enhanced Best Management Practices (BMPs) and control techniques that will be implemented and reported on as part of the Fourth Term NPDES Permit annual reports.

**Table 3-3**
**Beneficial Uses of Project Drainages**

| BENEFICIAL USE | | | | | | | | | | | | | | | | | | | | | | Hydrologic Unit | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ocean Waters** | **MUN** | **AGR** | **IND** | **PROC** | **GWR** | **NAV** | **POW** | **REC1** | **REC2** | **COMM** | **WARM** | **LWRM** | **COLD** | **BIOL** | **WILD** | **RARE** | **SPWN** | **MAR** | **SHELL** | **EST** | **Primary** | **Secondary** |
| Near shore Zone – San Gabriel River to Poppy Street in Corona Del Mar | + | | X | | | X | | X | X | X | | | | | X | X | X | X | X | | 801.11 | |
| Offshore Zone – Waters Between Near shore Zone and Limit of State Waters | + | | X | | | X | | X | X | X | | | | | X | X | X | X | | | | |
| **Bays, Estuaries and Tidal Prisms** | | | | | | | | | | | | | | | | | | | | | | |
| Anaheim Bay – Outer Bay | + | | | | | X | | X | X | | | | | X | X | X | X | X | | | 801.11 | |
| Anaheim Bay – Seal Beach National Wildlife Refuge | + | | | | | | | X[1] | X | | | | | X | X | X | X | X | | X | 801.11 | |
| Sunset Bay – Huntington Harbour | + | | | | | X | | X | X | X | | | | | X | X | X | X | | | 801.11 | |
| Bolsa Bay | + | | | | | | | X | X | X | | | | X | X | X | X | X | X | | 801.11 | |
| Bolsa Chica Ecological Reserve | + | | | | | | | X | X | | | | | X | X | X | X | X | | X | 801.11 | |
| Tidal Prism of Santa Ana River (to within 1000' of Victoria Street) and Newport Slough | + | | | | | | | X | X | X | | | | | X | X | | X | | | 801.11 | |
| Tidal Prisms of Flood Control Channels Discharging to Coastal or Bay Waters [3] | + | | | | | | | X | X | X | | | | | X | | | X | | | 801.11 | |
| **Inland Surface Streams** | | | | | | | | | | | | | | | | | | | | | | |
| Lower Santa Ana River Basin – Santa Ana River, Reach 1 – Tidal Prism to 17th Street in Santa Ana | + | | | | | | | X[2] | X | | I | | | | I | | | | | | 801.11 | |

Notes:
MUN = Municipal and Domestic; AGR = Agricultural Supply; IND = Industrial Service Supply; PROC = Industrial Process Supply; GWR = Groundwater Recharge; NAV = Navigation; POW = Hydropower Generation; COMM = Commercial and Sport Fishing; WARM = Warm Freshwater Habitat; LWRM = Limited Warm Freshwater Habitat; COLD = Cold Freshwater Habitat; BIOL = Preservation of Biological Habitats of Special Significance; WILD = Wildlife Habitat; RARE = Rare, Threatened, or Endangered Species; SPWN = Spawning, Reproduction, and/or Early Development; MAR = Marine Habitat; SHELL = Shellfish Harvesting; EST = Estuarine Habitat

X = Present or Potential Beneficial Use
I = Intermittent Beneficial Use
+ = Excepted from MUN (see text)
[1] = No access per agency with jurisdiction (U.S. Navy)
[2] = Access prohibited in all or part by Orange County Environmental Management Agency (OCEMA)
[3] = Anaheim Barber City Channel, Bolsa Chica Channel, Westminster Channel, Sunset Channel, East Garden Grove Wintersburg Channel, Ocean View Channel, Talbert Channel, East Valley Fountain Valley Channel, Slater Channel, and Huntington Beach Channel

Source: Santa Ana Regional Water Quality Control Board, March 1994, Updated February 2008, Water Quality Control Plan, Santa Ana Region. The Drainage Area Management Plan contains requirements in seven general program categories:

The City has been implementing local programs in accordance with the Drainage Area Management Plan and the NPDES Permit since the issuance of the first Drainage Area Management Plan in 1993. The relationship between federal, state, and local regulatory agencies and permits, and the City's implementation of its storm water program is illustrated in Figure 3-3c.

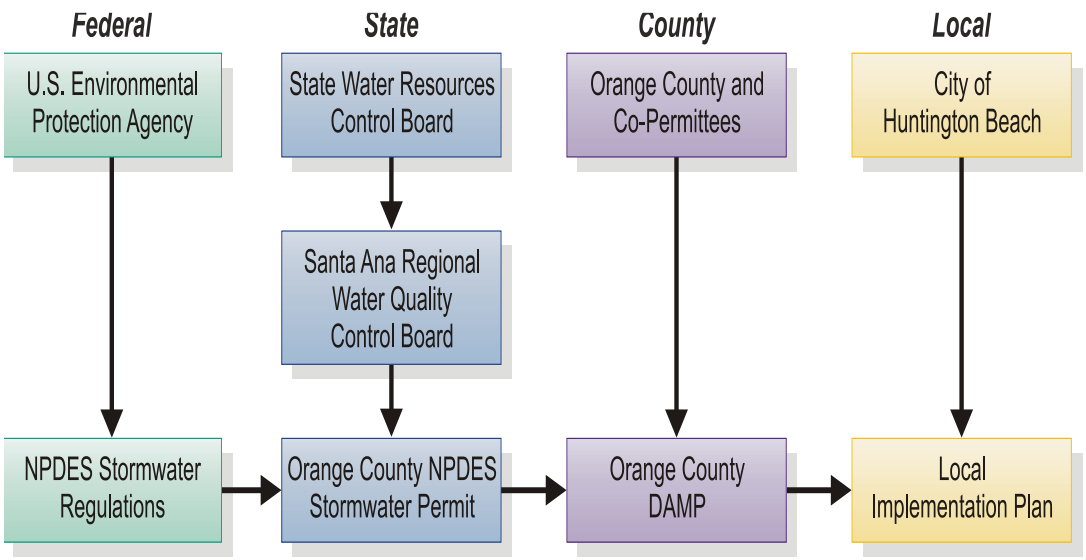



**Figure 3-3c**
**Regulatory Framework**

#### 3.1.3.1 Regulatory Requirements for Construction

The City also has programs to ensure that developers agree to comply with the Statewide NPDES General Permit for Storm Water Discharges associated with Construction and Land Disturbance Activities (Construction General Permit). Developers planning construction activities as well as any city construction project disturbing an area greater than one acre are required to file a Notice of Intent (NOI) to discharge under the Construction General Permit. After a NOI has been submitted, the discharger is authorized by the SWRCB to discharge storm water under the terms and conditions of the Construction General Permit in effect at the time of application. As stated in the Construction General Permit, the major provisions of the permit are as follows:

- Develop and implement a Storm Water Pollution Prevention Plan (SWPPP) which specifies BMPs that will prevent all construction pollutants from contacting storm water and with the intent of keeping all products from moving off site into receiving waters;

- Eliminate or reduce non-storm water discharges to storm sewer systems and other waters of the US; and
- Perform inspections of all BMPs.

#### 3.1.3.2 Total Maximum Daily Loads

The CWA Section 303(d) also established the Total Maximum Daily Load (TMDL) Program. The purpose of the TMDL program is for states to identify streams, lakes, and coastal waters that do not meet certain water quality standards and are not expected to meet standards solely through technology-based controls of point source discharges. For such watersheds, a TMDL for the constituent(s) for which the water body is impaired must be determined.

The TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still achieve the target water quality objective. All sources of the constituent(s) must be identified and loads quantified. Load reductions are determined and then allocated among the sources. Finally, an implementation plan is prepared to achieve the load reductions.

The purpose of the TMDL program is not to replace existing water pollution control programs, but to provide a framework for evaluating pollution control efforts and allow for coordination between federal, state and local efforts to meet water quality standards.

Anaheim Bay, Huntington State Beach and Huntington Harbor are the water bodies in the City listed on the 2010 California 303(d) list. A list of the identified impairments and the TMDL priority for each water body is summarized in Table 3-4. To date, no TMDL's have been established for water bodies in the City.

**Table 3-4**
**2010 California 303(d) and TMDL Priority**

| Water Body | | | | | ***Pollutants/ Stressor*** | ***Source*** | ***Priority*** |
|---|---|---|---|---|---|---|---|
| **EGGWC** | **Bolsa Chica Channel** | **Anaheim Bay** | **Huntington Harbour** | **Huntington State Beach** | | | |
| | | | | | *Enterococci* | *Unknown* | *Low* |
| | X | | | | *Indicator Bacteria* | *Unknown* | *Low* |
| | | | X | | *Chlordane* | *Unknown* | *Low* |
| | | | X | | *Copper* | *Unknown* | *Low* |
| | | | X[1] | | *Lead* | *Unknown* | *Low* |
| | | X | X[1] | | *Nickel* | *Unknown* | *Low* |
| | | | X[1] | | *Pathogens* | *Urban Runoff/ Storm Sewers* | *Low* |
| | | X | | | *Dieldrin* | *Unknown* | *Low* |
| | | X | X[1] | X | *PCBs* | *Unknown* | *Low* |
| X | X | | | | *Ammonia* | *Urban runoff/ Storm Sewers/ Surface Runoff/ Unknown* | *Low* |
| | X | | | | *pH* | *Unknown* | *Low* |
| | | X | X | | Sediment Toxicity | Unknown | Low |

X = *Listed on the 2010 CWA Section 303(d) List of Water Quality Limited Segment*

[1] = *Listing made by USEPA*

## 3.2 Plan Components

The Water Quality Element of the CURMP for the City consists of programs and specific projects that can be implemented to meet the established water quality objectives. The plan components are contained in three major categories:

- Citywide Source Control Programs: This category includes a wide variety of activities and programs whose primary purpose is to prevent the introduction of pollutants to the storm drain system or receiving waters through control at the source. Pollutant sources can originate from virtually all land uses and activities within the City, and these programs generally are applicable Citywide. In some

cases, source control programs may include focused or customized emphasis in certain planning areas.

- Program for New Development/Significant Redevelopment
- Water Quality Planning Area-Based Programs and Projects

### 3.2.1 Citywide Source Control Programs

Most of the source control programs are existing core elements of the City's NPDES compliance program and are already being implemented to some degree. Additional commitments to meet new NPDES Permit requirements and/or the objectives of this plan are noted. Table 3-5 summarizes the major elements of the Citywide source control programs, denotes whether the City currently implements each listed element and briefly summarizes potential future program measures. Under this heading, two columns are listed. The first column summarizes future measures that maintain or expand the City's program to meet all applicable requirements of the Fourth Term NPDES Stormwater Permit (NPDES Permit) and these actions are noted as "mandatory." Additional future program measures were also identified during the development of the City of Huntington Beach LIP or CURMP. These potential measures would enhance the program beyond the prescribed permit requirements and are noted as "discretionary" measures. A brief description of each element follows:

**Table 3-5**
**Summary of Citywide Source Control Program Elements**

| Program Element | Existing Program | Future Program Measures: Actions To Meet NPDES Permit Requirements (Mandatory) | Future Program Measures: Potential Additional Enhancement (Discretionary) |
|---|---|---|---|
| Legal Authority | Yes | Continue to update ordinances as necessary | |
| Municipal Activities | Yes | Continue procedures, activities and training to comply with Municipal Activities Program | ■ Identify areas of high trash/debris where City can install gross pollutant separators<br>■ Increase cleaning and maintenance: channels and pump station forebays and high trash/debris accumulation areas<br>■ Consider enhancement of catch basin stenciling to more permanent and discharge specific<br>■ Consider increased street/parking lot sweeping and litter control<br>■ Consider enhanced Integrated Pest Management, pesticide and fertilizer guidelines and training<br>■ Consider enhanced training of field program staff<br>■ Consider additional equipment (e.g., vac truck) for maintenance activities |
| Public Education | Yes | Support and continue participating with other Permittees to reach 100% of residential, commercial and industrial uses through the use of local print, radio and television | ■ Consider increasing existing programs/events<br>■ Consider enhancement of existing programs/events<br>■ Conduct local public outreach effort focused on restaurants, litter control in the coastal/harbor area, landscape/concrete construction contractors, boaters/boat owners, & local schools |
| Construction | Yes | Continue activities to comply with Model Construction Program | ■ Consider implementation of new BMP technology<br>■ Consider enhanced training of inspection staff |
| Existing Development | Yes | Continue activities to comply with the Industrial & Commercial Components of the Existing Development Program | ■ Focus on restaurant inspections/implementation of FOG (Fats, Oils & Grease) Ordinance<br>■ Consider requiring mandatory sweeping of all parking lots |
| Illicit Discharges/Illicit Connections | Yes | Continue existing detection, response, investigation, elimination & enforcement program | ■ Consider dedicating information line for public regarding ID/IC<br>■ Consider enhanced staff training |

#### 3.2.1.1 Legal Authority

Regulatory requirements promulgated by the U.S. EPA in 1990, require municipal NPDES Permit applicants, such as the City, to demonstrate having the following adequate legal authority to:

- Control the contribution of pollutants to the municipal storm drain system by storm water discharges associated with industrial activities.
- Prohibit illicit discharges to the municipal storm drain system.

- Prohibit spills, dumping or disposal of materials other than storm water.
- Control through interagency agreements among the Permittees, the contribution of pollutants from one municipality into the common combined flood control and storm water conveyance system managed by the Orange County Public Works Flood Control District.
- Require compliance with conditions in ordinances.
- Carry out all inspections, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions, and effectively prohibit illicit discharges to the municipal storm drain system.

As an element of implementing the current LIP, the City is currently reviewing Chapter 14.25 Storm Water and Urban Runoff Management ordinance and Chapter 17.05 Grading and Excavation Code and will be making necessary modifications to effectively implement the NPDES Permit.

The City, in coordination with the other Co-Permittees of the NPDES Permit, will continue, as required, to review and update these ordinances to maintain adequate legal authority to implement current and future program measures.

#### 3.2.1.2 Municipal Activities

*EXISTING PROGRAM*

The City conducts routine preventive maintenance activities that are considered effective BMPs for pollutant control. The NPDES Permit requires documentation of these municipal activities conducted by the City. Thus, the City annually reports its public agency activities as part of its submittal to the SARWQCB.

The City has incorporated the Drainage Area Management Plan Model Municipal Activities Program as a basis for the Municipal Activities component of the City of Huntington Beach LIP. The City of Huntington Beach LIP includes areas of responsibilities for overseeing, implementing and enforcing the municipal activities of the storm water program.

As part of this program, the City developed an inventory of fixed facilities and field programs which is updated on a regular basis. Once compiled, the fixed facilities and field programs are prioritized into high, medium, or low categories based on the threat to water quality.

City staff performs inspections at fixed facilities, within field programs and at drainage facilities according to the procedures and BMPs described within the model maintenance procedures such as: drainage facility inspections and maintenance; sidewalk, plaza, and fountain maintenance and cleaning inspections and corrective actions; and fixed facility inspections and corrective actions. To assist the appropriate

municipal staff in understanding the maintenance procedures, education and training is annually conducted.

Inspections are also performed on a regular frequency at municipal facilities, based upon the priority of the fixed facility, to assess program effectiveness. Different areas of the Municipal Activities Program that the City has also implemented include the Integrated Pest Management Policy.

The City's public agency activities that have water quality impacts include the following areas:

- Litter Control

Litter debris control is an important element in the overall effort to reduce pollutant discharges from entering the storm drain system. The City's current litter control efforts include the following:

- Littering ordinance 13.48.050
- Clean-up programs
- Special/bulky item pickups
- Pick-up of illegally discarded large items
- Litter pick-up at sidewalks, dead-end streets, etc.
- Provision of public trash receptacles

The City, as part of the current LIP, will continue implementing these litter control efforts. Additional focused public education efforts with respect to litter control are contained in Section 3.2.1.3.

- Solid Waste Collection/Recycling

The City has existing solid waste collection programs for public, residential, commercial, and industrial areas. The City educates the public in its efforts to emphasize recycling through its recycling kiosks located in the Civic Center and the main public library. Several City-sponsored functions emphasizing the recycling message also take place throughout the year. In addition, informational messages on proper solid waste disposal and recycling are conveyed through utility bill inserts, public service announcements (PSAs) on television and radio, community newsletters, and brochures.

- Drainage Facility Maintenance

The City maintains drainage facility inspection and maintenance procedures. The activities include maintaining inspection log sheets for documenting the total volume of material and percentages of each type of material removed from its municipal facilities. These facilities include channels, water ways and catch basins. Specific inspection requirements are to inspect 80 percent of storm drain inlets and catch basins within City jurisdiction at least annually with 100 percent cumulative completion bi-annually. The City will continue to perform these facility and infrastructure maintenance activities to meet the permit requirements.

- Catch Basin Stenciling

The City has an existing catch basin stenciling program as a part of its NPDES Permit. The label is comprised of the phrase "No Dumping – Drains to Ocean" and is stenciled on either the top of the curb or the curb face adjacent to the inlet. Each year, the City is required to report the total number of catch basins re-stenciled. The City will continue to conduct these stenciling activities to help reduce the amount of pollutants discarded directly into catch basins.

- Street Sweeping

The City maintains an existing street sweeping program in residential, commercial, and industrial areas. The sweeping program maintains a record of the frequency of sweeping and the weight of debris sweep on a fiscal basis. In order to increase the effectiveness of the sweeping program, parking restrictions on roadways are also utilized to further contribute to water quality improvements. Sweeping equipment is also selected based upon pollutant removal effectiveness and maintained to manufacturer's specifications.

- Household Hazardous Waste Collection

The Orange County Integrated Waste Management Department administers a household hazardous waste collection program located at four sites. These sites are located in the cities of Anaheim, Huntington Beach, San Juan Capistrano, and Irvine. The collection effort also involves a Community Awareness Program that includes public presentations to schools, civic organizations, and private industry.

The City implements a used oil recycling program through the Fire Department. The City reports on its oil recycling program to the SARWQCB in the Annual Progress Report.

- Emergency Spill Response

The City, as a Co-Permittee, has enacted the authority to control releases to the storm drain system through a common Water Quality Ordinance. The City maintains a hazardous material plan outlining planned responses to hazardous materials

emergencies. The plan addresses issues related to chain-of-command, other public agency participation, and the allocation of authority. The City designates Authorized Inspectors and annually reports to the SARWQCB of any sources, types, and quantity of discharge incidents.

- Fertilizer and Pesticide Management

The City implements the Model Integrated Pest Management, Pesticides and Fertilizer Guidelines as developed by the Permittees. The City annually reports its management and application practices for fertilizers and pesticides to include types and quantities applied. Integrated pesticide management techniques implemented are also reported. The City will continue to review and update the guidelines for the management of fertilizers and pesticides, perform annual self-audits and participate in any training discussing the revision of such guidelines.

- Fixed Facility Inspections

The City will continue inspections at its fixed facilities. At each facility, General and Activity Specific Inspection forms will be completed and any problems identified and corrective actions to be implemented. Currently, the City's Fixed Facility Inventory includes approximately 110 facilities.

- Field Programs

The City will continue its review of field programs. As with fixed facilities, the City currently conducts interviews of its field program managers to verify that maintenance procedures are being implemented, are appropriate for that facility, and are protective of water quality. The current field programs are shown below.

| FIELD PROGRAM TYPES |
|---|
| Annual City Wide Field Service Program Inspection |
| Beach and Harbor Field Activities |
| Library Plaza Cleaning |
| Downtown Power-washing |
| Drainage Facility Inspection |
| Concrete Cutting Contract Field Services |
| Graffiti Removal |
| Flood Control Channel Maintenance |
| Street Maintenance |
| Rodent Control |
| Landscape Maintenance |
| Sanitary Sewer Overflow Response |

- Sewer System Operation and Maintenance

The City will continue to operate and maintain the sewer collection system so as to prevent overflows or leaks that could result in discharges to the storm drain system.

*POTENTIAL ADDITIONAL ENHANCEMENT*

As described above, the City has several municipal activities that could be enhanced to reduce water quality impacts. These areas of potential enhancement include:

- Continue identifying areas of high trash/debris where the City can install gross pollutant collection devices or other effective Best Management Practices.
- Continue its program to increase the frequency of cleaning pump station wet wells and the maintenance of existing City-owned storm drain channels and high trash/debris accumulation areas.
- Evaluate the feasibility of expanding the street sweeping/cleaning program to include areas such as parking lots and alleys in order to minimize solid wastes and debris from entering the storm drain system.
- Evaluate enhanced guidelines and training under the Integrated Pest Management, pesticide and fertilizer guidelines.
- Evaluate enhanced training of field program staff by conducting program specific and one-on-one training.

#### 3.2.1.3 Public Education

*EXISTING PROGRAM*

Public education/participation is an essential part of the City's storm water program by informing and involving the public in effectively controlling urban runoff and storm water pollution. The City, consistent with NPDES Permit requirements, participates in educational and public information activities with other Permittees to present a consistent message on storm water pollution prevention. The goal is to inform the public and municipal staff about the origins and causes of storm water pollution and to promote behavioral changes that will help control pollutants at the source. The goal, as set by the Fourth term NPDES Permit, is to target 10,000,000 impressions county wide through the county program of the Permittees' residents, including commercial and industrial establishments, through the use of local print, radio and television.

The City conducts public education outreach to its community through a variety of means such as:

- Public Education Focus
- Employee Training and Outreach

- Outreach to Construction Site Contractors/Developers
- Outreach to Industrial Site Owners and Operators
- Outreach to Commercial Site Owners and Operators
- Outreach to Community, General Public, and School Children
- Outreach to Quasi-Governmental Agencies/Districts

The City also supports and continues to participate with the County and other Permittees on a Countywide Public Education Program, as described in the 2003 Drainage Area Management Plan, which provides the common message and theme for the program, and coordinates that message with neighboring counties. The Countywide program currently provides for the development of public education and outreach materials for countywide distribution to focus on public education and business activities with potentially polluting businesses. The public education and business elements include activities such as:

- Public service announcements (PSAs) through television and radio
- Community newsletters
- Recycling brochures (placed at Civic Center and main library and local real estate business offices)
- Utility bill inserts
- City-sponsored events with litter/debris cleanup and recycling emphasis
- 24-hour water pollution reporting hotline
- School education opportunities (e.g., Tours of the Materials Recovery Facility for schools grades 3-6)
- City website postings of educational materials
- Building relationships with community organizations and chamber of commerce
- Implementing Point-of-Purchase campaigns with stores, such as home improvement and pet stores

***POTENTIAL ADDITIONAL ENHANCEMENT***

The following specific areas have been identified in the City of Huntington Beach LIP for targeting enhanced public participation:

- The City plans on creating a comprehensive storm water website to facilitate public education and provide information to businesses and residents.
- Outreach and collaboration is planned in the next reporting year with the Sunset Beach Sanitary District to facilitate a more cohesive FOG program for the City.
- The City works closely with the Specific Events Committee to ensure proper BMPs are addressed and implemented for this target audience. Events are assessed for the need to provide a Storm Water Pollution Prevention Plan, detailing event specific BMPs, prior to the beginning of the event.

#### 3.2.1.4 Construction

*EXISTING PROGRAM*

The City of Huntington Beach LIP has incorporated the model construction program described in the Drainage Area Management Plan. The construction program includes requirements, guidelines and methods that construction site owners, developers, contractors and other responsible parties must use for pollution prevention to protect water quality from construction discharges. The City's LIP construction component began with the development of a construction site inventory consisting of a Public Works Construction Site Inventory and the Community Development Department's Inventory. These inventories are based on known public works construction projects and building and grading permit activities, and are, at a minimum, updated on a bi-annual basis. In addition, new projects as they are initiated are added to each inventory. Once compiled, construction projects are prioritized into high, medium, or low categories, based on threat to water quality. As with the inventories, priorities are also updated, at a minimum, monthly.

With the exception of low priority projects (e.g., swimming pools, etc.), all construction projects are required to prepare Erosion and Sediment Control Plans (ESCPs) or to implement BMPs to prevent runoff and discharges into the storm drain system or water bodies. At a minimum, all construction projects must include erosion and sediment controls, as well as waste and materials management controls. The City of Huntington Beach LIP designates the construction-specific BMPs that the City has determined acceptable for use within the City's jurisdiction.

Construction sites over one (1) acre of disturbed area are subject to the Construction General Permit and the responsible party is required to prepare, implement, and follow a Storm Water Pollution Prevention Plan (SWPPP). Construction projects not covered under the Construction General Permit would be required to prepare ESCPs to assure the project is protected by an effective combination of erosion and sediment controls and waste and materials management BMPs to meet the minimum requirements summarized in Table 8-6 of the DAMP.

The City's construction inspection program ensures that construction sites are complying with City-issued grading and building permit requirements, ordinances and the Construction General Permit, as applicable. Construction sites are inspected according to priority and until construction activities have been completed. Enforcement is undertaken by the City's inspectors through established policies and procedures. A site will be considered non-compliant when there exists one or more violations of local ordinances, permits, or plans, and in violation with the Construction General Permit if those requirements apply.

To assist City staff in understanding the model construction program, construction management and inspection of construction site BMP training sessions are conducted on an annual basis.

Annually, the City reports on the construction program in the Program Effectiveness Assessment. This assessment is based on the inventory, prioritization, inspection, enforcement, and training records to assess the City's individual storm water program components, including those focused on addressing storm water and non-storm water discharges associated with construction activity.

#### 3.2.1.5 Existing Development

*EXISTING PROGRAM*

The City of Huntington Beach LIP has incorporated the model construction program described in the Drainage Area Management Plan. The construction program includes requirements, guidelines and methods that construction site owners, developers, contractors and other responsible parties must use for pollution prevention to protect water quality from construction discharges. The City's LIP construction component began with the development of a construction site inventory consisting of a Public Works Construction Site Inventory and the Community Development Department's Inventory. These inventories are based on known public works construction projects and building and grading permit activities, and are, at a minimum, updated on a bi-annual basis. In addition, new projects as they are initiated are added to each inventory. Once compiled, construction projects are prioritized into high, medium, or low categories, based on threat to water quality. As with the inventories, priorities are also updated, at a minimum, monthly.

- Industrial / Commercial Program

As described in detail in the City of Huntington Beach LIP, Industrial/ Commercial components include the following elements:

- Specifications for pollution prevention methods
- Annual source identification of sites with the potential to discharge pollutants
- Prioritization for inspection based on high, medium, or low threat to water quality

- Minimum set of activity-specific BMP implementation to prevent and/or mitigate pollution
- Regular inspections at a frequency based on the site's priority
- Monitoring and enforcement to ensure compliance with ordinances and NPDES Permit requirements
- Training and outreach covering different aspects of the Existing Development Program and its components (industrial and commercial) in an effort to outline the basic program element requirements and their importance
- Assessment of the effectiveness of the program in addressing storm water and non-storm water discharges associated with existing industrial and commercial activities

- Food Service Facility Program

The food service facility program includes conducting follow-up inspections, in support of the annual water quality inspections performed by Orange County Health Care Agency (OCHCA), on facilities with water quality issues to confirm the implementation of best management practices for pollution prevention and to address the following activities:

- Trash storage and disposal
- Grease storage and disposal
- Maintenance of trash collection area and grease interceptors
- Proper discharge of wash water (e.g., from floor mats, driveways, sidewalks, etc.)
- Identification of outdoor sewer and MS4 connections
- Education of property managers when grease and/or trash facilities are shared by multiple facilities

To eliminate FOG related sewer spills and backups, the City has adopted an aggressive maintenance program to frequently inspect and clean sewer lines. However, the City has determined that the most effective way to minimize FOG accumulation in sewers is to prevent the introduction of FOG into the sewer system in the first place. To realize this goal, the City has developed a FOG Control Program that regulates restaurants and other food service establishments that produce FOG and provides them with a mechanism to help control and minimize the introduction of FOG into City sewers.

- Mobile Business Program

The mobile business program addresses mobile surface cleaner businesses that provide one or more of the following services:

- Cleaning (e.g., power sweeping, washing) driveways and parking lots
- Cleaning building exteriors (except sand blasting, window cleaning)

- Driveway cleaning services (e.g., power sweeping, washing)
- Parking lot cleaning services (e.g., power sweeping, washing);
- Power washing building exteriors
- Pressure washing (e.g. buildings, decks, fences)
- Steam cleaning building exteriors

A list is being compiled of mobile surface cleaner businesses that report their business address as being within the City and will update the inventory as necessary.

A set of minimum activity-specific BMPs for mobile surface cleaner businesses is being developed by the County.

A biennial inspection / self-certification program is being developed by the County to ensure that each known mobile surface cleaner business whose headquarters is listed within the City's jurisdiction achieves one of the following end points:

- Successful completion of an online training program
- Completion of a self-certification form
- Inspection conducted by the City

- Residential Program

The program described in this section was developed pursuant to Section XI of the MS4 Permit and DAMP Section 9.5.

The City's Residential Program includes specifications for pollution prevention methods for residential areas and activities located within the City. Specific pollution prevention practices that are recognized for each residential activity with high potential to pose a threat to water quality, as being effective and economically advantageous, are provided in the activity fact sheets presented in Exhibit A-9.II of the City of Huntington Beach Local Implementation Plan.

The City will primarily rely on the ongoing efforts of its countywide Public Education Program and the Illicit Discharges and Illicit Connections Program to assist with the implementation of this program component. The City will encourage implementation of the designated BMPs for each residence within its jurisdiction by conducting the following as appropriate:

- Training City personnel
- Responding to hotline calls
- Updating the City's website
- Conducting annual mailings
- Public Service Announcements

- Common Interest Areas/Homeowners Association activities

Pursuant to Section XI.4 of the MS4 Permit and LIP Section A-9.6, the City operates a pilot program to address pollutant discharges from common interest areas (i.e., apartments, condominiums, planned development) and homeowners associations (CIA/HOA). Table 3-5.1, presented below, illustrates the relationship of these activities and the potential pollutants they generate.

**Table 3-5.1**
**Potential Pollutants from CIA/HOA Activities**

| | Potential Pollutants | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Activity | Sediments | Nutrients | Pathogens/ Coliform | Foaming Agents | Metals | Hydrocarbons | Hazardous Materials | Pesticides and Herbicides | Others |
| Sidewalk, plaza and fountain cleaning | X | X | X | X | | | X | | |
| Landscape maintenance | X | X | X | | | | X | X | |
| Home and garden care | X | X | X | X | X | | X | X | X |
| Pet waste | X | X | X | | | | | | |
| Garden waste | X | X | X | | | | X | X | |
| Automobile parking | X | | | | X | X | X | | |
| Community center O&M | X | X | X | | | | | | X |
| Recreation area O&M | X | X | X | | | | X | | |
| Maintenance yard operation | X | X | X | X | X | X | X | X | X |

Each CIA/HOA area is expected to implement the BMPs that are associated with the activities being conducted. If the desired result is not being achieved, the BMPs will be assessed and modified or, if necessary, changed.

The following implementation efforts will be utilized for all CIAs/HOA areas within the City's jurisdiction:

- Mail a letter explaining the CIA/HOA program to association governing boards. The letter will explain activities of concern and their environmental impacts, BMPs to reduce the impact, and consequences of not complying with the CIA/HOA program. The letter will also encourage participation in annual outreach workshops described in DAMP Section A-9.6.5.
- Mail BMP fact sheets to maintenance association governing boards.

Enforcement mechanisms available to the City, as detailed in DAMP Section 10.0, are as follows (in increasing order of severity):

- Notice of Non-compliance (verbal and/or written warnings, to individual resident and/or CIA/HOA Board)

- Administrative Compliance Order (citation) (written notice to CIA/HOA Board)
- Cease and Desist Order (written notice to CIA/HOA Board)

- Civil or Criminal Enforcement (includes fines and assessments levied on CIA/HOA Board and/or individual resident)

While these measures typically escalate in enforcement action, they need not be issued in the exact order presented here. City officials will apply or recommend any of the enforcement steps as appropriate based on the enforcement consistency guide (Section 10 of the DAMP). The City will ensure that violations of a similar nature are subjected to similar types of enforcement remedies.

- Training and Outreach Program

The outreach strategy for reaching industrial and commercial businesses as well as residents includes efforts to provide storm water information on the City's website, mailings, workshops, and development and distribution of brochures, posters, and fact sheets.

Six training modules covering different aspects of the Model Existing Development Program have been developed by the Principal Permittee. These modules are provided in the DAMP Appendix B, Section B-9, and will be reviewed by the Principal Permittee and updated as necessary. The modules include the following:

- Existing Development Program Management Module
- Field Implementation of Existing Development Program Module
- Automobile Mechanical Repair, Maintenance, Fueling and Cleaning Businesses Module
- Landscape Maintenance Business Module

The City will supplement the County's training modules by implementing its own training program, including annual or bi-annual review of the following:

- Enforcement Consistency Guide
- Water Quality Ordinance
- BMP Fact Sheets
- DAMP Chapter 9

***POTENTIAL ADDITIONAL ENHANCEMENT***

Because of the number of restaurant and food service establishments in the City, and in particular in the downtown and Huntington Harbour areas, reducing water quality impacts from restaurant operations is a high priority for the City. The following specific areas have been identified for potential enhancement:

- Evaluate the existing inspection program and enforcement of the FOG Ordinance to determine whether to rely on the program or supplement the program with additional inspections and enforcement.

- Investigate the feasibility of developing a program to require grease trap retrofits, especially on older facilities, including incentives (e.g., reduced fees for licensing and permits, temporary reductions in sewer service charges). Feasibility includes considering technical, legal and financial issues.

- Consider requiring mandatory sweeping of all parking lots.

#### 3.2.1.6 Illicit Discharges/Illicit Connections

***Existing Program***

Illicit discharges and illicit connections can be significant sources of contamination entering the City's storm water drainage system. The City's illicit discharges and illicit connections (ID/IC) component of its LIP, and the corresponding sections of the Drainage Area Management Plan, includes a comprehensive program for detection, response, investigation and elimination of these types of discharges/connections. In an effort to ensure that the program is efficient and effective, the City has instituted procedures for the regular documentation of activities associated with water pollution complaints and the City's spill response. The City's ID/IC Program provides a practical guide for the City to identify, respond to, mitigate, and enforce the ID/IC component of the City of Huntington Beach LIP, and in turn the NPDES Permit. The following is the framework for the programs NPDES Permit compliance:

- Program implementation/administration

- Detection of illicit discharges and illicit connections

- Responding to water pollution incidents and complaints

- Inspections/investigations

- Education/Enforcement

- Training

- Assessment of program effectiveness

The City has integrated the ID / IC Program into a number of programs that facilitate the detection of sources of illicit discharges and illicit connections. These include the programs discussed in previous sections (Municipal Activities, Public Education/Participation, Construction Activities, Industrial / Commercial Activities, and Existing Development Activities), as well as the Water Quality Monitoring Program (discussed in Section 3.4.2.4 of this document) and active participation in the Orange County Hazardous Materials Strike Force. In order to be effective, the ID/IC program has been integrated with the municipal, industrial, commercial and construction inspection programs. If an illicit discharge or illicit connection is

discovered during an inspection, it is immediately and properly addressed. The City works with the responsible party to eliminate the illicit connection. In addition to the City of Huntington Beach LIP commitments, under the Drainage Area Management Plan, the Principal Permittee implements water quality monitoring programs that can also assist in identifying illicit discharges and illicit connections.

In its attempt to oversee, implement and enforce the ID/IC program within its jurisdiction, the City has designated resources to provide 24-hour spill response and ordinance enforcement for the storm water program. The City has also designated Authorized Inspectors who come from several different departments (including Public Works, Fire, Code Enforcement and Building & Safety) whose job is to investigate compliance and detect incidences of violations of the various ordinances dealing with water quality violations.

In addition to the proactive detection and elimination of illegal discharges and illicit connections, a large portion of the City's ID/IC program is responding to water pollution complaints and incidents. For illegal discharges, all spills to the municipal storm drain system and water bodies, are covered under the City's General Spill Response Procedures and Sewage Spill Response Procedures. Both spill response procedures contain specific investigation, notification, response, cleanup, record keeping and reporting requirements. For illicit connections, the City relies on its municipal storm water program to identify and eliminate the illicit connections, as well as the tracking of a pollutant source upstream.

Finally, the City understands that the success of the storm water program is in the educating and training of individuals (municipal staff and the public) in the importance of compliance with the ID/IC program. In addition, by conducting extensive investigation efforts and enforcement actions in a public manner, the City can also emphasizes the importance of complying with storm water and water quality requirements.

***POTENTIAL ADDITIONAL ENHANCEMENT***

The following specific areas have been identified for potential enhancement:

- Consider dedicating an information line for public regarding IC/ID questions, comments and concerns.
- Consider enhanced staff training.

#### 3.2.1.7 Trash Amendment

Trash discarded on land frequently makes its way into streams, creeks, rivers, and eventually the ocean, as rain storms wash it into gutters and storm drains. Types of trash generated by human activity that frequently pollute waterways include cigarette butts, paper, fast food containers, plastic grocery bags, cans and bottles, used diapers,

construction site debris, industrial preproduction plastic pellets, old tires, and appliances. Trash is a significant pollutant of California's waters that adversely affects beneficial uses, including but not limited to uses that support aquatic life, wildlife, and public health.

Reducing trash in waterways can be accomplished with the collective effort of the public, agencies, organizations, and permittees. Just as there are many kinds of trash, there are many methods to prevent it from fouling our waterways, such as street sweeping, education programs for littering, and the installation of trash-catching devices on storm drains.

The project objective for the Trash Amendments is to provide statewide consistency for the Water Boards' regulatory approach to protect aquatic life and public health beneficial uses, and reduce environmental issues associated with trash in state waters, while focusing limited resources on high trash generating areas.

The State Water Board adopted Amendments to Statewide Water Quality Control Plans to Control Trash (Trash Amendments) to the California Ocean Plan and the forthcoming Inland Surface Waters, Enclosed Bays, and Estuaries Plan. The Trash Amendments include six elements:

- Water quality objective for trash
- Prohibition of discharge of trash
- Implementation requirements for permitted storm water discharges and other discharges
- Time schedule for compliance
- Time extension option for State Water Board consideration
- Monitoring and reporting requirements

The storm water discharge permit categories include medium to large municipalities (MS4 Phase I), small municipalities (MS4 Phase II), Caltrans, industrial facilities (Industrial General Permit), and construction sites (Construction General Permit). The Trash Amendments provide an implementation framework that are incorporated into the respective NPDES storm water discharge permits.

The Trash Amendments were adopted by the State Water Board in 2015.

### 3.2.2 Program for New Development/Significant Redevelopment

New development and significant redevelopment of property, and changes of land use within the City, present unique challenges and opportunities relative to urban runoff quality management. Although there is a relatively small amount of vacant, undeveloped land within the City, there is and will continue to be substantial opportunity for redevelopment over time. The NPDES Permit defines "Significant Redevelopment" as a development that would create or add at least 5,000 square feet of impervious surfaces on an already developed site. Significant redevelopment may include:

- Expansion of a building footprint
- Addition to or replacement of a structure
- Replacement of an impervious surface that is not part of routine maintenance activity
- Land disturbing activities related with structural or impervious surfaces

Development or redevelopment of a property often adds new impervious surface area that results in increased runoff and increased pollutant load. Redevelopment also creates an opportunity to incorporate design features into a project based on current storm water management principles to fully mitigate the water quality impact of development of that property. This can be done at relatively low incremental cost compared to potentially much higher costs to construct or retrofit regional or city facilities to manage runoff quality from existing developed areas. Furthermore, management of new development/redevelopment is another core element of the City's NPDES compliance program. The component applies to both private development projects and equivalent City Capital Improvement Projects. Implementation of this program component is primarily the responsibility of property owners/developers, the City staff that oversee the planning review and approval and construction permit programs, and City Departments that undertake major new capital projects. Major program elements are briefly summarized in Table 3-6 using the same criteria as in Table 3-5.

**Table 3-6**
**Summary of New Development and Significant Redevelopment Program Elements**

| Program Element | Existing Program | Future Program Measures | |
|---|---|---|---|
| | | **Actions To Meet NPDES Permit Requirements (Mandatory)** | **Potential Additional Enhancement (Discretionary)** |
| General Plan and Local Coastal Program Assessment | Yes | General Plan was amended to include watershed protection in the Land Use, Environmental Resources/Conservation, Circulation, Utilities and Growth Management elements. | ■ Local Coastal Program NPDES enhancement<br>■ Review of General Plan to ensure compliance with renewed NPDES Permit |
| CEQA Environmental Review Process | Yes | Continue to review and Revise City's Project Application Form and Initial Study Checklist to identify permanent water quality BMPs. | ■ Update City's CEQA Procedures Handbook as necessary<br>■ Continue supporting in-house training of environmental planning staff on NPDES requirements |
| Development Project Review, Approval and Permitting | Yes | Continue to require project-specific WQMP's, as applicable, and standard conditions of approval.<br>Incorporate Low Impact Development BMPs into WQMP.<br>Develop Watershed Master Plans to address hydrological conditions of concern and to identify opportunities for subregional/ regional water quality projects. | Incorporate water quality standards in Zoning and Subdivision Ordinance, Municipal Code, and/or other planning documents, as well as public works standard drawings and specifications standards in Zoning and Subdivision Ordinance, Municipal Code, and/or other planning documents, as well as public works standard drawings and specifications. |

As required by the 2003 Drainage Area Management Plan, a comprehensive assessment of the City's planning and development process was performed to provide a greater focus on the protection of water bodies and use of BMPs. A model program was developed by the City that links new development BMP design, construction and operation to new development planning phases covered by the General Plan, environmental review process and development permit approval process. The City has used this model program in developing its new development and significant redevelopment plan contained in the City of Huntington Beach LIP.

#### 3.2.2.1 General Plan and Local Coastal Program Assessment

*EXISTING PROGRAM*

The City, as a Permittee, is required by the NPDES Permit to minimize short- and long-term impacts, to the maximum extent practicable, from new development and significant redevelopment on the water quality of receiving waters. The City recently reviewed its General Plan, specifically those elements that covered land development issues, goals and policies, for opportunities to address water quality protection from urban and storm water runoff. In particular, General Plan elements were reviewed with sensitivity to the existence of sensitive water resources within the City; existing

regulations pertaining to receiving waters within the City; expected major new development or significant redevelopment; anticipated major new infrastructure projects (e.g., roads, sewers, flood control, storm drains); and possible effect of urban and storm water runoff on recreational use of water bodies within the City.

The Local Coastal Program (Coastal Element) has separate goals, objectives and policies specific to Water and Marine Resources. The Local Coastal Program (Coastal Element) was updated and certified by the California Coastal Commission effective October 2011. The purpose of the update was to ensure consistency with the policies and format of the 1996 Huntington Beach General Plan and to incorporate revisions of the Coastal Act to date. The City evaluated the updated Coastal Element to determine if additional amendments were necessary to comply with the NPDES Permit. It was determined that no additional amendments were necessary at the time.

*POTENTIAL ADDITIONAL ENHANCEMENT*

The following specific areas have been identified for potential enhancement:

- Initiate a process to review and amend, as necessary, the Local Coastal Program. Specifically, the City will evaluate amending the Local Coastal Program to provide NPDES enhancement, reflect location-specific watershed protection/storm water quality management policies, and to eliminate any conflicts among land use districts, permitted land uses and storm water-specific goals and policies, as applicable.

#### 3.2.2.2 CEQA Environmental Review Process

*EXISTING PROGRAM*

During the planning review and approval process for development and redevelopment processes, the City currently reviews a project to identify any potentially significant short- and long-term impacts on hydrology and water quality, which may require mitigation measures to reduce impacts. The City reviewed its CEQA Initial Study process (Project Application Form and Checklist) and the EIR preparation and review process. The result of this evaluation was a revision of the City's Project Application Form to include items for: 1) Expected percent change in pervious surface area of the site; and 2) Submittal of a preliminary project-specific Water Quality Management Plan, if applicable, along with required submittal of other developmental plans, to identify permanent or post-construction Low Impact Development BMPs that will be incorporated into the project's design, construction and operation. The evaluation also resulted in the City adding the following items to the Initial Study Checklist Appendix G of the CEQA Guidelines:

Under the Hydrology/Water Quality section –

(k) Potential impact of project construction on storm water runoff

(l) Potential impact of project's post-construction activity on storm water runoff

(m) Potential for discharge of storm water pollutants from areas of material storage, vehicle or equipment fueling, vehicle or equipment maintenance (including washing), waste handling, hazardous materials handling or storage, delivery areas, loading docks or other outdoor work areas

(n) Potential for discharge of storm water to affect the beneficial uses of the receiving waters

(o) Potential for significant changes in flow velocity or volume of storm water runoff to cause environmental harm

(p) Potential for significant increases in erosion of the project site or surrounding areas

Under the Utilities and Service Systems section -

(h) Would the project include a new or retrofitted storm water treatment control Best Management Practice (BMP), (e.g. water quality treatment basin, constructed treatment wetlands), the operation of which could result in significant environmental effects (e.g. increased vectors and odors)?

*POTENTIAL ADDITIONAL ENHANCEMENT*

To support the City's revisions to its environmental review process as required by the NPDES Permit, the following enhancements are being pursued:

- Update the City's existing CEQA Procedures Handbook as necessary
- Continue supporting in-house training of environmental planning staff on NPDES requirements

#### 3.2.2.3 Development Project Review, Approval and Permitting

*EXISTING PROGRAM*

The City maintains planning and design review procedures, Urban Design Guidelines and zoning ordinances as well as standards and standard details that govern the design of projects to minimize the effects of urbanization on site hydrology, runoff flow rates or velocities, and pollutant loads. Standards and guidelines provide for consistency with desired policies among projects and reduce the need for project-specific conditions of approval. During the project review, approval and permitting process, the City requires all new development and significant redevelopment to address the quantity and quality of storm water runoff from the completed development. A project-specific Water Quality Management Plan (WQMP) describing how the project will address runoff is required for the following:

- Private and public projects that are listed under the NPDES Permit's "Priority Project Category"

- A Non-Priority Project Plan is required to be completed for private new development and redevelopment projects within Permittees' jurisdictions, and equivalent public agency capital projects undertaken by the Permittees that qualify as Non-Priority Projects. These projects do not fall under one of the Priority Project Categories defined within the Model WQMP, but do meet one of the following conditions:

  - Require discretionary action that will include a precise plan of development, except for those projects exempted by the Permittee Water Quality Ordinance (as applicable); or
  - Require issuance of a non-residential plumbing permit for pipelines conveying hazardous materials (e.g. gasoline) as defined in the Permittee Water Quality/ Stormwater Ordinance.

The WQMP describes how the project will meet the following requirements:

- Priority new development and significant redevelopment projects are required to:

  - Develop and select LID and Hydromodification Control BMPs for source control, pollution prevention, site design, LID implementation, and structural treatment control BMPs.
  - Determine if the priority project has an impact on the site's hydrologic regime. Hydromodification shall be addressed and additional site design controls, on-site management controls, structural treatment controls, and/or in-stream controls shall be implemented to mitigate the impacts.
  - Incorporate and implement all applicable Source Control BMPs (routine structural (e.g., design of trash storage areas), and routine non-structural, (e.g., street sweeping for private roads and parking lots) unless not applicable to the project);
  - Consider the implementation of Site Design BMPs (e.g. pervious pavement, bioretention), and document those BMPs included and those not included; and
  - Either implement Treatment Control BMPs (e.g. vegetated swales, media filter, detention basins), including a selection of such BMPs into the project design; or participate in or contribute to an acceptable regional or watershed management program. Projects participating in a regional or watershed management program will also implement Source Control BMPs and Site Design BMPs.
- All Non-Priority Projects are required to document the selection of site design, source control, and any other BMPs included in the project.

- The City has incorporated the requirements for a Project WQMP into the planning, design, approval and construction processes; therefore, an applicant is required to submit the WQMP at the following points in the project planning and permitting process:

- For Preliminary WQMP : Land Use Permit (entitlement process) when the City uses discretion in whether to approve or disapprove a new development or significant redevelopment

- For Final WQMP: Issuing of grading, building, demolition or similar construction permits that require ministerial processing (fixed standards and measures are applied)

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In general, the same Project WQMP overall development steps apply to public agency projects and private development projects. However, some unique issues associated with certain Public Agency Projects are either specifically recognized in the Permits, or consider the use of particular approaches. Streets, roads, highways and freeways of 5,000 square feet or more of paved surface shall incorporate United States Environmental Protection Agency (EPA) guidance.

Above ground linear lined drainage projects typically consist of lined vertical or trapezoidal channels. These projects may result in the creation of more than 10,000 square feet of impervious surface and have BMP implementation constraints similar to streets, roads, highways, and freeways, and must implement similar practices as described in EPA Green Street Manual.

Below ground linear drainage and utility construction projects may result in the replacement of more than 5,000 square feet of impervious surface within a developed public street, road or highway, such as storm drains, sewers, and water lines. Such projects would not qualify as a Priority Project since they are in a similar category as projects which maintain original line and grade at the surface and would not require the preparation of a Project WQMP but a Non-Priority Project Plan will be required.

These projects involve trenching within existing developed rights-of-way; replacement, refurbishment, or extension of sewers, water lines, and dry utilities; and replacing existing pavement. In these cases, implementation of LID or structural treatment controls would result in a significant expansion of the project.

#### 3.2.2.3.1 Standard Conditions of Approval

The City has general/standard conditions of approval to protect receiving water quality from short- and long-term impacts of new development and significant redevelopment. In brief, the City currently uses the following standard conditions of approval:

THE FOLLOWING DEVELOPMENT REQUIREMENTS SHALL BE COMPLETED PRIOR TO ISSUANCE OF A GRADING PERMIT:

1. Prior to the issuance of any grading or building permits for projects that will result in soil disturbance of one or more acres of land, the applicant shall demonstrate that coverage has been obtained under the Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities (Order No. 2009-009-DWQ) [General Construction Permit] by providing a copy of the Notice of Intent (NOI) submitted to the State of California Water Discharge Identification (WDID) Number. Projects subject to this requirement shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) conforming to the current National Pollution Discharge Elimination System (NPDES) requirements, which shall be submitted to the Department of Public Works for review and acceptance. A copy of the current SWPPP shall be kept at the project site and another copy shall be submitted to the City.

2. A Project Water Quality Management Plan (WQMP) conforming to the current Waste Discharge Requirements Permit for the County of Orange (Order No. R8-2009-0030) [MS4 Permit] prepared by a Licensed Civil Engineer, shall be submitted to the Department of Public Works for review and acceptance. The WQMP shall address Section XII of the MS4 Permit and all current surface water quality issues.

3. The project WQMP shall include the following:

    a. Low Impact Development

    b. Discusses regional or watershed programs (if applicable)

    c. Addresses Site Design BMPs (as applicable) such as minimizing impervious areas, maximizing permeability, minimizing directly connected impervious areas, creating reduced or "zero discharge" areas, and conserving natural areas.

d. Incorporates the applicable Routine Source Control BMPs as defined in the Drainage Area Management Plan. (DAMP)

e. Incorporates Treatment Control BMPs as defined in the DAMP.

f. Generally describes the long-term operation and maintenance requirements for the Treatment Control BMPs.

g. Identifies the entity that will be responsible for long-term operation and maintenance of the treatment Control BMPs.

h. Describes the mechanism for funding the long-term operation and maintenance of the Treatment Control BMPs.

i. Includes an Operations and Maintenance (O&M) Plan for all structural BMPs.

j. After incorporating plan check comments of Public Works, three final WQMPs (signed by the owner and the Registered Civil Engineer of record) shall be submitted to Public Works for acceptance. After acceptance, two copies of the final report shall be returned to the applicant for the production of a single complete electronic copy of the accepted version of the WQMP on CD media that includes:

    i. The 11″ by 17″ Site Plan in TIFF format (400 by 400 dpi minimum)

    ii. The remainder of the complete WQMP in PDF format including the signed and stamped title sheet, owner's certification sheet, Inspection/Maintenance Responsibility sheet, appendices, attachments, and all educational material.

k. The applicant shall return one CD media to Public Works for the project record file.

4. Indicate the type and location of Water Quality Treatment Control Best Management Practices (BMPs) on the Grading Plan consistent with the Project WQMP. The WQMP shall follow the City of Huntington Beach; Project Water Quality Management Plan Preparation Guidance Manual dated June 2006. The WQMP shall be submitted with the first submittal of the Grading Plan.

5. In Complexes larger than 100 dwelling units where car washing is allowed, a designated car wash area that does not drain to a storm drain system shall be provided for common usage. Wash water from this area may be directed to the sanitary sewer (upon approval by the Orange County Sanitation District),

to an engineered infiltration system, or to an equally effective alternative. Pre-treatment may also be required.

6. A suitable location, as approved by the City, shall be depicted on the grading plan for the necessary trash enclosure(s). The area shall be paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, and screened or walled to prevent off-site transport of trash. The trash enclosure area shall be covered or roofed with a solid, impervious material. Connection of trash area drains into the storm drain system is prohibited. If feasible, the trash enclosure area shall be connected into the sanitary server.

THE FOLLOWING DEVELOPMENT REQUIREMENTS SHALL BE COMPLETED PRIOR TO FINAL INSPECTION OR OCCUPANCY

7. Prior to grading or building permit close-out and/or the issuance of a certificate of use or a certificate of occupancy, the applicant shall:

    a. Demonstrate that all structural Best Management Practices (BMPs) described in the Project WQMP have been constructed and installed in conformance with approved plans and specifications.

    b. Demonstrate all drainage courses, pipes, gutters, basins, etc. are clean and properly constructed.

    c. Demonstrate that the applicant is prepared to implement all non-structural BMPs described in the Project WQMP.

    d. Demonstrate that an adequate number of copies of the approved Project WQMP are available for the future occupiers.

Certain development standards influence the quantity or quality of runoff from a project and design details standardize practices for common site design issues features that may also have an influence on water quality features. Examples of such design standards include:

- Minimum landscape and pervious surface requirements
- Open space requirements
- Hardscape allowance in lieu of landscape requirement
- Commercial design standards for planter/landscaping
- Drainage facility design standards and details

The City currently has Urban Design Guidelines that provide general guidance and incorporate some of the general concepts noted above. Furthermore, prescriptive planning and design requirements are contained in the City's Zoning and Subdivision Ordinance (ZSO). There are additional procedures that should be incorporated into the ZSO, and additional guidelines that could be adopted to further promote and encourage effective runoff management as discussed below.

### *POTENTIAL ADDITIONAL ENHANCEMENT*

The following specific areas have been identified for potential enhancement:

- Consider incorporating water quality design standards in the ZSO, Municipal Code, and/or other planning documents, as well as Public Works Standard Plans and Specifications.

While the City's zoning code encompasses some of the general design principles that can help promote storm water quality and quantity, there are design concepts and planning and review procedures that should be considered to provide more explicit direction to potential developers and to City staff.

Specific areas of the ZSO that should be reviewed and considered for addition or revision include Title 23 Provisions Applying in All or Several Districts, and Title 25, Subdivisions.

The following conceptual changes to Title 25 would be for the purpose of providing greater clarity and certainty for both the City and project applicants for both WQMP review and approval process and the incorporation of the identified BMPs in project plans.

### *Minimize Directly Connected Impervious Areas (DCIA)*

Impervious areas directly connected to the storm drain system are the greatest contributor to non-point source pollution. The first effort in site planning and design for storm water quality protection is to minimize the "directly connected impervious area (DCIA)" as shown in Figure 3-4 (Source, CASQA California Stormwater BMP Handbooks, CASQA 2003).

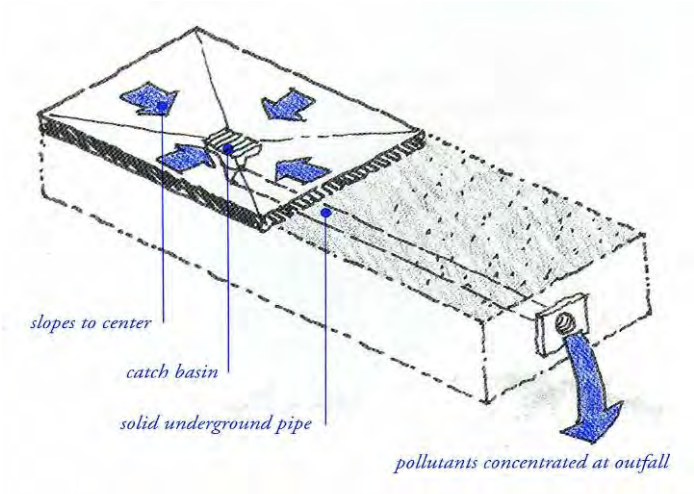



**Figure 3-4**
**Directly Connected Impervious Area**

Any impervious surface that drains into a catch basin, area drain, or other conveyance structure is a "directly connected impervious area." As storm water runoff flows across parking lots, roadways, and paved areas, the oils, sediments, metals and other pollutants are collected and concentrated. If this runoff is collected by a drainage system and carried directly along impervious gutters or in closed underground pipes, it has no opportunity for filtering by plant material or infiltration into the soil. It also increases in speed and volume, which may cause higher peak flows downstream, and may require larger capacity storm drain systems, increasing flood and erosion potential.

Minimizing directly connected impervious areas can be achieved in two ways:

- Reducing overall impervious land coverage in site design
- Directing runoff from impervious areas to pervious areas for infiltration, retention/detention, or filtration

Strategies for reducing impervious land coverage include:

- Use of pervious surfaces (see Table 3-7) for light duty roads, parking lots and pathways
- Sod or vegetative "green roofs" (roofs that incorporate vegetation) rather than conventional roofing materials
- Reduce street pavement where possible such as landscape medians

Example strategies directing runoff from impervious surfaces (roofs, walks, driveways, parking areas) for infiltration, retention/detention, and bio-filtration include:

- Vegetated swales
- Planter areas
- Crushed stone reservoir base rock under pavements or in sumps
- Cisterns and tanks
- Infiltration basins and trenches
- Drainage trenches at end of driveways
- Dry wells

Unlike conveyance storm drain systems that convey water beneath the surface and work independently of surface topography, a drainage system for storm water infiltration can work with natural landforms and land uses to become a major design element of a site plan. Solutions that reduce DCIA prevent runoff, detain or retain surface water, attenuate peak runoff rates, benefit water quality and convey storm water. Site plans that apply storm water management techniques use the natural topography to optimize the drainage system, pathway alignments, locations for parks and play areas, and the most advantageous locations for building sites. In this way, the natural landforms help to generate an aesthetically pleasing urban form integrated with the natural features of the site.

### *INCORPORATE ZERO DISCHARGE AREAS*

For Priority Projects determined by the WQMP, an area within a development project can be designed to infiltrate, retain, or detain the volume of runoff requiring treatment from that area. This approach is encouraged wherever possible over mechanical/structural treatment systems. The term "zero discharge" in this philosophy applies at stormwater treatment design storm volumes. For example, consider an area that functionally captures and then infiltrates the 85th percentile storm volume. Since the WQMP requires treatment of the 85th percentile storm volume, the area generates no treatment-required runoff.

Site design techniques available for designing areas that produce no treatment-required runoff include small site techniques such as those described above under Minimize DCIA as well as:

- Retention/Detention Ponds

- Infiltration Areas

Infiltration areas, and ponds, can provide "dual use" functionality as storm water retention measures and development amenities. Detention ponds and infiltration areas can double as playing fields or parks. Wet ponds and infiltration areas can serve dual roles when meeting landscaping requirements.

Figure 3-5 illustrates a typical residential tract, and a tract incorporating Zero Discharge Area techniques (infiltration areas) (Source California Stormwater BMP Handbooks, CASQA, 2003). The Zero Discharge Area designed tract represents a design to infiltrate (i.e., achieve zero discharge from) a portion of the tract's runoff, reducing total runoff from the tract.

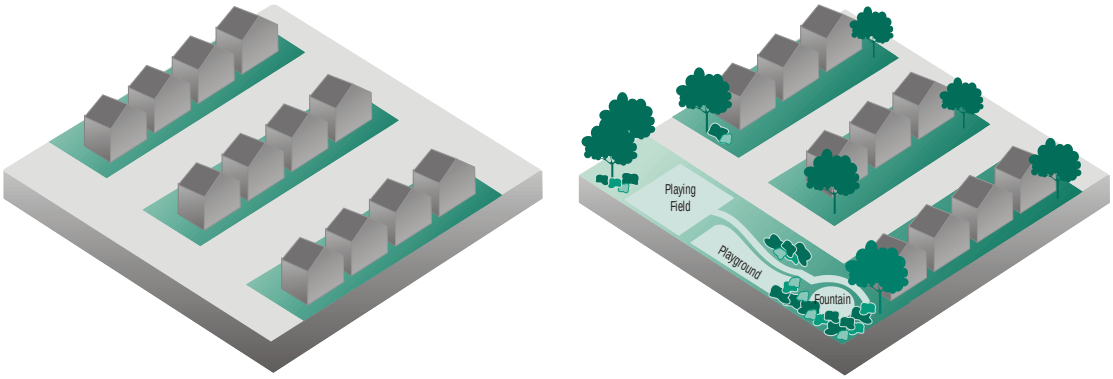



**Figure 3-5**
**Zero Discharge Area Usage**

### *INCLUDE SELF-TREATMENT AREAS*

Developed areas may provide "self-treatment" of runoff if properly designed and drained. Self-treating site design techniques include:

- Conserved Natural Spaces
- Large Landscaped Areas (including parks and lawns)
- Grass/Vegetated Swales
- Turf Block Paving Areas

The infiltration and bio-treatment inherent to such areas provides the treatment control necessary. These areas therefore act as their own BMP, and no additional BMPs to treat runoff should be required. Site drainage designs must direct runoff from self-treating areas away from other areas of the site that require treatment of runoff. Otherwise, the volume from the self-treating area will only add to the volume

requiring treatment from the impervious area. Likewise, under this philosophy, self-treating areas receiving runoff from treatment-required areas would no longer be considered self-treating, but rather would be considered as the BMP in place to treat that runoff. These areas could remain as self-treating, or partially self-treating areas, if adequately sized to handle the excess runoff addition.

### *INCORPORATE RUNOFF REDUCTION AREAS*

Using alternative surfaces with a lower coefficient of runoff may reduce runoff from developed areas. Surfaces that produce smaller volumes of runoff are represented by lower coefficients of runoff, such as more pervious surfaces. Instead of conventional paving surfaces (e.g., concrete and asphalt), alternative surfaces (e.g., crushed aggregate, pervious asphalt/concrete) can be incorporated into a development (see Figure 3-6), resulting in lower volumes of runoff. Lower volumes and rates of runoff translate directly to lower treatment requirements. In addition, these techniques can help reduce peak drainage rates.

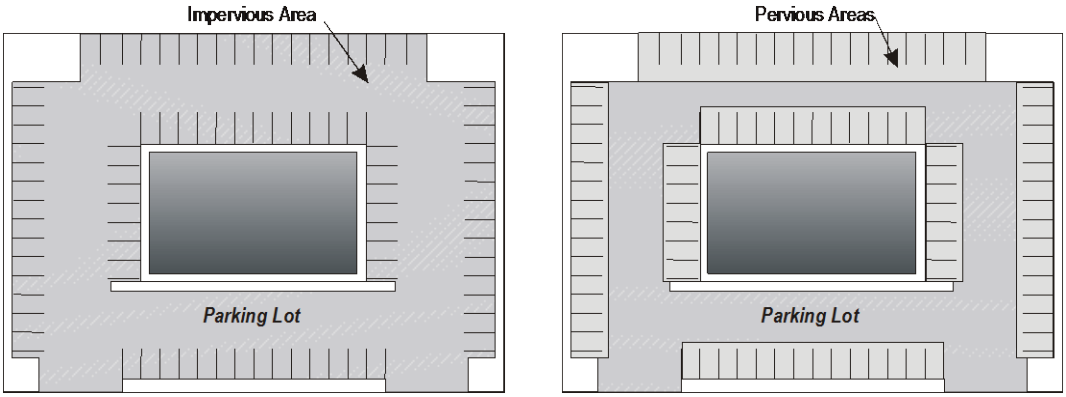



**Figure 3-6**
**Impervious Parking Lot vs. Parking Lot with Some Pervious Surfaces**

Site design techniques that incorporate pervious materials may be used to reduce the runoff from a developed area, reducing the amount of runoff requiring treatment. These materials include:

- Pervious Concrete
- Pervious Asphalt
- Turf Block
- Brick (un-grouted)
- Natural Stone
- Concrete Unit Pavers
- Crushed Aggregate
- Cobbles
- Wood Mulch

Other site design techniques such as disconnecting impervious areas, preservation of natural areas, and designing concave medians may be used to reduce the runoff coefficient of development areas.

Table 3-7 presents a list of site design and landscaping techniques and indicates whether they are applicable for use in Zero Discharge Areas, Self-Treating Areas, and/or Runoff Reduction Areas. Several different techniques may be implemented within the same design philosophy. Some techniques may be used to implement more than one design philosophy. Where feasible, combinations of multiple techniques may be incorporated into new development and redevelopment projects to minimize the amount of treatment required.

**Table 3-7**
**Site Design and Landscaping Techniques**

| Site Design and Landscape Techniques | Design Philosophy | | |
|---|---|---|---|
| | Zero Discharge | Self-Treating | Runoff Reduction |
| Permeable Pavements | | | |
| Pervious concrete | | | X |
| Pervious asphalt | | | X |
| Turf block | | X | X |
| Un-grouted brick | | | X |
| Un-grouted natural stone | | | X |
| Un-grouted concrete unit pavers | | | X |
| Unit pavers on sand | | | X |
| Crushed aggregate | | | X |
| Cobbles | | | X |
| Wood mulch | | | X |
| Streets | | | |
| Urban curb/swale system | | | X |
| Rural swale system | | | X |
| Concave median | X | | X |
| Pervious island | | | X |
| Parking Lots | | | |
| Hybrid surface parking lot | | | X |
| Pervious parking grove | | | X |
| Pervious overflow parking | | X | X |

**Table 3-7 (continued)**
**Site Design and Landscaping Techniques**

| Site Design and Landscape Techniques | Design Philosophy | | |
|---|---|---|---|
| | Zero Discharge | Self-Treating | Runoff Reduction |
| Driveways | | | |
| Not directly connected impervious driveway | | | X |
| Paving only under wheels | | X | X |
| Flared driveways | | | X |
| Buildings | | | |
| Dry-well | X | | X |
| Cistern | X | | X |
| Foundation planting | | | X |
| Pop-up drainage emitters | | | |
| Landscape | | | |
| Grass/vegetated swales | | X | X |
| Extended detention (dry) ponds | X | X | X |
| Wet ponds | X | X | X |
| Bio-retention areas | X | X | X |

Other BMPs that should be considered and encouraged in the design of new and redevelopment projects include:

- Roof runoff controls - Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

  *Pop-up Drainage Emitter:* Roof downspouts can be directed to an underground pipe that discharges some distance from the building foundation, releasing the roof runoff through a pop-up emitter. The emitter is similar to a pop-up sprinkler irrigation head and only opens when there is flow from the roof. During dry periods, the emitter is flush with the ground for ease of landscape maintenance.

*Foundation Planting:* Landscape planting can be provided around the base of the foundation to allow increased opportunities for storm water infiltration, as well as protect the soil from erosion caused by concentrated sheet flow coming off the roof. These plantings must be sturdy enough to tolerate heavy runoff and periodic soil saturation.

- *Efficient Irrigation* - Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

- *Alternative Building Materials* - Alternative building materials are selected instead of conventional materials for new construction and renovation. These materials reduce potential sources of pollutants in stormwater runoff by eliminating compounds that can leach into runoff, reducing the need for pesticide application, reducing the need for painting and other maintenance, or by reducing the volume of runoff.

Information on these and other techniques are contained in the CASQA California Stormwater BMP Handbook – New Development and Redevelopment (https://www.casqa.org/resources/bmp-handbooks).

#### 3.2.2.2 Specific New Development/Significant Redevelopment Opportunities

Key properties with substantial land area that may be subject to future (near or long term) new development or significant redevelopment should be considered as opportunities for incorporating water quality features that have additional benefits beyond just addressing project-specific impacts. These are identified in the following section by water quality planning area-based programs.

### 3.2.3 Water Quality Planning Area-Based Programs

This category includes structural measures or source control programs that are targeted in each water quality planning area that will provide enhanced water quality benefits beyond what are addressed primarily through implementation of the routine measures implemented to meet NPDES Permit requirements and other citywide programs. While all of these measures can be considered discretionary (i.e. beyond base permit requirements, they are a major part of the City's long-range commitment to improving receiving water quality).

Some of these are "opportunistic" projects that take advantage of available land or natural features, potentially serve dual benefits, or have already been identified and are either under study or have been identified for possible grant funding. These potential opportunities are summarized below for each of the areas that have been identified for water quality planning purposes. General locations of the identified projects and programs are shown in Figures 3-7 and 3.7.1 thru 3-7.8, where applicable, and in the Drainage Maps (Appendix C).

# City of Huntington Beach

Water Quality Planning Area – Based Programs and Projects

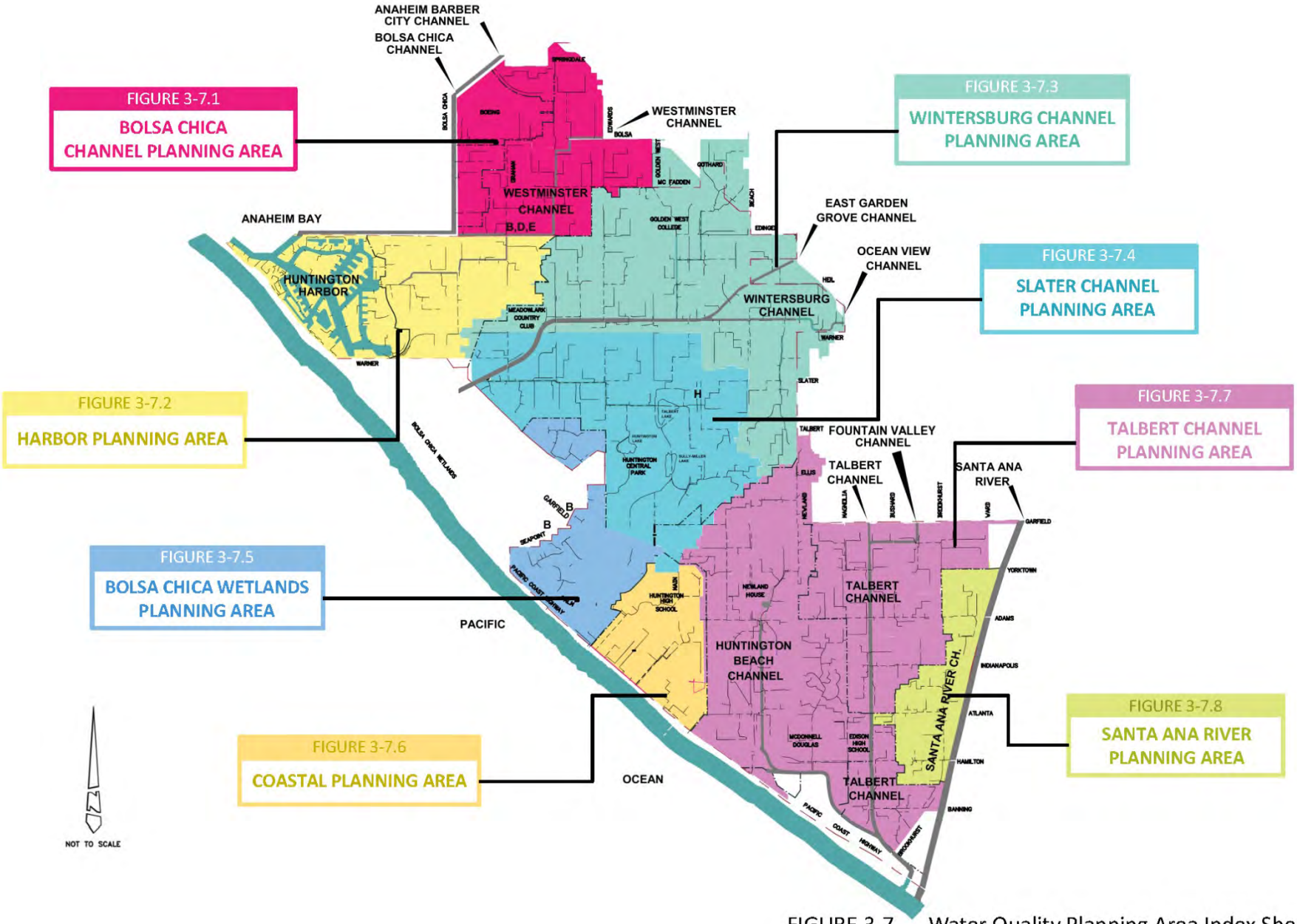



FIGURE 3-7 Water Quality Planning Area Index Sheet

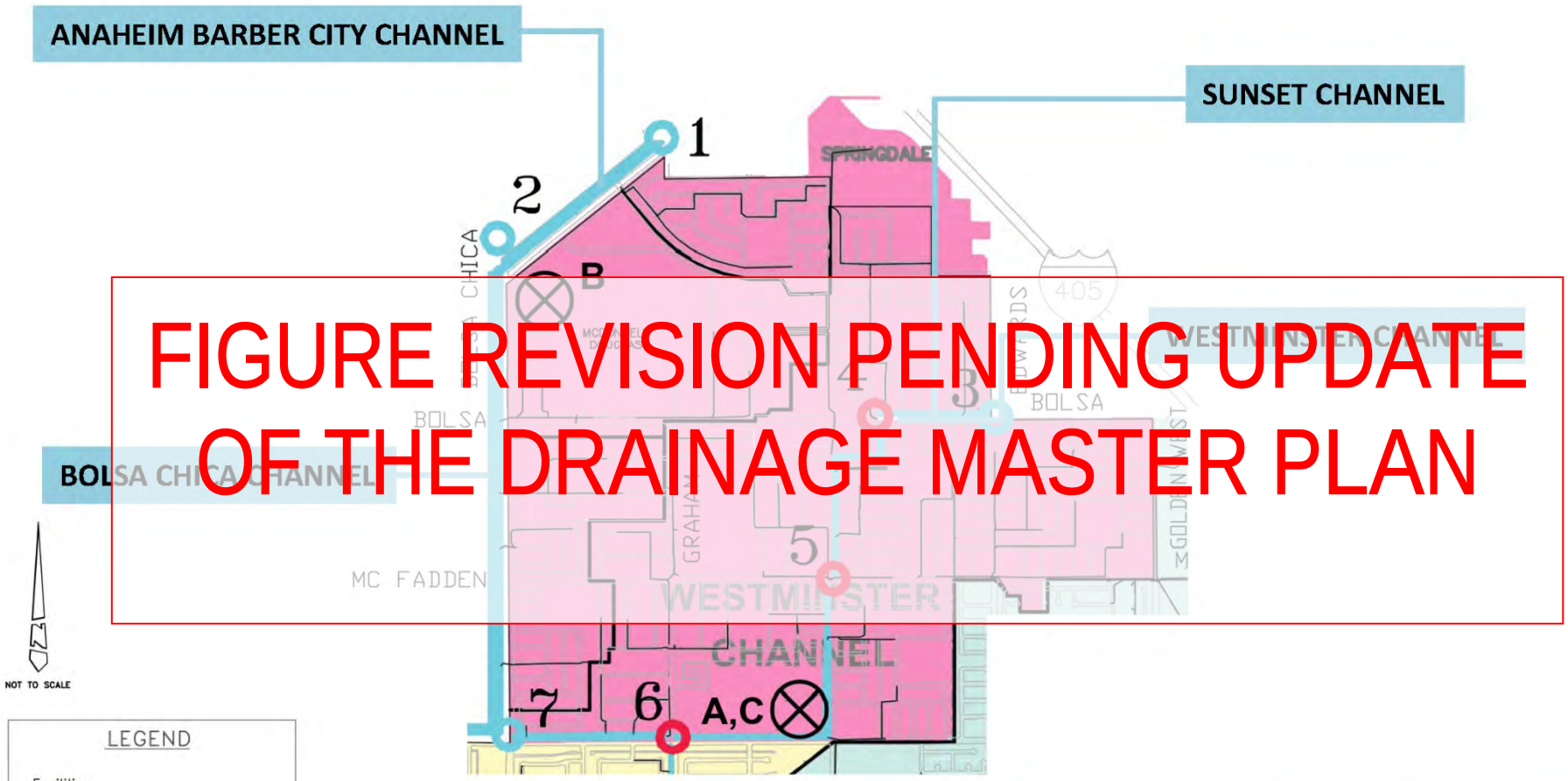



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

1 - Anaheim Barber City Channel Entry Point
2 - Bolsa Chica Channel Entry Point
3 – Sunset Channel Entry Point
4 – Outfall new Bolsa Ave.
5 – Outfall near McFadden Ave.
6 – Outfall near Graham St.
7 – Sunset Channel Exit Point

**BOLSA CHICA CHANNEL PLANNING AREA**

A. Westminster Channel – County.
B. Boeing
C. County Channel

FIGURE 3-7.1

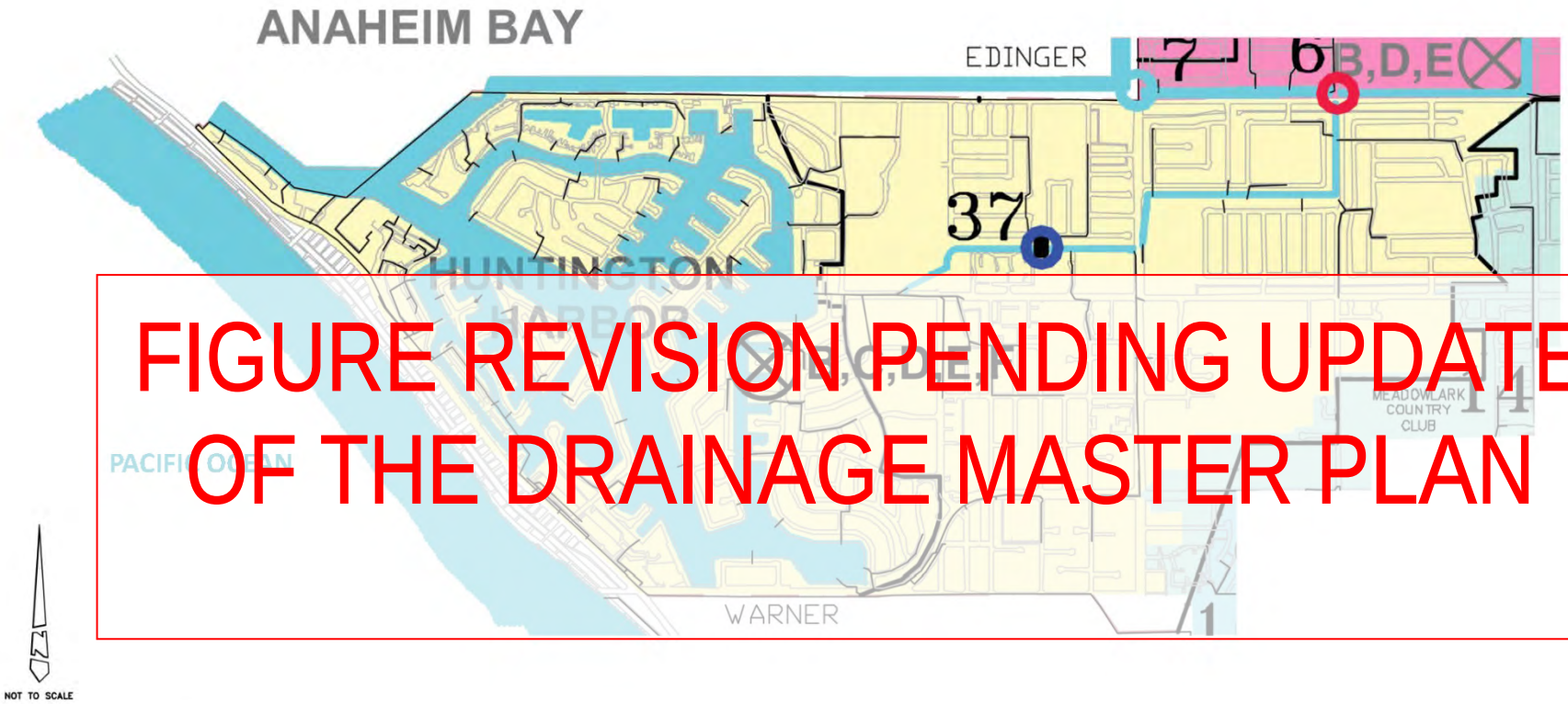



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

LEGEND

Facilities
- Flood Control Channel
- Tributary Channel
- Pump Station

Sampling Locations
- Pump Station
- Channel
- Outfall to Channel
- Other Outfall
- Lake
- Program/Project

37 – Scenario Pump Station

**HARBOR PLANNING AREA**

B. Trash Boom, County
C. Consider catch basin retrofit
D. Expand education and enforcement program.
E. Control water quality impacts from live aboard activities.
F. Collection/disposal of water borne trash enhanced.

FIGURE 3-7.2

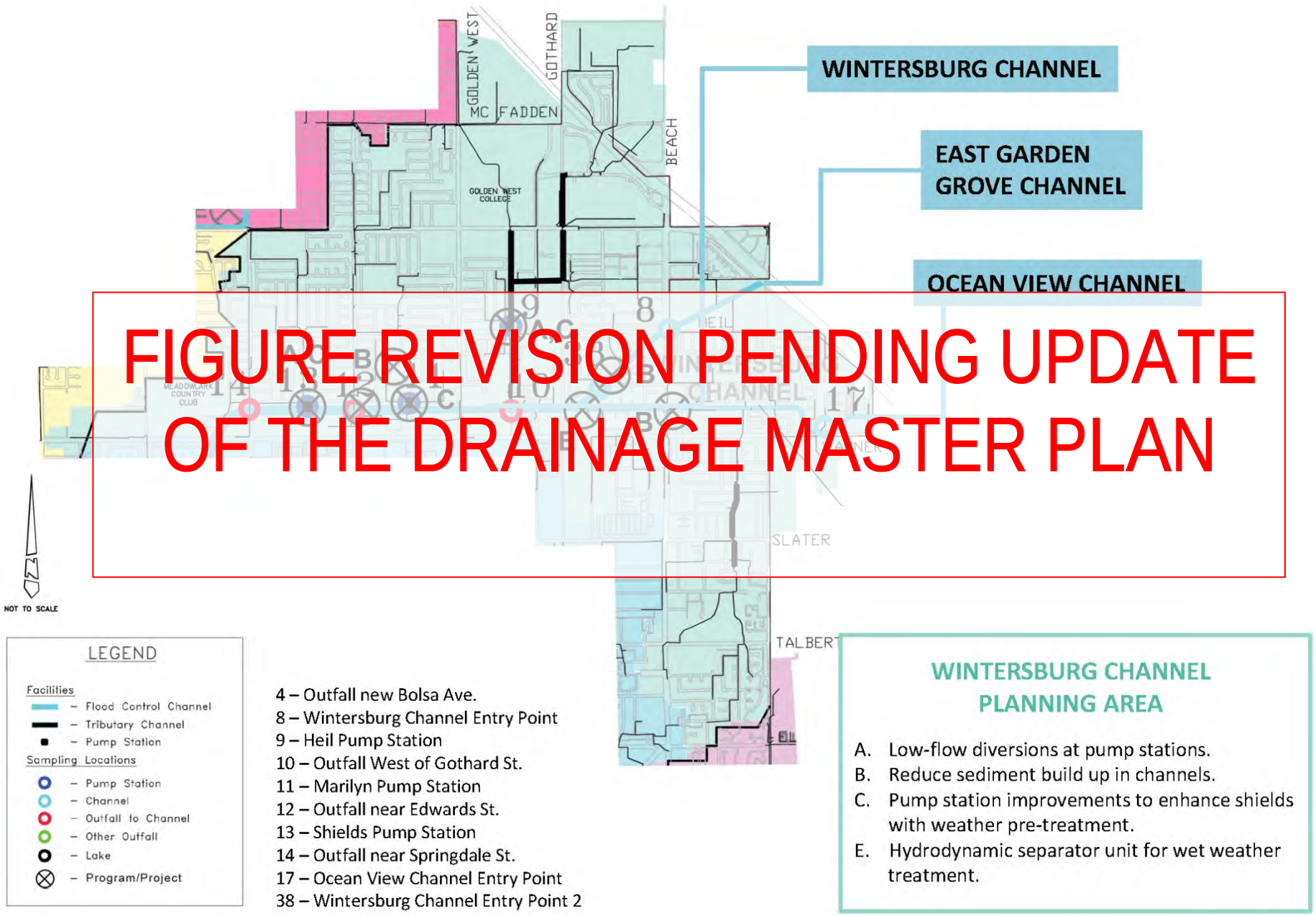



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

FIGURE 3-7.3

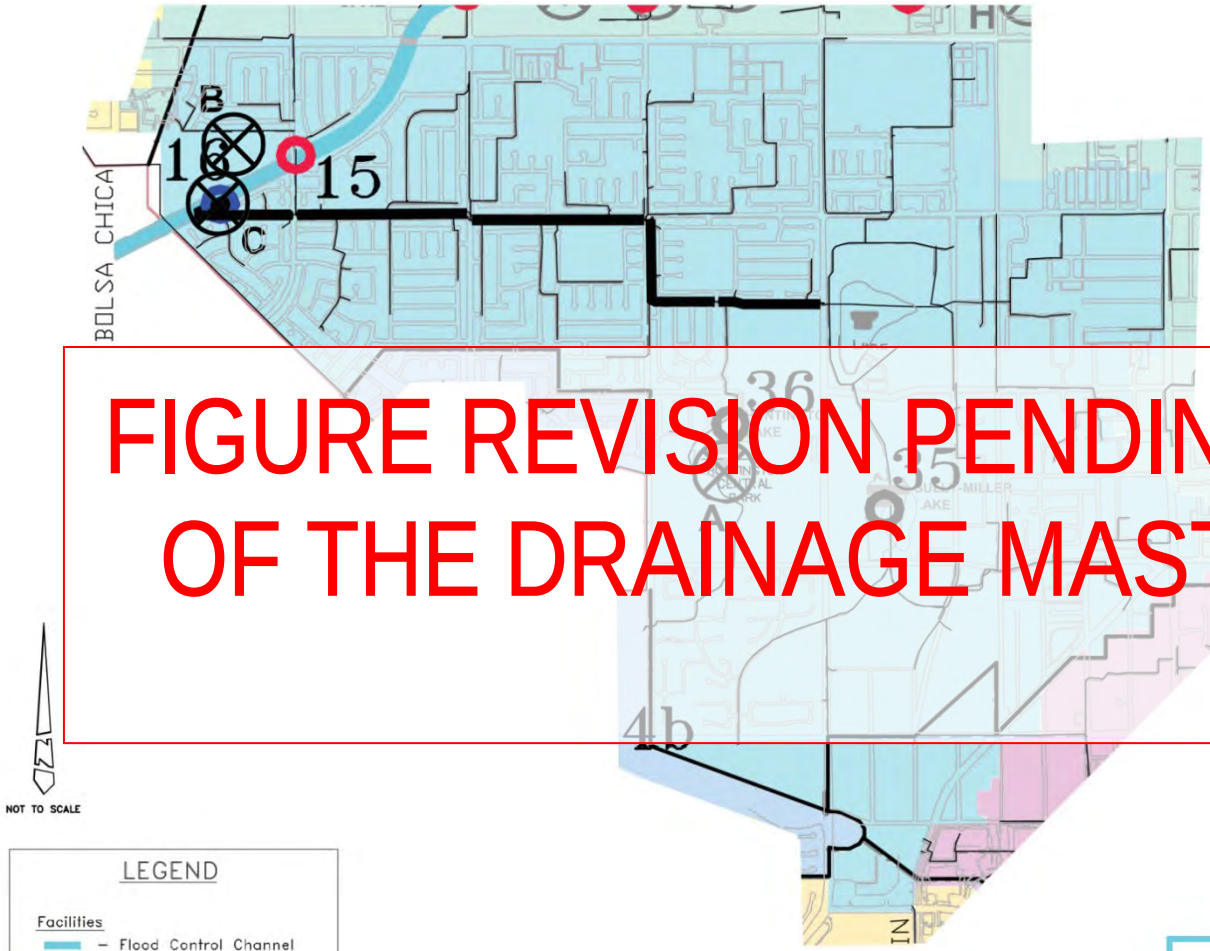



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

LEGEND

Facilities
- Flood Control Channel
- Tributary Channel
- Pump Station

Sampling Locations
- Pump Station
- Channel
- Outfall to Channel
- Other Outfall
- Lake
- Program/Project

15 – Outfall near Graham St.
16 – Slater Pump Station
35 – Sully Miller Lake
36 – Huntington Lake

**SLATER CHANNEL PLANNING AREA**

A. Protect/restoration of Huntington Lake
B. Use of Sully-Miller for treatments/recharge.
C. Future development/redevelopment opportunities.

FIGURE 3-7.4

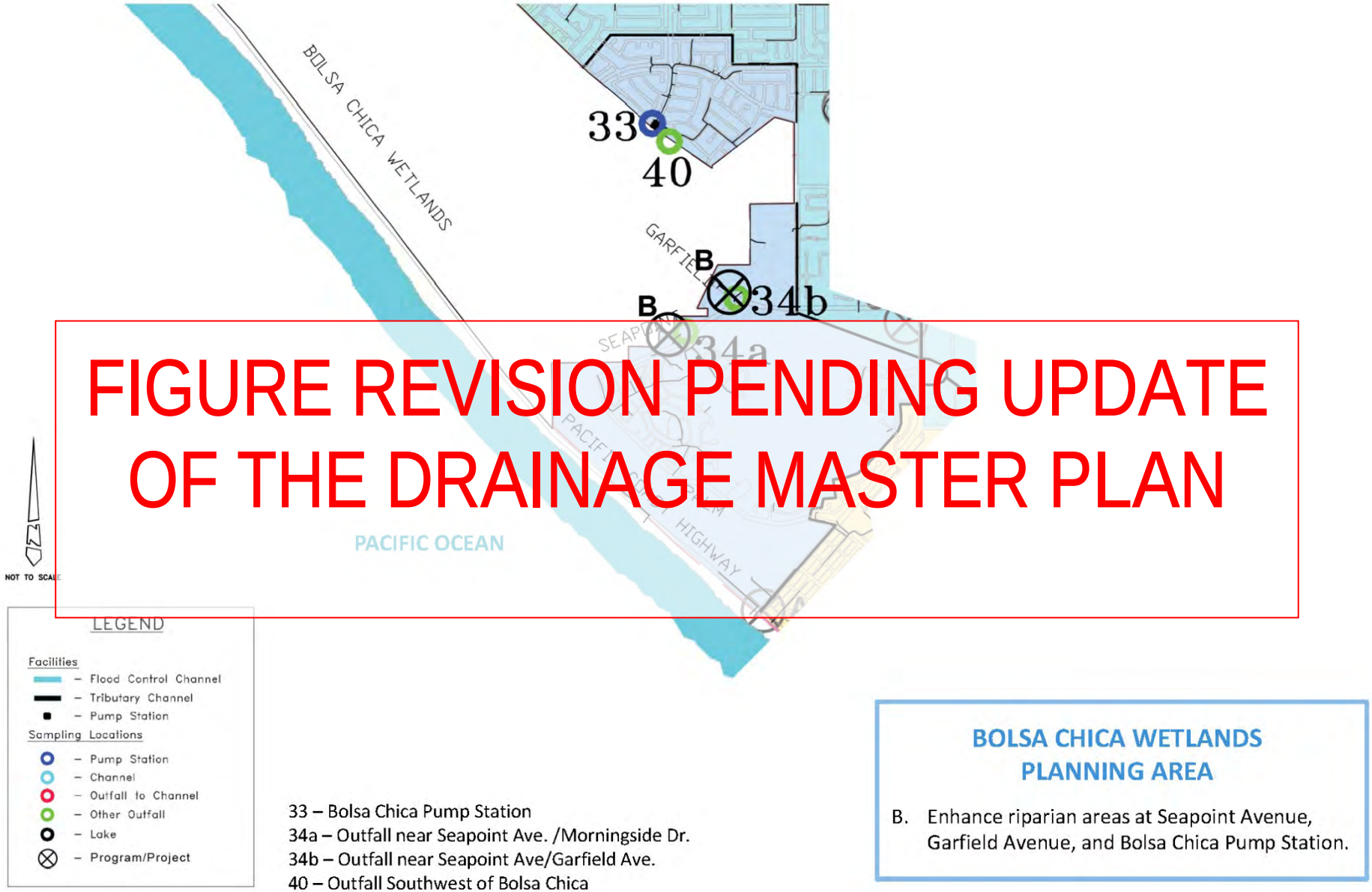



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

FIGURE 3-7.5

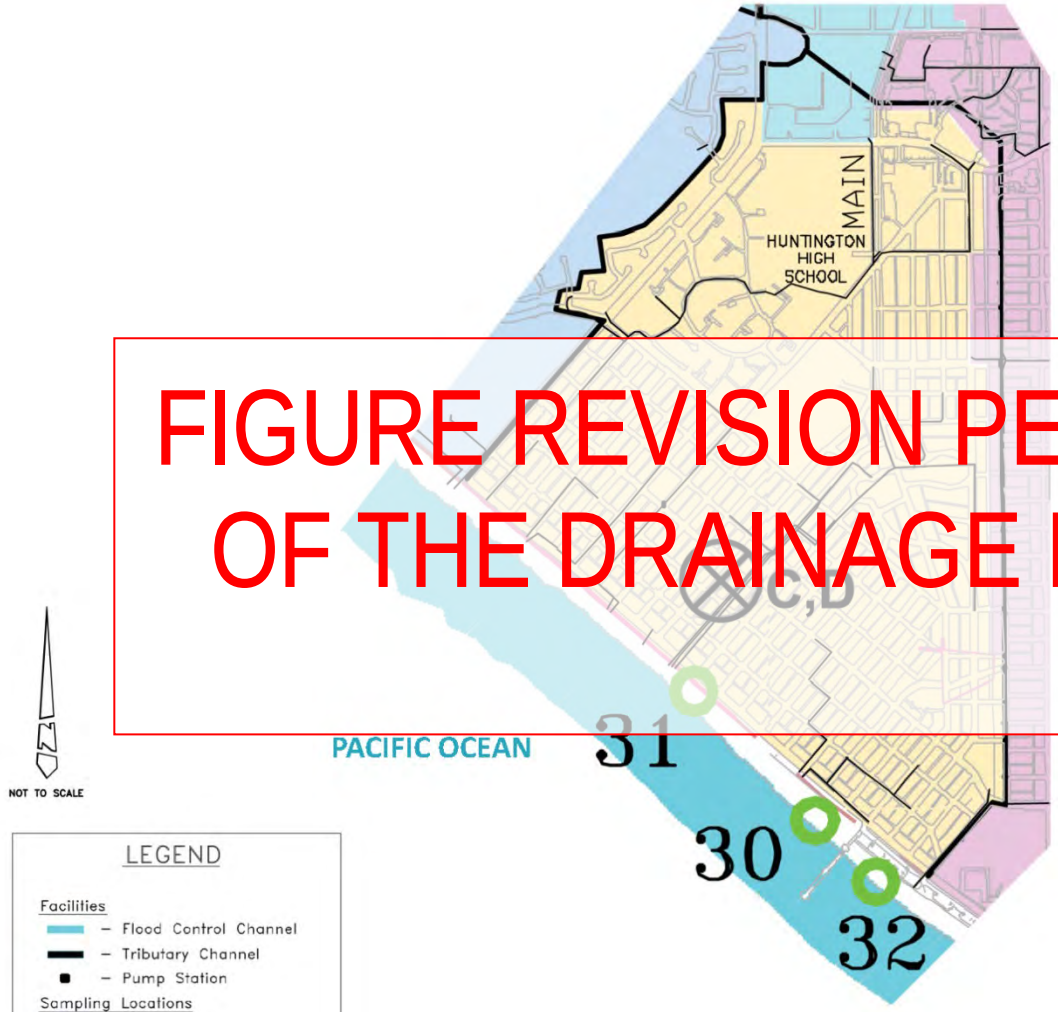



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

30 – Downtown Outfall between 5th / 6th St.
31 – Downtown Outfall near 13th St.
32 – Downtown Outfall between 2nd / 3rd St

**COASTAL PLANNING AREA**

C. Enhanced street and alley cleaning.
D. Expanded education and enforcement program.

FIGURE 3-7.6

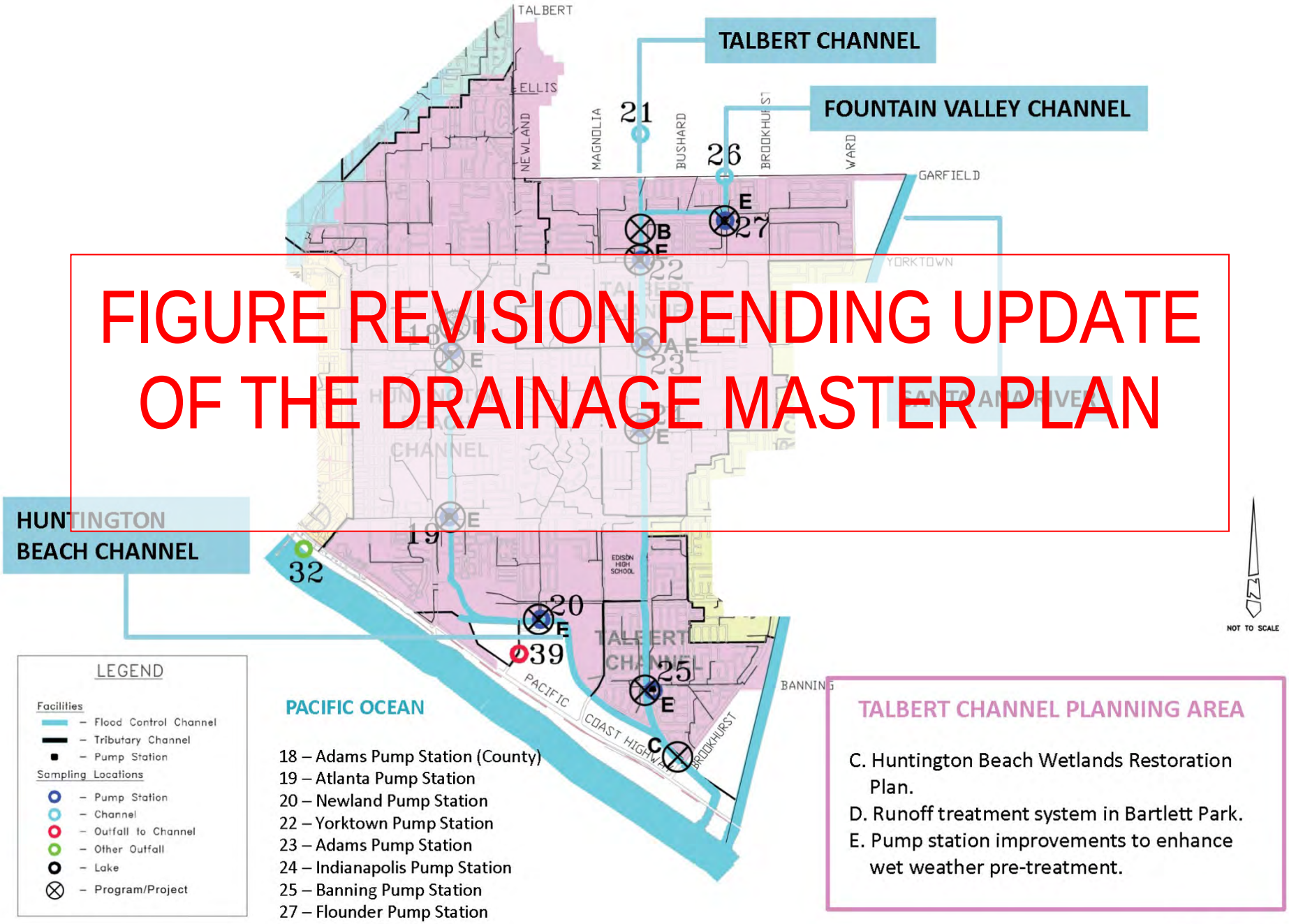



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

FIGURE 3-7.7

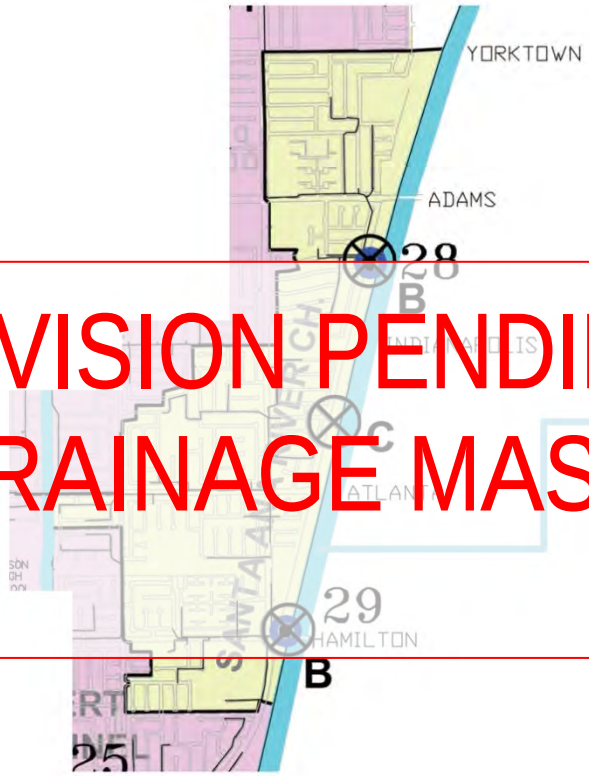



FIGURE REVISION PENDING UPDATE OF THE DRAINAGE MASTER PLAN

NOT TO SCALE

LEGEND

Facilities
- Flood Control Channel
- Tributary Channel
- Pump Station

Sampling Locations
- Pump Station
- Channel
- Outfall to Channel
- Other Outfall
- Lake
- Program/Project

28 – Meredith Pump Station
29 – Hamilton Pump Sation

**SANTA ANA RIVER PLANNING AREA**

B. Pump station improvements to enhance wet weather pre-treatment.
C. Work with OCRP water quality enhancement projects.

FIGURE 3-7.8

Dry weather runoff flows were estimated using the average unit factor of 150 gal/ac/day presented in Section 3.1.1 applied to the tributary area. In general, treatment of wet weather flows focuses on runoff from smaller, more frequent storm events as discussed in Section 3.1 as this approach provides cost-effective treatment strategy. Good storm water management practice and NPDES permit requirements for sizing treatment BMPs for New Development and Significant Redevelopment projects target capturing and treating at least 80 percent of long-term average annual runoff. This is approximately equivalent to sizing the BMP to capture and treat the runoff from about the 85$^{th}$ percentile storm event and all smaller flows, which has been determined to be 0.7 in rainfall for the Huntington Beach area. This is typically less than a 1-yr recurrence interval.

For volume based BMPs such as water quality detention basins and wetlands treatment, this target capture volume to meet the permit requirements is typically called the Water Quality Volume (WQV). Designing larger treatment systems is not considered cost-effective as the marginal increase in the amount of long-term runoff treated becomes less than the marginal increase in treatment system size and hence, cost.

Therefore, the "upper limit" sizing criteria for the potential runoff treatment system sites taken as the WQV determined using the tributary area and land use and the methodology from the Model WQMP in the Orange County Drainage Area Management Plan.

#### 3.2.3.1 Santa Ana River Planning Area

The following programs/projects are recommended for implementation in the Santa Ana River Planning Area. Water quality opportunities are more limited in this area due to the relatively small area, and fully developed condition.

Continue current dry weather flow diversion program from the Meredith and Hamilton Pump Stations to the Orange County Sanitation District and evaluate opportunities to reduce future need for dry weather diversions through flow reduction.

- Continue to work with the Orange Coast River Park Project (OCRP) and incorporate water quality enhancements into the project where feasible.
- Identify and construct improvements to pump stations to provide more effective wet weather pre-treatment (e.g. screening) and evaluate maintenance practices for possible improvement.

#### 3.2.3.2 Talbert Channel Planning Area

The following programs/projects are recommended for implementation in the Talbert Channel Planning Area.

- Continue existing dry weather flow diversion program from seven pump stations to Orange County Sanitation District and evaluate opportunities to reduce future need for dry weather diversions through flow reduction, and treatment of a portion of dry weather flow at Bartlett Park and near the Huntington Beach Wetlands.

- Support the County's channel low flow diversion projects to the sewer system, and encourage diversion to Bartlett Park.

- Develop a runoff treatment system in the southern portion of Bartlett Park for dry and wet weather treatment and coordinate with plans for multiple park uses as discussed below.

***Bartlett Park***

Bartlett Park, located west of the intersection of Adams Avenue and Coldwater Lane, offers an additional opportunity to develop a natural water quality treatment system by utilizing the more open, southern area of the park that already effectively functions as a natural detention area for local runoff. Approximately 1.6 acres of land was identified as potentially available for developing a system that could provide year-round treatment of dry weather flow from the storm drain systems that pass by the park, as well as other dry weather flows that are tributary to some or all of the pump stations in the general vicinity. The area is shown in Figure 3-8. The area considered for additional natural detention currently has very limited vegetation and habitat value, and development of a wetland-based natural treatment system that would, at a minimum, treat dry weather flows through processes including screening, sedimentation, absorption, evapotranspiration and biological uptake and transformation would be beneficial.

Estimates of dry weather flows from the above sources range from less than 0.1 million gallons per day (mgd) from the local watershed only to as much as 0.5 – 0.75 mgd if all of the above sources were pumped to this location. A natural treatment system accommodating these flows could be constructed within a portion of the available land. Bringing flows from beyond the local tributary watersheds would require pipelines and possible upgrades of the existing dry weather pumps located at the pump stations.

0 60 120 180 240 Feet

**Figure 3-8**
**BMP Evaluation Site for Huntington Beach Bartlett Park**

The system could also be expanded and constructed to function as an extended (dry) detention basin to treat a limited portion of the wet weather flow that is tributary to the drainage systems near the park that drain watersheds area of over 500 acres. With the available land, the water quality volume that could be captured for treatment would be approximately 6 acre-ft, and could provide treatment for approximately 30-40 percent of the runoff from the local drainage watershed, then discharge the treated water to the Orange County pump station.

Any projects that are considered in Bartlett Park will need to be implemented in accordance with all previous agreements and strategic plans associated with the Park. Historically, there have been several agreements and permits issued (with Orange County Flood Control District, adjacent new developments projects, and California Department of Fish and Wildlife) addressing various aspects of the Park that will need to be reviewed prior to any project implementation.

#### 3.2.3.3 Coastal Planning Area

The following programs/projects are recommended for implementation in the Coastal Planning Area.

- For dry weather flow, continue current practice of localized sand infiltration at beach storm drain outlets where effective.
- Operate and maintain hydrodynamic separator (CDS) treatment units for wet weather treatment at seven storm drain outlet locations from First Street to Goldenwest.
- Enhance street sweeping and alley cleaning (see discussion under source controls) such as increased seasonal sweeping.
- Continue enhanced education and enforcement programs for downtown business/commercial establishments including restaurant grease trap and clean-up operations (see discussion under source controls).

#### 3.2.3.4 Bolsa Chica Wetlands Planning Area

The following programs/projects are recommended for implementation in the Bolsa Chica Wetlands Planning Area:

- Continue to operate and maintain hydrodynamic separator (CDS) treatment unit at Bolsa Chica wetland outfall (Garfield and Seapoint).

- Work with State Lands for water quality opportunities for enhancing the existing riparian and ponded areas at discharge location(s) from the Seapoint Avenue Storm Drain, Garfield Avenue Storm Drain and the Bolsa Chica Pump Station.

#### 3.2.3.5 Slater Channel Planning Area

The following programs/projects are recommended for implementation in the Slater Channel Planning Area:

- Evaluate opportunities to reduce future need for dry weather diversions through flow reduction and treatment of upstream dry weather flow in Talbert and Huntington Lakes.

- Two pumps are being added to Slater Pump Station and a natural treatment system is being added (through the Parkside development project by Shea Homes) to provide more effective wet weather pre-treatment (e.g. screening) and continued evaluation of maintenance practices for possible improvement.

- Maintain hydrodynamic separator units for wet weather treatment at Central Park.

- Implement and coordinate other improvements within Huntington Lake drainage area:

    - Improve erosion control in areas draining to Huntington Lake.
    - Continue NPDES inspections of improvements at Equestrian Center and monitor the effectiveness of the Equestrian Center's desiltation/infiltration basin located to the east of the City's desiltation basin.
    - Continue maintenance of the City's desiltation basin south of Huntington Lake.
    - Evaluate feasibility of implementing sub regional BMP's south of Huntington Lake.

#### 3.2.3.6 East Garden Grove Wintersburg Channel Planning Area

The following programs/projects are recommended for implementation in the East Garden Grove Wintersburg Channel Planning Area:

- Coordinate with Orange County to enhance maintenance in order to reduce sediment build-up in East Garden Grove Wintersburg Channel.

- Operate, and maintain CDS units (2) at Warner.

#### 3.2.3.7 Bolsa Chica Channel Planning Area

The following programs/projects are recommended for implementation in the Bolsa Chica Channel Planning Area:

- Reduce trash/debris accumulation from entering the Channel.
- Consider runoff treatment opportunities at Marina Park.
- Coordinate with Orange County to develop natural treatment system on NWS Property (regional project).

#### 3.2.3.8 Huntington Harbour Area

The following programs/projects are recommended for implementation in the Huntington Harbour Planning Area:

- Continue existing signage and install new signage, where appropriate, on storm drains and entrances into Huntington Harbour, prohibiting dumping of waste and reminding that storm water discharges to the Harbour and Ocean.
  - Continue education and enforcement for Huntington Harbour area Homeowners Associations.
  - Support a fair and equitable means to upgrade, monitor, and inspect existing pumpout facilities and install new pumpout facilities at appropriate locations in the Harbour.
- Monitor the effectiveness of the catch basin screen retrofit program.
- To date, 33 catch basin screens and 133 inlet baskets without media screens have been retrofitted in the planning area. The City will continue applying for grants for this type of retrofit work.

#### 3.2.3.9 Additional Citywide Opportunities

Several additional projects/programs are recommended for consideration and implementation where appropriate and applicable throughout the City:

- Conduct feasibility and cost analysis studies for constructing trash/gross solids removal devices at any direct storm drain outlets to drainage channels that do not go through pump stations and will not be included in any of the water quality planning area treatment projects described in previous sections.
- Continue to work with property owners/Homeowner and/or Property Owner Associations to encourage implementing full scale state-of-the-art irrigation controllers and systems.
- Continue working with Orange County Water District on the possibility of using dry weather urban runoff for future injection project to assist with the seawater barrier enhancements.

# 3.3 Program Phasing

Section 3.2 identifies a comprehensive set of elements to be included in a long-range Water Quality Management Program for the City. Many of the elements require additional planning, study and substantial additional funding of capital or operating costs that are not currently budgeted. Therefore, phasing program elements is important for the Water Quality Element of the CURMP to provide direction for resource commitment and scheduling of implementation steps described in Section 3.4.

In general, program elements fall into several broad categories including:

- Existing program elements
- Modifications to, or expansion of existing programs, and new programs required to meet current permit requirements ("mandatory elements")
- Additional program enhancements and new projects to meet City goals and objectives ("discretionary elements")

Existing programs and projects with committed funding do not need to be phased. Phasing for the discretionary elements needs to be established.

## 3.3.1 Phasing Criteria and Categories

Additional efforts that are required to meet permit requirements (mandatory elements) are considered the first priority. All other elements are discretionary and establishing phasing is beneficial. Two primary criteria that generally encompass the Water Quality Element program objectives were used to establish phasing categories as well as to place discretionary program elements within these categories. These two criteria are:

- Ability to achieve water quality goals.
- Probability of implementation.

### 3.3.1.1 Ability to Achieve Water Quality Goals

The decision to commit resources and funding to discretionary program elements should be weighted in favor of projects that make the greatest contribution toward reducing pollutants which affect the beneficial uses that are of highest local and regulatory concern. The criterion takes into account both the importance of the pollutants that the program element or project will effectively address and the relative magnitude of the contribution. To assist in evaluating and establishing a relative comparison of program elements with respect to the first criteria, water quality phasing goals were established for runoff. Because the nature of runoff and receiving

water conditions and the approach to management is substantially different between dry and wet weather conditions, the phasing goals were further segregated into dry weather and wet weather runoff conditions. The phasing goal priorities used are as follows:

***Near-Term Goals***

***Dry Weather Runoff:***

- Reduce dry weather closures/postings of coastal waters adjacent to beaches and bacterial exceedance in the Huntington Harbour area by: reducing sources of bacteria, reducing or eliminating dry weather runoff discharges through diversions, natural treatment and wetland systems, infiltration or beneficial reuse.
- Reduce other potentially toxic or harmful constituents in dry weather runoff including pesticides and metals (e.g. from illegal dumping, spills, etc.).
- Reduce constituents of concern (suspended solids, nutrients, etc.) to inland water features, especially Huntington Lake. (Intermediate term)

Wet Weather Runoff:

- Reduce loadings of metals in wet weather discharges to the Harbour area. (Long term)
- Minimize or eliminate trash/debris/coarse solids from discharges to beach and Harbor area. (Near term)

#### 3.3.1.2 Probability of Implementation

This criterion allows a qualitative comparison between program elements of the probability and ease of implementation and takes into account several of the Water Quality Program objectives. For example, a program element or project would have a high probability of implementation if it requires minimal new funding or land acquisition, is based on proven technology, has minimal permitting or other environmental requirement concerns, and provides multiple benefits that help gain support or possible supplemental funding due to having benefits to the region or other partners. Conversely, projects that require substantial new capital or operational funds, have significant permitting issues, require new land, or may take significantly more time and resources to implement. Table 3-8 provides examples of applying the factors.

**Table 3-8**
**Factors Used for Phasing Program Elements**

| Criterion | Probability of Implementation | |
|---|---|---|
| | **Higher** | **Lower** |
| New Capital Costs | No new capital costs required | High capital cost<br>No budgeted funds |
| Additional O&M Costs | No additional O&M costs required | High O&M costs<br>No budgeted funds |
| Multi-Purpose Benefits | Multiple benefits<br>Additional opportunities for funding sources | Water quality benefits only |
| Regional vs. Local Projects | Multi-agency or other city funding partners | City of Huntington Beach only |
| Environmental Assessment and Permitting Requirements | Non-complex Permitting requirements | Complex permitting requirements<br>Multi- agencies involvement |

## 3.3.2 Phasing Categories

Three broad categories were established to allow a placement of the discretionary program elements into one of three categories. The categories include:

- **Level 1 –**Program elements that are effective at addressing the highest priority water quality concerns and have a high probability of implementation.
- **Level 2 –** Program elements that are effective at addressing the highest priority water quality concerns but have lower probability of implementation; and program elements that have a high probability of implementation but address lower priority water quality concerns.
- **Level 3 –** Program elements that address lower priority water quality concerns and have a lower probability of implementation.

Over time, as more detailed information becomes available, the phasing categories can be revised and program elements can be shifted.

## 3.3.3 Phasing of Program Elements

Using the approach described above, all discretionary program elements and projects have been listed in the Tables 3-9 through 3-11 with initial phasing priorities.

**Table 3-9**
**Water Quality Program Element Phasing**
**Citywide Source Control Programs**

| Program Element | Achievement of Water Quality Goals | | Probability of Implementation | Priority Level |
|---|---|---|---|---|
| | Goals addressed | Relative Effectiveness | | |
| Increased/enhanced training of Citywide field program staff | All pollutants | High | High | 1 |
| Increased pump station wet well cleaning | Wet weather pollutants; other pollutants and metals | Moderate - High | Moderate; increased O&M cost | 1- Planning Areas Draining to Huntington Harbour<br>2 – Other areas |
| Increased sweeping (street, parking lots and alleys) and litter control | Trash and debris; other wet weather pollutants | Moderate | Moderate; increased O&M cost | 1-2 |
| Increased program to install and maintain gross pollutant separators in high trash/debris areas | Trash and debris | High | Moderate – High O&M cost | 1-2 |
| Enhanced Integrated Pest Mgmt, pesticide & fertilizer program | Nutrients, organics in dry and wet weather | Moderate | High | 1-2 |
| Enhanced catch basin stenciling | Trash and debris; other dry weather pollutants | Low | High | 2 |
| Increased channel maintenance | Trash and debris; other wet weather pollutants | Moderate | Moderate; increased O&M cost | 2 |
| Obtain additional equipment (e.g., vac truck) for maintenance activities | Trash and debris, other pollutants | Moderate | Moderate; increased O&M cost | 2 |
| Target increased maintenance in high trash/debris accumulation areas | Trash and debris | High | Moderate; increased O&M cost | 3 |
| New education programs, esp. for target groups (e.g. landscape/concrete construction contractors, boaters/boat owners, local schools) | Dry weather pollutants; wet weather pollutants; trash and other pollutants | Moderate | High | 1 |
| Increased outreach programs/events | Trash and debris | Low | High | 1 |
| Enhanced outreach through special programs/events | Trash and debris, other pollutants | Low | Moderate | 2 |
| Support implementation and enforcement of new BMP technology | Sediment, construction sites | High | High | 1 |
| Enhanced training of inspection staff | Sediment, construction sites | High | High | 1 |
| Enhanced restaurant inspections/implementation of FOG (Fats, Oils, & Grease) Ordinance | Dry weather bacteria; dry weather flow; other dry weather pollutants | Moderate | Moderate; may require additional staff | 1 |
| Consider requiring mandatory sweeping of all parking lots | Trash and debris; other wet weather pollutants | Moderate | Moderate - High | 3 |
| Enhanced ID/IC staff training | All pollutants | High | High | 1 |
| Provide dedicated information line for public regarding ID/IC issues/concerns | All pollutants | Low | Moderate | 2 |

**Table 3-10**
**Water Quality Program Element Phasing**
**Program for New Development/Significant Redevelopment**

| Program Element | Achievement of Water Quality Goals | | Probability of Implementation | Priority Level |
|---|---|---|---|---|
| | Goals addressed | Relative Effectiveness | | |
| Local Coastal Program NPDES enhancement | All pollutants | Moderate | Moderate | 2 |
| Review General Plan to ensure compliance with renewed NPDES Permit | All pollutants | Moderate | Moderate | 3 |
| Continue providing in-house NPDES training | All pollutants | High | High | 1 |
| Update CEQA Procedures Handbook | All pollutants | Moderate | High | 2 |
| Refine WQMP treatment BMP requirements (i.e., modify runoff rate allowances for dry and wet weather to capture more water onsite) | All pollutants | High; only targets new development | Moderate; additional burden on private development | 1-2 |
| Incorporate water quality standards in Zoning and Subdivision Ordinance, Municipal Code, or other planning documents, as well as public works standard drawings and specifications | All pollutants | High | Moderate | 2 |

**Table 3-11**
**Water Quality Program Element Phasing**
**Water Quality Planning Area-Based Program**

| Planning Area and Program Element | Achievement of Water Quality Goals | | Probability of Implementation | Priority Level |
|---|---|---|---|---|
| | Goals addressed | Relative Effectiveness | | |
| Santa Ana River | | | | |
| Continue current dry weather flow diversions from pump stations to OCSD system | Dry weather bacteria, dry weather flow | High | High | 1 |
| Evaluate opportunities to reduce/reuse dry weather flow and reduce diversions (e.g., more efficient irrigation) | Dry weather bacteria; dry weather flow; other dry weather pollutants | High | Low – Moderate | 2 |
| Continue to work with OC River Park Project and incorporate water quality enhancements where feasible | Various pollutants | High | Moderate | 2 |
| Identify and construct improvements to pump stations | Trash and debris, some other pollutants | Moderate | Low; high cost, combine with drainage needs | 2-3 |
| Talbert Channel | | | | |
| Continue existing dry weather flow diversions from pump stations to OCSD system | Dry weather bacteria, dry weather flow | High | High | 1 |
| Support the County's Talbert Channel low flow diversion project | Dry weather bacteria, dry weather flow | High | High | 1 |
| Evaluate opportunities to reduce/reuse dry weather flow at Bartlett Park and near HB Wetland | Dry weather bacteria; dry weather flow; other dry weather pollutants | High | Low – Moderate | 2 |
| Continue to participate in studies and implementation of HB Wetland Restoration Plan | Potentially several goals | High | Moderate; cost & permitting | 2 |
| Develop additional runoff treatment system in Bartlett Park | Dry weather bacteria; dry weather flow; other dry weather pollutants; other wet weather pollutants | High | Low - Moderate; capital and O&M; coordinate w/Park Planning | 2-3 |
| Identify and construct improvements to pump stations | Trash and debris, some other pollutants | Moderate | Low; high cost, combine with drainage needs | 2-3 |

**Table 3-11 (continued)**
**Water Quality Program Element Phasing**
**Water Quality Planning Area-Based Program**

| Planning Area and Program Element | Achievement of Water Quality Goals | | Probability of Implementation | Priority Level |
|---|---|---|---|---|
| | Goals addressed | Relative Effectiveness | | |
| Coastal | | | | |
| Develop expanded education and enforcement program | Multiple pollutants | High | High | 1 |
| Continue dry weather flow sand infiltration, where feasible; construct flow diversion where not feasible | Dry weather bacteria, dry weather flow | High | High | 1 |
| Operate and maintain hydrodynamic separator (CDS) treatment units at beach outlets | Trash and debris, other wet weather pollutants | High | High | 1 |
| Evaluate opportunities to reduce/reuse dry weather flow | Dry weather bacteria; dry weather flow; other dry weather pollutants | High | Low – Moderate | 2 |
| Enhanced street and alley sweeping | Trash and debris, dry and wet weather pollutants | Moderate | Low - Moderate | 2-3 |
| Continue to explore treatment option for storm flows from First St watershed | Multiple pollutants | High | Moderate; Longer Lead Time & Funding | 3 |
| Bolsa Chica Wetlands | | | | |
| Continue to operate & maintain hydrodynamic separator (CDS) treatment unit at wetland outfall | Trash and debris, other wet weather pollutants | High | High | 1 |
| Conduct feasibility study and implement recommendations to enhance natural treatment areas at Seapoint, Garfield and Bolsa Chica Pump Station discharges | Dry and wet weather, all pollutants | High | Low – Moderate; Need authorization for access | 2 |
| Evaluate opportunities for water quality features in future development/redevelopment on AERA property | Various pollutants | High | Low; Long Lead Time | 3 |

**Table 3-11 (continued)**
**Water Quality Program Element Phasing**
**Water Quality Planning Area-Based Program**

| Planning Area and Program Element | Achievement of Water Quality Goals | | Probability of Implementation | Priority Level |
|---|---|---|---|---|
| | Goals addressed | Relative Effectiveness | | |
| Slater Channel | | | | |
| Optimize direction of runoff to Sully-Miller Lake for treatment and/or recharge | All pollutants | High | High | 1 |
| Optimize water quality benefits of detention area south of Sully-Miller Lake | Multiple pollutants | High | Moderate | 2 |
| Evaluate opportunities for water quality features in future development/ redevelopment | Dry weather bacteria; dry weather flow; other dry weather pollutants | High | Low – Moderate | 2 |
| Identify and construct improvements to Slater Pump Station | Trash and debris, some other pollutants | Moderate | Low; High cost, combine with drainage needs | 2 |
| Implement and coordinate improvements in Huntington Lake drainage area | Pollutants to inland lakes | High | Moderate | 2 |
| East Garden Grove / East Garden Grove Wintersburg Channel | | | | |
| Evaluate opportunities to reduce/reuse dry weather flow | Dry weather bacteria; dry weather flow; other dry weather pollutants | High | Low – Moderate | 2 |
| Identify and construct improvements to pump stations | Trash and debris, some other pollutants | Moderate | Low; high cost, combine with drainage needs | 2 |
| Coordinate with OC on maintenance to reduce sediment build-up in East Garden Grove Wintersburg Channel | Other wet weather pollutants | Moderate | Low – Moderate | 2-3 |
| Bolsa Chica Channel | | | | |
| Clean-up and protect channel in vicinity of Marina HS | Trash and debris, other pollutants | Moderate | Moderate - High | 2 |
| Coordinate with Orange County to develop natural treatment system on NWS property (regional project) | Dry and Wet weather bacteria, trash and debris, other pollutants | High | Moderate - High | 2 |
| Coordinate with OC on projects to improve/restore channels for aesthetics and treatment potential | Trash and debris, other pollutants | Moderate | Moderate; high costs | 2-3 |
| Investigate runoff treatment system at Marina Park | Dry and wet weather pollutants | Moderate – High; limited drainage area | Moderate; cost, permitting | 3 |

**Table 3-11 (continued)**
**Water Quality Program Element Phasing**
**Water Quality Planning Area-Based Program**

| Planning Area and Program Element | Achievement of Water Quality Goals | | Probability of Implementation | Priority Level |
|---|---|---|---|---|
| | Goals addressed | Relative Effectiveness | | |
| Huntington Harbour Area | | | | |
| Coordinate with Orange County to monitor, maintain, and improve trash boom collection system | Trash and debris | High | Moderate-high | 1 |
| Review and install new storm drain signage | Dry weather pollutants | Low | High | 1-2 |
| Implement recommendations for controlling live-aboard activities | Bacteria, other pollutants | Moderate | Moderate | 2 |
| Develop and implement expanded education, incentive and enforcement programs | Trash, bacteria | Moderate | High | 2 |
| Initiate better response to storm events and conducting maintenance/inspection of new vessel pump-out stations | Trash, bacteria | Moderate | Moderate | 2 |
| Support a fair and equitable means to upgrade, monitor and inspect existing pump-out facilities and install new pump-out facilities at appropriate locations in the Harbour | Trash, bacteria | Moderate | Moderate | 2 |
| Evaluate and implement drain inlet retrofit opportunities | Trash and debris, limited other wet weather pollutants | Moderate | Low; high cost, maintenance | 3 |

# 3.4 Program Implementation

This section presents an implementation schedule, a summary table of all of the plan elements and respective priorities, estimated cost associated with plan elements, a listing of possible funding options, a summary of potential ordinance and policy development needs, a framework for program monitoring and assessment, and an organizational plan of responsibilities for maintaining and implementing the Water Quality Element of the CURMP.

## 3.4.1 Policy and Ordinance Development

Implementation of some of the program elements depends upon adoption of new or revised City policies, standards, and ordinances. Table 3-12 summarizes key items to be reviewed and revised as necessary to support program implementation and preliminary target dates for action.

**Table 3-12**
**Policy and Ordinance Development**

| Program Element | Policy/Ordinance Action | Time Frame |
|---|---|---|
| Legal Authority – Ordinances, Codes & Regulations | ■ Periodically review and update | ■ As necessary |
| Construction Procedures, Activities & Training | ■ Periodically review and update to comply with Construction General Permit | ■ As necessary |
| Existing Development | ■ Implement FOG (Fats, Oils, & Grease) Ordinance | ■ Completed 2013 |
| New Development/Significant Redevelopment | ■ Incorporate water quality design standards in zoning and subdivision ordinances, Municipal Code, and/or other planning documents, as well as public works standard drawings and specifications | ■ 2015 |

## 3.4.2 Monitoring and Program Assessment

The Water Quality Element requires systematic monitoring and assessment to determine if the plan is being effectively implemented and to revise and update the plan based on feedback from the assessment. A framework for monitoring is described below. The framework includes five principal components:

- Program implementation assessment
- NPDES Permit required monitoring and reporting
- BMP effectiveness evaluations
- Water quality monitoring

- Information management using GIS

Each of the components is briefly summarized below.

#### 3.4.2.1 Water Quality Element Implementation Assessment

On an annual basis, the components of the Water Quality Element will be reviewed, progress summarized and the elements and phasing priority levels updated. It is anticipated that Priority Level 1 elements will be reviewed at a greater level of detail to identify progress made in the past year and flag any major outstanding implementation issues (e.g. funding, permits, ordinance adoption, etc.). Elements can be added or deleted, and phasing priority levels revised. It is recommended that the assessment be completed after the City's NPDES Permit annual report is completed each year (see following section).

#### 3.4.2.2 NPDES Required Monitoring and Reporting

The County performs wet/ dry monitoring for the City. The City monitors and tests at the 11 diversion sites. Compliance with the NPDES Permit and Drainage Area Management Plan requirements requires the City to compile, summarize, and report information and progress in each of the major program areas. The current specific water pollutant control program elements are documented in the City of Huntington Beach LIP. The City of Huntington Beach LIP provides a written account and detailed information regarding activities that the City has undertaken, or is undertaking, to meet the requirements of the Fourth Term NPDES Permit and a means of displaying a meaningful improvement in water quality. The City of Huntington Beach LIP provides more detailed information regarding the mandatory program elements and is a supporting document to the Water Quality Element Implementation Assessment.

#### 3.4.2.3 BMP Effectiveness Monitoring

More focused evaluations of how effective individual program elements or BMPs are performing can be conducted, particularly for new programs or projects with substantial capital and/or annual expenditure investments. Many of the programmatic elements can be evaluated using the information compiled for the annual reporting associated with the City of Huntington Beach LIP. However, representative performance information on structural BMPs is also desirable. These will be identified and implemented on a case-by-case basis and factored into project funding for new projects or programs.

The following BMP monitoring is recommended:

- Monitor performance and maintain records of gross solids removed from hydrodynamic separator units

- When runoff treatment systems are developed as recommended under Section 3.2.3, develop and implement a monitoring program that may include:

- Influent and effluent water quality monitoring
- Collection of operation and maintenance information
- Compilation of operation and maintenance cost data

#### 3.4.2.4 Water Quality Monitoring

Regional water quality monitoring required under the permit will continue to be conducted by Orange County Watersheds with all of the Permittees contributing to the cost of the program as described in Section 3.1.2. This program provides regional data that is of interest to the City and can be used for general background comparisons. The City will continue to provide funds for these monitoring activities.

The City currently conducts dry weather flow sampling as described in Section 3.1.2 at the ten southern pump stations and at the First Street location as required by the Orange County Sanitation District's Dry Weather Diversion Permit program. The sampling conducted includes testing for numerous constituents that can be used to develop baseline data and trend analyses.

No additional local wet weather monitoring is recommended, other than the possibility of monitoring BMP performance as discussed under Section 3.4.2.3.

A limited on-going dry weather monitoring program as described in Section 3.1.2 is coordinated with the County sampling program. The program is designed to expand upon baseline data and to develop trend analyses.

#### 3.4.2.5 Information Management Using GIS

The City has an extensive Geographic Information System (GIS) that could be used to assist in water quality program management and assessment and reporting. As described in Section 4 of the CURMP, new mapping and data base information has recently been compiled for the City for the storm drain system. This data base focuses primarily on attributes related to storm drain system physical characteristics, drainage system hydrologic characteristics, and drainage hydrology and hydraulics. However, a number of additional features and attributes could be added to assist the City in tracking a wide variety of information related to management of the Water Quality program element. Examples include:

- Water quality monitoring data
- Construction sites, industrial and commercial sites and key inspection information
- Water quality features and BMPs (both new development/redevelopment projects and City retrofit projects
- Illicit discharge/illicit connection reporting and response data

In order for the City to meet its obligation to implement BMPs, it would be ideal to develop a comprehensive preventative maintenance plan. The use of Geographic Information Systems (GIS) to automate field-based inspections and facilitate data integration should be considered to maximize efficiency and minimize data errors. The process of traditional documentation, transcription, and mapping is extremely inefficient, particularly because it centered on replicating data from a paper medium to an electronic medium. The inefficiency associated with transferring the data from paper to a database results in accuracy issues. Data entry errors and illegible field notes/sheets are typically the culprit for erroneous results. As a result, projects must dedicate significant resources toward quality assurance and quality control.

Automated field-based inspections will facilitate the electronic and immediate capture of inspection data and can be successfully integrated with the City's information systems, providing value for future projects. Utilization of this automated field-based GIS system will benefit both internal City users and the public. The general public, surveyors, Engineering firms, Title researchers, Real Estate professionals, Developers, and others will be able to access the City's data base via the web for all permit, license, and other documentation.

#### 3.4.2.6 Additional Opportunities

Additional opportunities may exist to achieve water quality improvement beyond those discussed above. Other opportunities may include specific projects within the general categories of:

- Treatment wetlands – similar to the treatment wetlands mentioned above, other sites may be available for use as treatment wetlands such as the Shea Homes site, Newland Marsh in Huntington Beach Wetlands, Central Park and Shipley Nature Preserve areas, and potentially along Seapoint Drive feeding into Bolsa Chica from the Seacliff Golf Course.

- Rebate programs to reduce water use and increase on-site retention– financial or other incentives to use less water and to keep more irrigation and stormwater on-site in non-point source areas such as within residential areas and at public schools.

Table 3.4.2 lists some potential projects that address water quality implementation.

**Table 3.4.2**
**Potential Water Quality Projects**

| Project Title | Funding Source | Construction Completion | Project Description | Project Need |
|---|---|---|---|---|
| Northwest Catch Basin Retrofit Project - Phase II | OCTA Tier 1 | FY 2014/15 | Retrofit existing catch basins with Bio Clean Round Curb Inlet Filters | Protect water quality of the East Garden Grove Wintersburg and Westminster Channels. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Heil Pump Station Relocation | Infrastructure Fund | FY 2015/16 | Construct Heil Pump Station at new location | The old pump station is in need of replacement due to age and lack of sufficient capacity. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Pier Piling Inspection, Cleaning, and Maintenance | General Fund | N/A | Provide underwater visual and video inspection of the Pier's concrete pilings; clean marine growth; repair cracks or spalling; and document any anomalies found in the concrete pilings. | This is a specialized, periodic major maintenance activity necessary to preserve and extend the life of the pier structure. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Concrete Replacement | General Fund | FY 2014/15 | Replace worn, damaged, lifted and broken sections of concrete sidewalk, curb and gutter, and ADA compliant curb ramps at various locations, in support of the zone maintenance program. | Identified concrete areas need replacement in order to provide safe pedestrian walkways and facilitate drainage. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Nichols Street Rehabilitation | Gas Tax; Working with Rainbow Disposal on other funding source | FY 2014/15 | Rehabilitation of asphalt paving and miscellaneous sidewalk and curb and gutter. | Nichols Street has reached its design life and is in need of rehabilitation. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Sunset Beach Improvements | General Fund | FY 2015/16 | This project will provide improvements to the Sunset Beach Community, including Entry Sign and Landscape Improvements to the Warner Turnaround median. | Improvements as part of the Sunset Beach Annexation. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |

**Table 3.4.2**
**Potential Water Quality Projects**

| Project Title | Funding Source | Construction Completion | Project Description | Project Need |
|---|---|---|---|---|
| Bartlett Park Phase I | PA&D (Park Fees) | FY 2015/16 | Phase 1 Construction Plans and Specifications to determine possible uses and development of Bartlett Park for passive, recreation use, including preservation of native habitat and vegetation. | The 25-acre undeveloped parcel would provide available open space for the neighborhood. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| LeBard Park Design | PA&D (Park Fees) | FY 2015/16 | Completion of construction plans and specifications plans and specifications for the undeveloped 2-acre portion of LeBard Park within the Edison easement right of way currently leased by the City. | LeBard Park is 5 acres total, with 2 acres being undeveloped within the Edison easement. The park is adjacent to school open space that is used as home fields for Sea View Little League. Additional developed open space is needed. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| New Senior Center | General Fund; Donations; Potential Bond; Other Financing | FY 2015/16 | Completion of construction plans and specifications and construction of a new senior center in Huntington Central Park and completion of an enhanced raptor foraging habitat plan to comply with mitigation measures for the project. | The current Senior Center at 17th Street and Orange Avenue is undersized to effectively serve the needs of the growing senior population. More programming space is needed to adequately serve the public. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Worthy Park | PA&D (Quimby Fees) | FY 2015/16 | Demolition of the enclosed 10,000 square foot racquetball building and reconfiguration of the park to include additional recreational amenities and a public restroom | Reconfiguration of the park is needed due to the Huntington Beach Union High School District reconfiguring a portion of its property that was once part of the park. Demolition of the closed racquetball facility is also needed. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Arterial Rehabilitation | General Fund; Measure M; Prop 1B | FY 2014/15 | Arterials identified for FY 14/15 include Main Street (Yorktown to Garfield), Lake Street (Indianapolis to Adams), and Indianapolis Avenue | Required to meet the goals of the Pavement Management Plan. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |

**Table 3.4.2**
**Potential Water Quality Projects**

| Project Title | Funding Source | Construction Completion | Project Description | Project Need |
|---|---|---|---|---|
| | | | (Magnolia to Brookhurst). Arterials identified for FY 15/16 include Main Street (Garfield to Beach), Indianapolis Avenue (Newland to Magnolia), and Talbert Street (Gothard to Beach) | |
| Atlanta Avenue Widening | Measure M; Traffic Impact Fee (TIF); Infrastructure Fund; Prop 42; MPAH | FY 2015/16 | Project will widen the south side of Atlanta Avenue from Huntington Street to Delaware Street. | This project is required to meet the goals of the General Plan. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Beach Boulevard and Warner Avenue Intersection Improvement Project | Traffic Impact Fee (TIF); OCTA GMA; OCTA ICE | N/A | Widening Capacity Improvements - Beach Boulevard and Warner Avenue. Install westbound right turn pocket. Project is for PS&E, environmental studies and right-of-way engineering only. | This project is required to meet the goals of the General Plan. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Beach Preventive Maintenance | Gas Tax; Measure M; Prop 42; BPMP | FY 2015/16 | Design and construction to provide preventative maintenance for City bridges. Design continuing with construction of Magnolia Bridge and Brookhurst Bridge in FY 14/15 | Many of the City's bridges are aged and need maintenance and minor rehabilitation to extend their design life. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Bridge Rehabilitation | HBP; Prop 42 | FY 2018/19 | Design and rehabilitation of City Bridges, including Admiralty, Humboldt, Davenport, and Gilbert. Design is slated for FY 12/13 thru FY 15/16. Construction is slated for outlying years. | Many of the City's bridges are aged and need maintenance and minor repair to extend their design life. Improvements may include replacement of rails, fencing, and minor concrete patching. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |

**Table 3.4.2**
**Potential Water Quality Projects**

| Project Title | Funding Source | Construction Completion | Project Description | Project Need |
|---|---|---|---|---|
| Brookhurst Street and Adams Avenue; Intersection Improvement Project | Traffic Impact Fee (TIF); OCTA GMA; OCTA ICE | FY 2014/15 | Widening Capacity Improvements - Add through lanes and right turn pockets. Project is for PS&E, environmental studies and right-of-way engineering only. | Improve traffic flow and reduce congestion. These improvements were identified in the cooperative study and interagency MOU regarding the Garfield Avenue overcrossing of the Santa Ana River. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Gothard Street and Center Avenue Rehabilitation | Gas Tax | FY 2014/15 | This project will rehabilitate Gothard Street (Edinger Avenue to McFadden Avenue) and Center Avenue (Gothard Street to railroad tracks). Rehabilitation along the south and east frontages will be funded by adjacent developments. | Both Gothard Street and Center Avenue are in need of rehabilitation and have been delayed pending the adjacent developments. Implement applicable BMPs and upgrade appurtenant storm drain structure to protect storm drain runoff quality. |
| Marina Trash Skimmers | OCTA Tier 1 | FY 2016/2017 | Install seven Marina Trash Skimmers in various areas within Huntington Harbour. | Improve water quality in Huntington Harbour. |

# 3.5 Costs and Funding

## 3.5.1 Costs

Table 3-13 summarizes estimated planning level cost estimates for the specific planning-area based water quality BMP opportunities identified in the 3.2.3. Cost estimates for these BMPs were developed by preparing preliminary conceptual layouts assuming an approach using water quality detention basins, and applying unit cost estimates from a variety of sources including the Orange County Stormwater Program report "Identification of Regional BMP Retrofitting Opportunities – Draft" (RBF, April 2014), CDM cost estimating files and estimates from other projects, and brought to current cost levels. The costs include a 20 percent contingency allowance and a 15 percent engineering allowance. For consistency with the drainage system improvements cost estimates in Section 4 of the CURMP, this is equivalent to an ENR index of 7730. The ENR construction cost index for June 2014 is 9800. The BMP cost estimates have been increased 26.8% to reflect current estimated construction costs.

Table 3-14 presents estimates of capital costs (including those shown in Table 3-13), operation and maintenance costs and staffing requirements for all of the potential

additional program elements where these can be estimated. The basis for cost estimates in addition to the water quality BMP opportunities have been developed from experience with other storm water programs, discussion with City staff, and other reported cost information. As shown in Table 3-13, a total of $1,120,000 is estimated for potential capital costs for identifiable water quality programs and projects. In addition, a total of $656,000 in additional operation and maintenance costs, and approximately 4.7 person-years have been estimated for the implementation and on-going support of these additional efforts. These estimates are in addition to the existing estimated budget for all NPDES and Drainage Area Management Plan related activities by the City as given in the City's November 2004 Fiscal Analysis Report under the Drainage Area Management Plan for projected FY 04/05 costs of $915,000 in capital costs and $5,761,900 in operation and maintenance costs (which includes $2,000,000 for operation of the Materials Recovery Facility).

**Table 3-13**
**Huntington Beach Water Quality BMP Opportunities**
**Estimated Costs**

| **Area 23** | **BARTLETT PARK** | | **Area =** | **1.50** | **Acres** |
|---|---|---|---|---|---|
| **Item No.** | **Description** | **Unit of Measure** | **Estimated Quantity** | **Unit Price $** | **Total $** |
| 1 | Excavation | Cu Yds. | 9,680 | 15 | 145,000 |
| 2 | Mobilization/Clearing & Grubbing | Lump Sum | 1 | 66,760 | 67,000 |
| 3 | Manhole/Junction Box | EA | 2 | 7,600 | 15,000 |
| 4 | Concrete Apron | EA | 1 | 3,800 | 4,000 |
| 5 | RCP Pipe (48" assumed) | LF | 350 | 200 | 70,000 |
| 6 | Headwall | EA | 1 | 3,800 | 4,000 |
| 7 | Screening and Pumping | Lump Sum | 1 | $500,000 | 500,000 |
| 8 | Landscaping | LF | 1250 | 19 | 24,000 |
| | | | | SUBTOTAL | 829,000 |
| | | | | 20% CONTINGENCY | 167,000 |
| | | | | 15% ENGINEERING | 124,000 |
| | | | | **TOTAL CONSTRUCTION AND ENGINEERING** | **$1,120,000** |

**Table 3-14**
**Costs and Resources for Program Elements**

| Program Element | Cost ($) or Resources Needed | | |
|---|---|---|---|
| | Capital ($) | O&M ($/yr) | Increased Staff (Person-Years) |
| **ADDITIONAL PROPOSED ELEMENTS** | | | |
| **Citywide Source Control** | | | |
| **Legal Authority** | | | |
| Continue to update ordinances as necessary | __ | __ | 0.01 |
| **Municipal Activities** | | | |
| Increased/enhanced program specific training of Citywide field program staff | __ | __ | 0.05 |
| Increased pump station wet well cleaning | __ | $150,000 | __ |
| Increased sweeping of parking lots and alleys and litter control | __ | $63,000 | __ |
| Increased program to install gross pollution separators in high trash/debris areas (assume 3 units) | $380,000 | $13,000 | __ |
| Increase fertilizer and pesticide management guidelines and training | __ | __ | 0.05 |
| Enhanced catch basin stenciling to include more permanent and discharge specific markers. | __ | $32,000 | __ |
| Target increased maintenance in channels | __ | $25,000 | __ |
| Obtain additional equipment (e.g., vac truck) for maintenance activities | $127,000 | __ | __ |
| Target increased maintenance in high trash/debris accumulation areas | __ | $32,000 | __ |
| **Public Education/Participation** | | | |
| New local education programs for target groups (e.g. Landscape/Concrete Construction Contractors, boaters/boat owners, local schools) | __ | $6,000 | 0.05 |
| Increased and Enhanced outreach through special programs/events (i.e., Harbor Clean-up and Awareness Day and Adopt A Waterway) | __ | $13,000 | 0.05 |

**Table 3-14**
**Costs and Resources for Program Elements**

| Program Element | Cost ($) or Resources Needed | | |
|---|---|---|---|
| | Capital ($) | O&M ($/yr) | Increased Staff (Person-Years) |
| **Construction** | | | |
| Support Implementation of BMP Technology | __ | $3,000 | 0.01 |
| Enhanced training of Inspection Staff | __ | $4,000 | 0.05 |
| **Existing Development** | | | |
| Enhanced restaurant inspection/implementation of FOG (Fats, Oils & Grease) Ordinance | __ | __ | 0.15 |
| Develop incentive program for restaurant grease trap retrofits | __ | __ | 0.1 |
| Consider requiring mandatory sweeping of all parking lots | __ | To Be Determined | 0.01 |
| **Illicit connections / Illegal Discharges** | | | |
| Enhanced training of staff | __ | __ | 0.05 |
| Provide dedicated information line for public regarding ID/IC | __ | $1,300 | __ |
| **New Development/ Significant Redevelopment** | | | |
| **General Plan Assessment** | | | |
| Local Coastal Program NPDES enhancement | __ | __ | 0.1 |
| Review General Plan to ensure compliance with renewed NPDES Permit | __ | __ | 0.01 |

**Table 3-14**
**Costs and Resources for Program Elements**

| Program Element | Cost ($) or Resources Needed | | |
|---|---|---|---|
| | Capital ($) | O&M ($/yr) | Increased Staff (Person-Years) |
| **CEQA Environmental Review Process** | | | |
| Provide additional training of planning staff on NPDES requirements. | __ | __ | 0.05 |
| Update CEQA Procedures Handbooks | __ | __ | 0.1 |
| **Development Project Review, Approval & Permitting** | | | |
| Incorporate water quality design standards in zoning and subdivision ordinances, municipal code and/or other planning documents, as well as public works, standard drawings and specifications | __ | __ | 0.5 |
| **Water Quality Planning Area-Based Controls** | | | |
| **Santa Ana River** | | | |
| Evaluate opportunities to reduce via flow reduction | __ | __ | 0.05 |
| Work with OCRP in water quality enhancement projects | __ | __ | 0.01 |
| Identify and construct improvements to pump stations | $630,000 | $13,000 | 0.1 |
| **Talbert Channel** | | | |
| Evaluate opportunities to reduce/reuse dry weather flow | __ | __ | 0.05 |
| Develop additional runoff treatment system in Bartlett Park; for dry and wet weather treatment | $1,167,000 | $32,000 | 0.1 |
| Identify and construct improvements to pump stations | $888,000 | $32,000 | 0.1 |

**Table 3-14**
**Costs and Resources for Program Elements**

| Program Element | Cost ($) or Resources Needed | | |
|---|---|---|---|
| | Capital ($) | O&M ($/yr) | Increased Staff (Person-Years) |
| **Coastal** | | | |
| Develop expanded education and enforcement programs | — | — | 0.2 |
| Continue dry weather flow sand infiltration practice where feasible; construct flow diversion where not feasible (2 outfalls) | — | $6,000 | 0.05 |
| Operate and maintain hydrodynamic separator units at beach outlets | — | $25,000 | 0.05 |
| Evaluate opportunities to reduce/reuse dry weather flow | — | — | 0.1 |
| Enhance street and alley sweeping | — | See Municipal Activities | — |
| **Bolsa Chica Wetlands** | | | |
| Operate and maintain hydrodynamic separator unit at wetland outfall | — | $6,000 | — |
| Evaluate opportunities to incorporate water quality features into future development/redevelopment | — | — | 0.05 |

**Table 3-14**
**Costs and Resources for Program Elements**

| Program Element | Cost ($) or Resources Needed | | |
|---|---|---|---|
| | Capital ($) | O&M ($/yr) | Increased Staff (Person-Years) |
| **Slater Channel** | | | |
| Incorporate water quality features at future development/redevelopment sites | __ | __ | 0.01 |
| Identify and construct improvements to pump station | $127,000 | $6,000 | 0.05 |
| Implement improvements in Huntington Lake drainage area | $101,000 | $13,000 | 0.02 |
| **East Garden Grove Wintersburg Channel** | | | |
| Evaluate opportunities to reduce/reuse dry weather flow | __ | __ | 0.05 |
| Identify and construct improvements to pump stations | $380,000 | $19,000 | 0.05 |
| Coordinate with Orange County on maintenance to reduce sediment build-up in East Garden Grove Wintersburg Channel | __ | $63,000 | 0.05 |
| **Bolsa Chica Channel** | | | |
| Clean-up and protect Westminster Channel near Marina High School | $127,000 | __ | 0.1 |
| Incorporate water quality features at future development/redevelopment sites | __ | __ | 0.05 |
| Coordinate with Orange County on projects to improve/restore channels for aesthetics and treatment potential | __ | __ | 0.1 |
| **Huntington Harbour** | | | |
| Review and install new storm drain signage | __ | $6,000 | 0.05 |

**Table 3-14**
**Costs and Resources for Program Elements**

| Program Element | Cost ($) or Resources Needed | | |
|---|---|---|---|
| | **Capital ($)** | **O&M ($/yr)** | **Increased Staff (Person-Years)** |
| Continue expanded education and enforcement programs | — | $6,000 | 0.5 |
| Initiate better response to storm events and conducting maintenance/inspection of new vessel pump-out station | — | — | 0.05 |
| Support a fair and equitable means to upgrade, monitor and inspect existing pump-out facilities and install new pump-out facilities at appropriate locations in the Harbour | — | — | 0.05 |
| Evaluate and implement drain inlet retrofit opportunities | To be determined | To be determined | 0.1 |
| **Additional Citywide Opportunities** | To be determined | To be determined | 0.35 |
| Subtotal, Additional Proposed Elements | $4,070,000 | $656,000 | 4.7 |
| **EXISTING NPDES/DAMP PROGRAM ACTIVITIES** (From November 2004 Annual Report Submittal) | $767,000 | $2,406,000 | — |
| Total, all program elements | $4,837,000 | $3,062,000 | 4.7 |

### 3.5.2 Funding

The proposed Fiscal Year 2013/2014 budget includes projected General Fund revenues of $193.5 million. Approximately 26.6 percent of General Fund revenues go toward maintenance, rehabilitation, and the building of infrastructure. Special funds, such as the Water and Sewer funds, contribute over $ 87.1 million toward infrastructure maintenance and rehabilitation. Additionally, the FOG (Fats, Oils & Grease) Ordinance brought in approximately $72,000 in 2012/2013 in revenues.

To fund both new capital projects and increased operation and maintenance costs associated with both mandatory and discretionary water quality and drainage program elements sources of funding in addition to the General Fund may be necessary. Potential additional sources include:

- Fees
    - Storm Water Utility Fee - fee based on stormwater and pollutant discharge using impervious area and pollutant loading factors to determine the fees required by Proposition 218, any utility fee may require a 2/3 majority vote of City residents.
    - Redevelopment Fee - fee equivalent to the drainage fee for new development tied into certain redevelopment activities.
- Grants and Loans
    - Integrated Waste Management Grant Program
    - OCTA Tier 1 and 2 Grants
    - State and Federal Grants including:
        - Congressionally-directed Federal Grants
        - State legislative bills
        - Proposition 40 funding (expired in 2008)
        - Proposition 50 funding (expired in 2010)
        - Proposition 84 funding – Clean Beaches Initiative (CBI) also uses any unused or re-appropriated Prop 40 and Prop 50 funding - agency matching requirement is 20% for projects valued at $1M - $5M; 15% for projects less than $1M and 75% for sewer infrastructure projects)
        - Proposition 1E funding available for storm water management and flood control projects which are consistent with the Integrated Regional Water Management Grants (IRWM) program (minimum agency matching requirement is 25%).

- Cal-fed funding
- Coastal Non-Point Source Control Program
- CalRecycle Used Oil Block Grants
- Wetlands Recovery Projects Program (Agency provides 25% cost share)
- Clean Water Act (CWA) §319(h) Non-Point Source (NPS) Grant Program (Agency provides 25% fund match)

- Boating and waterway grants for Huntington Harbour projects. Loans and grants are available. Under the Clean Vessel Act the pumpout grant program will reimburse up to 75% of the installed cost of pumpout and dump stations.

- Cost sharing arrangements with other agencies for regional/joint projects

With the exception of project-specific grants or loans, securing funding should be considered on a city-wide basis versus funding for discrete zones. Improved water quality and drainage capacity can have a positive impact at the beaches, the Harbour, and lakes which provide benefits to all residents and businesses in Huntington Beach. In addition, many of the improvements are synergistic in their benefits to the City. Improvements in downstream drainage systems improve the service to the surrounding customers as well as upstream customers. Implementation of regional water quality projects can enhance drainage system capacity as well as improve water quality. A number of the water quality practices recommended herein can have a positive impact on drainage management requirements. For instance, reducing impervious surfaces and providing increased opportunities for storm water infiltration in new or existing developments could reduce the need for increased storm water carrying capacity in the drainage system.

A resource for funding research is infrastructure funding fairs organized by the California Financing Coordinating Committee (CFCC) to assist local government representatives with learning about available funding. Projects eligible for funding involve drinking water, wastewater, solid waste, water quality, water supply, water conservation, energy efficiency and flood management. The CFCC is made up of seven funding members, The State Water Board, California Department of Public Health, California Department of Water Resources, California Department of Housing and Community Development, U.S. Department of Agriculture Rural Development , U.S. Department of the Interior Bureau of Reclamation, and California Infrastructure and Economic Development Bank.

## 3.6 Responsibilities

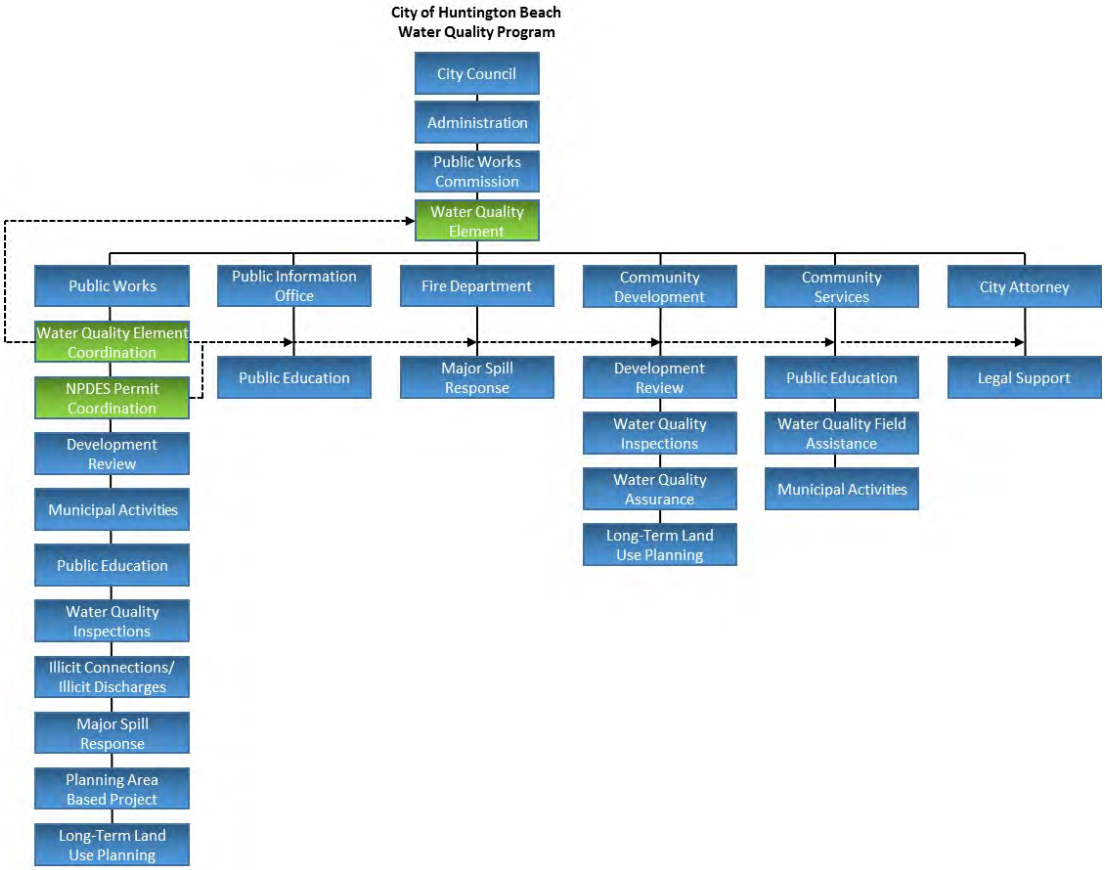
The City Council holds the overall responsibility for adopting the Citywide Urban Runoff Management Plan and overseeing the implementation of the program elements. Implementation of the program requires active involvement by most City Departments, as shown in Figure 3-9. While program responsibilities are distributed

throughout the City organization, the Public Works Department has two key responsibilities with regards to the Water Quality Element:

- Maintain, review, and update Water Quality Element and training and report annually to City Council and coordinate implementation of the Water Quality Element with other City Departments.
- Coordinate compliance and reporting activities under the NPDES Permit and Drainage Area Management Plan, and coordinate activities with other City Departments.

The Public Works Commission will provide detailed liaison between the Council and City Administration and staff on the water quality program.

**Figure 3-9 Area of Reponsibilities**



# Section 4
# Drainage Element

## 4.1 Introduction

The Drainage Element of the CURMP incorporates a city-based Master Plan of Drainage (MPD) that is a comprehensive drainage study of the community, which identifies and creates an inventory of existing storm drain facilities, identifies those areas where system elements do not meet the latest goals established by the City, ranks the severity of the difference between existing capacity and the capacity needed to achieve those goals, prepares planning level cost opinions for system upgrades, and recommends system improvements to initiate the corrections. The City can then initiate the individual drainage projects within its budgetary, political and discretionary restraints.

### 4.1.1 Purpose of Master Plan of Drainage

As communities mature, it is necessary to periodically review and model the adequacy of their drainage systems to insure that changes in population density, land use and percentage of impervious surfaces, and changes in City drainage policy and goals have not caused the need to upgrade some system elements. The purpose of this Master Plan of Drainage is to provide an update to the City's current MPD, created in 1979 by L.D. King Engineering. In 1993 Williamson & Schmid Consulting Engineers performed work on an updated MPD which is used for planning purposes only. Periodic updates to the MPD are useful in planning for the safety and well-being of the members of the community, cost-effectively reducing the risk of flooding.

### 4.1.2 Characteristics of the Watershed

A community's watershed area is defined as the total land area contributing non-absorbed, excess rainfall (or runoff) to the community and its flood control facilities. The City of Huntington Beach encompasses approximately 28 square miles. The total watershed boundary was determined by using the City's previous Drainage Map as a guide, comparing drainage maps from surrounding cities, and performing field verification of areas in question. Figure 4-1 illustrates the City's watershed boundary.

#### 4.1.2.1 Sub-drainage Regions

For hydrologic modeling purposes, the City was divided into 5 distinct regions, or Sub-drainage areas (see Figure 4-2), based upon topographic and computer modeling features. The regions correspond with one or more Water Quality Planning areas described in Section 3.

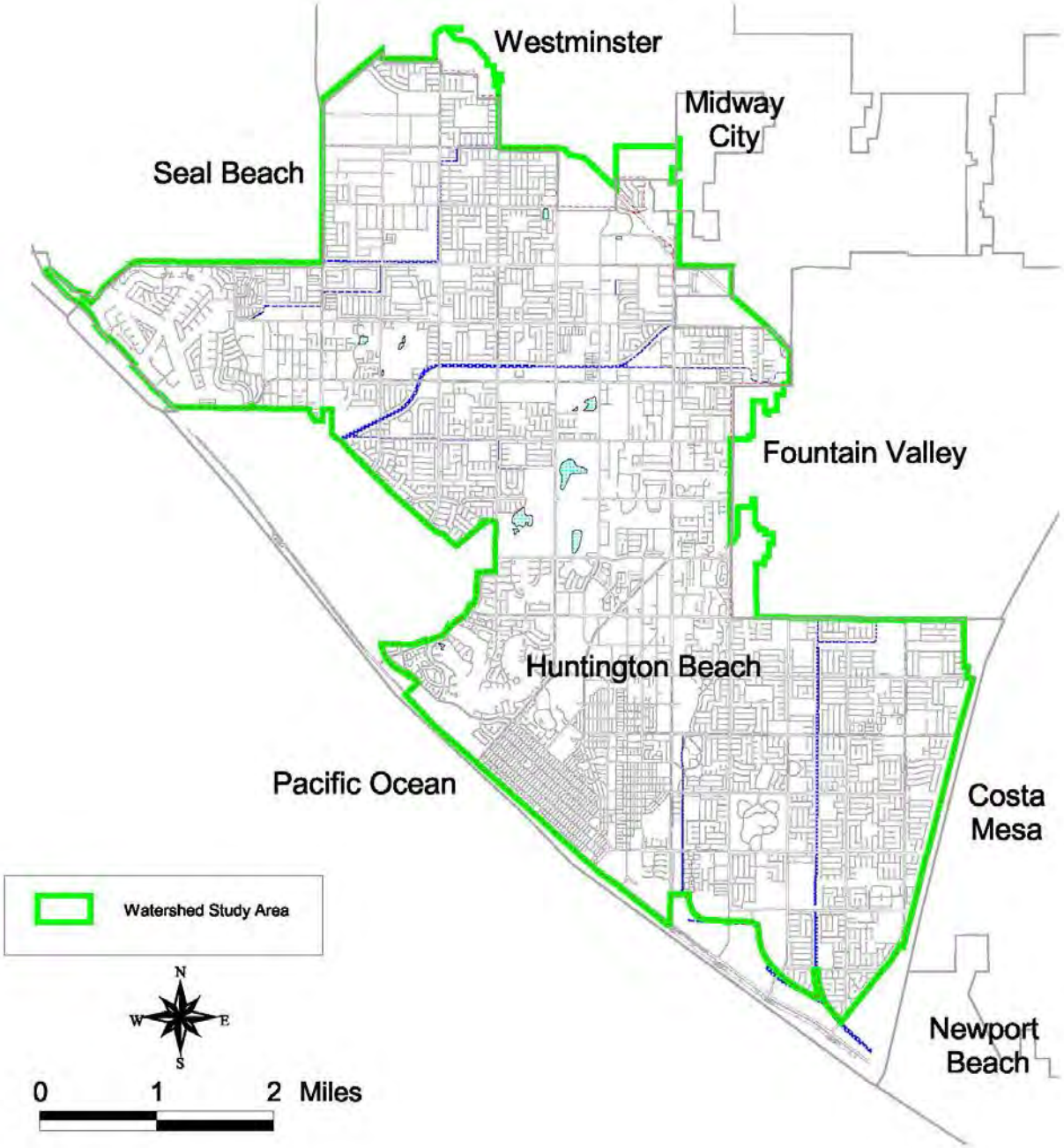



**Figure 4-1 Watershed Boundary Map**

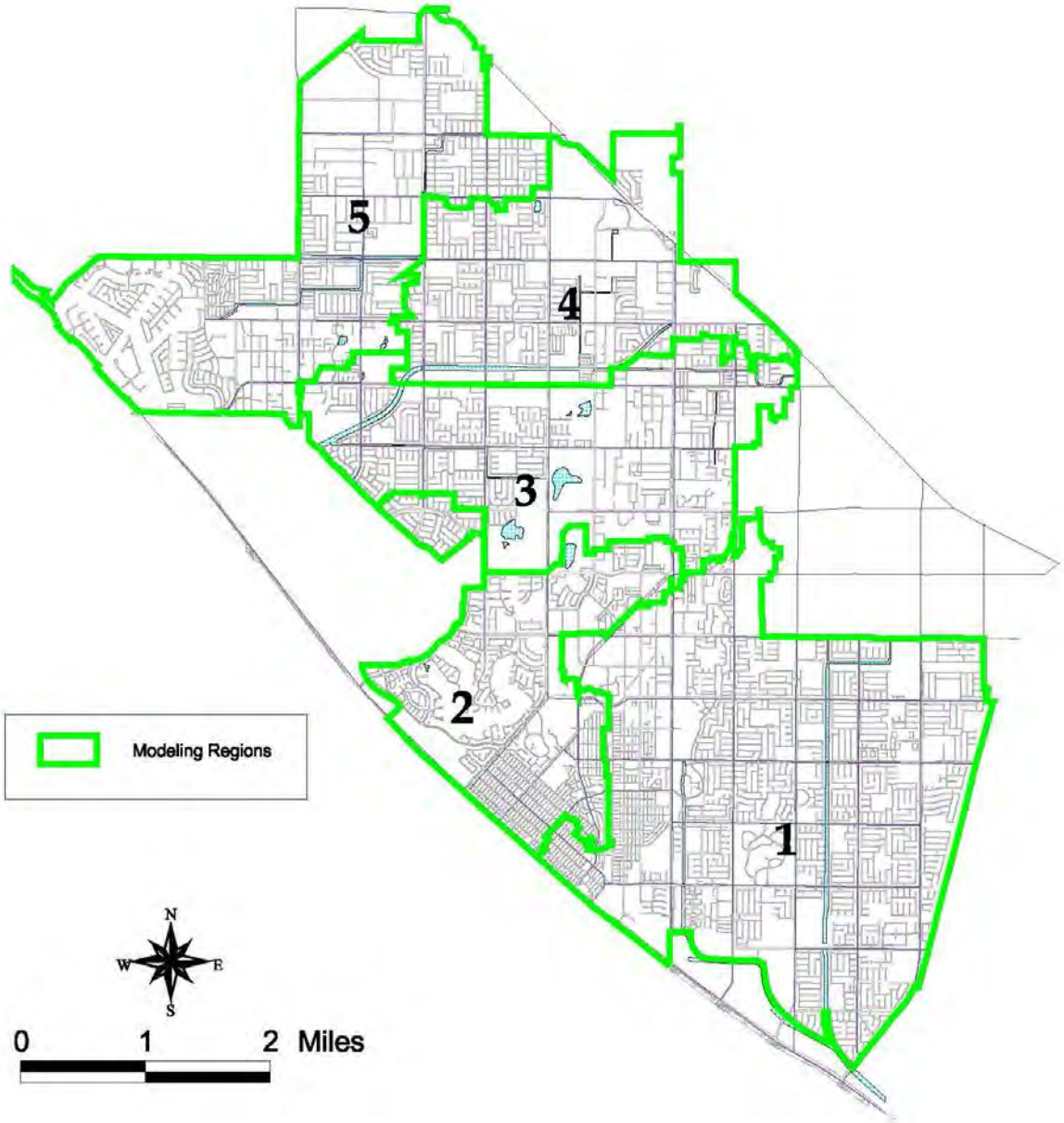



**Figure 4-2 Modeling Drainage Sub-Regions for the Huntington Beach Watershed**

The City's watershed was further divided into 31 smaller study sections, or individual watershed areas, for the purposes of modeling and mapping. These sections are numbered 1-27, 29-32, 40, and 41. The drainage maps provided as Appendix C (in a separate attachment) are based on these individual watershed areas. The Sub-drainage areas were delineated as follows:

- **Sub-drainage region 1 –** drains the lower central to east and southerly areas of the City. It is generally bordered on the east by the Santa Ana River Channel, on the southwest by the Pacific Coast Highway and the Pacific Ocean, on the west mainly by Alabama and Main Streets, and on the north by Garfield and Ellis Avenues. It encompasses the Santa Ana River and the Talbert Channel Water Quality Planning Area and is represented in watershed Drainage Maps 20-27, 29-32, 40, and 41.
- **Sub-drainage region 2 –** drains the central southwest area of the City, and is generally bordered by Lake and Main Streets on the east, Pacific Coast Highway on the south and west, Seapoint Avenue and Edwards Street on the west, and Ellis Avenue on the north. Sub-drainage 2 also includes the community surrounding the Springdale/Talbert intersection. It encompasses the Bolsa Chica Wetlands and the Coastal Water Quality Planning Area and is represented in watershed Drainage Maps 16-19.
- **Sub-drainage region 3 –** drains the central section of the City, including a portion of the City of Fountain Valley, and is generally bordered by Newland and Magnolia Avenues on the east, Ellis, Taylor and Talbert Avenues on the south, Graham and Bolsa Chica Streets on the west, and Warner Avenue on the north. Sub-drainage 3 consists of the Slater Channel Water Quality Planning Area and is represented in watershed Drainage Maps 10-15.
- **Sub-drainage region 4 –** includes the northern and northeastern parts of the City, and is generally bordered by Newland Street on the east, Heil and Warner Avenues on the south, Springdale Street on the west, and McFadden Avenue on the north. Sub-drainage 4 corresponds to the Wintersburg Water Quality Channel Planning Area and is represented in watershed Drainage Maps 6-9.
- **Sub-drainage region 5 –** covers the northwestern section of the City, including a portion of the City of Westminster. Sub-drainage 5 corresponds to the Harbor Water Quality Planning Area and the Bolsa Chica Channel Water Quality Planning Area and is represented in watershed Drainage Maps 1-5.

With the exception of the mesa area to the southeast and south central areas, the City's watershed is topographically flat, with a maximum of 25 feet of fall across the entire City. The highest point is at elevation 115, near the intersection of Summit Drive and Goldenwest Street. The majority of streets contain multiple sumps, channeled by facilities with slopes less than 0.5 percent.

### 4.1.3 Drainage Master Plan Methodology

In order to analyze the City's drainage system, coupled hydrologic and hydraulic analyses were performed. The hydrologic analysis determined the peak flow to which each element in the system will be subjected under a particular design storm. The hydrologic analysis was performed using the Advanced Engineering Software program Stormwater Information Management System (SIMS), an integrated Rational Method and Unit Hydrograph software program which estimates runoff from small subareas, then integrates and routes the flows throughout the system. Hydrology was developed for multiple design storms to allow assessment of the existing system for different levels of flood protection.

The hydraulic analysis assesses the conveyance capacity of the existing system (streets, pipes, and box structures) to drain the runoff determined during the hydrologic analyses. A 'balanced HGL' analysis was used to determine the conveyance capacity of each element in the system, and the factor needed to upgrade particular system elements were identified by comparing the existing capacity of an element with the peak flow rate determined for that element in the hydrologic analysis. Mitigation elements or improvements needed to meet the goals were also sized using the 'balanced HGL' analysis.

## 4.2 Existing Facilities

### 4.2.1 Existing City Facilities

The City owns and maintains approximately 131 miles of storm drainage system within its boundary, some installed as far back as the mid-1940's, and annually added to since that time. Due to the topographic nature of the City, the City operates 15 pump stations, generally located near principle County of Orange drainage channels. The flood waters are collected at each pump station site through the City's drainage facilities, and then lifted up to the nearest County of Orange channel, which ultimately conveys the floodwaters from the City to the Pacific Ocean. No private facilities have been mapped as part of this project. Drainage Maps for the City can be found in Appendix C.

There are three lakes within the City boundaries which can serve as temporary detention basins in flood conditions: Huntington Lake, Talbert Lake and Sully-Miller Lake.

### 4.2.2 County of Orange Drainage Facilities

County of Orange Flood Control District owns and/or maintains approximately 18 miles of storm drain systems within the City. County owned and maintained channels found in the City include the CO-2 (Bolsa Chica), CO-4 (Westminster), CO-5 (East Garden Grove Wintersburg), CO-6 (Oceanview), CO-7 (Sunset), DO-1

(Huntington Beach), DO-2 (Talbert) channel, DO-5 (Fountain Valley) channel, and the EO-1 channel (Santa Ana River). Figure 4-3 presents the major County facilities within the City. Additionally, the County owns and maintains a storm drain pump station located at the head of the DO-1 channel.

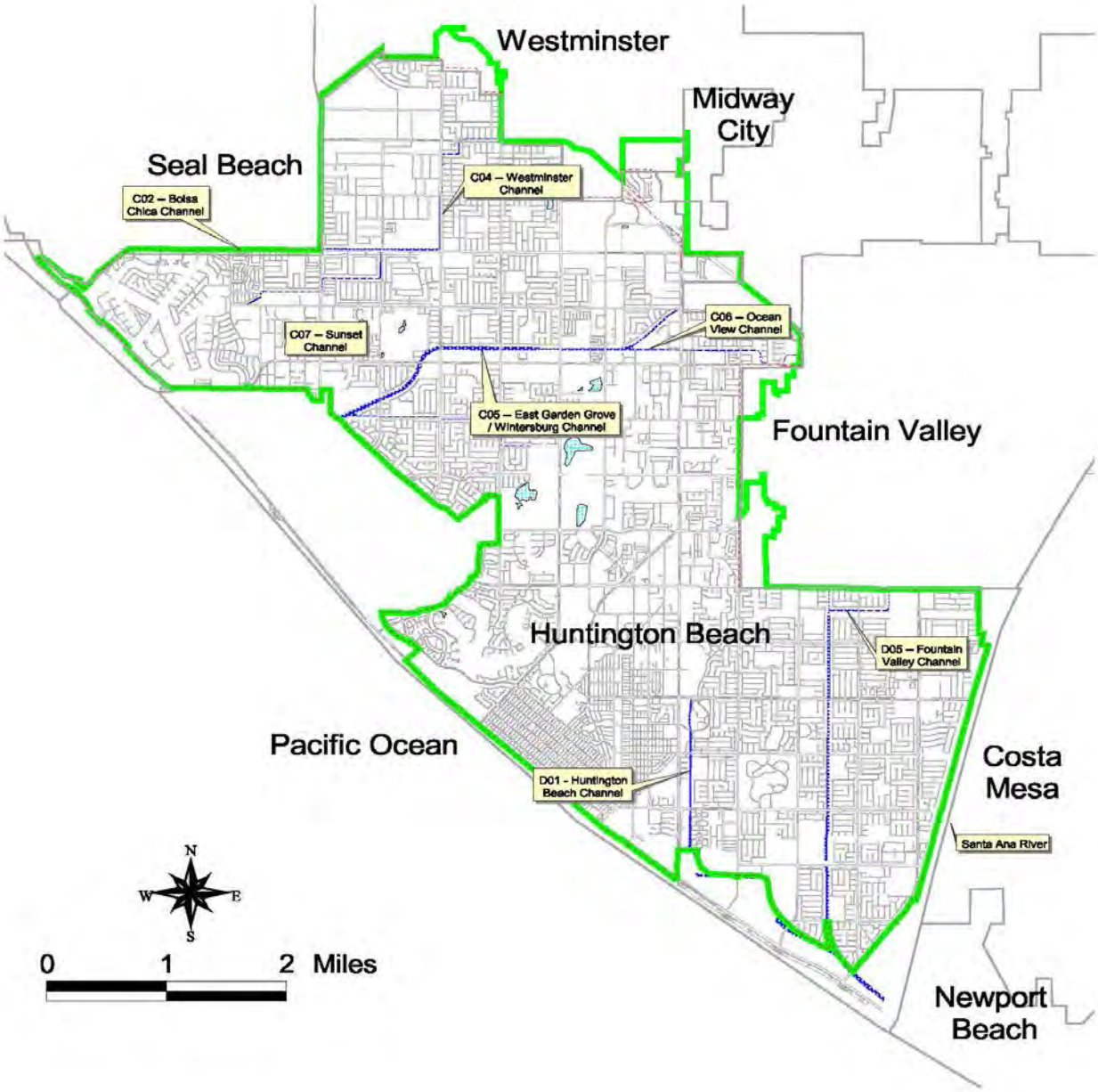



**Figure 4-3 County of Orange Drainage Facilities**

### 4.2.3 Other Public Agency Facilities

The eastern-most portion of the City is adjacent and utilizes the Santa Ana River Channel, built and operated by the U.S. Army Corps of Engineers. Two City pump stations and a private outlet make use of the Santa Ana River Channel facility.

No modeling was conducted in conjunction with the California Department of Transportation 405 Freeway drainage facilities, which utilizes a County channel as the floodwaters receiving site.

### 4.2.4 Soil Classifications

The United States Department of Agriculture, Soil Conservation Service, has defined four general soil groups for use in hydrologic studies, namely:

Soil Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well-drained to excessively drained sands or gravel sands. These soils have a high rate of water transmission.

Soil Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist mainly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture.

Soil Group C. Soils having a slow infiltration rate when thoroughly wet. These consist mainly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture. These soils have a slow rate of water transmission.

Soil Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist mainly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over near impervious material. These soils have a very slow rate of water transmission.

Hydrologic soil type attributes are contained in the 1986 OCEMA Hydrology Manual. The hydrology manual provides maps delineating a detailed breakdown of the City watershed into four hydrologic soil groups. An AutoCAD layer for the soil groups within the watershed boundary was also prepared for the computer link-node model. Figure 4-4 demonstrates the four major classifications as they apply to the City.

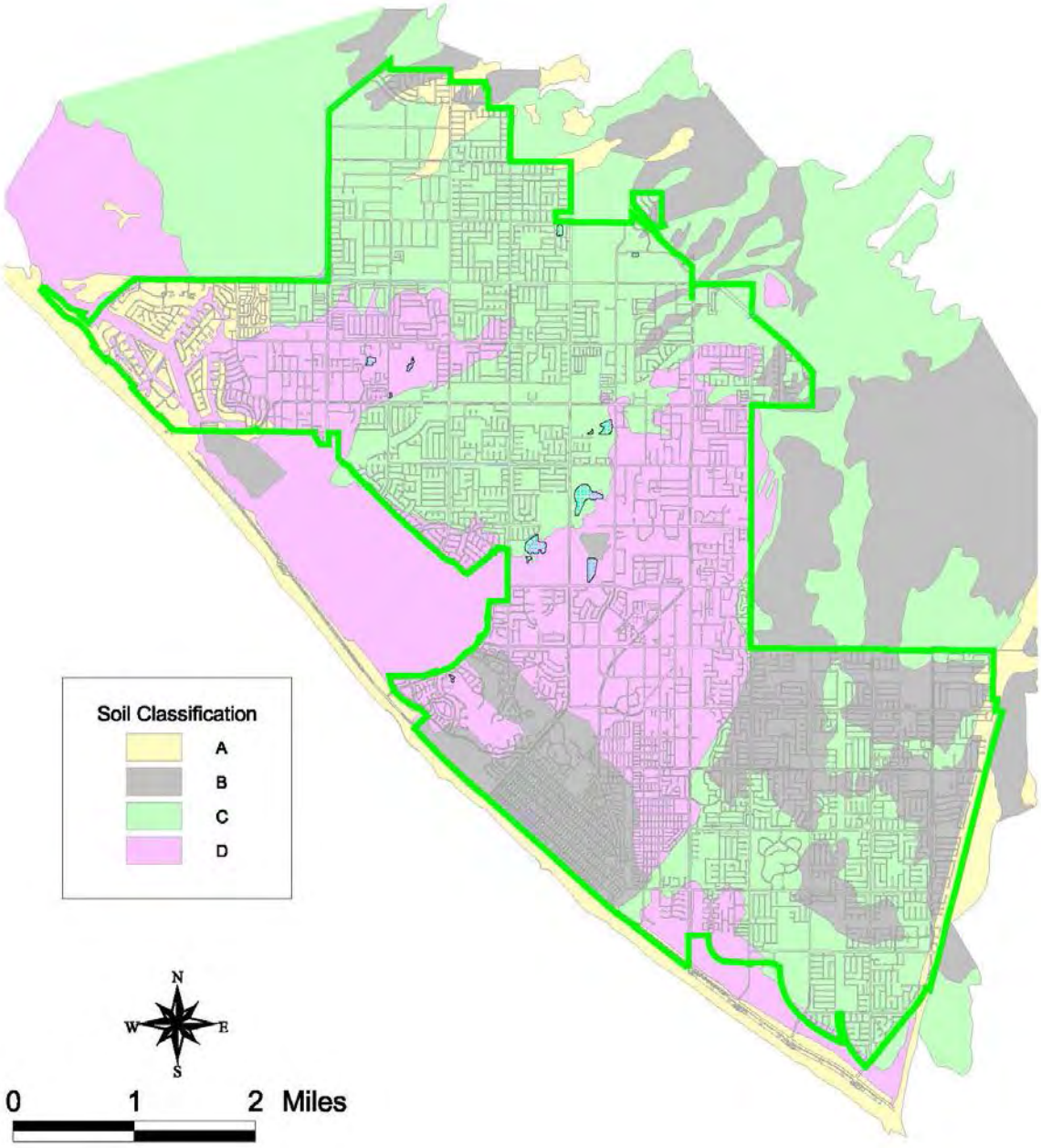



**Figure 4-4 Hydrologic Soil Classification**

### 4.2.5 Land Use and Zoning

Land use designations were obtained from the City of Huntington Beach General Plan Land Use Diagram. The twenty-five land use categories were combined into ten hydrologically similar categories and then digitized for use in the Graphic Data Base. Figure 4-5 demonstrates the land-use impervious factors used in modeling runoff quantities.

### 4.2.6 Data Capture

GIS storm drainage features were captured primarily from as-built engineering drawings and GPS surveyed locations of manholes and other drainage features. The GIS mapping process began with the inventory, collection, and scanning of over 4,000 as-built drawings. The drawings were used to position facilities relative to rights-of-way and parcels on the City GIS base map and to the GPS coordinates of manholes, inlets and other ground features. Facilities were entered in the direction of drainage and snapped to assure the resulting drainage network is traceable.

The storm drain centerlines have been digitized as individual storm drain system segments each with unique identifiers defined by their upstream node and downstream node. Each segment is attributed with material, type, diameter, owner, inverts, and length. Manholes are attributed with type, owner, depth, rim elevation, plan, and GPS elevation. Where as-built drawings were not available, positioning and attribution was supplied from the city and noted within the database. The GIS Data Conversion Specifications provide a more detailed definition of the database.

## 4.3 Hydrologic Modeling

### 4.3.1 Hydrologic Model Development

#### 4.3.1.1 Introduction

One of the most widely recognized hydrologic models is the Rational Method, which essentially estimates flow on the basis of rainfall intensity, surface imperviousness, loss rates, and area of the watershed. The City's MPD uses a customized version of the Advanced Engineering Software program called SIMS. Following the County of Orange Hydrology Manual methodology, data are updated using the computer program, which reads the hydrologic parameters (i.e. subarea acreage, soil type, development type, land use -impervious factor, time of concentration of runoff, etc.) directly from the graphic data base layers via a polygon processor and writes them to the SIMS data file. In this way, future changes in the watershed characteristics (such as General Plan Amendments, new development, etc.) can be incorporated into the data base files and then the program re-executed through a SIMS update to the MPD.

The model input data for the City's MPD was developed through a Geographic Information System (GIS). For this purpose, ArcView GIS (ESRI, Redlands, California)

was used as the primary drawing and analysis tool. The existing City land base was utilized as the drainage model base map. The drainage facilities were then transferred

to the base maps and plotted for development of watershed areas, flow paths and nodal schemes. Additional hydrologic layers, such as topography, drainage path flow arrows, rainfall zones and contours, soil groups and land use were developed separately then overlaid on to the drainage base map, by means of GIS themes.

As a simplistic explanation, a theme is a collection of graphic features such as point, lines, and closed polygons that carry certain alphanumeric attribute data in a database type format. These data are used to identify and query spatial and geographic features, such as nodes, storm drain lines, or subarea polygons. In other themes, attribute information such as drain diameter or invert elevations can be stored. Related themes can then be assembled as a GIS coverage that combines spatial (geographic or drawing) and attribute (characteristic information) data. The coverage can then be separated from ArcView GIS and analyzed using other mapping, database and spreadsheet software that allow varying levels of data and drawing analysis and interrogation.

The Orange County Hydrology Manual (1986) and subsequent addendums provide for the estimation of upper confidence level estimates of runoff. For example, use of a policy to use peak flow rates estimated at the 85-percent upper confidence level throughout Orange County will eventually result, after full build-out of the flood control system and tributary watershed, that 85-percent of the system elements will be larger than what is exactly needed to carry the peak flow rate from the "expected" design storm. In this case, the term "expected" has a precise meaning; namely, it is the 50-percent upper confidence level value. Some view the 85-percent confidence level estimate as a form of application of a safety factor in design storm hydrology design and planning.

Many issues arise in the discussion of confidence interval estimates, but for planning purposes, it may be sufficient for most applications to use the lower 50-percent confidence interval estimate of runoff for testing existing storm drain elements as to whether they satisfy planning goals and objectives. Such goals may include the objectives of convenience, such as specified driving lanes being relatively open from runoff during certain design storm events of certain return frequencies, and also may include objectives of flood risk reduction, such as handling the 100-year return frequency event design storm runoff within specified flow depths in street confines.

In the current City of Huntington Beach Master Plan, as with the prior 1993 Master Plan of Drainage, storm drain system elements are tested for both convenience and flood risk reduction objectives, among other objectives, by use of the "expected" runoff quantities, and for those elements that do not meet the current City goal objectives, element upgrades are recommended to approximately meet the objectives

at the 85-percent confidence level. This use of a coupled criteria uniformly tests the entire City, but recommends possible system element upgrades at a level of confidence such that future evaluations will find these upgrades still sufficient to meet City goals and objectives.

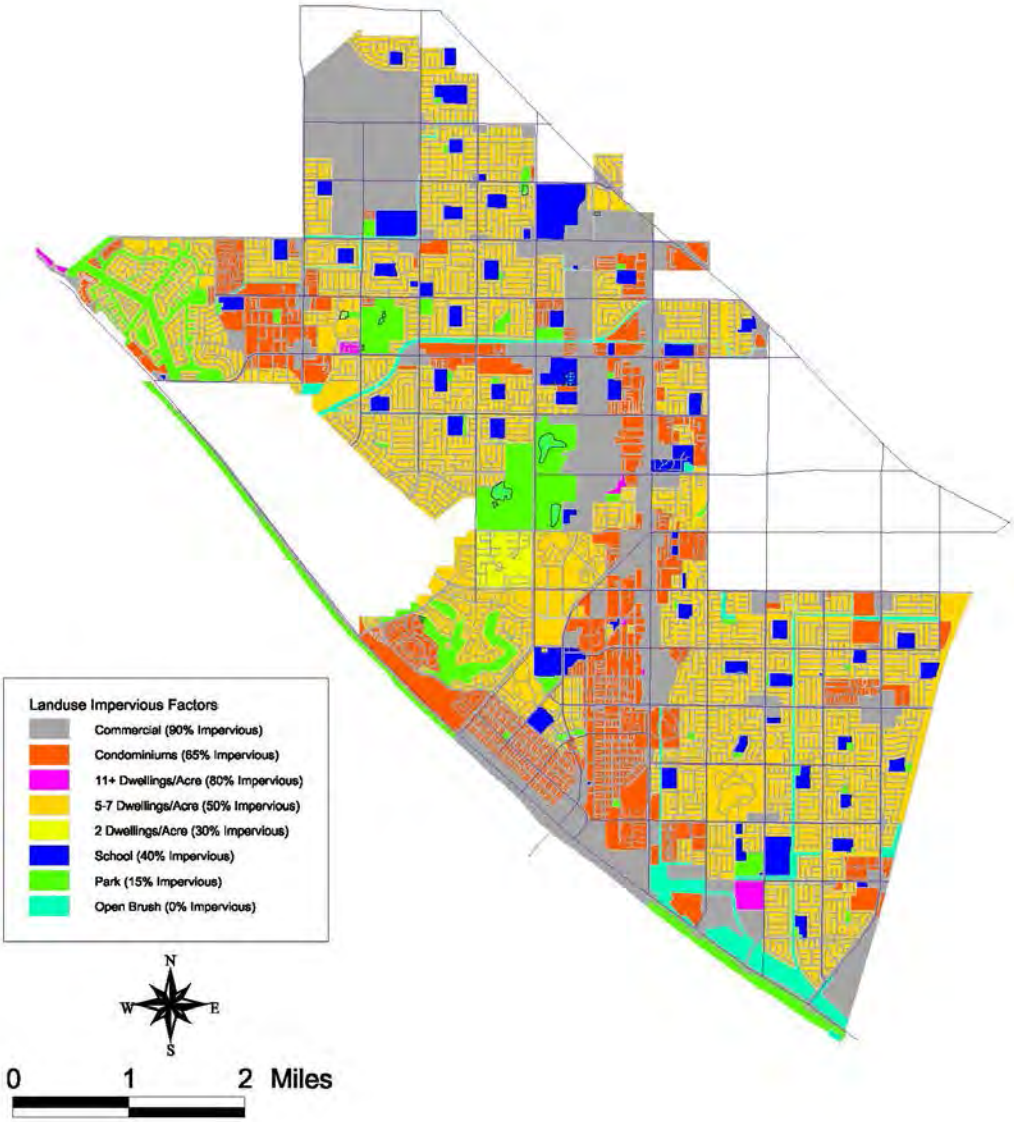



**Figure 4-5 Hydrologic Land Use Impervious Factors**

#### 4.3.1.2 Development of the New MPD Analysis and Improvements

The new MPD computer modeling results differ from those developed in the 1993 Master Plan of Drainage in the following ways:

- The current computer modeling effort utilizes a balanced hydraulic grade line approach to develop a target hydraulic grade line for each system in the model network, based upon hydraulic control elevations or criteria set by the City. For many pipe network systems, this approach results in the use of significantly less energy head than was assumed in the 1979 effort, and provides a more accurate analysis of coupled hydrology and hydraulics.

- Different rules are being employed as to the handling and drainage of street intersections, with the goal now to achieve a modeled 'no flow' of runoff across particular street intersections. This modeling condition is equivalent to a total pick-up of runoff for both of the return frequency storm events being modeled, and for confidence levels of both 50-percent and 85-percent. No similar rule was used in the 1993 MPD, except that there was to be *"...100-year pick-up at all sumps…" (1993 MPD Report, page 4).*

- The storage element hydraulic assumptions are now being modeled with coupled hydraulic and hydrologic analyses and, therefore, also involve definitions of hydraulic boundary conditions at both the inflow and outflow elements to and from the storage element, as well as hydraulic assumptions regarding the specified outflow flow rates from available flow elements draining the storage element. For the current computer model, water surfaces are defined as being one foot below a 'break-out' water surface elevation as estimated using the available topographic mapping information. However, when available, prior reports from drainage studies prepared using the 1986 criteria were used to obtain estimates of storage element water surface elevations and outflow rates. It is noted that these reports were not analyzed or reviewed as part of this study. These 'break-out' elevations are used as the water surface elevation for both the inflow and outflow hydraulic grade line elevations, and approximate the level targeted by the City as the modeling objective at peak flow conditions. Because the travel times are relatively small in value, it is assumed that flood wave travel time through the storage element is small, and that the time of concentration values at inflow and outflow coincide with the timing of the peak water surface elevation in each storage element and their associated flow elements. This particular assumption relates the arrival of the inflow peak flow rate to occur when the storage element is at its maximum water surface elevation and, therefore, considers the eventual sizing of storage elements to achieve that assumption.

- In many cases, target water levels are estimated in other reports. These other reported estimates are used as the modeling target water levels when directed by the City.

It is noted that in both of the prior 1993 and 1979 MPDs, "... no existing or proposed retention/detention facilities were modeled or considered. All storm drain facilities were analyzed and sized based on a free flowing system..." (1993 MPD Report, page 5). Consequently, due to just the effects of the coupled hydraulics modeling and the modeling of storage element hydraulic effects, the new 2004 MPD differs considerably from the prior master plans of drainage in the modeling approach used.

- Storage element outflow systems are analyzed by estimating a one-foot freeboard normal depth flow in open channel elements or by estimating normal depth full-flow conditions in closed conduits. In many cases, outflow rates are estimated in other reports. These other reported estimates are used as the modeling hydraulic boundary conditions when directed by the City.

- In the current computer model, receiving water systems such as the County of Orange facilities and the Pacific Ocean are hydraulically modeled as boundary conditions to the drainage elements. In this case, County of Orange channels are estimated to have a water surface elevation that is approximately one foot below the top-of-bank elevation as estimated from the available topographic information. For the Pacific Ocean, including Huntington Harbor, water surface hydraulic boundary conditions were estimated considering both ocean levels and outlet pipe soffit elevations. Table 4-4 lists these hydraulic boundary condition elevations.

- It is noted that while existing systems are considered to be eligible for upgrade when they do not meet the City's current flood handling goals for street flow depths, as developed using the 50 percent confidence level flow estimates, the upgraded systems are estimated using the 85 percent confidence level flow estimates. Consequently, upgrade incremental system element sizing not only accommodates the 50 percent confidence flow increment needed to meet current City goals, but also the entire difference between the 85 percent and 50 percent confidence levels of flow estimates. As a result, system upgrading estimates will appear to be considerable in comparison to the original system element under analysis because of different flow handling requirements being involved.

- Another criteria that impacts the new MPD is that for street grades that are negative, and therefore have zero street flow capacity in the direction of the associated storm drain, both the 10-year and 100-year return frequency storms are set to be accommodated by the storm drain system which, of course, results in storm drain systems that have total pick-up of 100-year return frequency storm event flows. Another rule set into the computer model is that flow 'bubble-up' is

not to be included; that is, even though a downstream street reach might be able to carry more flow and therefore the storm drain element may be reduced in size to take advantage of the available increase in street flow capacity (according to City set street flow depth rules), this advantage is not be taken and therefore "bubble-up" options are ignored. These two rules results in a considerable number of segments to be identified as candidates for upgrading.

- In the 1993 MPD effort, "...Preliminary cost estimates were developed for both the existing facilities to be improved and the proposed new facilities (see Chapter 4). Only the replacement alternative was evaluated for the existing facility improvements. Due to the limited knowledge of surface and underground constraints (i.e., available right-of-way, utility conflicts, etc.) available for this study, the replacement alternative was chosen over the parallel alternative to ensure adequate costs for the improvements. The optimum replacement facility would be determined during the design phase of the improvement project." (1993 MPD Report, page 5). The new 2004 MPD also utilizes this same concept and approach. Although the modeling developed parallel element solution targets, only the replacement alternative is used in this MPD.

- An alternative to direct drainage strategies is to use future planning controls to reduce storm runoff as discussed in Sections 3.2.2.3 and 3.2.3. For example, future land development can be targeted for reduced runoff design objectives including, but not limited to:

  - Runoff storage in on-site storage elements, including maintenance cost planning.

  - Runoff storage in below ground infiltration elements, such as buried large diameter pipelines, including infiltration enhancement components such as leaching pipeline networks, and also including maintenance cost planning.

  - Onsite storage using landscaping infiltration ponds and porous pavement, including maintenance cost planning.

  - Multi-use mini-park areas in new clustered developments, with a storage element or infiltration element, including maintenance cost planning.

  - Rainfall capture systems for subsequent use for landscape irrigation.

As development continues, the cumulative effect of such Alternative Drainage Schemes may derive sufficient runoff load reduction that storm drain upgrades are no longer targeted for particular systems.

A difficulty in accommodating such Alternative Drainage Schemes is the monitoring, maintenance, and management of the ever increasing number of elements involved.

Such considerations may be appropriate for the City's information management system.

#### 4.3.1.3 Computer Modeling Assumptions

##### *4.3.1.3.1 Streetflow Drainage Strategies*

Arterial streets are designed to carry considerable volumes of traffic traveling at high speeds. The MPD effort involved building and running SIMS models for a variety of drainage schemes.

- Street Intersection Drainage Strategy - The approach chosen selected by the City as the criteria to be used in development of the MPD was total pickup of runoff at intersections of major, primary and secondary streets. Selected arterial streets are shown in Figure 4-6.

- Streetflow Capacity Modeling Targets – Generally, different goals were set depending on the return frequency of the design storm and the confidence level used. Therefore, multiple target criteria are used in the analysis of streetflow capacity, including the street type and size. The following criteria were used in building the MPD model:

  - 10-year flow cannot exceed top-of-curb

  - 100-year flow cannot exceed one-foot above back-of-walk and for arterial highways one lane is to be dry

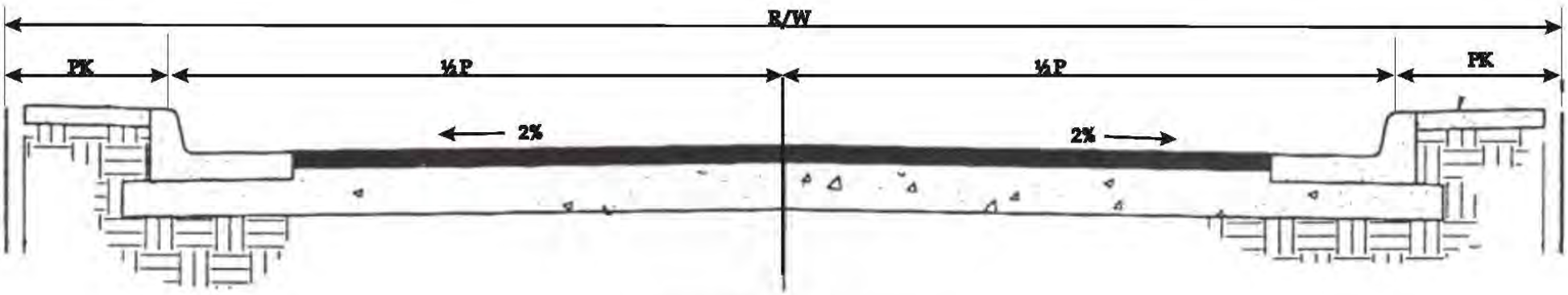
  - The product of flow depth and flow velocity must be less than 6

It is noted that the 1993 MPD used a similar streetflow rule set, except that the 100-year flow conditions were targeted at the right-of-way (1993 MPD Report, page 4). Figure 4-7 demonstrates typical arterial street cross sections.

##### *4.3.1.3.2 Hydrologic/Hydraulic Modeling Assumptions*

Other modeling assumptions involved both hydrologic and hydraulic considerations. Table 4-1 provides a spreadsheet of information that describes various modeling assumptions used in the SIMS computer model.

**Figure 4-6 Selected Arterial Highways**




Typical Street Cross-Section

| Description | Major Arterial Highway | Primary Arterial Highway | Secondary Arterial Highway | Local Street Ind./Com. | Local Street Collector | Local Street Residential | Local Street Residential |
|---|---|---|---|---|---|---|---|
| Right-of-Way (R/W) (feet) | 120 | 100 | 80 | 60 | 54 | 52 | 44 |
| Curb Height (H) (feet) | 0.67 | 0.67 | 0.67 | 0.50 | 0.50 | 0.50 | 0.50 |
| Half Street Width (1/2 P) (feet) | 52 | 42 | 32 | 22 | 20 | 20 | 16 |
| Parkway Width (PK) (feet) | 8 | 8 | 8 | 8 | 7 | 6 | 6 |
| Gutter Lip (feet) | 0.03125 | 0.03125 | 0.03125 | 0.03125 | 0.03125 | 0.03125 | 0.03125 |
| Gutter Width (feet) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Gutter Hike (feet) | 0.083 | 0.083 | 0.083 | 0.083 | 0.083 | 0.083 | 0.083 |
| Distance from Crown to Grade Break | 26.0 | 21.0 | 16.0 | 11.0 | 10.0 | 10.0 | 8.0 |
| Interior Street Grade | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Exterior Street Grade | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Parkway Grade | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Street Allowable Flow Depth for Storm Event #1 | 0.67 | 0.67 | 0.67 | 0.50 | 0.50 | 0.50 | 0.50 |
| Street Allowable Flow Depth for Storm Event #2 | 1.83 | 1.83 | 1.83 | 1.66 | 1.64 | 1.62 | 1.62 |

Street Cross-Section Parameters

**Table 4-1**
**Modeling Assumptions**

| Hydrologic Modeling Assumptions | |
|---|---|
| Parameter | Assumption |
| Return Event | 10- & 100-Year |
| Confidence Level Rainfall - Existing Condition | 50% |
| Confidence Level Rainfall - Recommended Condition | 85% |
| Hydraulic Modeling Assumptions (20 Questions) | |
| Parameter | Assumption |
| Minimum Topographic Slope | 0.0014 |
| Friction Slope Model | Balanced |
| Default Minimum Friction Slope | N/A |
| Minimum Allowable Flow Velocity | 3.00 fps |
| Minimum Allowable Friction Slope | 0.0010 |
| Manning's Friction Factor | 0.013 |
| Clearance between Topography and HGL - Minimum | 1.00 ft. |
| Clearance between Topography and HGL - Maximum | 10.00 ft. |
| Downstream Hydraulic Control | User Defined HGL (if possible) |
| Offset below Topography to Define Downstream HGL | 1.00 ft. |
| Pipe Capacity Estimation | Full Flow Capacity 0.82*D=Dn |
| Flow Bubble Up | Not Allowed |
| Telescoping - Proposed Pipe | Yes |
| Telescoping - Existing Pipe | No |
| Minimum Pipe Diameter (Modeled) | 18 in. |
| Proportion of Estimated Friction Slope to be used as Pipeflow Friction Slope | 0.90 |
| Design Flow - Pipe | Upstream Flow Rate |
| Constructible Sizes - Box and Channel | Increase to Nearest 0.50 ft. |
| Design Flow - Box and Channel | Upstream Flow Rate |
| Telescoping - Box | No |
| Telescoping - Channel | No |
| Telescoping - Pipe / Box / Channel Interface | No |
| Design Modeling Assumptions | |
| Parameter | Assumption |
| Maximum Street Flow Depth - 10-Year | Top-of-Curb |
| Maximum Street Flow Depth - 100-Year | 1 ft above back of walk |
| Total Streetflow Pick-up at Arterial Intersections | Yes |
| Total Streetflow Pick-up at Local Intersections | No |
| Total Streetflow Pick-up at Residential Intersections | No |
| Maximum Street Flow Depth * Street Flow Velocity | 6 |
| ***Watershed 22***<br>Fountain Valley flows were brought in at nodes 220104, 220106, 220111, 220136, and 220176 for each return frequency analyzed. Flows were generated for each return frequency at each entry point using the Fountain Valley MPD SIMS files. | |
| ***Watershed 8***<br>Link 080000-080334 brings inflow from City of Westminster in 48” pipe. Pipe capacity as constant inflow and tributary area A=300 acres were assumed. | |

#### *4.3.1.3.3 Data Base Attribute Approximations*

In some cases, detailed information regarding drainage element attributes was not available and, therefore, approximations were made in the SIMS model. Typically, element size information was approximated from aerial photographs or other information from the City. Table 4-2 provides a spreadsheet that describes the data base attribute approximations used in the modeling.

**Table 4-2**
**Data Base Attribute Approximations**

| Watershed | Link | Comment |
|---|---|---|
| 12 | 120250-120251 | Link added with length=479 ft and s=0.0015 |
| 13 | 130179-130226 | 18" pipe link not modeled since it is parallel to channel which carries a majority of the flow along link 130179-130231 |
| 13 | 130150-130151 | Link 130150-130151 was removed and not modeled since it simply joined two basins. |
| 17 | 170881 | Elevation of node changed from 27.65 to 22.65 to make slope of adjacent initial subarea non-negative |
| 17 | 170669-170670 | Downstream invert elevation changed to 45.50 |
| 17 | 170762-170763 | Downstream invert elevation changed to 16.70 |
| 18 | 180207-180208 | Link changed to total box pickup with base=6 ft, height=1 ft, and Manning's n=0.013. |
| 20 | 200217-200218 - 200219 | Box changed to have base=8 ft and height=1 ft (minimum allowed height=1 ft, true height=0.79 ft). |
| 14,17,18,27 | 140205-140206<br>170356-170406<br>170522-170544<br>170543-170544<br>170544-170545<br>180109-180123<br>180123-180174<br>180174-180175<br>180175-180208<br>180331-180332<br>180332-180333<br>180333-180334<br>180334-180335<br>180328-180335<br>270154-270155 | Default natural channel values of base width=3 ft, depth=2.5 ft, side slope z=4 and Manning's n=0.035 used. |

#### *4.3.1.3.4 Storage Element Boundary Conditions*

In order to establish target hydraulic and hydrologic boundary conditions at existing storage elements, Hydraulic Grade Line (HGL) elevations were established by the City and outflow estimates were made based upon outflow element normal depth capacity estimates. These two types of information were used as boundary conditions for both the inflow and outflow elements to/from the storage element that were simulated as detention basins under the study. Table 4-3 provides a spreadsheet of information that describes the boundary conditions used at such storage elements that

were simulated as detention basins used in the SIMS modeling. Figure 4-8 depicts storage element candidate locations.

#### *4.3.1.3.5 Street Element Topographic Grade Regulator*

Because many areas in the City have street grades that measure close to a zero value, small discrepancies between topographic data interpretation schemes result in modeling grades that are sensitive to GIS results. Therefore, in collaboration with the

**Table 4-3**
**Storage Element Values**

**Table 4-3**
**Storage Element Values**

| Watershed | Basin Node | Outlet Node | Area | Q=capacity of outlet pipe | Tc 5yr | Tc 25yr | Tc 10yr | Tc 100yr |
|---|---|---|---|---|---|---|---|---|
| 8 | 080161 | 080162 | 34.89 | 3.93 | 30.07 | 28.88 | 28.93 | 27.95 |
| 8 | 080350 | 080351 | 24.05 | 8.46 | 13.21 | 11.25 | 12.19 | 10.46 |
| 13 | 130160 | 130161 | 6.41 | 20.00 | 43.19 | 39.66 | 40.01 | 37.80 |
| 13 | 130270 | 130271 | 362.58 | 170.00 | 28.14 | 27.00 | 27.14 | 25.96 |
| 14 | 140210 | 140250 | 147.37 | 17.00 | 20.28 | 20.03 | 20.14 | 18.97 |
| 14* | --- | 140251 | 15.00 | 8.60 | --- | --- | --- | --- |
| 18 | 180500 | 180501 | 394.72 | 633.49 | 41.42 | 37.18 | 39.85 | 33.77 |

*Constant flow added from basin with no inflows

City, a 'Regulator' computer program was built that adjusts street topographic grades whenever the absolute values of particular grades are less than the value 0.0014. The Regulator adjusts such grades to equal positive 0.0014.

#### *4.3.1.3.6 Candidate Storage Elements*

Possible candidate sites for storage elements to be used in the MPD were identified by an analysis of available locations as shown in Figure 4-8, these included the detention basins shown in Table 4-3 as well as other storage elements in the City. The candidate locations were considered in examining the possibility of reducing storm drainage element sizes and also for water quality enhancement.

Candidate sites provide an easy way of reducing storm drain element sizes because of the location of the candidate element within the watershed and also because of the available storage volume versus the impact to the storage area from runoff outflows and corresponding maintenance cost potential. Additionally, due to the high price of land in the City, the cost effectiveness of introducing new storage element sites may be prohibitive. However, other means for accessing land area for new storage element sites, such as by donation, may be available. For reference as discussed in Section 3, there are sites that have potential for use as water quality features that would require

less land.

**Figure 4-8 Storage Candidate Locations**

#### *4.3.1.3.7 Watershed Cascading Flow Effects*

Because of the many topographically flat areas in the City, there is a potential for cascading flow effects that depends upon the design storm return frequency. In order to handle this effect in the MPD, it is assumed that drainage element performance will accommodate the relevant target runoff quantities such that cascading flow effects are not a significant source of runoff in neighboring drainage areas. Consequently, during the design phase of a particular drainage system, the design of the actual drainage elements will need to also consider the drainage inlet flow capacities such as to intercept the target flow rates, in order to offset the potential for cascading flow effects. This is not to say that cascading flow effects do not occur naturally, but instead that the system planning anticipates the pickup of runoff at the points of concentration or at other locations that are relevant to the subject drainage collector system, such that the target drainage watershed boundaries apply. Consequently, the City can be effectively subdivided into drainage 'sub-watersheds,' which in turn are grouped together into 5 regions for modeling convenience purposes.

#### *4.3.1.3.8 Hydraulic Boundary Conditions*

The current SIMS modeling effort considers hydraulic grade line and hydraulic boundary conditions in the estimation of MPD system element sizes. This applies, in addition, to hydraulic boundary conditions at storage elements as discussed in the previous sections, and also at system outflows into County channels and to the ocean. Such hydraulic boundary conditions, as applied to a particular modeling nodal point, are examined in Table 4-4. The estimation of such boundary conditions includes the target of high water surfaces in collector channels being one-foot below the top of channel at the pipeline confluence point, as estimated from the relevant City topographic mapping, and also one-foot below the lowest elevation of confinement estimated at a storage element as estimated from the said City topographic mapping.

#### *4.3.1.3.9 Computer Modeling Algorithms*

The SIMS computer program uses hydrologic and hydraulic calculations in order to build the MPD. The modeling estimates, therefore, are dependent upon the applicability of such formulae and parameters selected, among other factors.

#### *4.3.1.3.10 Existing System Element Capacity Analysis and New System Element Sizing Analysis*

In order to estimate such flow capacity estimates, the same friction slope is used for both the existing system element and the possible new or parallel system element at a particular location. These friction slopes are in turn estimated using a balanced hydraulic grade line that considers hydraulic constraints and boundary conditions. This approach moves the system analysis closer to the design analysis results as compared to the use of friction slopes being set equal to the local street topographic grade such as was used in the City's prior MPD studies.

**Table 4-4**
**Hydraulic Boundary Conditions**

| Storage Elements | | |
|---|---|---|
| Watershed | Node | Elevation* |
| 8 | 0116 | 15.00 |
| 8 | 0128 | 15.00 |
| 8 | 0347 | 19.00 |
| 13 | 0149 | 8.00 |
| 13 | 0151 | 1.00 |
| 13 | 0213 | 0.50 |
| 14 | 0205 | 8.63 |
| 17 | 0885 | 0.00 |
| 18 | 0208 | 31.00 |
| 18 | 0339 | 31.00 |
| 18 | 0430 | 31.00 |
| 18 | 0459 | 31.00 |
| County Channels | | |
| Watershed | Node | Elevation* |
| 1 | 0114 | 23.43 |
| 1 | 0134 | 18.93 |
| 1 | 0165 | 17.93 |
| 1 | 0196 | 17.93 |
| 1 | 0274 | 13.43 |
| 1 | 0285 | 13.43 |
| 1 | 0296 | 13.43 |
| 1 | 0316 | 13.23 |
| 1 | 0357 | 17.93 |
| 1 | 0377 | 17.93 |
| 1 | 0408 | 15.43 |
| 2 | 0128 | 22.43 |
| 2 | 0134 | 22.43 |
| 2 | 0174 | 23.22 |
| 2 | 0185 | 23.13 |
| 2 | 0220 | 21.43 |
| 2 | 0238 | 21.43 |
| 2 | 0247 | 20.93 |
| 2 | 0328 | 16.73 |
| 2 | 0359 | 16.73 |
| 2 | 0378 | 19.43 |
| 3 | 0113 | 11.93 |
| 3 | 0128 | 11.43 |
| 3 | 0178 | 15.43 |
| 3 | 0199 | 12.43 |
| 3 | 0208 | 12.43 |
| 3 | 0219 | 12.43 |
| 3 | 0246 | 12.43 |
| 3 | 0268 | 12.43 |
| 3 | 0278 | 12.44 |
| 3 | 0370 | 11.83 |
| 5 | 0122 | 12.43 |
| 5 | 0147 | 12.43 |
| 6 | 0117 | 14.30 |
| 6 | 0130 | 13.60 |
| 6 | 0290 | 14.00 |

| County Channels | | |
|---|---|---|
| Watershed | Node | Elevation* |
| 7 | 0184 | 9.60 |
| 7 | 0259 | 12.10 |
| 7 | 0262 | 15.43 |
| 7 | 0299 | 9.00 |
| 8 | 0431 | 17.43 |
| 8 | 0442 | 17.13 |
| 8 | 0459 | 17.13 |
| 8 | 0466 | 18.53 |
| 8 | 0475 | 17.43 |
| 8 | 0485 | 18.83 |
| 8 | 0495 | 18.63 |
| 8 | 0509 | 17.20 |
| 8 | 0518 | 21.00 |
| 8 | 0524 | 19.00 |
| 8 | 0551 | 22.43 |
| 8 | 0572 | 18.63 |
| 8 | 0585 | 19.13 |
| 9 | 0115 | 24.73 |
| 9 | 0133 | 22.93 |
| 9 | 0152 | 24.40 |
| 10 | 0105 | 26.10 |
| 10 | 0114 | 26.10 |
| 10 | 0122 | 26.10 |
| 10 | 0135 | 27.43 |
| 10 | 0146 | 27.43 |
| 10 | 0152 | 25.73 |
| 10 | 0165 | 27.93 |
| 10 | 0176 | 28.43 |
| 10 | 0186 | 28.43 |
| 10 | 0197 | 28.93 |
| 10 | 0208 | 28.93 |
| 10 | 0247 | 20.50 |
| 10 | 0256 | 26.83 |
| 10 | 0267 | 26.83 |
| 10 | 276 | 24.00 |
| 10 | 291 | 24.00 |
| 10 | 322 | 24.00 |
| 10 | 0333 | 24.00 |
| 10 | 0357 | 24.73 |
| 10 | 0364 | 17.50 |
| 10 | 0460 | 24.73 |
| 10 | 0495 | 22.93 |
| 23 | 0659 | 13.63 |
| 23 | 0753 | 13.63 |
| 23 | 0855 | 13.63 |
| 23 | 0917 | -3.57 |
| 24 | 0718 | 13.93 |
| 27 | 0158 | 16.23 |
| 27 | 0270 | 8.43 |
| 27 | 0307 | 14.43 |
| 27 | 0407 | 14.43 |
| 29 | 0364 | 9.93 |

| County Channels | | |
|---|---|---|
| Watershed | Node | Elevation* |
| 30 | 0386 | 18.93 |
| 31 | 0241 | 10.93 |
| 32 | 0370 | 12.93 |
| 40 | 0221 | 9.43 |
| 41 | 0379 | 12.93 |
| Ocean | | |
| Watershed | Node | Elevation* |
| 4 | 0115 | 6.00 |
| 4 | 0143 | 6.00 |
| 4 | 0166 | 6.00 |
| 4 | 0185 | 6.00 |
| 4 | 0211 | 6.00 |
| 4 | 0237 | 6.00 |
| 4 | 0253 | 6.00 |
| 4 | 0265 | 6.00 |
| 4 | 0276 | 6.00 |
| 4 | 0285 | 6.00 |
| 4 | 0295 | 6.00 |
| 4 | 0306 | 6.00 |
| 4 | 0316 | 6.00 |
| 4 | 0326 | 6.00 |
| 4 | 0335 | 6.00 |
| 4 | 0347 | 6.00 |
| 4 | 0366 | 6.00 |
| 4 | 0387 | 6.00 |
| 4 | 0395 | 6.00 |
| 4 | 0405 | 6.00 |
| 4 | 0412 | 6.00 |
| 4 | 0423 | 6.00 |
| 4 | 0435 | 6.00 |
| 4 | 0446 | 6.00 |
| 4 | 0454 | 6.00 |
| 4 | 0466 | 6.00 |
| 4 | 0473 | 6.00 |
| 4 | 0497 | 6.00 |
| 4 | 0505 | 6.00 |
| 4 | 0514 | 6.00 |
| 4 | 0522 | 6.00 |
| 4 | 0533 | 6.00 |
| 4 | 0544 | 6.00 |
| 4 | 0553 | 6.00 |
| 4 | 0587 | 6.00 |
| 4 | 0598 | 6.00 |
| 4 | 0605 | 6.00 |
| 4 | 0635 | 6.00 |
| 4 | 0648 | 6.00 |
| 4 | 0655 | 6.00 |
| 4 | 0665 | 6.00 |
| 4 | 0675 | 6.00 |
| 4 | 0684 | 6.00 |
| 4 | 0695 | 6.00 |
| 4 | 0705 | 6.00 |

| Ocean | | |
|---|---|---|
| Watershed | Node | Elevation* |
| 4 | 0713 | 6.00 |
| 4 | 0724 | 6.00 |
| 4 | 0746 | 6.00 |
| 4 | 0752 | 6.00 |
| 4 | 0775 | 6.00 |
| 4 | 0782 | 6.00 |
| 4 | 0799 | 6.00 |
| 4 | 0809 | 6.00 |
| 5 | 0183 | 6.00 |
| 5 | 0227 | 6.00 |
| 5 | 0232 | 6.00 |
| 5 | 0245 | 6.00 |
| 5 | 0254 | 6.00 |
| 5 | 0268 | 6.00 |
| 5 | 0289 | 6.00 |
| 5 | 0308 | 6.00 |
| 5 | 0314 | 6.00 |
| 5 | 0327 | 6.00 |
| 5 | 0381 | 6.00 |
| 5 | 0406 | 6.00 |
| 5 | 0420 | 6.00 |
| 17 | 0151 | 6.63 |
| 18 | 0502 | 20.92 |
| 19 | 0231 | 16.59 |
| 19 | 0283 | 15.35 |
| 19 | 0320 | 13.59 |
| 19 | 0363 | 14.05 |
| 19 | 0568 | 18.18 |
| 19 | 0624 | 14.56 |
| 19 | 0850 | 17.21 |
| 24 | 0411 | 9.98** |
| 24 | 0521 | 9.98** |
| 24 | 0844 | 5.95** |
| 24 | 0934 | 8.29** |

*Elevation shown in feet relative to mean sea level.
** max of tidal control vs. soffit from recent plans.

#### *4.3.1.3.11 Bifurcation Element Analysis*

A few locations involve bifurcation elements, where storm drains divide into two downstream systems. Table 4-5 provides information as to bifurcation system location, relevant node numbers, and element sizing involved. Also included is the modeling approach used to estimate MPD needs.

**Table 4-5**
**Bifurcation Systems**

***Watershed 1***

Bifurcation at node 010154 was handled by ending flow at this node and adding two phantom initial subareas with constant flows determined by iterative SIMS runs.

Phantom subareas 010115 and 010117 were initialized along added links 010115-010116 and 010117-010118 respectively, located concurrent with node 010154. Link 010154-010155 was renamed as link 010116-010155. Link 010154-010184 was renamed as link 010118-010184. At the phantom initial subareas, the following Tc, A, and Q values were assigned by running SIMS iteratively. Note that the Q and A from 010154 were split proportionately (Q1, Q2, A1, A2) according to exiting pipe diameters.

| | 5 yr | 25 yr | 10 yr | 100 yr |
|---|---|---|---|---|
| Tc | 35.31 | 33.61 | 34.22 | 32.86 |
| A1 | 40.03 | 40.03 | 40.03 | 40.03 |
| A2 | 40.03 | 40.03 | 40.03 | 40.03 |
| Q1 | 37.22 | 58.11 | 47.56 | 75.03 |
| Q2 | 37.22 | 58.11 | 47.56 | 75.03 |

***Watershed 19***

Bifurcation at node 190258 was handled by ending flow at this node and adding two phantom initial subareas with constant flows determined by iterative SIMS runs. Phantom subareas 190260 and 190263 were initialized along added links 190260-190261 and 190263-190264 respectively, located concurrent with node 190258. Link 190258-190665 was renamed as link 190261-190262. Link 190665-190277 was renamed as link 190262-190277. Link 190258-190259 was renamed as link 190264-190265. Link 190259-190260 was renamed as link 190265-190266. Link 190260-190261 was renamed as link 190266-190267. Link 190261-190278 was renamed as link 190267-190278. Subarea 190259 was renamed as subarea 0265. At the phantom initial subareas, the following Tc, A, and Q values were assigned by running SIMS iteratively. Note that the Q and A from 190258 were split proportionately (Q1, Q2, A1, A2) according to exiting pipe diameters.

| | 5 yr | 25 yr | 10 yr | 100 yr |
|---|---|---|---|---|
| Tc | 16.87 | 16.38 | 16.52 | 16.40 |
| A1 | 20.89 | 20.89 | 20.89 | 20.89 |
| A2 | 41.79 | 41.79 | 41.79 | 41.79 |
| Q1 | 26.72 | 42.50 | 36.14 | 55.44 |
| Q2 | 53.44 | 85.00 | 72.27 | 110.88 |

Bifurcation at node 190618 was handled by ending flow at this node and adding one phantom initial subarea with constant flow determined by iterative SIMS runs and adding the other constant flow as if it came in a lateral. Phantom subarea 190630 was initialized along added link 190630-190631 located concurrent with node 190618. Link 190618-190619 was renamed as link 190631-190619. At the phantom initial subarea and lateral constant flow location, the following Tc, A, and Q values were assigned by

running SIMS iteratively. Note that the Q and A from 190618 were split proportionately (Q1, Q2, A1, A2) according to exiting pipe diameters.

| | 5 yr | 25 yr | 10 yr | 100 yr |
|---|---|---|---|---|
| Tc | 36.00 | 38.83 | 34.85 | 37.42 |
| A1 | 13.93 | 13.93 | 13.93 | 13.93 |
| A2 | 27.85 | 27.85 | 27.85 | 27.85 |
| Q1 | 12.28 | 18.12 | 15.84 | 23.66 |
| Q2 | 24.57 | 36.25 | 31.68 | 47.33 |

#### *4.3.1.3.12 Equivalent Pipe Element Analysis*

Some system elements are of irregular size or geometry, and so 'equivalent pipe sizes' are estimated to match the flow area and flow velocity energy losses under pressure flow conditions. An "equivalent Manning's n" value is estimated in order that the equivalent pipe element also matches the friction loss estimates under pressure flow conditions. Because hydraulic energy loss formulae involve either the friction factor or flow velocities, matching these two attributes under pressure flow assumptions will result in analogous energy loss estimates in the hydraulic analyses used to build the system target HGL. That is in turn used to estimate existing element flow capacity values and for sizing new system elements. Table 4-6 provides the relevant information regarding the use of equivalent pipe elements in the MPD.

| Table 4-6<br>Equivalent Pipe Elements |
|---|
| **Watershed 6:** Bifurcation at 060280 is for two outlet pipes, 51” and 48”. An equivalent pipe size, 70”, was determined and used for link 060280-060281. Bifurcation at 060288 is for three outlet pipes, 36”, 51” and 36”. An equivalent pipe size, 72”, was determined and used for link 060288-060289. |
| **Watershed 7:** Bifurcation at 070257 is for two outlet pipes, 30” and 42”. An equivalent pipe size, 52”, was determined and used for link 070257-070258. Bifurcation at 070182 is for two outlets, 84” pipe and 68”x106” box. An equivalent pipe size, 128”, was determined and used for link 070182-070183. |
| **Watershed 8:** Bifurcation at 080280 is for two outlet pipes, 24” and 24”. An equivalent pipe size, 34”, was determined and used for link 080280-080404. |
| **Watershed 19:** In the downtown area there are several half rounds modeled as 36” arches. |

#### *4.3.1.3.13 Pump Stations*

The City's pump stations were analyzed in detail in the previous 1993 Master Plan of Drainage and, therefore, an update analysis was not part of this Project. Hydraulic boundary conditions for the controlling target HGL at each of the pump stations were provided by the City. These HGL target boundary condition values are listed in Table 4-4. The same boundary condition values are used for each of the return frequency storm event models.

## 4.3.2 Stormwater Information Management System and Hydrologic Analysis

Stormwater Information Management System (SIMS) can be developed for Master Plans of Drainage, (MPDs), which provides a variety of analysis tool sets and linkages. Figure 4-9 summarizes some of these linkages.

### 4.3.2.1 Primary Logic Paths

The SIMS has two primary logic paths:

- Creation Mode – where the MPD is developed from scratch, with or without GIS information
- Maintenance Mode – where the MPD has been developed via the Creation Mode, and can be updated and revised by using quick run procedures or a subset of the Creation Mode operation.

### 4.3.2.2 Databases

Three Databases are defined for this SIMS:

- *Subareas* -- containing hydrologic data such as land use, precipitation, and SCS soil group designation.
- *Nodes* -- containing topographic elevation data, system elevation data at nodal locations, hydrologic results, and other information.

- *Links* -- containing hydraulic data such as length, flow conveyance properties and computed estimates, and other information.

A GIS can be used to develop parameter estimates for subarea hydrologic data link hydraulic parameters, and nodal elevation data. These data typically need to be computed by the GIS, usually by a polygon processor, and then communicated to the SIMS by use of another but smaller subset of the three databases for subareas, nodes and links. In this way, memory allocation is reduced. Using a communications file formatter, files can be created that contain the GIS polygon processor results, which are then read by the SIMS and inserted appropriately into the Global Database structure.

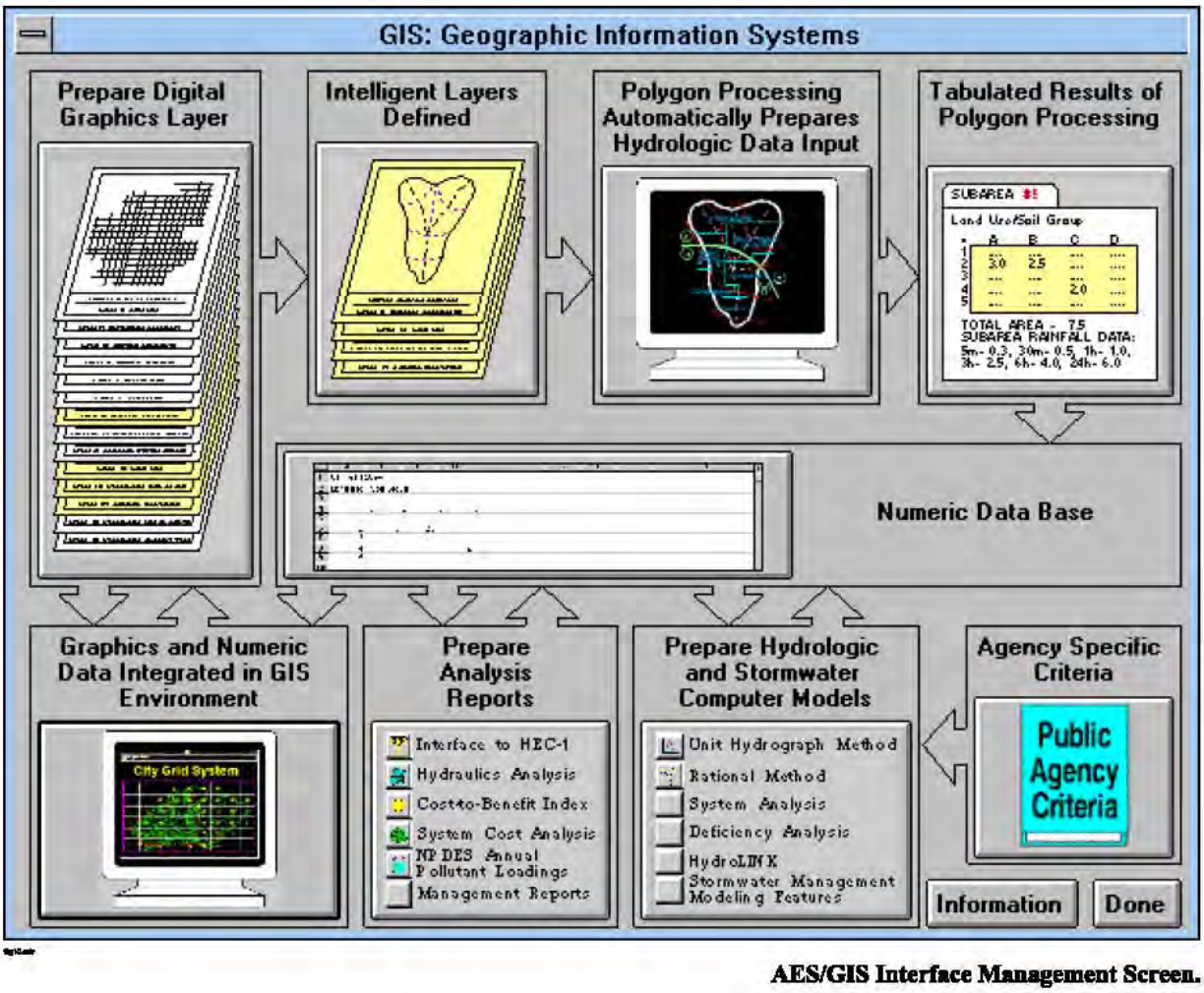



**Figure 4-9 Interface Management Screen**

The availability of GIS data significantly reduces the Network model (i.e., the link-node model structure that defines the drainage system topology) input requirements in that the user can enter, for example, simply the subarea ID number rather than entering the tabulation of land-use/soils/precipitation data. The SIMS analysis tools operate on the input data and Network data to create intermediate results which are used, in turn, by other analysis tools. The ensemble of operations provides an "A to Z" analysis sequence which is essentially deterministic, except for a set of control questions, and a set of "User Interface" modules whereby the User can interface and approve/modify computer recommended computed results at various occasions in the global database evolution. For example, one interface point in SIMS enables the end-user to modify computer recommended upgrade targets. Figure 4-9 demonstrates the initial SIMS Interface Management Screen.

#### 4.3.2.3 SIMS Linkages

Figure 4-10 depicts the linkage between the various components used in the SIMS. The upper left of the Figure depicts the availability of several GIS digital layers. For the City's MPD, GIS layers are available for street right-of-way, street centerlines, street names, parcels, parcel numbers, land use or zoning data, and utility maps. For the MPD SIMS, layers for existing flood control and drainage systems are necessary in order to conduct an upgrade target analysis; otherwise, only a MPD for future conditions can be developed. As can be seen, several layers are useful in developing the MPD by a SIMS.

As shown on the bottom of Figure 4-10, the synthesized digital graphics data are then accessed by a succession of analysis models which store computed results in the global database. The lower left of Figure 4-10 shows that a subset of the global database (i.e., as selected by the user) is then available for read/display/editing via a GIS display routine.

#### 4.3.2.4 Watershed Discretization

Central to any hydrologic method is the discretization of the total watershed or study area into hydrologic modeling subareas. Figure 4-11 demonstrates the method used in this SIMS:

**Step 1.** Identify the total watershed containing the study area. This includes upstream tributary areas, canyons, and so forth. Label the study area watershed by a two-letter ID. [The watershed is also represented by a digital layer for later use in developing other layers. ] The two-letter ID designation is "HB" for the new MPD.

**Step 2.** Draw the major watercourses, and make another digital layer.

**GIS Database Development**

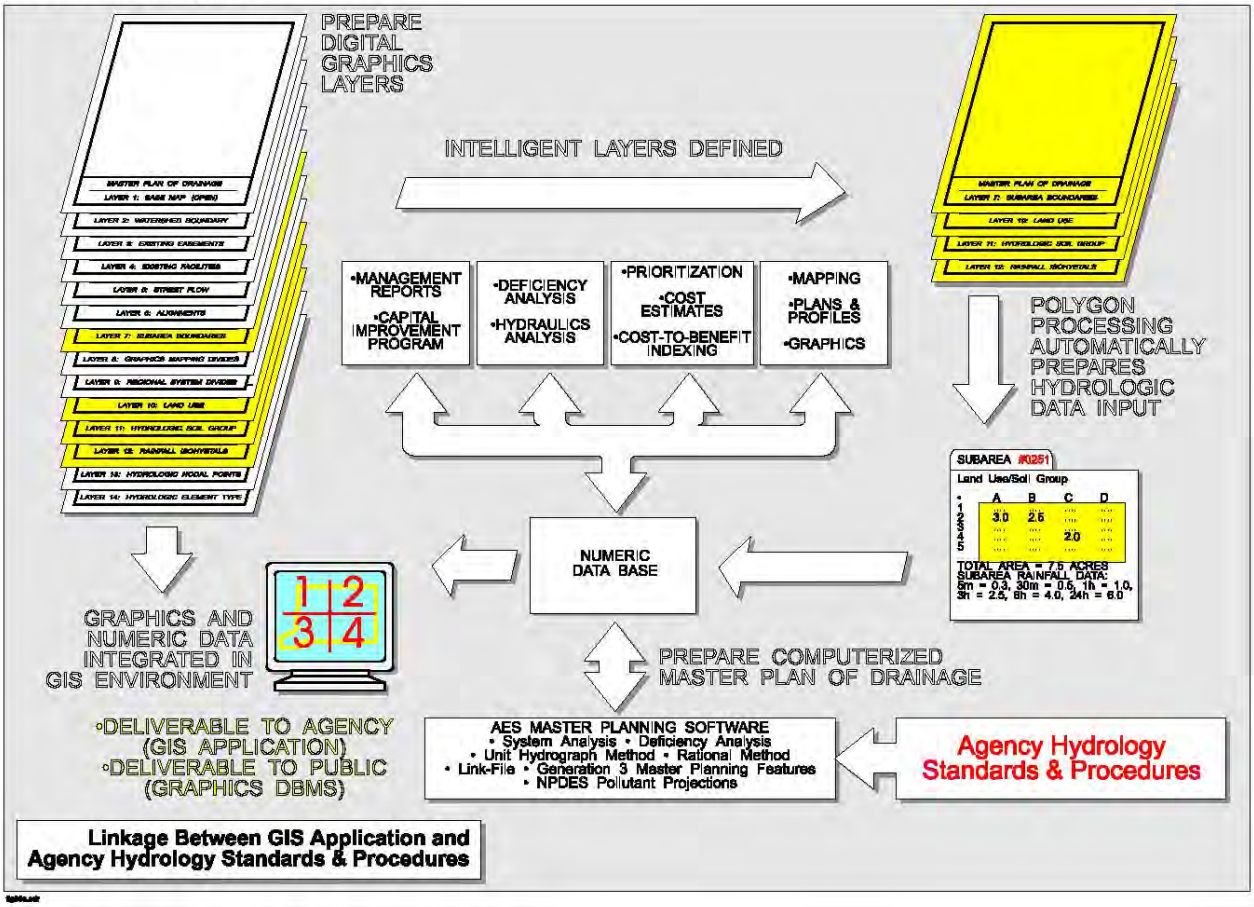



**Figure 4-10 GIS Database Development**

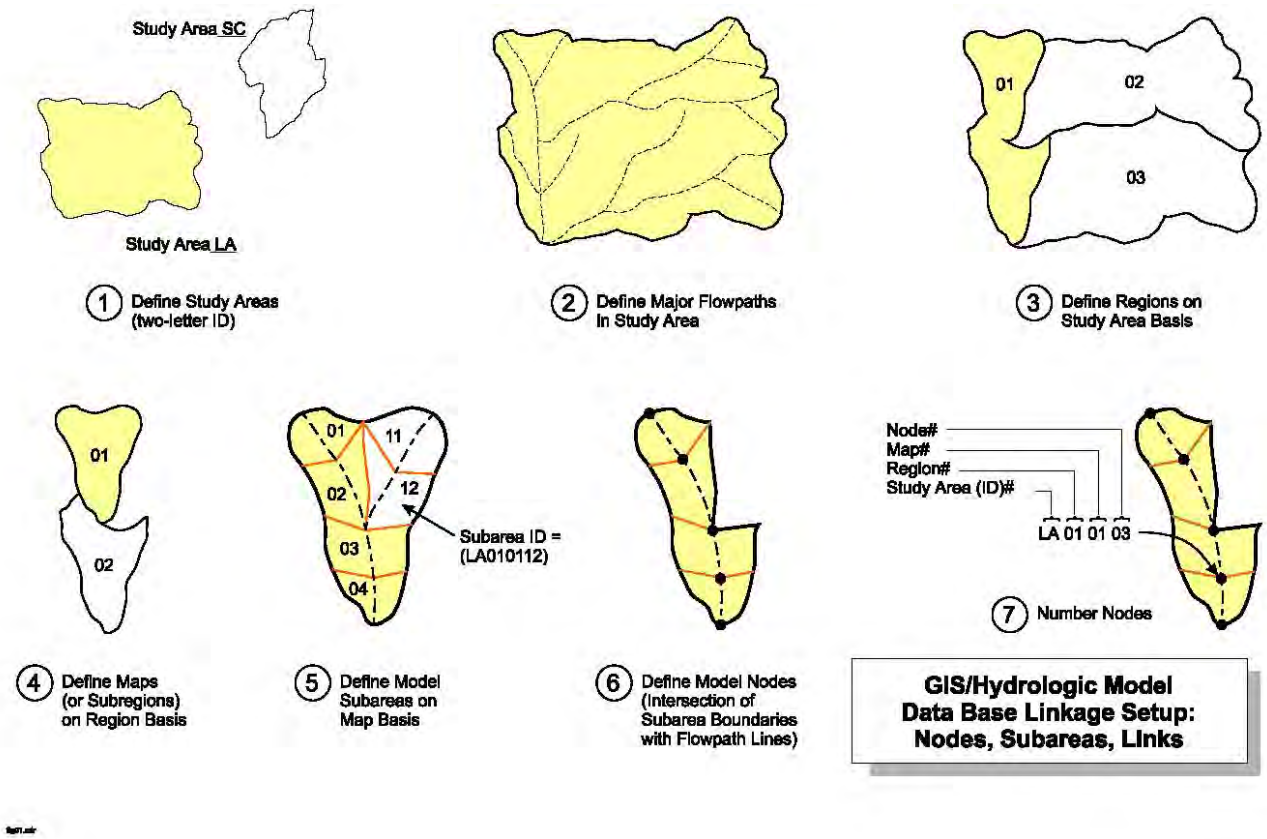



**Figure 4-11 GIS Hydrologic Model**

**Step 3.** Using the major watercourse layer, determine the watershed regions of area tributary to each major watercourse. Make a digital layer for the regions. Note that the regions may coincide with the watershed boundary layer at several locations. For the City's MPD, there are 34 regions, ranging in size from 0.3 to 1.5 square miles.

**Step 4.** Subdivide each region into subregions or "MAPs," (i.e., between 1 and 99), as convenient. Regions and subregions are defined to represent appropriate hydrologic drainage units, consistent with flow paths, and with no flow crossing drainage divides except along watercourses. For the City's MPD, there are 126 sub regions.

**Step 5.** Subregions are subdivided into modeling subareas, of size appropriate for the hydrologic modeling technique used, namely, the Orange County Hydrology Manual (1986). In the City's MPD, there are 3888 subareas, with an average subarea size of 4.1 acres.

**Step 6, 7.** Hydrologic subareas and nodes are then numbered as shown in Figure 4-11. The numbering sequence is important! Node numbers typically increase in the downstream direction. This rule is used in the SIMS logic to simplify several analysis steps. Node numbering issues are further discussed in Section 4.3.2.10.

#### 4.3.2.5 Polygon Processing – Subarea Data

After hydrologic modeling areas area established, a digital layer is made, and each subarea is defined by a unique ID according to Figure 4-11. Now, the parameter proportions attributed to each subarea can be computed by means of the GIS polygon processor. As shown in Figure 4-12, a typical subarea is geometrically intersected with the parameter attribute layers of rainfall, soils, and land use data, resulting in the relative proportions of area tabulated in the attribute file. This attribute file is then stored in the global database, for subsequent use and access by the analysis tools. Other parameters can also be geometrically defined for subareas by developing appropriate attribute layers; the polygon processor can then resolve the area proportions of each attribute value, for each subarea.

#### 4.3.2.6 Unit Hydrograph Method Parameters

The County of Orange Hydrology Manual includes two techniques for estimating runoff rates; namely, a Rational Method for tributary areas less than about one square mile, and a Unit Hydrograph (UH) Method for areas larger than one square mile. In this SIMS, the UH technique needs the parameters of tributary catchment rainfall, land use, soils, longest watercourse, time of concentration of longest watercourse, and UH designation, (e.g., valley, foothill, mountain, desert), in order to compute runoff quantities. As depicted in Figure 4-13, these UH method parameters are readily developed by the GIS and Network model topology information. These data are then stored in the global database.

**Hydrologic Layer Development.**

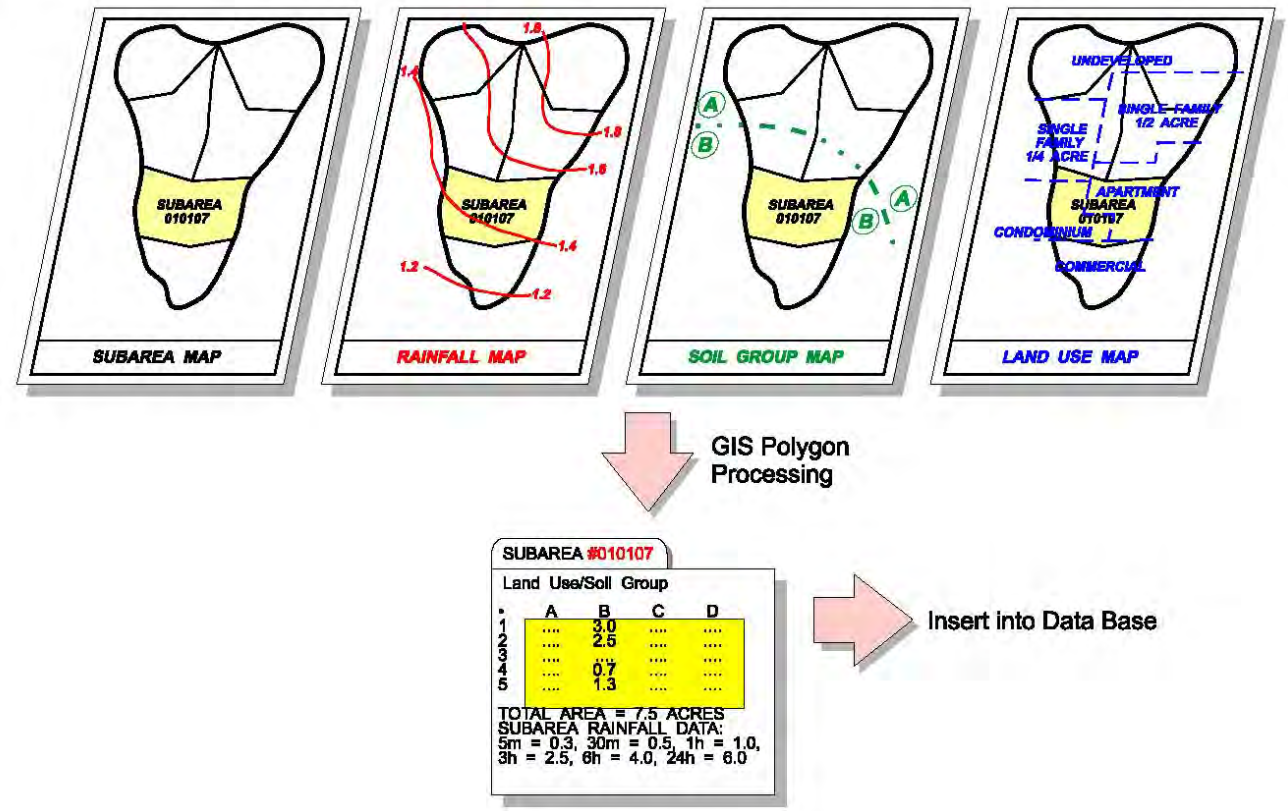



**Figure 4-12 Hydrologic Layer Development**

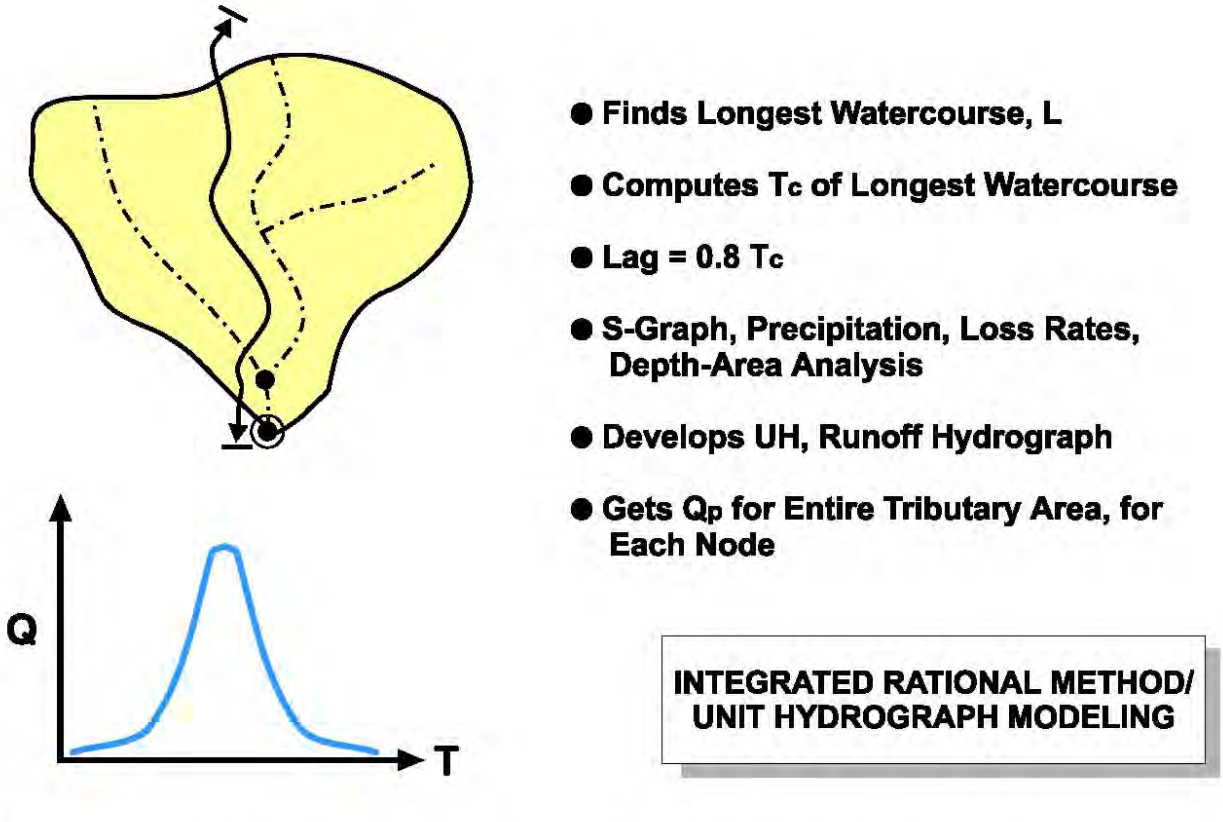



**Figure 4-13 Integrated Rational Method Unit Hydrograph Modeling**

#### 4.3.2.7 Link Information

A 'link' in the model topology is a connection between two 'nodes,' where a node is a point of concentration in the study area. A link connects an **upstream** node to a **downstream** node. Only at a **confluence** does more than one link connect to a given node. In this SIMS, proportional branching is undefined (i.e., where flow bifurcates into more than one path in the downstream direction). Thus, by definition, if a node is common to 2 or more links, it is a confluence node. Also, given that nodes are numbered monotonically increasing in a downstream direction, if a link downstream node number is less than its upstream node number, then the downstream node is a confluence point. This logic is used to perform diagnostic checks on the Network model topology.

Attributes of the link are needed in order to perform hydraulic estimates as well as upgrade target analysis. Some of these characteristics may be entered via the GIS process, although such attributes are usually defined during the Network model building process. Figure 4-14 shows a variety of link-node modeling processes that the user typically uses to build the network topology.

#### 4.3.2.8 GIS Data Forms – Summary

From Sections 4.3.2.3 thru 4.3.2.7, a variety of subarea/link/node data are typically available to the MPD developer via use of digital graphics data and a GIS polygon processor. Although using a GIS in not mandatory in the SIMS, it typically greatly reduces costs and increases quality control. A review of topics concerning digital graphics is contained in Figure 4-15. Also shown in the figure's lower left corner is the link-node model topology or Network model. The Network is a description of the path-node model assemblage. The GIS process provides the data that is connected by the Network.

From Figure 4-15, the Subarea database is an intersection of a variety of parameters; consequently, additional parameters significantly increase memory allocation. In comparison, nodal and link attributes are generally a definition of values such as channel type (pipe, box, open channel, natural channel, special template), and hence only increase the dimension of the memory allocation. These two concepts are depicted in Figure 4-15 by the multiplication and addition symbols, respectively, placed between the attribute types.

The Network model data, in contrast, is typically developed during the hydrologic model setup phase of the project, and is a data form assemblage that is typically handled separately from the GIS data forms.

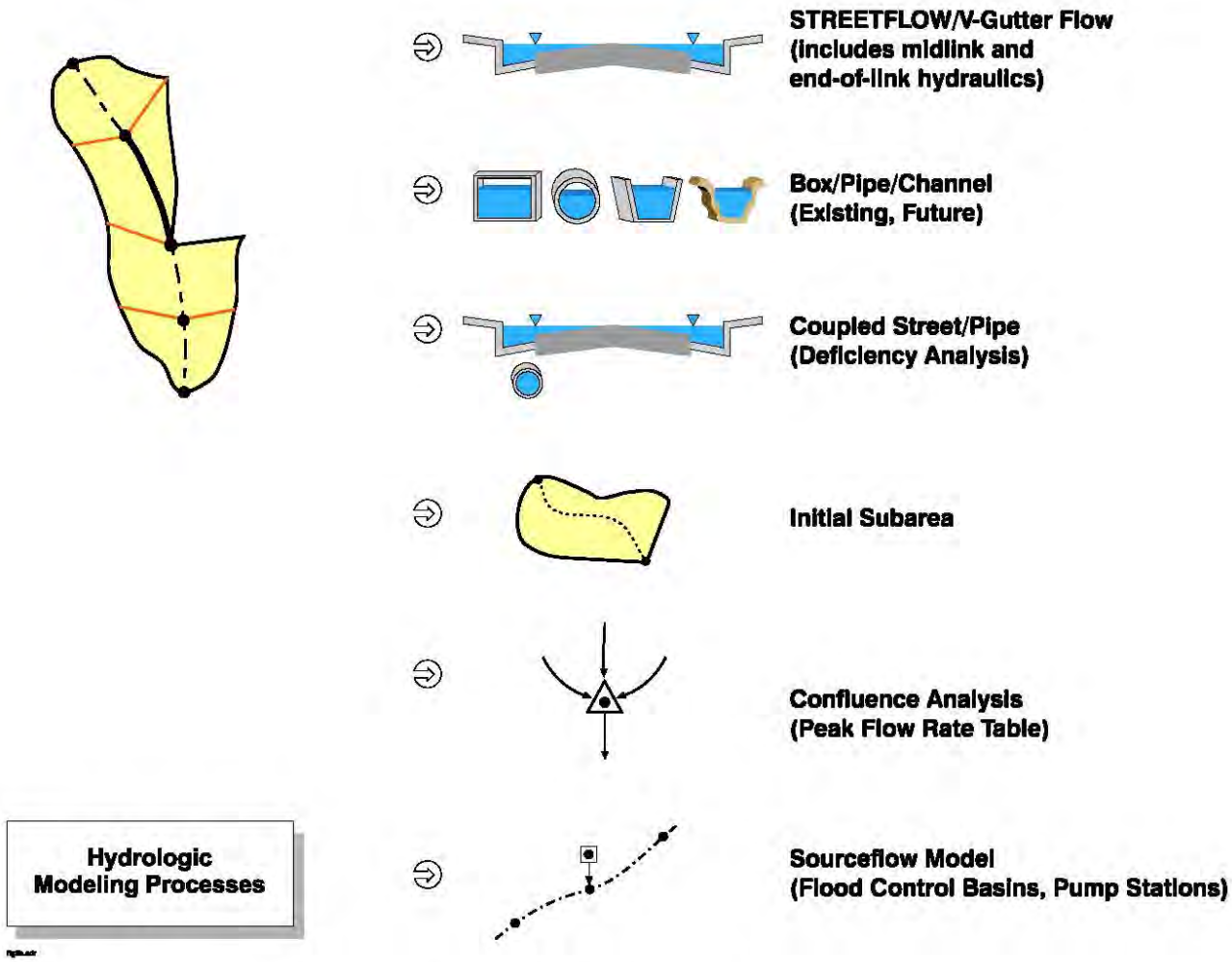



**Figure 4-14 Hydrologic Modeling Processes**

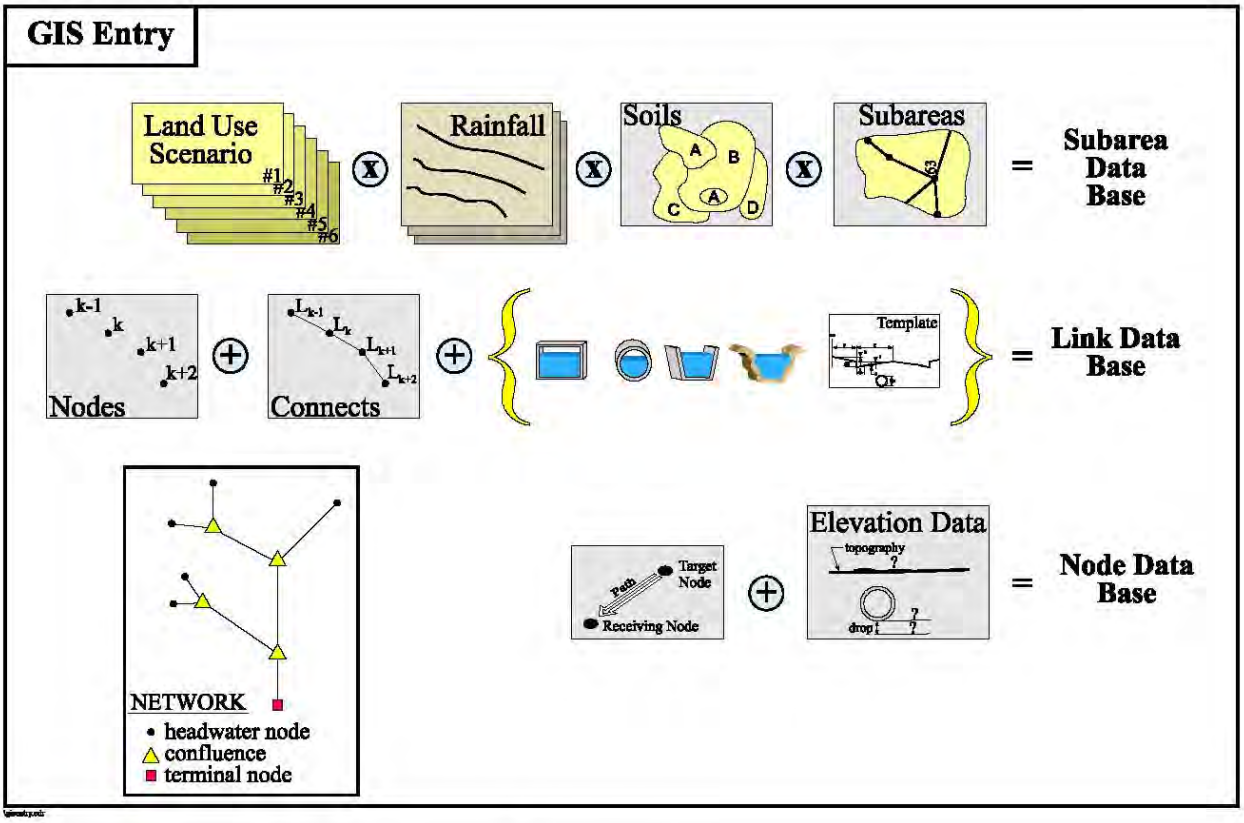



**Figure 4-15 GIS Entry**

#### 4.3.2.9 Getting Ready for Network Model Development – GIS Data Diagnostics

- In the first diagnostic test, all Upstream (US) nodes are verified to be an element of a link, and used only once, in the Network model. In Figure 4-16, the futuristic "E" symbol means, "is an element of."

- The second diagnostic test is to verify that all subareas are used, and used only once, in the Network.

- The third diagnostic checks that all links are used, and used only once, in the Network.

- The fourth diagnostic verifies that all Downstream (DS) nodes are used in the Network, and, if a node is used more than once, it is a confluence point.

- The fifth diagnostic verifies that each US node is also a DS node of the upstream link (i.e., a connection); otherwise, it must be a headwater node (i.e., a node defined at the most upstream point of a flowpath).

- The sixth diagnostic checks whether the US node number of a link is smaller than the DS node number of that link; otherwise, that DS node is probably a confluence point, and is then matched, by SIMS, to the confluence nodes identified in diagnostic test four.

The seventh diagnostic test, shown in Figure 4-16, is a comparison of the Network model topology, against the topology deduced from the logic of the nodal point numbering.

Other diagnostic tests are performed in the AES SIMS, and results are included in the SIMS' Diagnostics report.

#### 4.3.2.10 Network Model Node Numbering Convention

Now that an overview of the AES SIMS has been studied, the underpinnings of the data structure, i.e., the node numbering protocol, can be examined.

- Locating Nodes

After the entire study area is discretized into regions, subregions (or Maps), and subareas, node numbering is then initiated by first overlaying the subarea layer over the flowpath layer. The intersection of subarea boundaries with flowpaths locates nodal points that are needed for hydrologic modeling purposes.

Additional Network model nodes are needed for hydraulic modeling purposes. Nodes usually are appropriate whenever there exists a change in system element:

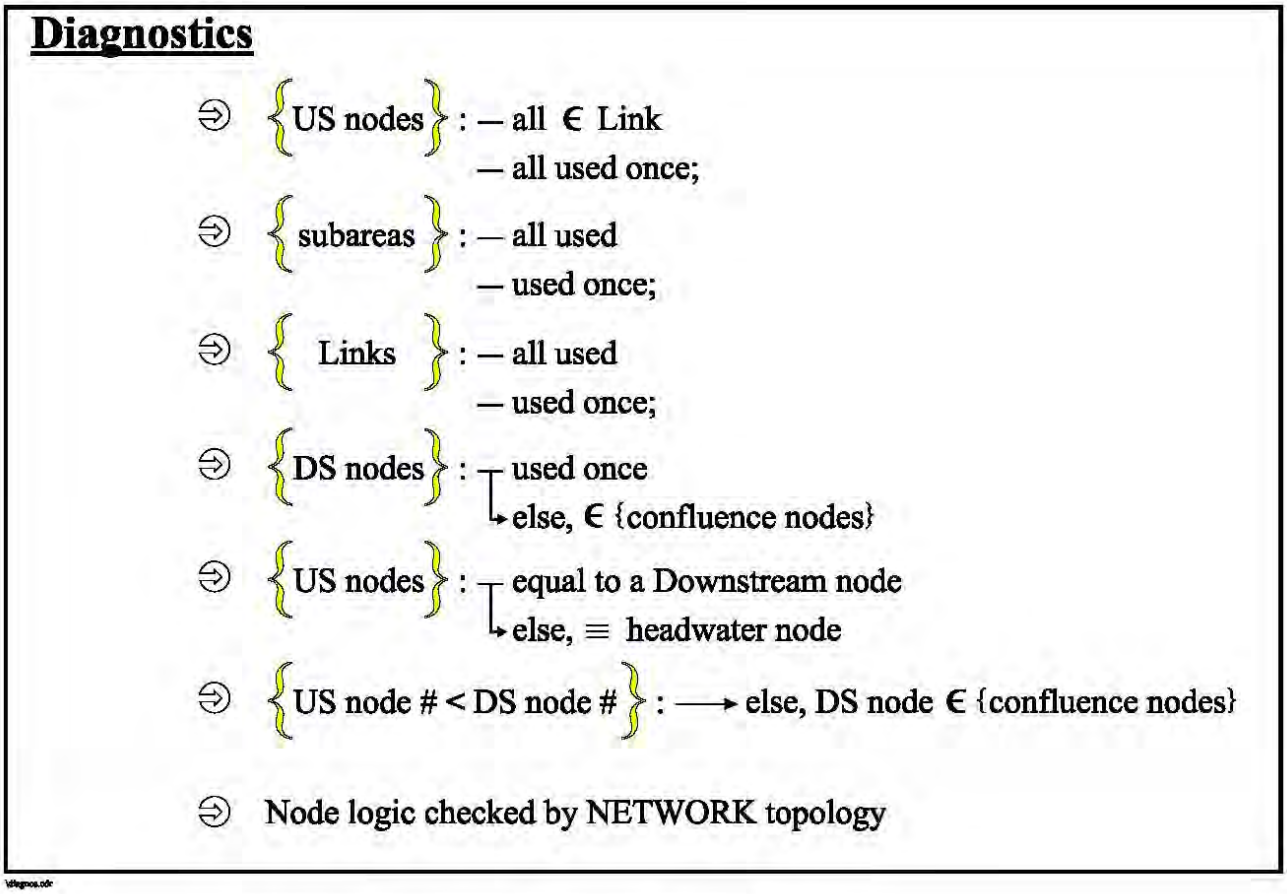



**Figure 4-16 Diagnostic Flowchart**

(1) Size (e.g., pipe diameter)

(2) Type (e.g., pipe to box)

(3) Shape (e.g., rectangular to trapezoidal channel)

(4) Slope (e.g., mild gradient to steep)

(5) Other significant hydraulic effects, depending on detail desired.

After identifying the nodes deemed necessary to properly model the hydraulic effects (to the level of detail assumed for the study purposes), it is useful to then overlay the hydrologic nodes defined previously. Typically, nodes should already have been located at confluences of system strings or at catch basin or inlet clusters.

It is then useful, but not necessary, to shift hydrologic node locations slightly to also fit hydraulic node locations to minimize the number of nodes. This will not affect the modeling results for the MPD.

This 'massaging' of nodal point locations may cause a redefinition of affected subarea boundaries. Consequently, at least one iteration is undertaken for each modeling watershed by the model builder.

- Numbering Nodes

In the AES SIMS for MPDs, nodes are numbered, in increasing magnitude, in the downstream direction.

Generally, all the level zero topology strings are numbered first. Then, level 1 topology strings are numbered, followed by level 2, and so forth. In this fashion, all nodes are smaller in value than a downstream node, except possibly at a confluence point. (Stream topology levels are useful to describe collector system levels. For example, the ultimate collector system is topology level "zero." Systems that drain into level "zero" topology levels are called topology level "1." Systems that drain in to level "1" systems are topology level "2," and so forth).

It is useful to number all headwater nodes (i.e., the most upstream node of a string), to end with the digit zero. Note that the number of confluence nodes plus terminal nodes, (i.e., the most downstream node of a system), is typically less than the number of headwater nodes. Also, every string begins with a headwater node, and ends with either a confluence node or a terminal node. These facts are used in the AES Diagnostics program module to investigate the properties of the model Network, and in the AES String-Finder module to determine the network topology.

- Node Number Sequence Interval

It is useful to number nodes along the string in anticipation of future nodal point additions. For example, numbering nodes by two's, (i.e., 0, 2, 4, 6, etc.), allows for future network model growth. Numbering nodes by three's provides for even more densification in the future. However, recall that there is a numerical limit to the number of nodes on a sub-region or region basis.

- Confluences

At a confluence node, there will be two to five tributary branches, one branch being the "main" line. Consequently, there will be from two to five Network model links with a common downstream node number, but with differing upstream node numbers. And, for these branches, there may be some links that have the property that the upstream node number is greater than the downstream node number (i.e. the confluence node number). This fact is used in the AES String-Finder module to resolve the model Network into Strings and topology levels.

- Subarea Numbers

It is useful to number a subarea according to the node number that the subject subarea is tributary to. At a confluence node, assemble all local subareas tributary to the confluence node, into one subarea; otherwise, link the subarea to the branch line downstream node before confluencing the branch with the confluence point.

# 4.4 Capacity Analysis

## 4.4.1 Conduit Capacity

In the Citywide Urban Runoff Master Plan, the term conduit was generally applied to any existing or proposed pipe or box designed to convey storm runoff. The conveyance capacity analyses were prepared based on the use of Manning's equation as recommended by the County of Orange Hydrology Manual.

### 4.4.1.1 Hydraulic Grade Line Assumptions

The AES 'balanced' hydraulic design method, which was used in this MPD, can be characterized as considering the conduit flow to be hydraulically independent of the street flow. This represents a 'flow-by' condition where there is no ponding at the catch basins. Under this assumption, the hydraulic gradient for a particular section of pipe is determined by an iterative process that considers the hydraulic head at each node along a drainage line, and the major hydraulic losses in each section of pipe. The hydraulic head is normally limited by a regulatory maximum, which was assumed to be one foot below the street surface in this study. Finally, minimum grade line, or friction slope was assumed, meaning that the hydraulic grade line (HGL) was always assumed to drop at least 0.001 (or 0.1 percent) foot of drop (rise) per foot of link length (run).

#### 4.4.1.2 Existing System Flow Capacity Estimation: HGL Envelopes

Another technique for estimating existing system flow capacities is a decision-based method that constructs HGL envelopes that bound the resulting "balanced" HGL for the system, where decisions are used involving, for example, the minimum clearance between topography and target HGL, among others.

The first step of the balanced HGL technique is to evaluate the minimum and maximum allowable clearances between the HGL and topography. These clearances are included in Table 4-1. Figure 4-17 depicts the clearances being applied to a particular storm drain system reach, or 'string.' Note that a representative topography exists in the global database; therefore, specified clearances must be consistent with the topographic data stored in the global database.

#### 4.4.1.3 Existing System Flow Capacity Estimation: Minimum Friction Slopes

The second step in the balanced HGL technique is to modify the HGL envelopes of Section 4.4.1.2 in order to satisfy user-specified minimum friction slopes. Two decisions are made: minimum slope allowed, and minimum pressure flow velocity (at the peak flow rate). These two decisions transform the envelopes of Section 4.4.1.2 to look like the HGL envelopes of Figure 4-18. Included in Figure 4-18 is the HGL control for the string under study. The balanced HGL is a fit between the downstream control and the string's most upstream point's top HGL envelope. This fitting is discussed in the next section.

#### 4.4.1.4 Existing System Flow Capacity Estimation: Balanced HGL

The balanced HGL is a minimum length fit between the downstream HGL control and the upstream end top HGL envelope. It is analogous to stretching a rubber band from the HGL control to the upstream end top HGL envelope, where the rubber band is constrained by the top and bottom HGL envelopes. Several cases are demonstrated in Figure 4-19. The easiest case is a direct connection without interference by either HGL envelope. The other two cases of this figure consider interference by one or both HGL envelopes.

### 4.4.2 Upgrade Target Analysis

#### 4.4.2.1 Multiple Return Frequency Hydrology Model Results

A MPD typically has multiple design storm return frequency (e.g., 10-year, 25-year, 100-year, etc.) criteria for flood control system planning guidelines. Generally, streetflow regulatory criteria is mandated (see Figure 4-20) such that:

- one lane is open, in each direction, for a 10-year design storm;
- flow cannot exceed top of curb for a 25-year storm;
- flow cannot exceed 0.20 feet above top of curb for a 50-year event;

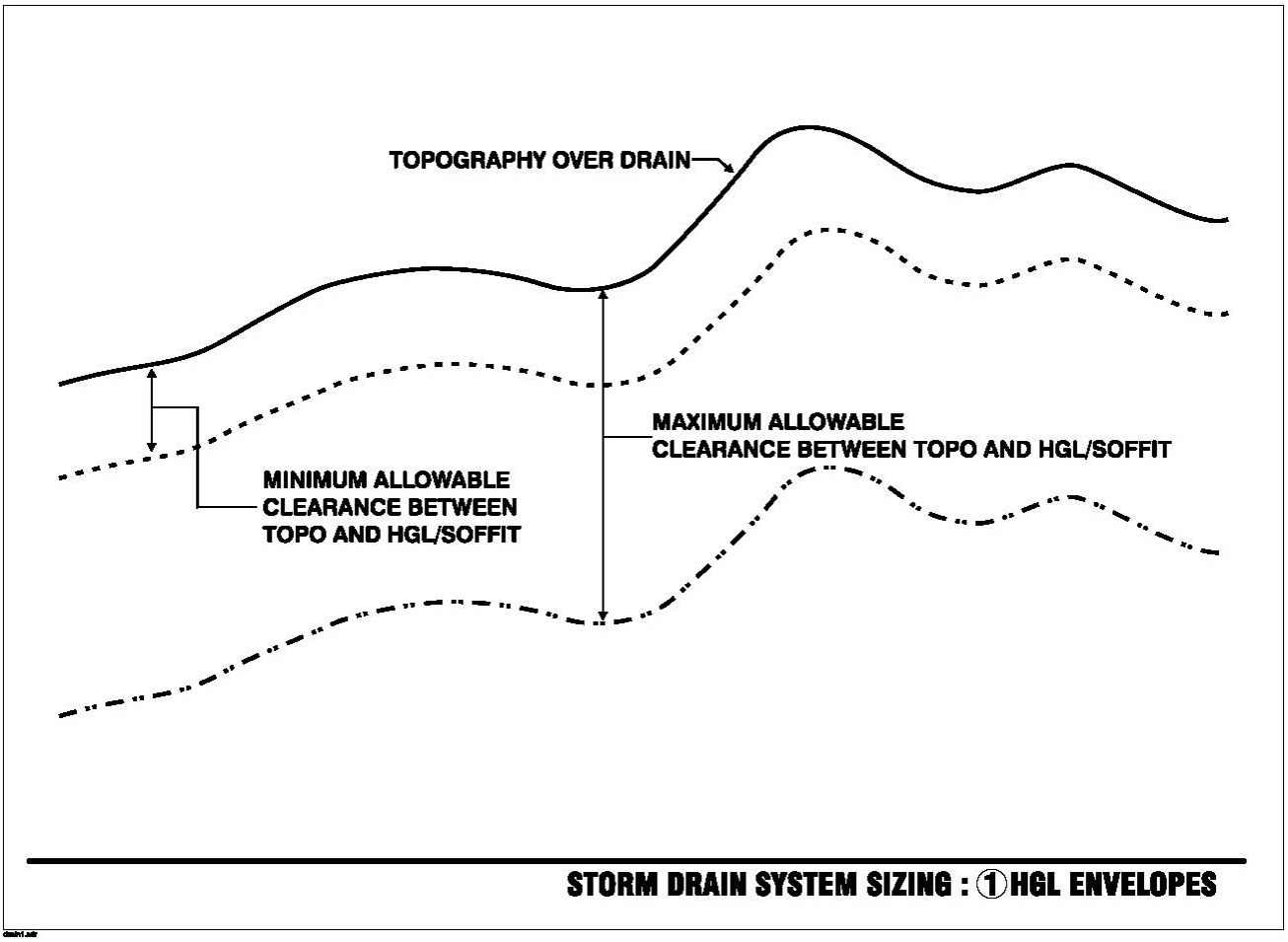



**Figure 4-17 Storm Drain System Sizing: HGL Envelopes**

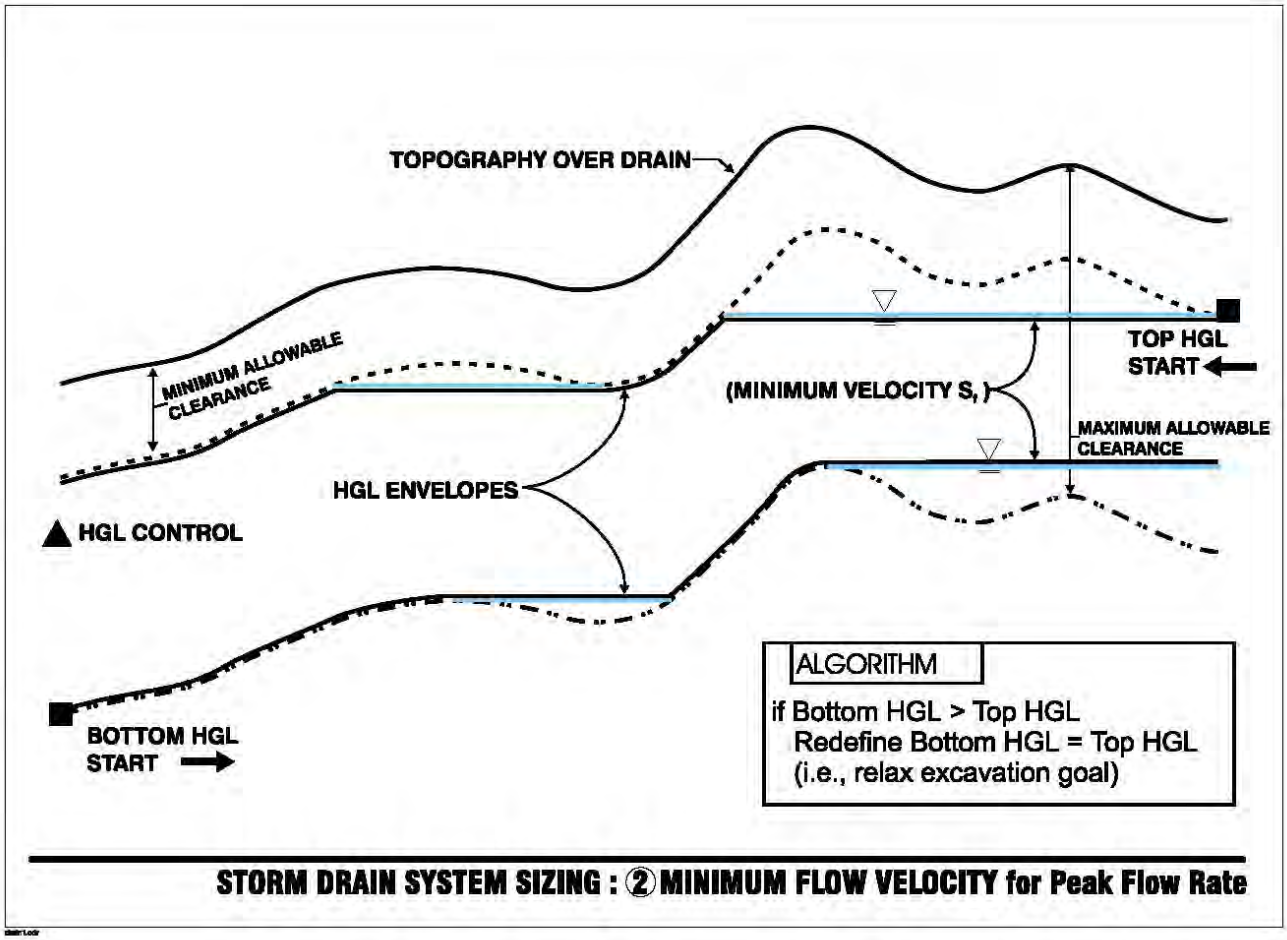



**Figure 4-18 Storm Drain System Sizing: Minimum Flow Velocity**

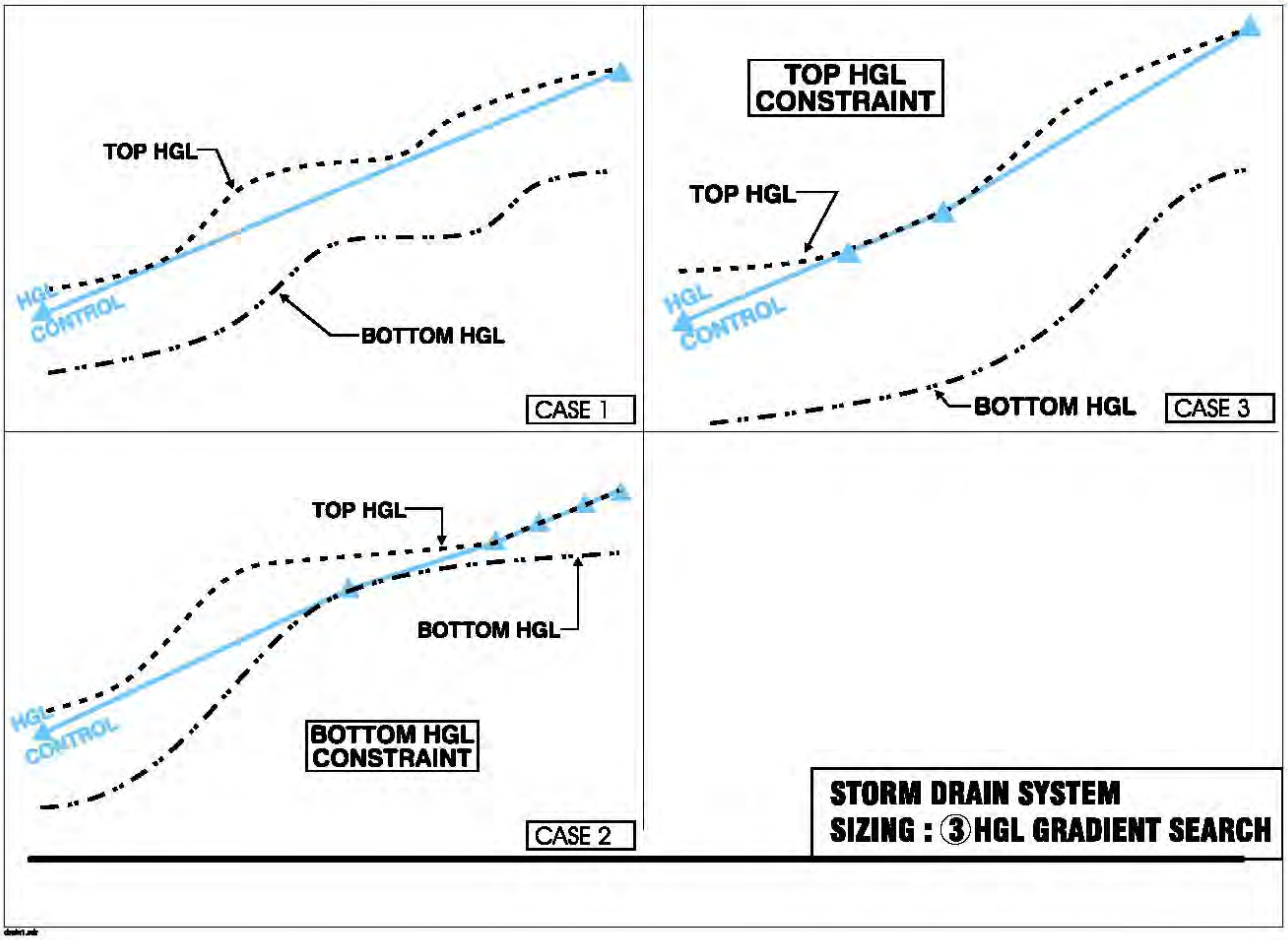



**Figure 4-19 Storm Drain System Sizing: HGL Gradient Search**

**REGULATORY FLOOD PROTECTION GOALS AND EXISTING CAPACITY**

**Existing Regulatory Flood Control Capacity**

| Storm Frequency | Street Flow | Pipe Flow | TOTAL |
|---|---|---|---|
| T1 (10) | 12 | 25 | 37 |
| T2 (25) | 18 | 26 | 44 |
| T3 (50) | 30 | 25 | 55 |
| T4 (100) | 60 | 18 | 78 |

(i) one lane is open, in each direction, for a 10-year design storm;

(ii) flow cannot exceed top of curb for a 25-year storm;

(iii) flow cannot exceed 0.20 feet above top of curb for a 50-year event;

(iv) flow cannot exceed 0.50 feet above top of curb for a 100-year event.

(v) For a typical street section and model reach length, the flow depths at issue are typically 1-foot or less, whereas the reach length (i.e., the link length) is well over several hundred feet. Thus, the hydraulics of this reach may be modeled as normal depth flow using Manning's equation,

$$Q = 1.486AR^{0.67}S^{0.50}/n \qquad (1)$$

where Q is the flow capacity estimate; A is the cross section of street flow; R is the hydraulic radius; S is the street slope; and n is the friction factor.

**Figure 4-20 Regulatory Return Frequency Hydrology Model Results**

- Flow cannot exceed 0.50 feet above top of curb for a 100-year event.
- For a typical street section and model reach length, the flow depths at issue are typically 1-foot or less, whereas the reach length (i.e., the link length) is well over several hundred feet. Thus, the hydraulics of this reach may be modeled as normal depth flow using Manning's equation,

$$Q = 1.486AR^{0.67}S^{0.50}/n$$

where Q is the flow capacity estimate; A is the cross section of street flow; R is the hydraulic radius; S is the street slope; and n is the friction factor (0.015 for the City's MPD.) As noted in Section 4.3.1.3.1, three target criteria were used in the City's MPD modeling effort:

- 10-year flow cannot exceed top-of-curb
- 100-year flow cannot exceed one-foot above back-of-walk
- The product of flow depth and flow velocity must be less than 6

Based on the given regulatory criteria, Q estimates for streetflow can be readily estimated and tabulated as shown in Figure 4-20. Note that due to streetflow modeling being hydraulically "long", these normal depth flow estimates are usually accomplished independent of a hydrology analysis.

Similarly, the pipe shown in Figure 4-20 has a full flow capacity that can be estimated and tabulated (existing system capacity estimation is further discussed in a later section) as the pipe flow. The sum of street flow and pipe flow gives the existing system regulatory flow capacity estimate.

From Figure 4-20, the existing system regulatory flow capacity estimate for the particular link is 78 cfs and 44 cfs for the 100-year and 25-year design events, respectively. The difference in capacity estimates is, in this example, due to different regulatory rules regarding street flow depths. The estimates are subsequently used in comparison to the corresponding MPD peak flow runoff estimates in order to test whether the existing system meets regulatory street flow depth requirements.

#### 4.4.2.2 Multiple Return Frequency Upgrade Target Analysis

Figure 4-21 carries through a tabulation of hydrologic peak flow runoff estimates, existing pipe system flow capacity estimates, regulatory street flow capacity estimates, upgrade target estimates, and estimation of mitigation for the deficiencies.

In Step 1 of Figure 4-21, existing condition peak flow estimates are shown for 2-year through 200-year return frequency design storms. These flow values are generated by

the hydrologic model, but are stored appropriately in the global database so that these values are used in the upgrade target analysis. The AES SIMS is set up in anticipation

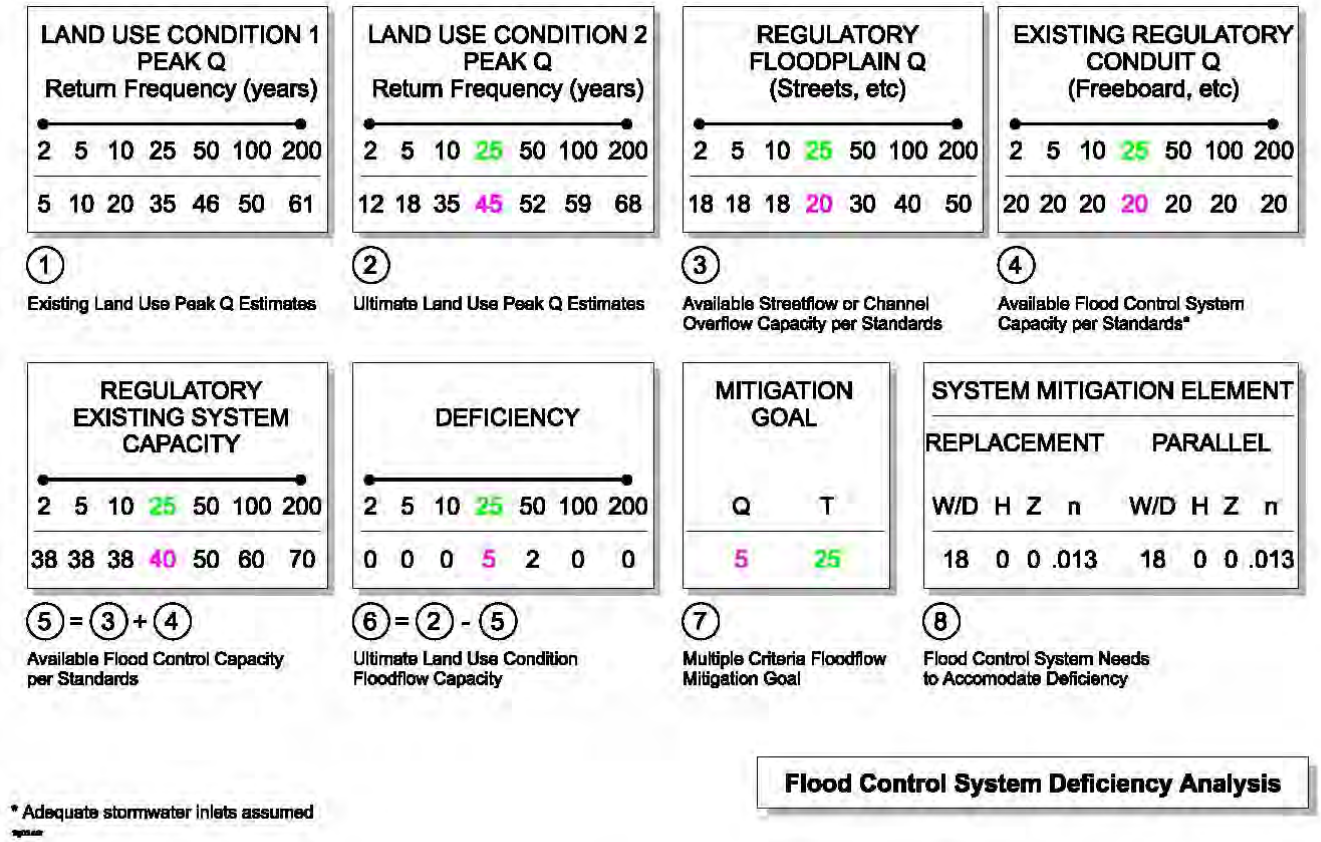



**Figure 4-21 Flood Control System Analysis**

of up to six land use scenarios, and six return frequency peak flow estimates per land use scenario. Separate global databases (literally, separate MPDs) are constructed for each land use scenario. Usually, only one ultimate land use target scenario is considered in an MPD. However, sometimes it is important to consider intermediate land use scenarios, such as at 10-year intervals, in order to better prioritize MPD elements according to anticipated build-out versus time projections rather than some future 50-year build-out land use scenario. In other words, it may not be appropriate to invest in a flood control system placed in a natural setting when there is no one to protect at that vicinity.

Steps 3 and 4 tabulate the regulatory streetflow and existing pipe flow capacity estimates, respectively. Step 5 is the sum of the computed results from Steps 3 and 4, and provides a tabulation of available regulatory flood protection versus return frequency. Step 6 provides the upgrade target of Step 5 in meeting the demands of the ultimate land use scenario runoff estimates of Step 2. Note that deficiencies are values greater than or equal to zero. Step 7 is the mitigation goal. From Step 7, it is seen that

an additional 5 cfs flow capacity is needed in order to meet all of the several regulatory rules regarding streetflow depth versus return frequency. The mitigation of a replacement or parallel pipe element is tabulated in Step 8, given a user-specified minimum pipe size of an 18-inch diameter RCP.

#### 4.4.2.3 Telescoping Analysis

After the existing flow capacity estimates have been tabulated for all links, and stored in the global database, the upgrade target analysis is performed and mitigation replacement and parallel elements are computed such as described in Section 4.4.2.2. These computed mitigation element sizes are the 'computer estimated' sizes. Another analysis is needed to coordinate these elements, typically known as a 'telescoping' analysis, which is accomplished for target upgrades or existing links according to Table 4-1.

Rules are now applied to the computer estimated mitigation replacement system elements in order to control changes in pipe sizes (boxes or channels). Figure 4-22 depicts three 'filters' typically applied: (i) minimum size constraint, (ii) drop in flow area, and (iii) drop in flow capacity. Each string is filtered with respect to the telescoping rules, resulting in 'computer recommended' replacement (or new) mitigation, system.

### 4.4.3 Summary of Modeling Results

As previously described, the AES Stormwater Information Management System (SIMS) was built for the City of Huntington Beach and tributary areas, and relevant hydrologic and hydraulic parameters estimated and subsequently reviewed by the City for appropriateness for use with the SIMS. The SIMS was executed for each of the watersheds delineated for the City, resulting in over 16,000 links, nodes and subarea elements used in the model network. Design storm peak flow rate estimates were developed for both the 50-percent and 85-percent upper confidence levels and for 5-, 10- and 25-year return frequency rainfalls. Runoff return frequency estimates were developed for 5- through

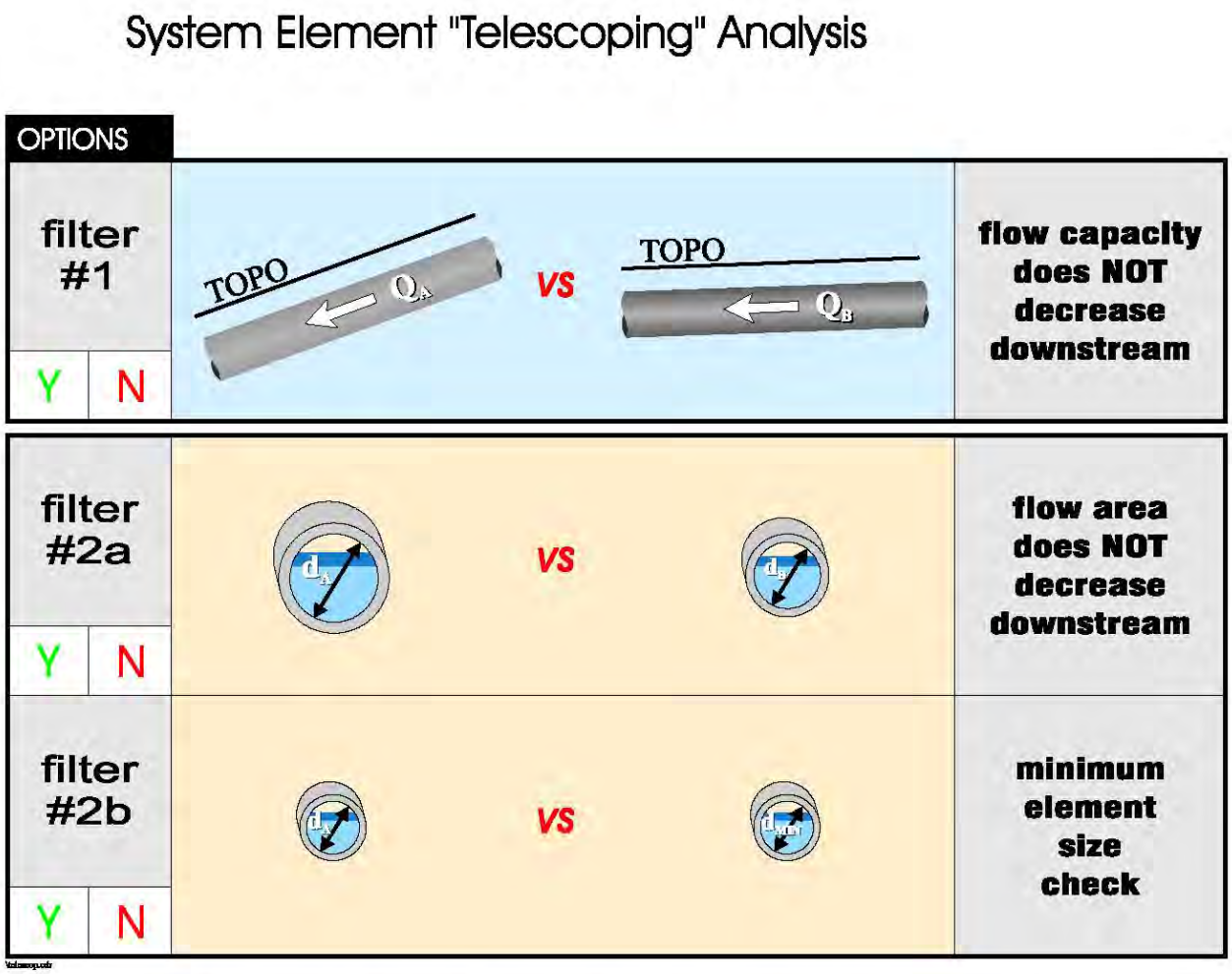



**Figure 4-22 System Element Telescoping Analysis**

100-year intervals, depending on the confidence level under consideration. Different rules for flood risk handling and for convenience were used in estimating street flow capacity trends. For example, the 10-year return frequency design storm rainfalls focused on convenience and efficiency goals whereas the 100-year return frequency flood risk goals focused on flood protection considerations. As discussed previously, street intersection drainage rules involving a goal of total pick-up of flows at target return frequencies also provided numerous modeling constraints. Storage elements were modeled by coupling the hydraulic boundary and storage element peak outflow estimates to the network's hydraulic model. Other hydraulic constraints included the Ocean, the Harbor area, County collector channels and water surface levels at storage elements.

The results produced from the SIMS computer modeling effort fills a data base composed of over 16,000 elements (links, nodes and subareas), each with about 300 attributes and mathematical estimates developed, or a total of about 5 million computational and input estimates. This data base does not include the digital information developed representing the graphical representation of the City's land use, soil group trends, flood control system, topography, and other digital representations.

In order to provide a general overview of the modeling results, some statistics of the modeling results have been developed for the modeling links used in the network. There are 5,212 modeling links, and the following statistics summarize the modeling results.

There are 1,977 modeling links that are, in the existing condition, "street-only" links. That is, they currently do not have an associated storm pipe or channel element. Of these 1,977 links, 1,452 are not targeted for upgrades, while 525 links are. Of these 525 links, 85 are targeted to be upgraded to 100-year return frequency goals, and all of these links occur in adverse street grade conditions. Therefore, of the 1,977 "street-only" links, modeling results target all 85 adverse grade "street-only" links for 100-year upgrade goals. The remaining 440 "street-only" links are targeted for upgrades to meet the 10-year return frequency convenience goals. Of possible interest: for the non-adverse grade "street-only" links, the average street capacity (according to the specified street drainage rules) is estimated for the 10-year event to be about 20 cfs, whereas for the 100-year the capacity is estimated to be about 300 cfs.

There are 1,338 "coupled street and pipe" modeling links. Of these 1338 links, 442 links are targeted for upgrade. Of these 442 links, 225 are targeted for upgrade to the 100-year return frequency goal, and of these 225 links, 215 have adverse street grades. Of the remaining 10 "coupled street and pipe" modeling links, all have non-adverse street grade attributes, but 4 of these 10 links have positive street grade attributes because of the "street grade regulator" rule (i.e., street grades developed from the GIS application to the topography information, such that street grade values are between -0.0014 and 0.0014, are assigned the value 0.0014.). Therefore, from the modeling

results, 225 of the 442 "coupled street and pipe" modeling links that are targeted for upgrade are targeted to be upgraded to the 100-year return frequency goal and the underpinnings of that modeling result is that these links are associated with adverse street grades. It is noted that according to the street flow depth rules, street sections that are assigned adverse street grades are estimated to have zero flow capacity, which implies that the 100-year return frequency flood risk goals are the modeling target. Of possible interest: of the 1,113 "coupled street and pipe" links that are not targeted for upgrade, 425 are associated with street grades that were changed to 0.0014 according to the said "street grade regulator" rule.

There are 1,033 "total pick-up" or "pipe only" links; that is, modeling links that are pipes only and do not have associated with them a street flow or other channel flow routing attribute. Of these 1,033 "pipe only" links, 713 are targeted for upgrades. Of these 713 links, all 713 links are targeted to be upgraded to the 100-year return frequency flood risk goal and 315 are associated with adverse street grades. As discussed previously, the impact of adverse street grades assigned to modeling links is that the modeling target becomes the 100-year return frequency flood risk goal.

There are 41 "box" links. Of these, 24 are targeted for upgrade.

There are 77 "open channel" links. Of these, none are targeted for upgrade.

There are 142 "V-gutter" links. All 142 links are targeted for further consideration at the 100-year return frequency flood risk level. However, for these types of links, the modeling constraints are particularly sensitive to the target hydraulic attributes such that a small change in allowable flow depth removes most of these links issues.

From the above modeling results overview, it is noted that there is a significant impact to modeling links whether or not they have associated to them adverse street grades. This is because the modeling rules imply that adverse street grades have assigned to them a zero flow carrying capacity and, therefore, that the modeling target is the 100-year return frequency flood risk goal, which for such links is subsequently modeled as drainage by a pipe element under a "total pick-up" or "pipe only" link element. A field review of some of the areas that have a high population of links with small street grade values between
-0.0014 and 0.0014 indicate that oftentimes there is in fact flow capacity due to street reaches being able to pond and spill into neighboring street reaches. However, this "spill-over" effect is not included in the current SIMS model network.

Another significant impact to the modeling network are locations where street intersections are assigned a "total pick-up" or "pipe only" drainage element in order to meet street intersection drainage rules. Such locations imply that the 100-year return frequency flood risk goal is applied and that a "pipe only" element is assigned.

It is also noted that for "pipe only" links, the 100-year return frequency flood risk level is the target because no other flowpath is associated to these links for the design storm levels analyzed. Among other reasons, such "pipe only" links are assigned to modeling links located immediately downstream of street intersections that are specified to have a total pick-up goal at the street intersection.

From the above overview, the 100-year return frequency flood risk goal and its associated upgrade targets are primarily seen to be at modeling links where adverse street grades are associated, where street intersections are specified to have a total pick-up goal, and at "pipe only" modeling links where a parallel or alternative modeling flow linkage is not associated (for instance, where currently there exists only a pipe element to carry runoff with no alternative flow path available) Given that the current 2004 MPD upgrade targets are assumed to be at the 85 percent confidence level for runoff estimates, it is observed that the 85 percent confidence level, 100-year return frequency, peak flow rate flood risk goal is being modeled by the SIMS computer program to be widely distributed throughout Huntington Beach.

## 4.5 System Improvements

### 4.5.1 Introduction

As described in Section 4.4 the hydraulic analysis assessed the conveyance capacity of the City's existing drainage facilities (streets, pipes, culverts and channels) to drain the storm runoff determined by the hydrologic analysis. System upgrades to meet the City's upgrade target goals were then determined. The end result is a link-by-link listing of candidate system upgrade projects for the City's Master Plan of Drainage.

The purpose of the list is to serve as a tool to facilitate future project planning, annual budgeting, multi-year capital improvement program preparation, and preparation of grant applications. This section describes the procedures and assumptions that were used in preparing the listing of candidate system upgrade projects.

### 4.5.2 Cost Opinion Basis for Improvements

This section summarizes the methods and assumptions used in developing the unit cost and system upgrade cost opinions.

The cost opinions are intended to present an order of magnitude estimate to facilitate long term Capital Improvement Project planning. Actual construction costs could vary significantly from these opinions based on the specific project characteristics, final design analysis and prevailing construction costs at the time of construction.

The unit costs used for the Master Plan facilities estimates are based on 2004 estimated costs that can be adjusted in the future based on an Engineering News Record (ENR) Construction Cost Index Annual Average of 7730 through June 2004 for the Los

Angeles Region. The ENR Construction Cost Index data for the Los Angeles Region was used instead of the 20-city national average because the data is more representative of costs for the Huntington Beach area than a national average cost index. The unit costs are based on construction bids received by Southern California public agencies including the City of Huntington Beach between 2000 and 2004. The unit bid prices received prior to 2004 were adjusted to 2004 costs using the ENR Construction Cost Index for the Los Angeles Region.

#### 4.5.2.1 Unit Cost Opinions for Reinforced Concrete Pipe

The unit cost data presented in Table 4-7 for reinforced concrete pipe (RCP) for each pipe size diameter through 96 inch includes in the per lineal foot unit cost the cost of trench excavation and backfill and pavement removal and replacement. Added to that basic unit cost are an allowance for catch basins and connector pipe, and manholes. An additional cost allowance for miscellaneous construction items contingency, and an allowance for engineering, inspection and contract administration are reflected in the unit costs.

**Table 4-7**
**Storm Drain Reinforced Concrete Pipe Unit Cost Opinion**

| Facility Size (Inches) | Total Cost Per Lineal Foot (Includes $35/Ft for catch basins, connector pipe & manholes; includes Contingency Cost Allowance and Engr., Inspect., and Contract Admin. Allowance) |
|---|---|
| 18 | $235 |
| 21 | 249 |
| 24 | 264 |
| 27 | 278 |
| 30 | 292 |
| 33 | 307 |
| 36 | 320 |
| 39 | 334 |
| 42 | 349 |
| 45 | 363 |
| 48 | 377 |
| 51 | 392 |
| 54 | 406 |
| 57 | 421 |
| 60 | 435 |
| 63 | 449 |
| 66 | 464 |
| 72 | 491 |
| 78 | 520 |
| 84 | 549 |
| 90 | 577 |
| 96 | 606 |
| 102* | 1,369* |
| 108* | 1,403* |
| 114* | 1,479* |
| 120* | 1,555* |
| 126* | 1,631* |
| 132* | 1,709* |

**Table 4-7**
**Storm Drain Reinforced Concrete Pipe Unit Cost Opinion**

| Facility Size (Inches) | Total Cost Per Lineal Foot (Includes $35/Ft for catch basins, connector pipe & manholes; includes Contingency Cost Allowance and Engr., Inspect., and Contract Admin. Allowance) |
|---|---|
| 138* | 1,787* |
| 144* | 1,822* |
| 150* | 1,901* |
| 156* | 1,980* |

*Cost based on equivalent Reinforced Concrete Box Culvert

The following basic assumptions were used in developing the unit cost data for estimating the facility improvement cost opinions:

- Reinforced Concrete Pipe Minimum Diameter: 18-inches
- Reinforced Concrete Pipe Maximum Diameter: 96-inches
- Manholes: 400-foot spacing. The assumed unit cost is $3,600 per manhole, which results in a cost allowance of $9 per lineal foot of RCP storm drain pipe.
- Catch Basins and Connector Pipes: Two 7-foot wide catch basins per 600-feet of storm drain and 50-feet of 18-inch diameter RCP connector pipes. The unit cost per catch basin is assumed to be $4,500 per each and the cost per lineal foot of connector pipe is assumed to be $128 per lineal foot, which results in a unit cost allowance of $26 per lineal foot of storm drain.
- Right of Way Acquisition Cost Allowance: No allowance for right of way acquisition is included in the cost estimates as it is assumed that the master plan facilities will be constructed in existing right of way.
- Contingency Cost Allowance: 20 percent, which includes a cost allowance for mobilization, traffic control, utility relocations, and miscellaneous construction costs.

Engineering, Inspection, & Contract Administration Costs Allowance: 20 percent

For systems requiring a capacity exceeding that of a 96-inch diameter pipe, Table 4-8 includes the cost of an equivalent reinforced concrete box culvert, (RCB). The basis for RCB costs is discussed in Section 4.5.2.2.

**Table 4-8**
**Unit Cost Opinion for RCB Culvert Construction Costs**

| Construction Item | Unit Cost Opinion |
|---|---|
| Pavement Removal and Replacement | $5.50 Per Square Foot |
| Excavation | $20 Per Cubic Yard |
| Backfill | $25 Per Cubic Yard |
| Structural Concrete including reinforcing steel and form work | $500 Per Cubic Yard |
| Allowance for catch basins, connector pipes & manholes | $35 per foot of RCB |
| Contingency Cost Allowance | 20% |
| Engineering, Inspection, & Contract Administration Costs Allowance | 20% |

#### 4.5.2.2 Unit Cost Opinions for Reinforced Concrete Box Culverts

The unit cost data to develop the cost is for reinforced concrete box culvert (RCB) is shown in Table 4-8. Added to that basic unit cost are allowances for miscellaneous construction items contingency, and costs of engineering, inspection and contract administration.

The following basic assumptions were used in developing the unit cost data for estimating the facility improvement cost opinions:

- *Reinforced Concrete Box Culverts:* Where the facility is the replacement for an existing box culvert, the existing height of the existing box culvert is used and the width increased in half-foot increments. In the case where the facility improvement is a new box culvert in lieu of a large diameter storm drain pipe, an equivalent capacity box culvert is assumed rounded to a larger half-foot increment. The thickness of the invert, walls and top of the box culvert were assumed to be 12-inches for all RCB sections and, thus, the quantity of concrete per foot of box could be estimated. The amount of concrete per lineal foot of RCB multiplied by the unit cost of structural concrete per cubic yard yields the unit cost per foot of RCB. A cost allowance is included for over excavation of one foot on sides and bottom and 3-feet of fill over the box culvert. Also, the removal and replacement of pavement is included as a cost allowance.

- *Manholes:* 400-foot spacing. The assumed unit cost is $3,600 per manhole, which results in a cost allowance of $9 per lineal foot of RCB.

- *Catch Basins and Connector Pipes:* Two 7-foot wide catch basins per 600-feet of RCB and 50-feet of 18-inch diameter RCP connector pipes. The unit cost per catch basin is assumed to be $4,500 per each and the cost per lineal foot of connector pipe is

assumed to be $128 per lineal foot, which results in a unit cost allowance of $26 per lineal foot of RCB.

- *Right of Way Acquisition Cost Allowance:* No allowance for right of way acquisition is included in the cost estimates as it is assumed that the master plan facilities will be constructed in existing right of way.

- *Contingency Cost Allowance:* 20 percent which includes an cost allowance for mobilization, traffic control, utility relocations, and miscellaneous construction costs

Engineering, Inspection, & Contract Administration Costs Allowance: 20 percent

#### 4.5.2.3 Unit Cost Opinions for Open Channels and Other System Improvements

Since no open channel facilities or other types of facilities were identified for upgrading, no cost opinions were developed those types of system improvements.

### 4.5.3 System Upgrades Summary

At the time of preparing this Master Plan, there were approximately 131 miles of mainline storm drain facilities owned and maintained by the City. Based on the modeling results, there are approximately 46 miles of facilities that are candidates for upgrading with replacement or parallel pipe systems. In addition there are approximately 37 miles of potential new systems in locations where separate storm drain facilities currently do not exist as discussed in Section 4.4. Table 4-9 and 4-9B included at the end of this section presents a listing of all candidate system upgrade projects based on the results from the system-wide computerized modeling effort.

The key elements of Table 4-9A and 4-9B are:

- A tabular list of system links identified by a Project ID Number and upstream and downstream node numbers along with facility size, length, flow quantity, and estimated upgrade improvement cost. The flow value shown is the calculated rate used to size the recommended facility. This may be either the 100-year or 10-year frequency event depending upon the limitations condition for that link. The cost is based on the estimated replacement improvement alternative. The optimum improvement alternative (parallel versus replacement facility) would be determined during the preliminary design phase of the project.

- Also identified in the tabular listing are those upgrade projects that involve replacement of existing corrugated metal pipe (CMP) or corrugated steel (CS) facilities identified as candidates for capacity upgrading. These links, which represent projects with both hydraulic and a material upgrade to meet the City's goals, would potentially warrant an adjustment to a higher priority over those

that do not include a CMP facility replacement. Also, a separate list of links is presented which identifies the upstream and downstream node numbers along with facility size and length for existing CMP facilities not identified for hydraulic upgrade and/or not part of the system-modeling database. These non-hydraulic upgrade facilities are likely to need replacement due to risk of structural failure as a result of aging and material deterioration.

- A line item has been included at the bottom of the table for "half-rounds". There are a large number of half-rounds located primarily in the downtown part of the City. These are facilities at street intersections, which convey the water flowing in the street gutter under the intersection or around the corner to the side street. They are not an integral part of the city's stormwater conveyance system, but instead are intended for the convenience of pedestrians and are not typically used by cities anymore because of high maintenance requirements and stormwater quality considerations. They were installed instead of concrete cross-gutters at the intersections or to convey water around the corner. The facilities were not analyzed as part of the system modeling effort, nor was a complete inventory compiled. The facilities are considered substandard and in need of replacement in the future to eliminate ongoing maintenance and operation costs associated with cleaning the facilities and controlling stormwater quality. Even though these facilities are not part of the primary stormwater conveyance system protecting property from flooding, a line item cost is included for future capital project planning purposes.

- This modeling effort did not review or analyze the City's existing 15 storm water pump stations. The City did however conduct a thorough pump station analysis in 1993 to determine capacity deficiency and station needs. Additionally, the Integrated Infrastructure Management Program Committee further reviewed and determined in their adopted June 1997 Report that there were approximately $30 million in pump station improvements required in 1997. Subtracting out improvements that have been completed since that report (Shields PB Rebuild) and bringing the cost forward using 3 percent inflation per year, a cost of $32,500,000 for storm water pump station rehabilitation/replacement is included in the MPD cost as shown in Table 4-9A.

The data in Tables 4-9A and Table 4-9B represent an inventory of candidate system upgrade projects. It can serve as a starting point for further analysis and formulation of proposed projects for budgeting and programming purposes based on such considerations as:

- Downstream reaches may take precedence over upstream ones, since upstream improvements may require adequate downstream capacity.

- Main storm drain lines, which are collectors for multiple tributary reaches, should be considered for higher priority over more localized systems.
- Developed land use areas should be considered for protection prior to undeveloped areas.
- Storm drain improvements should be considered for coordination with other capital project in the same area. This condition would be especially prevalent in the case of street reconstruction projects.
- Integration of related links comprised of high benefit as well as lower benefit links should be considered in order to complete the system improvements in a localized area.

Not all projects in Table 4-9A are needed to address the 100-year return frequency flood risk goal. Table 9A also shows the subset of total system lengths and costs within each planning area and for the total program for those facilities that address the 100-year frequency goal.

A geographical summary of candidate upgrade projects aggregate extent and cost based on the City's five major drainage watershed planning areas is shown in the following Table 4-10. This table summarizes estimated costs for upgrading systems to meet the 100-year return frequency event for flood risk only, as well as a total estimated cost for upgrades to address the 100-year event as well as the convenience and efficiency requirements determined by the city for draining other storm events. This table does not include the cost for upgrading of existing "half-rounds" ($2.3 million) or pump stations ($32.5 million).

Analysis of the geographical cost summary shows that Drainage Watershed Planning Area No.1, which drains the lower central and southeast areas of the City, has by far the largest amount of candidate upgrade projects with the total length of system upgrades amounting to 189,900 feet (36 miles) at a cost of approximately $98 million. It encompasses the largest geographic area, has very flat topography, is very low in elevation, and encompasses some of the oldest areas in the City.

**Table 4-10**
**Geographical Summary**

| Major Drainage Watershed Planning Areas | Total Length of Upgraded System (Rounded to Nearest 100 ft) | | Total Estimated Upgrade Costs (Rounded in Millions Dollars) | |
|---|---|---|---|---|
| | All Facilities | Q100 Facilities Only | All Facilities | Q100 Facilities Only |
| No. 1- Santa Ana River & Talbert Channel Areas (Subareas 20-32 & 40-41) | 189,900 | 92,300 | $98 | $61 |
| No. 2 – Coastal and Bolsa Chica Wetlands Areas (Subareas 16-19) | 50,100 | 41,500 | $29 | $21 |
| No. 3 – Slater Channel Area (Subareas 10-15) | 74,500 | 36,000 | $34 | $21 |
| No. 4 – Wintersberg Channel Area (Subareas 6-9) | 58,800 | 18,800 | $21 | $8 |
| No. 5 – Bolsa Chica Channel and Harbor Areas (Subareas 1-5) | 67,000 | 23,400 | $24 | $9 |
| TOTALS | 440,000 (83 miles) | 212,000 (40 miles) | $206 | $120 |

Funding issues relative to the drainage element are included in the funding discussion in Section 3.5.2.

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# City of Huntington Beach
# Urban Dry Weather Runoff Monitoring
# Technical Memorandum

Prepared for:

City of Huntington Beach
Department of Public Works
Engineering Division

Prepared by:

CDM

August 2002

# Section 1
# Introduction

This Urban Dry Weather Runoff Monitoring Technical Memorandum (Technical Memorandum) describes the technical approach used to characterize dry weather runoff from storm water outfalls and other drainage structures within the City of Huntington Beach (City).

## 1.1 Background

Over the past few years, beach advisories and closings resulting from high bacterial counts in coastal waters have heightened the environmental concerns and awareness of the importance of receiving water and urban runoff quality within the City. At the same time, regulatory pressures are increasingly focusing on non-point source pollution impacts, particularly from urban runoff from developed areas discharged through municipal storm drainage systems and from industrial, commercial, and construction sites. As urban runoff (both dry and wet weather) can be one source of bacterial contamination, the City has already initiated a dry weather diversion program in the southern part of the City to minimize the impact of dry weather runoff and extensive studies conducted by the City have indicated that sources such leaking sewers are not a significant contributor to the high bacterial counts. Additional studies conducted by the City and others are continuing to identify sources and work toward resolving the bacterial problems. In addition, urban runoff can be a source of a number of other pollutants that can have a detrimental impact on receiving waters and discharges from the city storm drainage system is regulated under an NPDES municipal storm water permit issued to Orange County and all of the Cities.

## 1.2 Purpose and Objectives

The purpose of this monitoring program was to sample urban dry weather runoff throughout the City and perform analysis of selected constituents using field instruments to collect water samples for subsequent laboratory analyses of selected constituents. This Technical Memorandum includes a summary of the sampling program and results. This Technical Memorandum also characterizes the quality of the dry water runoff in drainage structures and storm water outfalls located within the City. The characterization data was used to prioritize proposed actions under the Citywide Urban Runoff Management Plan. Following is a description of the study objectives:

- Establish baseline dry weather water quality conditions at runoff monitoring locations throughout the City
- Conduct a reconnaissance survey to identify potential “hot spot” runoff locations and observe general runoff conditions throughout the City
- Identify monitoring locations and collect initial samples to characterize inflows from upstream areas as they enter the City boundaries

- Utilize monitoring results to assist in setting priorities for actions and programs that will be implemented under the WQMP
- Identify deficiencies in the existing available monitoring data and guide the design of a long-term water quality monitoring program
- Document potential hot spots encountered during field sampling and observations of any readily identifiable sources

## 1.3 Report Organization

Section 2 of this memorandum presents a summary of the sampling program that was performed during the urban dry weather runoff monitoring. Results of the monitoring are presented in Section 3. The Quality Assurance Project Plan approved for the monitoring is provided as Attachment A.

# Section 2
# Summary of Sampling Program

As described in detail in Section 2 of Attachment A: Quality Assurance Project Plan (QAPP), the Data Quality Objective (DQO) process is a planning approach, based on the scientific method that is used to prepare for a data collection activity. It provides a systematic procedure for defining the criteria that the data collection effort should satisfy. The DQO process involves quantitative and qualitative statements that clarify study objectives; determine analytes of concern; what types of samples to collect; how many samples to collect; when, where, and how to collect the samples; required levels of precision and accuracy for sample analyses; and tolerable levels of error in the analytical methods employed. DQOs help establish the quality and quantity of data needed to support decisions.

This section presents a summary of the activities performed during the monitoring, including sampling locations, procedures and constraints. A detailed description of the data and sample requirements, preparation and logistics, site selection, sample preparation and analytical methods, and quality assurance/quality control, can be found in the QAPP (Attachment A).

## 2.1 Sampling Locations

The study area consisted of the sample locations within the boundaries of the City of Huntington Beach. Because dry weather urban runoff may vary throughout the day, sampling times were varied to represent the discharge during various times of day. For the urban dry weather runoff sampling program, samples were collected during late spring/early summer 2002. Table 2-1 lists the potential sampling locations. A map of the locations of the potential sampling location is shown on Figure 2-1.

## 2.2 Constituents

Table 2-2 lists the constituents selected for the study. Refer to Section 4 of the QAPP (Attachment A) for the detailed information of the type, method and preservation requirements for each specific parameters.

## 2.3 Data Collected

The following data was collected:

- Water quality and flow data where possible for selected sites of urban runoff dry weather discharge flows. The water quality data was collected as grab samples at 36 representative locations within the City boundaries and the flow data was manually estimated, where available.

- General observations, site information, and QA/QC data.

For a detailed description of site selection, method of sample collection and QA/QC procedures, refer to the QAPP (Attachment A).

**Table 2-1**
**City of Huntington Beach – Potential Sampling Locations**

| No. | Location | Comments |
|---|---|---|
| | ***Anaheim Barber City Channel*** | |
| 1 | Entry Point – near Rancho Rd./Westminster | Sampling along channel |
| | ***Bolsa Chica Channel*** | |
| 2 | Entry point – near Rancho Rd./Bolsa Chica St. | Sampling along channel |
| | ***Sunset Channel*** | |
| 3 | Entry point – near Edwards St./Bolsa Ave. | Sampling along channel |
| 4 | Outfall – near Bolsa Ave | Sampling location to be field assessed |
| 5 | Outfall – near McFadden Ave. | Sampling location to be field assessed |
| 6 | Outfall – near Graham St. | Sampling location to be field assessed |
| 7 | Exit point – near Bolsa Chica St./Edinger Ave. | Sampling along channel |
| | ***Wintersburg Channel*** | |
| 8 | Entry point – near Beach Blvd./Heil Ave. | Sampling along channel |
| 9 | Heil Pump Station | Sampling from pump station forebay |
| 10 | Outfall/Channel tributary – west of Gothard St. | Sampling location to be field assessed |
| 11 | Marilyn Pump Station | Sampling from pump station forebay |
| 12 | Outfall – near Edwards St. | Sampling location to be field assessed |
| 13 | Shields Pump Station | Sampling from pump station forebay |
| 14 | Outfall – near Springdale St. | Sampling location to be field assessed |
| 15 | Outfall – near Graham St. | Sampling location to be field assessed |
| 16 | Slater Pump Station | Sampling from pump station forebay |
| | ***Ocean View Channel*** | |
| 17 | Entry point – near Asari Ln./Warner Ave. | Sampling along channel |
| | ***Huntington Beach Channel*** | |
| 18 | Adams Pump Station | Sampling from pump station forebay |
| 19 | Atlanta Pump Station | Sampling from pump station forebay |
| 20 | Newland Pump Station | Sampling from pump station forebay |
| | ***Talbert Channel*** | |
| 21 | Entry point – between Magnolia and Bushard Streets on Garfield Ave. | Sampling along channel |
| 22 | Yorktown Pump Station | Sampling from pump station forebay |
| 23 | Adams Pump Station | Sampling from pump station forebay |
| 24 | Indianapolis Pump Station | Sampling from pump station forebay |
| 25 | Banning Pump Station | Sampling from pump station forebay |
| | ***Fountain Valley Channel*** | |
| 26 | Entry point – between Bushard and Brookhurst Streets on Garfield Ave. | Sampling along channel |
| 27 | Flounder Pump Station | Sampling from pump station forebay |
| | ***Santa Ana River*** | |
| 28 | Meredith Pump Station | Sampling from pump station forebay |
| 29 | Hamilton Pump Station | Sampling from pump station forebay |
| | ***Downtown*** | |
| 30 | 30” Outfall on beach | Sampling location to be field assessed |
| 31 | 30” Outfall on beach | Sampling location to be field assessed |
| 32 | 30” Outfall on beach | Sampling location to be field assessed |

**Table 2-1 (Continued)**
**City of Huntington Beach – Potential Sampling Locations**

| No. | Location | Comments |
|---|---|---|
| | ***Bolsa Chica Wetlands*** | |
| 33 | Bolsa Chica Pump Station | Sampling from pump station forebay |
| 34 | Outfall – near Seapoint Ave. | Sampling location to be field assessed |
| | ***Sully Miller Lake*** | |
| 35 | Lake Quarry | Sampling from lake |
| | ***Huntington Lake*** | |
| 36 | Exit point | Sampling from lake |

**Table 2-2**
**Urban Dry Weather Runoff Monitoring - Constituents Analyzed**

| Constituent | Nutrients | Metals (total & dissolved) | Other |
|---|---|---|---|
| Conductivity | $NO_3$-N | Arsenic (As) | OP Pesticides |
| Temperature | $NO_2$-N | Cadmium (Cd) | TRPH |
| pH | Dissolved Ortho-P | Chromium (Cr) | |
| Turbidity | $NH_3$-N | Copper (Cu) | |
| Total Coliforms | Dissolved Phosphorous | Iron (Fe) | |
| Fecal Coliforms | Total Phosphorous | Lead (Pb) | |
| Enterococci | Total Nitrogen (calculated) | Nickel (Ni) | |
| TSS | TKN | Zinc (Zn) | |
| TDS | | | |
| Hardness as Ca $CO_3$ | | | |

# Section 3
# Results

When and where possible, dry weather runoff sampling and flow measurements were performed at the 36 potential locations over a period of five days in late May 2002 and four days in late June 2002, within the City. Table 3-1 summarizes the runoff and flow sampling effort. Figure 3-1 depicts the discharge (where it could be measured or estimated from pump station records) at the sampling locations.

Table 3-2 and Table 3-3 summarize the water quality data (nutrients and metals, respectively) from those sites where dry weather runoff were sampled. A presentation of all water quality data is graphically depicted on the pages following the tables.

**TABLE 3-1**
**SAMPLING SUMMARY - MAY to JUNE 2002**

Last updated 07/16/02

| Prefix | Site # | Type | Round | Sample Method | Channel Area (sq ft) | Velocity (ft/sec) | Discharge (cfs) | Sampled | Flow (visual) |
|---|---|---|---|---|---|---|---|---|---|
| AB | 01 | Entry Point - Channel | 1 | Cup | 1.23 | 1.59 | 1.96 | Yes | Low |
| | | | 2 | Cup | 2.93 | 0.90 | 2.64 | Yes | Low |
| BC | 02 | Entry Point - Channel | 1 | Cup | 4.44 | 0.34 | 1.51 | Yes | Low |
| | | | 2 | Cup | 2.73 | 0.32 | 0.86 | Yes | Low |
| SC | 03 | Entry Point - Channel | 1 | Cup | 0.71 | 1.56 | 1.11 | Yes | Low |
| | | | 2 | Cup | 0.32 | 1.24 | 0.40 | Yes | Low |
| SC | 04 | Outfall | 1 | Cup | NA | NA | NA | Yes | Very low flow |
| | | | 2 | Not sampled | NA | NA | 0.022 | No | NA |
| SC | 05 | Outfall | 1 | Cup | NA | NA | NA | Yes | Very low flow |
| | | | 2 | Not sampled | NA | NA | 0.009 | No | NA |
| SC | 06 | Outfall | 1 | Cup | NA | NA | NA | Yes | Very low flow |
| | | | 2 | Not sampled | NA | NA | 0.011 | No | NA |
| SC | 07 | Exit Point - Channel | 1 | Cup | 1.74 | 0.54 | 0.94 | Yes | Low |
| | | | 2 | Cup | 1.43 | 1.36 | 1.95 | Yes | Low |
| WC | 08 | Entry Point - Channel | 1 | Cup | 0.41 | 3.54 | 1.44 | Yes | Low |
| | | | 2 | Cup | 0.43 | 1.36 | 0.58 | Yes | Low |
| PS | 09 | Pump Station | 1 | Bailer | NA | NA | **0.044** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| | 10 | Outfall | 1 | | | | | No | |
| | | | 2 | | | | | No | |
| PS | 11 | Pump Station | 1 | Bailer | NA | NA | **0.011** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| WC | 12 | Outfall | 1 | Cup | NA | NA | NA | Yes | Very low flow |
| | | | 2 | Not sampled | NA | NA | 0.003 | No | NA |
| PS | 13 | Pump Station | 1 | Bailer | NA | NA | **0.015** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| | 14 | Outfall | 1 | No flow coming out of outfall | | | | No | No flow |
| | | | 2 | NA | NA | NA | No Flow | No | Spill gate shut |
| | 15 | Outfall | 1 | Could not find outfall | | | | No | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| PS | 16 | Pump Station | 1 | Bailer | NA | NA | **1.24** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| OV | 17 | Entry Point - Channel | 1 | Cup | 7.7 | Zero | NA | Yes | stagnant conditions |
| | | | 2 | Cup | 6.16 | Zero | NA | Yes | stagnant conditions |
| PS | 18 | Pump Station | 1 | Bailer | NA | NA | **0.1** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| PS | 19 | Pump Station | 1 | Bailer | NA | NA | **0.74** | Yes | NA |
| | | | 2 | NA | NA | NA | NA | No | NA |
| PS | 20 | Pump Station | 1 | Bailer | NA | NA | **0.42** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| TC | 21 | Entry Point - Channel | 1 | Not sampled due to vertical walls and water was flowing upstream due to diversion dam | | | | | |
| | | | 2 | Cup | 0.19 | Zero | NA | Yes | Wind is blowing surface water upstream |

**TABLE 3-1 (CONTINUED)**
**SAMPLING SUMMARY - MAY to JUNE 2002**

Last updated 07/16/02

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PS | 22 | Pump Station | 1 | Diversion dam located here | | | **0.1** | | |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| PS | 23 | Pump Station | 1 | Bailer | NA | NA | NA | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| PS | 24 | Pump Station | 1 | Bailer | NA | NA | **0.21** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| PS | 25 | Pump Station | 1 | Bailer | NA | NA | **0.42** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| FV | 26 | Entry Point - Channel | 1 | Cup | 4.13 | 0.37 | 1.53 | Yes | Low |
| | | | 2 | Cup | 0.61 | 0.43 | 0.26 | Yes | Low |
| PS | 27 | Pump Station | 1 | Bailer | NA | NA | **0.11** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| PS | 28 | Pump Station | 1 | Bailer | NA | NA | **0.42** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| PS | 29 | Pump Station | 1 | Bailer | NA | NA | NA | Yes | NA |
| | | | 2 | NA | NA | NA | NA | No | NA |
| DT | 30 | Outfall | 1 | Cup | NA | NA | NA | Yes | Low |
| | | | 2 | Cup | NA | NA | NA | Yes | Unable to capture flow, but yes some flow occurring |
| DT | 31 | Outfall | 1 | Cup | NA | NA | NA | Yes | Low |
| | | | 2 | Cup | NA | NA | 0.031 | Yes | very low |
| DT | 32 | Outfall | 1 | Outfall buried in sand - did not sample | | | | No | |
| | | | 2 | Outfall buried in sand - did not sample | | | | No | |
| PS | 33 | Pump Station | 1 | Bailer | NA | NA | **0.09** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| SP | 34a | Outfall | 1 | Not sampled due to safety concerns | | | | No | |
| | | | 2 | Not sampled due to safety concerns | | | | No | |
| SP | 34b | Outfall | 1 | Not located in field | | | | No | |
| | | | 2 | Cup | NA | NA | NA | Yes | Too much vegetation at outfall to collect good discharge data |
| SM | 35 | Lake | 1 | Cup | NA | NA | NA | Yes | NA |
| | | | 2 | Cup | NA | NA | NA | Yes | NA |
| HL | 36 | Lake | 1 | Cup | NA | NA | NA | Yes | NA |
| | | | 2 | Cup | NA | NA | NA | Yes | NA |
| PS | 37 | Pump Station | 1 | Bailer | NA | NA | **0.015** | Yes | NA |
| | | | 2 | Not sampled | NA | NA | NA | No | NA |
| WC | 38 | Entry Point - Channel | 1 | Cup | 5.25 | 0.28 | 1.47 | Yes | Low |
| | | | 2 | Cup | 3.70 | 0.27 | 1.00 | Yes | Low |
| PD | 39 | Ditch | 2 | Cup | NA | NA | NA | Yes | Stagnant, pump off, collect standing water near outlet |
| BC | 40 | Outfall | 2 | Cup | NA | NA | NA | Yes | No flow out of outfall. Collect sample from ponded water |

**Values in BLUE and BOLD in "Discharge" column represent flow estimate developed by City of HB or OCPFRD from pumping records**

# Table 3-2

## Huntington Beach
## Dry Weather Monitoring
## Nutrients, General Minerals, Bacterial and Miscellaneous Analyses

# Huntington Beach
## Dry Weather Monitoring
## Nutrients, General Minerals, Bacterial and Miscellaneous Analyses

| Sample Location | Sample Date | Sample Type | Phosphorus Total | Phosphorus Dissolved | Dissolved Orthophosphate | Nitrate (as N) | Nitrite (as N) | TKN | Ammonia (as N) | Hardness (as CaCO3) | TDS | TSS | TRPH | Total Coliform | Fecal Coliform | Entero-ccoci |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *ENTRY POINT* | | | | | | | | | | | | | | | | |
| AB-01 | 5/22/2002 | | 0.21 | 0.18 | 0.16 | 0.76 | 0.1 U | 0.28 | 0.1 U | 320 | 730 | 4.4 | 1 U | 30000 | 13000 | 300 |
| AB-01 | 6/24/2002 | | 5 | 0.033 | 0.03 U | 0.13 | 0.1 U | 2.2 | 0.1 U | 260 | 790 | 13 | 1 U | 2300 | 2300 | 40 |
| BC-02 | 5/22/2002 | | 0.11 | 0.061 | 0.038 | 0.16 | 0.1 U | 0.49 | 0.1 | 290 | 970 | 4.8 | 1 U | 50000 | 7000 | 170 |
| BC-02 | 6/24/2002 | | 1.9 | 0.034 | 0.03 U | 0.1 U | 0.1 U | 1.3 | 0.1 U | 220 | 1000 | 1 U | 1 U | 70 | 20 U | 20 U |
| BC-02 | 6/24/2002 | K | 1.7 | 0.037 | 0.03 U | 0.1 U | 0.1 U | 1.8 | 0.1 U | 220 | 990 | 1 U | 1 U | 230 | 20 | 20 U |
| BC-40 | 6/27/2002 | | 6.6 | 2.9 | 0.21 | 2.4 | 2.4 | 5.9 | 1.1 | 1300 | 5600 | 7.6 | 1 U | 20 U | 20 U | 20 U |
| FV-26 | 5/24/2002 | | 1.4 | 0.71 | 0.7 | 0.26 | 0.1 U | 0.84 | 0.1 U | 290 | 590 | 1 U | 1 U | 80 | 20 U | 20 U |
| FV-26 | 6/25/2002 | | 6.8 | 5.2 | 0.44 | 0.11 | 0.1 U | 2.5 | 0.1 U | 280 | 900 | 19 | 1 U | 300 | 230 | 170 |
| OV-17 | 5/22/2002 | | 0.43 | 0.22 | 0.21 | 0.71 | 0.1 U | 1.8 | 0.1 U | 360 | 1000 | 6.4 | 2.9 | 17000 | 5000 | 20 U |
| OV-17 | 6/24/2002 | | 3.3 | 0.12 | 0.092 | 0.7 | 0.1 U | 3.5 | 0.1 U | 310 | 910 | 12 | 1 U | 230 | 20 | 20 U |
| SC-03 | 5/22/2002 | | 0.22 | 0.2 | 0.15 | 1.8 | 0.1 U | 0.1 U | 0.1 U | 500 | 1000 | 1 U | 1 U | 240000 | 80000 | 500 |
| SC-03 | 5/22/2002 | K | 0.22 | 0.15 | 0.14 | 1.8 | 0.1 U | 0.1 U | 0.1 U | 490 | 810 | 1.2 | 1 U | 300000 | 30000 | 800 |
| SC-03 | 6/24/2002 | | 5 | 0.095 | 0.077 | 0.79 | 0.1 U | 2.8 | 0.22 | 410 | 930 | 1 U | 1 U | 300 | 80 | 80 |
| TC-21 | 6/25/2002 | | 1.8 | 0.69 | 0.044 | 0.12 | 0.1 U | 3.2 | 0.1 U | 420 | 960 | 13 | 1 U | 20 U | 20 U | 80 |
| WC-08 | 5/22/2002 | | 0.25 | 0.12 | 0.11 | 0.19 | 0.1 U | 0.98 | 0.1 U | 310 | 630 | 2 | 1 U | 30000 | 5000 | 20 |
| WC-08 | 6/24/2002 | | 1.3 | 0.035 | 0.03 U | 0.1 U | 0.1 U | 3.5 | 0.1 U | 330 | 750 | 5.5 | 1 U | 230 | 20 | 20 U |
| WC-38 | 5/28/2002 | | 0.041 | 0.035 | 0.03 U | 0.11 | 0.1 U | 1.8 | 0.1 U | 300 | 880 | 1 U | 1 U | 500 | 170 | 40 |
| WC-38 | 6/24/2002 | | 1.1 | 0.049 | 0.041 | 0.1 U | 0.1 U | 2.1 | 0.1 U | 310 | 800 | 10 | 1 U | 230 | 40 | 20 |
| *EXIT POINT* | | | | | | | | | | | | | | | | |
| DT-30 | 5/28/2002 | | 3.4 | 0.45 | 0.42 | 0.32 | 0.1 U | 4.3 | 1.3 | 250 | 630 | 94 | 2.1 | 240000 | 50000 | 5000 |
| DT-30 | 5/28/2002 | K | 4 | 0.43 | 0.43 | 0.24 | 0.1 U | 4.8 | 1.2 | 250 | 610 | 79 | 2 | 170000 | 170000 | 1300 |

# Huntington Beach
## Dry Weather Monitoring
## Nutrients, General Minerals, Bacterial and Miscellaneous Analyses

| Sample Location | Sample Date | Sample Type | Phosphorus Total | Phosphorus Dissolved | Dissolved Orthophosphate | Nitrate (as N) | Nitrite (as N) | TKN | Ammonia (as N) | Hardness (as CaCO3) | TDS | TSS | TRPH | Total Coliform | Fecal Coliform | Entero-ccoci |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DT-30 | 6/25/2002 | | 4.6 | 0.94 | 0.71 | 0.1 U | 0.1 U | 5.6 | 0.56 | 260 | 710 | 39 | 15 | 1600000 + | 130000 | 220 |
| DT-30 | 6/25/2002 | K | 4.7 | 0.96 | 0.72 | 0.1 U | 0.1 U | 4.9 | 0.5 | 250 | 700 | 37 | 1 U | 1600000 + | 13000 | 800 |
| DT-31 | 5/28/2002 | | 3 | 0.56 | 0.56 | 0.88 | 0.1 U | 1.7 | 0.1 U | 200 | 670 | 1 U | 1 U | 2300 | 500 | 800 |
| DT-31 | 6/25/2002 | | 4.9 | 0.53 | 0.5 | 0.75 | 0.1 U | 1.8 | 0.1 U | 270 | 670 | 11 | 1 U | 7000 | 300 | 260 |
| PD-39 | 6/26/2002 | | 0.17 | 0.03 U | 0.03 U | 24 | 3.5 | 2.8 | 0.9 | 2600 | 14000 | 7.6 | 1 U | 70 | 40 | 80 |
| SC-07 | 5/22/2002 | | 0.19 | 0.072 | 0.053 | 0.2 U | 0.2 U | 1.7 | 0.1 U | 490 | 2200 | 2.8 | 1 U | 13000 | 8000 | 20 U |
| SC-07 | 6/27/2002 | | 1.2 | 0.03 U | 0.03 U | 0.1 U | 0.1 U | 1.5 | 0.45 | 2100 | 12000 | 3.8 | 1 U | 20 U | 20 U | 20 U |
| SP-34 | 6/26/2002 | | 3.5 | 0.33 | 0.31 | 0.69 | 0.1 U | 3.6 | 0.34 | 280 | 720 | 70 | 1 U | 28000 | 5000 | 13000 |
| *LAKE* | | | | | | | | | | | | | | | | |
| HL-36 | 5/24/2002 | | 0.087 | 0.03 U | 0.03 U | 0.28 | 0.1 U | 0.84 | 0.1 U | 690 | 1600 | 1 | 1 U | 20 | 20 U | 20 U |
| HL-36 | 6/25/2002 | | 0.36 | 0.03 U | 0.03 U | 0.1 U | 0.1 U | 1.8 | 0.34 | 670 | 1800 | 19 | 1 U | 300 | 230 | 110 |
| SM-35 | 5/28/2002 | | 0.053 | 0.049 | 0.03 U | 0.11 | 0.1 U | 1.3 | 0.1 U | 130 | 370 | 1 U | 1 U | 20 | 20 | 20 U |
| SM-35 | 6/25/2002 | | 1.2 | 0.03 U | 0.03 U | 0.1 U | 0.1 U | 1.1 | 0.1 U | 120 | 380 | 1 U | 1 U | 20 U | 20 U | 20 |
| *OUTFALL* | | | | | | | | | | | | | | | | |
| SC-04 | 5/23/2002 | | 2.3 | 0.33 | 0.31 | 0.76 | 0.1 U | 2.9 | 0.1 U | 220 | 1700 | 3.5 | 1 U | 23000 | 23000 | 300 |
| SC-05 | 5/23/2002 | | 0.63 | 0.22 | 0.18 | 1.3 | 0.1 U | 0.56 | 0.1 U | 650 | 1500 | 1 U | 1 U | 13000 | 1400 | 500 |
| SC-06 | 5/23/2002 | | 0.58 | 0.51 | 0.48 | 0.71 | 0.1 U | 3.6 | 0.1 U | 410 | 820 | 1 U | 1 U | 50000 | 700 | 3000 |
| WC-12 | 5/29/2002 | | 0.19 | 0.076 | 0.068 | 1.1 | 1 U | 1.1 | 0.1 U | 2000 | 8700 | 1 U | 1 U | 20 U | 20 U | 130 |
| *PUMP STATION* | | | | | | | | | | | | | | | | |
| PS-09 | 5/23/2002 | | 0.42 | 0.091 | 0.062 | 0.11 | 0.1 U | 4.6 | 2.5 | 970 | 1200 | 10 | 1 U | 80000 | 900 | 500 |
| PS-11 | 5/23/2002 | | 0.46 | 0.087 | 0.087 | 0.13 | 0.1 U | 2.9 | 1.8 | 480 | 1200 | 5.8 | 1 U | 5000 | 230 | 40 |

# Huntington Beach
## Dry Weather Monitoring
## Nutrients, General Minerals, Bacterial and Miscellaneous Analyses

| Sample Location | Sample Date | Sample Type | Phosphorus Total | Phosphorus Dissolved | Dissolved Orthophosphate | Nitrate (as N) | Nitrite (as N) | TKN | Ammonia (as N) | Hardness (as CaCO3) | TDS | TSS | TRPH | Total Coliform | Fecal Coliform | Entero-ccoci |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS-13 | 5/23/2002 | | 0.24 | 0.073 | 0.044 | 1.2 | 0.1 U | 4.2 | 1.1 | 830 | 1600 | 7.4 | 1 U | 240000 | 23000 | 1700 |
| PS-16 | 5/23/2002 | | 0.19 | 0.047 | 0.031 | 0.54 | 0.5 U | 3.9 | 0.1 U | 1200 | 6200 | 38 | 1 U | 7000 | 230 | 230 |
| PS-18 | 5/28/2002 | | 2.8 | 0.29 | 0.29 | 0.71 | 0.2 U | 2.8 | 0.56 | 850 | 2300 | 7.5 | 1 U | 13000 | 230 | 500 |
| PS-19 | 5/23/2002 | | 0.44 | 0.18 | 0.17 | 1 U | 1 U | 1.1 | 1.1 | 5000 | 24000 | 3 | 1 U | 170 | 230 | 80 |
| PS-20 | 5/23/2002 | | 0.58 | 0.21 | 0.2 | 1.2 | 1 U | 3.2 | 2.7 | 2600 | 11000 | 3.8 | 1 U | 3000 | 3000 | 5000 |
| PS-23 | 5/23/2002 | | 0.62 | 0.33 | 0.3 | 2.6 | 0.2 U | 2.5 | 0.9 | 980 | 3200 | 6.5 | 1 U | 110000 | 300000 | 2300 |
| PS-24 | 5/23/2002 | | 0.69 | 0.41 | 0.37 | 1.8 | 0.5 U | 2.7 | 0.45 | 1900 | 7100 | 3.8 | 1 U | 110000 | 300000 | 2300 |
| PS-25 | 5/23/2002 | | 0.54 | 0.28 | 0.28 | 10 U | 10 U | 3.1 | 0.78 | 5100 | 26000 | 2.5 | 1 U | 20 U | 20 U | 20 U |
| PS-27 | 5/23/2002 | | 0.48 | 0.2 | 0.19 | 2.5 | 0.1 U | 2.4 | 0.9 | 740 | 1500 | 1 | 1 U | 13000 | 23000 | 800 |
| PS-28 | 5/23/2002 | | 0.67 | 0.62 | 0.61 | 12 | 0.2 U | 3.4 | 1 | 600 | 2000 | 1.9 | 1 U | 5000 | 5000 | 800 |
| PS-29 | 5/23/2002 | | 0.4 | 0.35 | 0.3 | 1 U | 1 U | 2.9 | 2 | 2500 | 12000 | 61 | 1 U | 130000 | 130000 | 130000 |
| PS-33 | 5/24/2002 | | 0.6 | 0.34 | 0.28 | 1.4 | 0.5 U | 1.7 | 2 | 2000 | 8900 | 79 | 1 U | 80 | 20 U | 230 |
| PS-37 | 5/22/2002 | | 0.42 | 0.18 | 0.17 | 3.5 | 1 U | 0.1 U | 0.1 U | 2800 | 12000 | 6.4 | 1 U | 2200 | 300 | 40 |

***Notes:***
TKN = Total Kjeldahl Nitrogen; TDS - Total dissolved solids; TSS = Total suspended solids; TRPH = Total recoverable petroleum hydrocarbons

All concentrations are reported in mlligrams per liter (mg/L), except for coliform and enterococci, which are in MPN/100 mL.
U = Not detected at a concentration greater than the reporting limit shown.

Sample Type:
K = Split (Duplicate) sample

# Table 3-3

## Huntington Beach
## Dry Weather Monitoring
## Total and Dissolved Metals

# Huntington Beach
# Dry Weather Monitoring
# Total and Dissolved Metals

| Sample Location | Sample Date | Sample Type | Arsenic | | Cadmium | | Chromium | | Copper | | Iron | | Lead | | Nickel | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved |
| *ENTRY POINT* | | | | | | | | | | | | | | | | | | |
| AB-01 | 5/22/2002 | | 1.89 | 1.84 | 0.2 U | 0.2 U | 1.6 | 1.33 | 4.01 | 1.34 | 85 | 56.7 | 1 U | 1.35 | 4.16 | 3.73 | 21.3 | 18.7 |
| AB-01 | 6/24/2002 | | 3.93 | 4.2 | 0.2 U | 0.2 U | 1 U | 1 U | 16.1 | 5.12 | 42.9 | 25 U | 1 U | 1 U | 3.2 | 2.77 | 25.7 | 9.68 |
| BC-02 | 5/22/2002 | | 2.56 | 2.25 | 0.2 U | 0.2 U | 1.33 | 1 U | 3.52 | 3.61 | 352 | 55.1 | 1.15 | 1 U | 7.24 | 5.8 | 37.9 | 9.89 |
| BC-02 | 6/24/2002 | | 4.7 | 5.36 | 0.2 U | 0.2 U | 1 U | 1 U | 4.74 | 3.46 | 164 | 25 U | 1 U | 1 U | 2.89 | 2.59 | 6.19 | 5 U |
| BC-02 | 6/24/2002 | K | 4.37 | 5.11 | 0.2 U | 0.2 U | 1.31 | 1 U | 5.12 | 4.05 | 157 | 25 U | 1 U | 1 U | 3.04 | 2.87 | 5.94 | 5.6 |
| BC-40 | 6/27/2002 | | 8.01 | 7.73 | 0.206 | 0.287 | 2.73 | 1.31 | 17.7 | 13.9 | 1640 | 59.9 U | 1 U | 1 U | 6.27 | 6.74 | 14.5 | 13.3 |
| FV-26 | 5/24/2002 | | 5.21 | 5.7 | 0.2 U | 0.2 U | 1 U | 1 U | 1 U | 1 U | 111 | 25.4 | 1 U | 1 U | 2.93 | 3.1 | 16 | 5.94 |
| FV-26 | 6/25/2002 | | 7.54 | 5.8 | 0.2 U | 0.2 U | 1 U | 1.11 | 6.23 | 2.28 | 278 | 43.3 | 1 U | 1 U | 6.1 | 5.19 | 7.32 | 25.1 |
| OV-17 | 5/22/2002 | | 3.48 | 3.38 | 0.217 | 0.2 U | 1.04 | 1 U | 6.12 | 3.59 | 188 | 61.6 | 1 U | 1 U | 5.23 | 5.1 | 20.4 | 12.6 |
| OV-17 | 6/24/2002 | | 4.19 | 3.98 | 0.2 U | 0.2 U | 1.22 | 1 U | 18.2 | 6.58 | 334 | 28.4 | 2.36 | 1 U | 6.21 | 5.97 | 24.2 | 21 |
| SC-03 | 5/22/2002 | | 2.09 | 2.01 | 0.2 U | 0.2 U | 1.27 | 1.4 | 1 U | 1 U | 155 | 68.9 | 1 U | 1 U | 3.58 | 2.68 | 34.2 | 16.3 |
| SC-03 | 5/22/2002 | K | 0.833 | 0.992 | 0.2 U | 0.2 U | 1.51 | 1.66 | 1 U | 1 U | 178 | 93.9 | 1 U | 1 U | 3.69 | 3.63 | 22 | 21.9 |
| SC-03 | 6/24/2002 | | 4.71 | 5 | 0.2 U | 0.2 U | 1.06 | 1 U | 4.5 | 3.26 | 141 | 34.4 | 1 U | 1 U | 2.99 | 2.74 | 14.5 | 10.6 |
| TC-21 | 6/25/2002 | | 6.56 | 4.45 | 0.2 U | 0.2 U | 1 U | 1 U | 18.3 | 10.9 | 123 | 37.3 | 1 U | 1 U | 7.41 | 5.47 | 10.9 | 20.1 |
| WC-08 | 5/22/2002 | | 3.37 | 1.95 | 0.2 U | 0.2 U | 1.17 | 1 U | 1 U | 1 U | 557 | 210 | 1 U | 1 U | 5.24 | 4.15 | 15.2 | 13.5 |
| WC-08 | 6/24/2002 | | 3.6 | 3.26 | 0.2 U | 0.2 U | 1 U | 1 U | 9.69 | 1.32 | 398 | 161 | 1.02 | 1 U | 4.21 | 3.95 | 16.5 | 6.75 |
| WC-38 | 5/28/2002 | | 1.92 | 2.02 | 0.2 U | 0.2 U | 1.26 | 1.43 | 1.41 | 1 U | 125 | 58.7 | 1 U | 1 U | 4 | 2.72 | 15.1 | 10.4 |
| WC-38 | 6/24/2002 | | 3.89 | 4.48 | 0.2 U | 0.2 U | 1 U | 1 U | 20.5 | 1.63 | 311 | 82.4 | 1 U | 1 U | 4.61 | 3.98 | 23.2 | 5.02 |
| *EXIT POINT* | | | | | | | | | | | | | | | | | | |
| DT-30 | 5/28/2002 | | 3.03 | 0.5 U | 0.376 | 0.212 | 3.17 | 1.48 | 53.1 | 8.19 | 2330 | 653 | 7.9 | 3.35 | 9.82 | 7.06 | 163 | 99.6 |
| DT-30 | 5/28/2002 | K | 2.18 | 0.774 | 0.45 | 0.214 | 3.28 | 1.94 | 50.2 | 8.55 | 2310 | 665 | 8.29 | 3.35 | 9.67 | 7.38 | 187 | 98.4 |

# Huntington Beach
# Dry Weather Monitoring
# Total and Dissolved Metals

| Sample Location | Sample Date | Sample Type | Arsenic | | Cadmium | | Chromium | | Copper | | Iron | | Lead | | Nickel | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved |
| DT-30 | 6/25/2002 | | 1.1 | 2.32 | 0.497 | 0.2 U | 3.4 | 1.11 | 39.4 | 16.4 | 1590 | 535 | 4.03 | 1.12 | 6.78 | 5.97 | 96.2 | 72.5 |
| DT-30 | 6/25/2002 | K | 2.06 | 2.11 | 0.437 | 0.226 | 3.01 | 1.17 | 38.7 | 16.6 | 1620 | 629 | 4.06 | 1.17 | 7.11 | 5.66 | 101 | 83.5 |
| DT-31 | 5/28/2002 | | 4.77 | 1.73 | 0.2 U | 0.2 U | 1.11 | 1.17 | 4.95 | 2.49 | 146 | 67.9 | 1.18 | 1 U | 3.17 | 2.61 | 34.8 | 19.2 |
| DT-31 | 6/25/2002 | | 4.75 | 3.57 | 0.2 U | 0.2 U | 3.88 | 3.1 | 21.4 | 12.4 | 520 | 71.8 U | 2.05 | 1 U | 8.05 | 7.37 | 40.6 | 37.9 |
| PD-39 | 6/26/2002 | | 18.5 | 17.7 | 0.638 | 0.51 | 1.9 | 1.36 | 41.9 | 34.4 | 137 | 31.2 | 1 U | 1 U | 16.2 | 15.2 | 8.34 | 8.62 |
| SC-07 | 5/22/2002 | | 4.88 | 3.98 | 0.2 U | 0.2 U | 1.13 | 1 U | 7 | 4.61 | 225 | 65.9 | 2.1 | 1 U | 4.84 | 4.1 | 10.8 | 9.83 |
| SC-07 | 6/27/2002 | | 11.8 | 10.8 | 0.2 U | 0.28 | 2.01 | 1 U | 21.6 | 12 | 163 | 25 U | 1 U | 1 U | 4.84 | 4.66 | 14.3 | 8.7 |
| SP-34 | 6/26/2002 | | 5.34 | 3.77 | 0.203 | 0.2 U | 3.08 | 1 U | 26.8 | 23.4 | 1420 | 40.8 | 2.44 | 1 U | 7.72 | 5.78 | 37.2 | 17.1 |
| *LAKE* | | | | | | | | | | | | | | | | | | |
| HL-36 | 5/24/2002 | | 5.74 | 4.76 | 0.2 U | 0.2 U | 1.49 | 1 U | 3.64 | 1 U | 206 | 64.9 | 1 U | 1 U | 4.39 | 2.73 | 22.1 | 21.5 |
| HL-36 | 6/25/2002 | | 9.79 | 9.5 | 0.2 U | 0.2 U | 1 U | 1 U | 2.2 | 1.41 | 580 | 25 U | 1.52 | 1 U | 4.54 | 3.84 | 12.1 | 8.54 |
| SM-35 | 5/28/2002 | | 2.54 | 3.39 | 0.2 U | 0.2 U | 1.66 | 1.18 | 1 U | 1 U | 226 | 29 | 1 U | 1 U | 2.78 | 2.03 | 26 | 8.45 |
| SM-35 | 6/25/2002 | | 3.57 | 4.96 | 0.2 U | 0.2 U | 2.05 | 1 U | 1.1 | 1 U | 63.1 | 35.3 | 1 U | 1 U | 2.59 | 2.05 | 5 U | 5 U |
| *OUTFALL* | | | | | | | | | | | | | | | | | | |
| SC-04 | 5/23/2002 | | 0.848 | 1.77 | 0.2 U | 0.2 U | 1.38 | 1.5 | 2.65 | 1.52 | 118 | 54.9 | 1.8 | 1.3 | 3.13 | 2.72 | 27.6 | 20.2 |
| SC-05 | 5/23/2002 | | 0.5 U | 1.23 | 0.2 U | 0.2 U | 1 U | 1 U | 1 U | 1 U | 51.7 | 35.8 | 1 U | 1 U | 3.5 | 3.01 | 13.1 | 14.6 |
| SC-06 | 5/23/2002 | | 1.04 | 1.36 | 0.2 U | 0.2 U | 1 U | 1 U | 6.04 | 2.88 | 161 | 67.2 | 1.37 | 1 U | 3.88 | 3.07 | 81.1 | 40.2 |
| WC-12 | 5/29/2002 | | 8.93 | 7 | 0.434 | 0.405 | 1 U | 1.52 | 9.94 | 9.26 | 471 | 128 | 1 U | 1 U | 6.67 | 4.47 | 12.5 | 13.5 |
| *PUMP STATION* | | | | | | | | | | | | | | | | | | |
| PS-09 | 5/23/2002 | | 1.03 | 0.5 U | 0.358 | 0.2 U | 3.43 | 1 U | 22 | 1 U | 6600 | 323 | 15.1 | 1 U | 10.3 | 5.97 | 89.7 | 66.8 |
| PS-11 | 5/23/2002 | | 2.21 | 2.12 | 0.2 U | 0.2 U | 1 U | 1 U | 1 U | 1 U | 3280 | 265 | 1 U | 1 U | 3.28 | 3.74 | 10.5 | 23.4 |

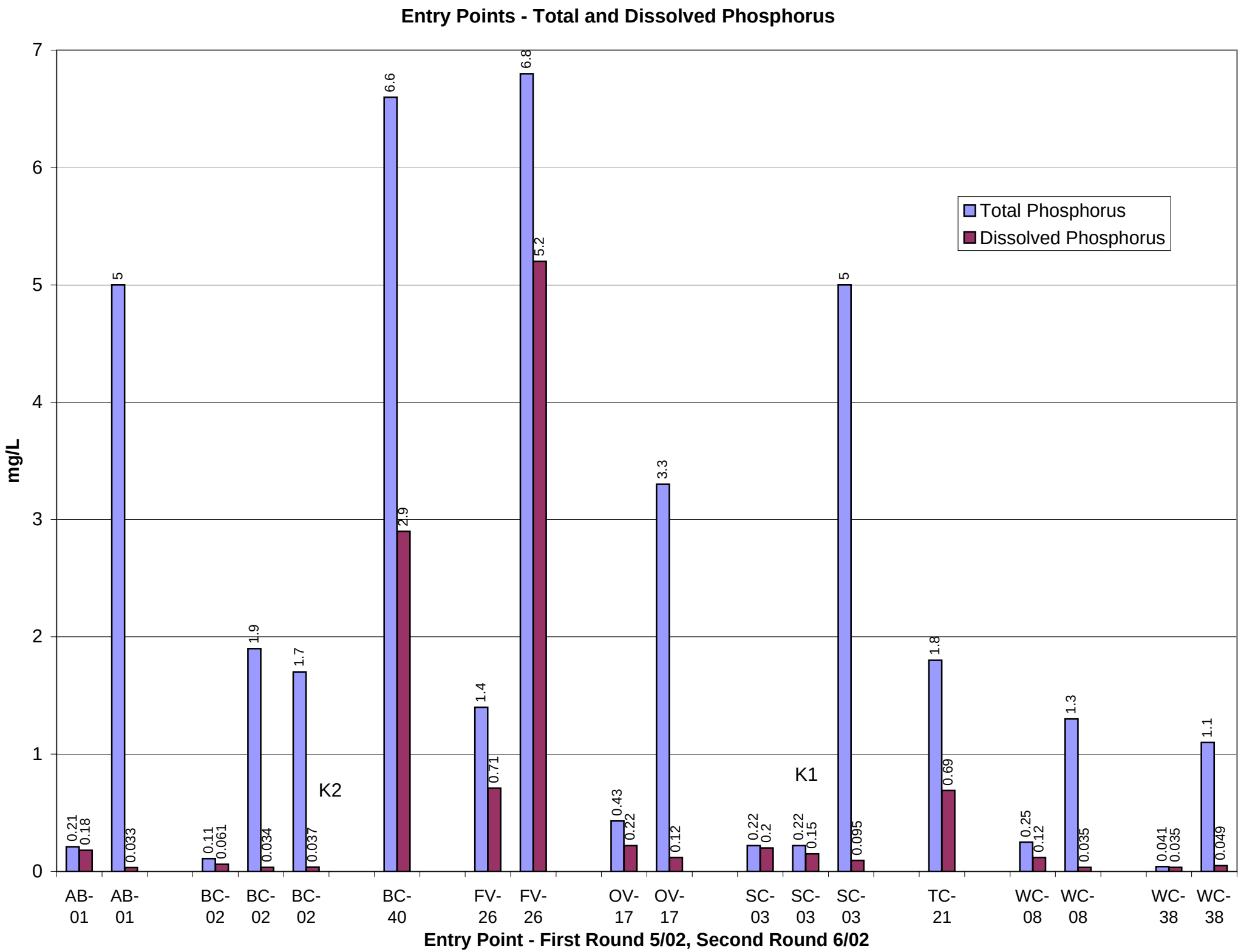
# Huntington Beach
# Dry Weather Monitoring
# Total and Dissolved Metals

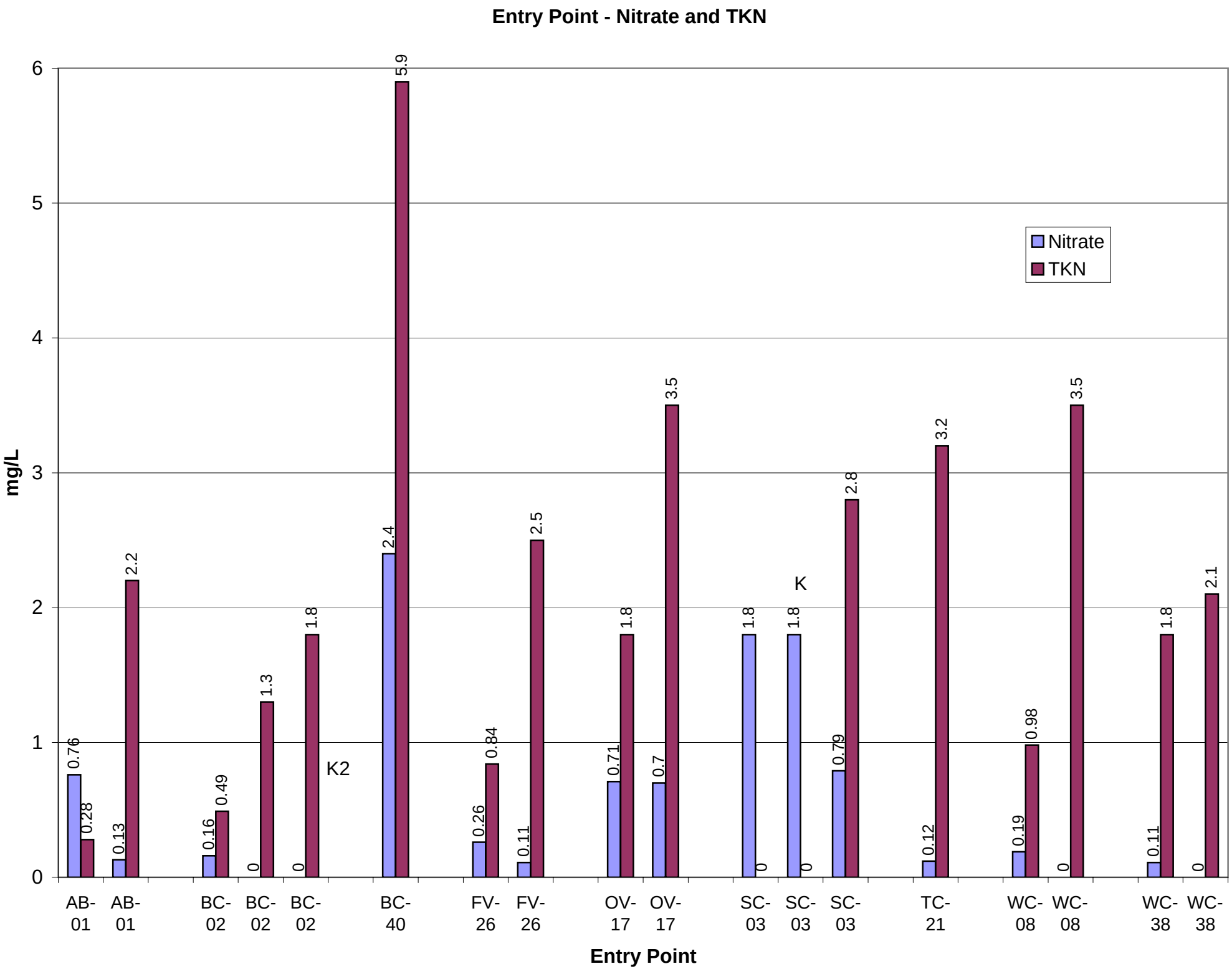
| Sample Location | Sample Date | Sample Type | Arsenic | | Cadmium | | Chromium | | Copper | | Iron | | Lead | | Nickel | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved | Total | Dissolved |
| PS-13 | 5/23/2002 | | 0.5 U | 0.88 | 0.2 U | 0.2 U | 1.28 | 1 U | 1.93 | 1 U | 2600 | 115 | 1.65 | 1 U | 6.39 | 4.87 | 61.8 | 49.3 |
| PS-16 | 5/23/2002 | | 2.89 | 3.59 | 0.2 U | 0.2 U | 1.26 | 1 U | 7.78 | 4.29 | 226 | 80.2 | 1 U | 1 U | 4.16 | 2.69 | 12.9 | 5 U |
| PS-18 | 5/28/2002 | | 5.53 | 3.83 | 0.228 | 0.2 U | 1.37 | 1.4 | 2.27 | 1 U | 525 | 155 | 1 U | 1 U | 5.31 | 4.44 | 27.2 | 21 |
| PS-19 | 5/23/2002 | | 4.9 | 0.5 U | 1.16 | 0.411 | 1.09 | 1 U | 20.6 | 5.99 | 844 | 68.3 | 1.16 | 1 U | 5.8 | 4.84 | 8.7 | 8.08 |
| PS-20 | 5/23/2002 | | 9.61 | 9.88 | 0.33 | 0.287 | 1 U | 1.52 | 6.45 | 4.27 | 1540 | 91.2 | 1 U | 1 U | 4.48 | 4.03 | 12 | 19.7 |
| PS-23 | 5/23/2002 | | 2.61 | 3.03 | 0.2 U | 0.2 U | 1.28 | 1 U | 3.77 | 1 U | 845 | 104 | 1.69 | 1 U | 5.34 | 3.04 | 38 | 16.5 |
| PS-24 | 5/23/2002 | | 4.16 | 4.96 | 0.382 | 0.2 U | 1.1 | 1.34 | 9.78 | 5.07 | 478 | 56.4 | 1 U | 1 U | 4.69 | 3.84 | 19.9 | 15.9 |
| PS-25 | 5/23/2002 | | 1.92 | 1.35 | 0.779 | 0.638 | 1 U | 1 U | 19 | 12.7 | 734 | 96 | 1 U | 1 U | 5.4 | 4.33 | 15.5 | 9.83 |
| PS-27 | 5/23/2002 | | 2.46 | 1.82 | 0.2 U | 0.2 U | 1.28 | 1 U | 4.46 | 1.32 | 1120 | 116 | 1.06 | 1 U | 5.51 | 4.84 | 24.6 | 28.5 |
| PS-28 | 5/23/2002 | | 3.03 | 3.92 | 0.2 U | 0.2 U | 1 U | 1.04 | 4.43 | 2.71 | 170 | 31.9 | 1 U | 1 U | 3.94 | 3.65 | 12.8 | 13.4 |
| PS-29 | 5/23/2002 | | 1.89 | 1.25 | 2 | 0.2 U | 2.51 | 1.02 | 21.6 | 2.34 | 2380 | 896 | 13.7 | 1 U | 6.01 | 4.25 | 64.6 | 18.1 |
| PS-33 | 5/24/2002 | | 6.57 | 5.28 | 0.262 | 0.208 | 1.27 | 1.28 | 4.3 | 2.67 | 9410 | 117 | 1 U | 1 U | 6.02 | 3.62 | 10.8 | 8.53 |
| PS-37 | 5/22/2002 | | 7.63 | 6.57 | 0.785 | 0.361 | 1.36 | 1.37 | 10.6 | 2.41 | 84.4 | 38.3 | 1.24 | 1 U | 6.45 | 4.67 | 63.8 | 16.4 |

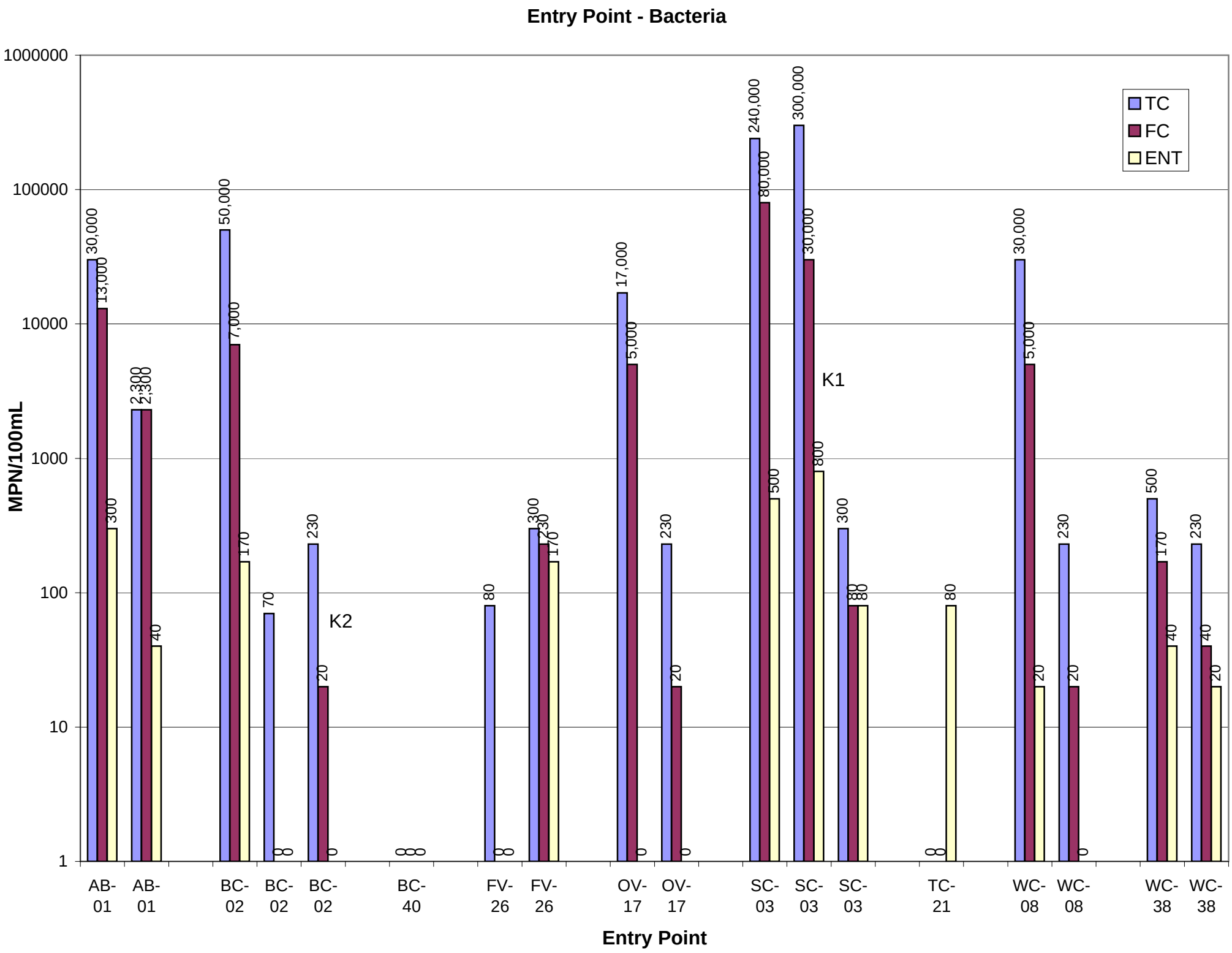
***Notes:***
All metals except iron analyzed by EPA Method 200.8; iron analyzed using EPA Method 6010B.
All concentrations are reported in micrograms per liter (ug/L).
U = Not detected at a concentration greater than the reporting limit shown.
T = Total metals concentration
D = Dissolved metals concentration (filtered sample)

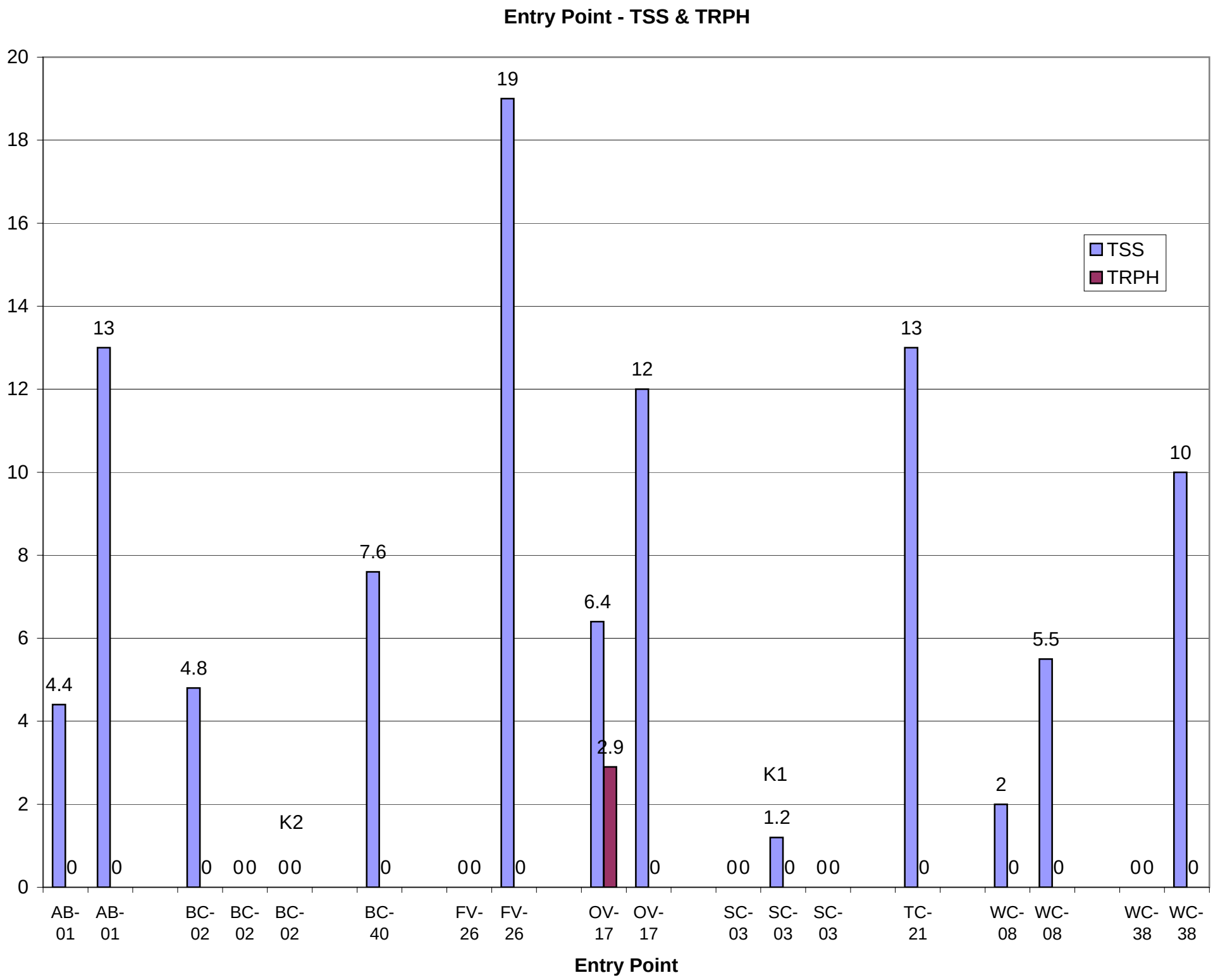
Sample Type:
K = Split (Duplicate) sample

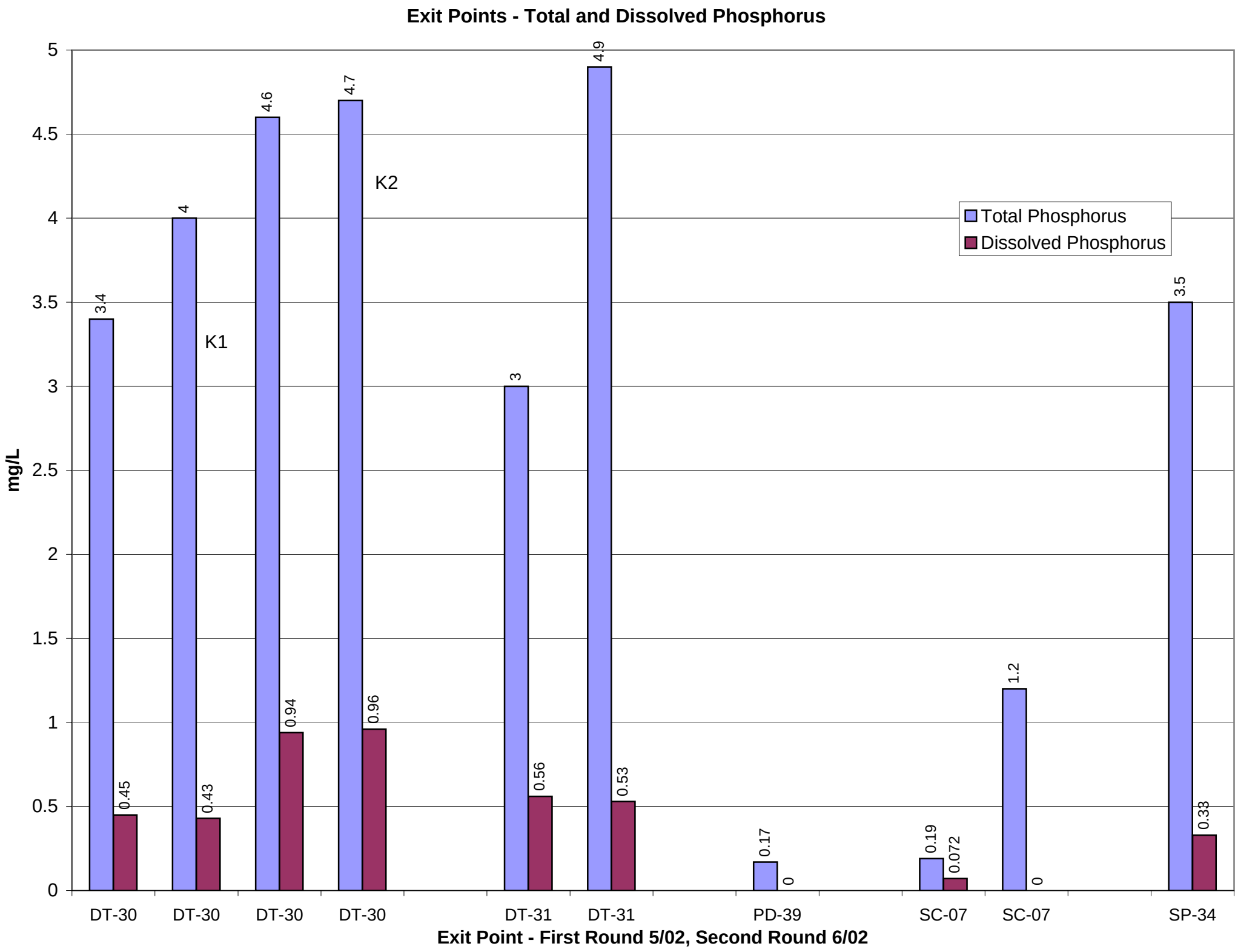
# Graphic Representation of Water Quality Data

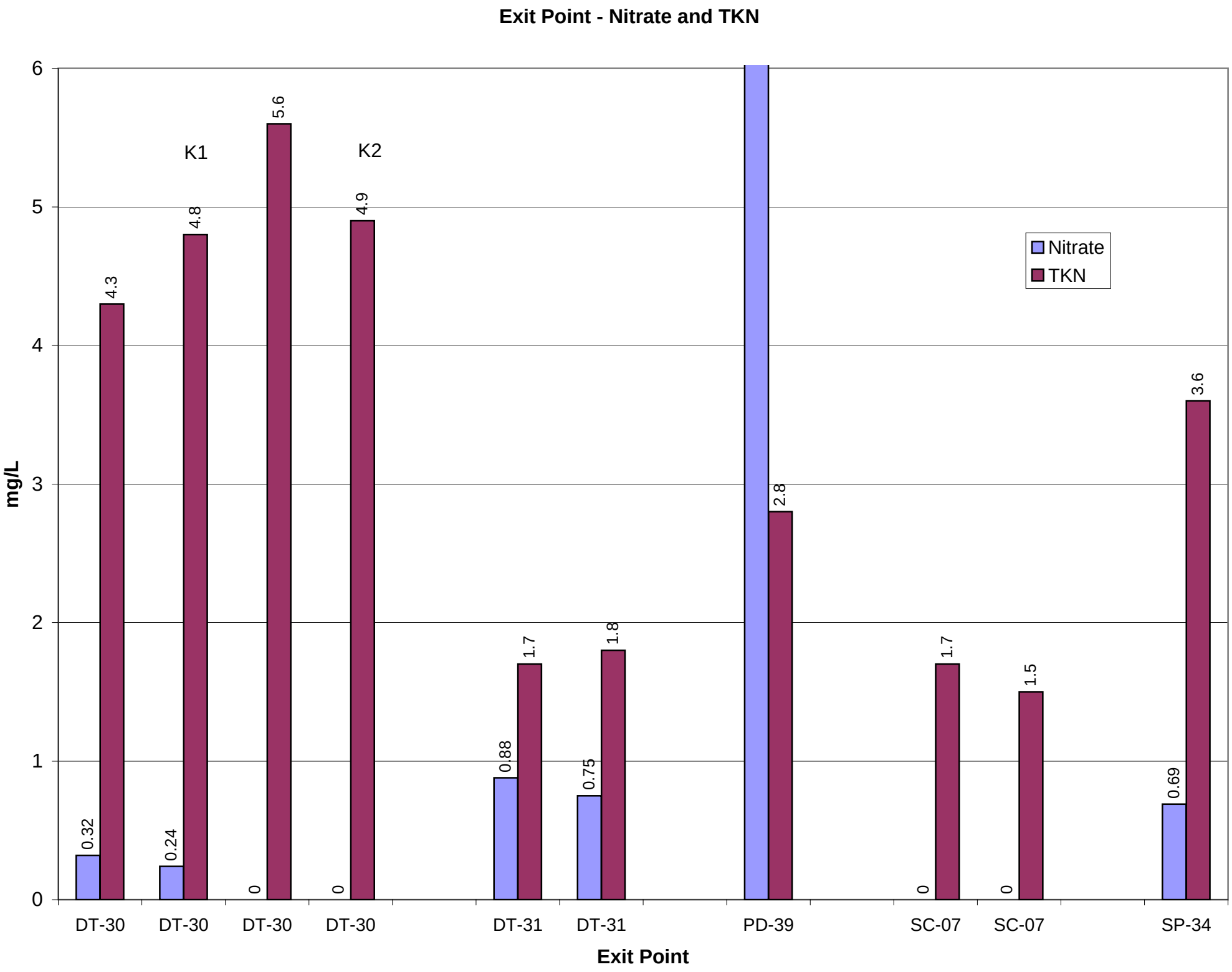

Entry Points - Total and Dissolved Phosphorus
mg/L
0
1
2
3
4
5
6
7
Total Phosphorus
Dissolved Phosphorus
0.21
0.18
5
0.033
0.11
0.061
1.9
0.034
1.7
0.037
K2
6.6
2.9
1.4
0.71
6.8
5.2
0.43
0.22
3.3
0.12
0.22
0.2
0.22
0.15
K1
5
0.095
1.8
0.69
0.25
0.12
1.3
0.035
0.041
0.035
1.1
0.049
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
Entry Point - First Round 5/02, Second Round 6/02

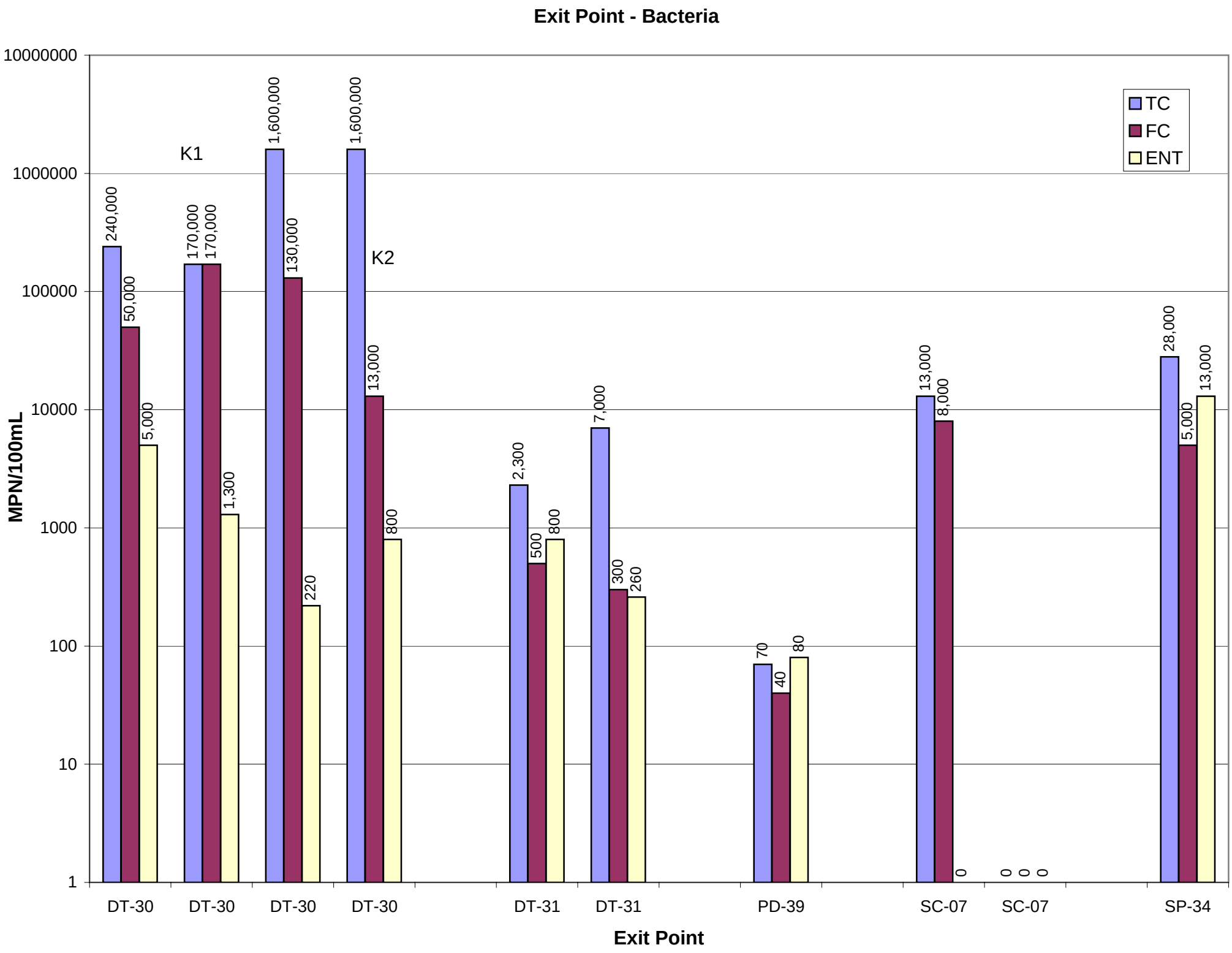

Entry Point - Nitrate and TKN
mg/L
0
1
2
3
4
5
6
Nitrate
TKN
0.76
0.28
0.13
2.2
0.16
0.49
0
1.3
0
1.8
K2
2.4
5.9
0.26
0.84
0.11
2.5
0.71
1.8
0.7
3.5
1.8
0
1.8
0
K
0.79
2.8
0.12
3.2
0.19
0.98
0
3.5
0.11
1.8
0
2.1
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
Entry Point

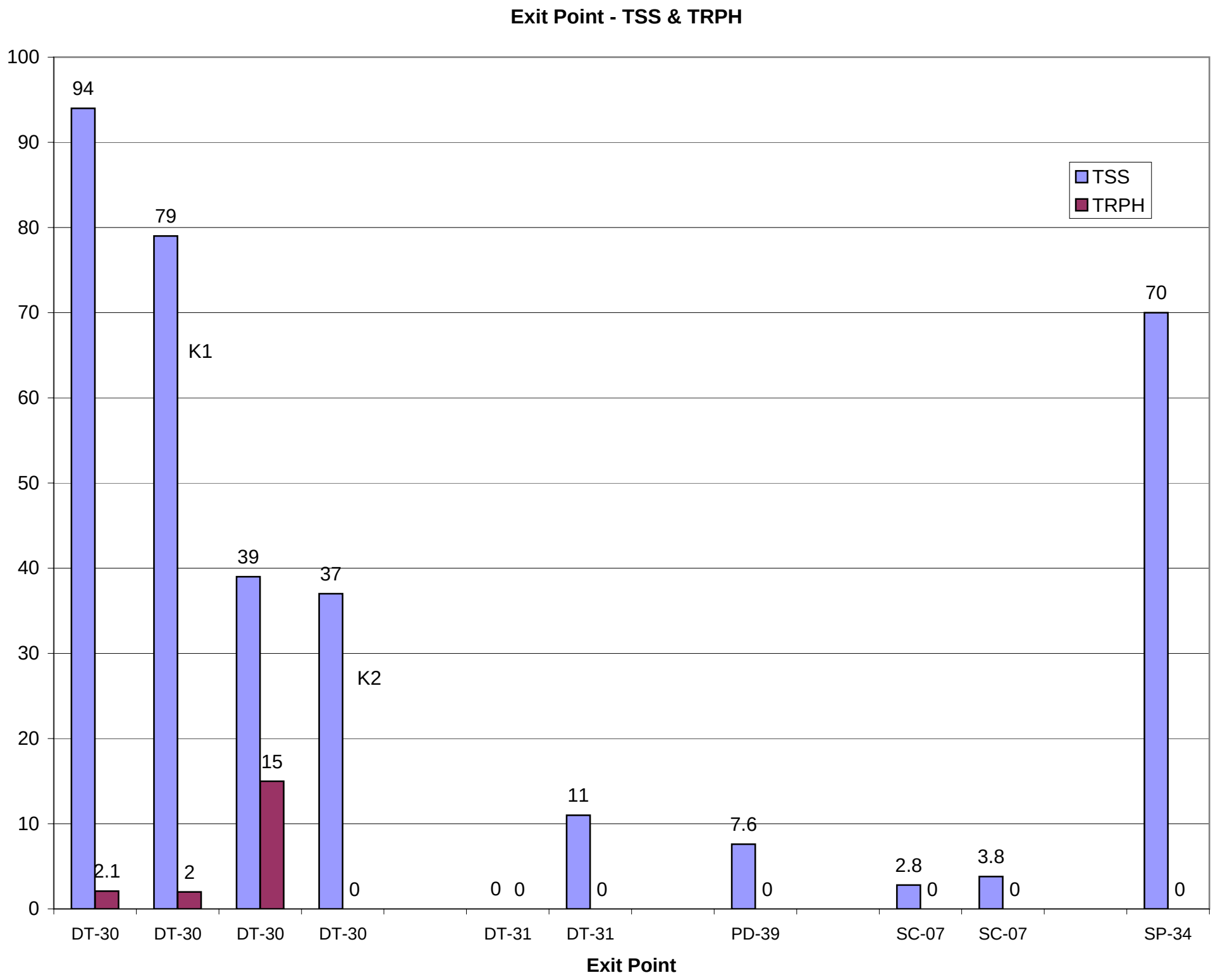

Entry Point - Bacteria
MPN/100mL
1000000
100000
10000
1000
100
10
1
TC
FC
ENT
K1
K2
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
Entry Point

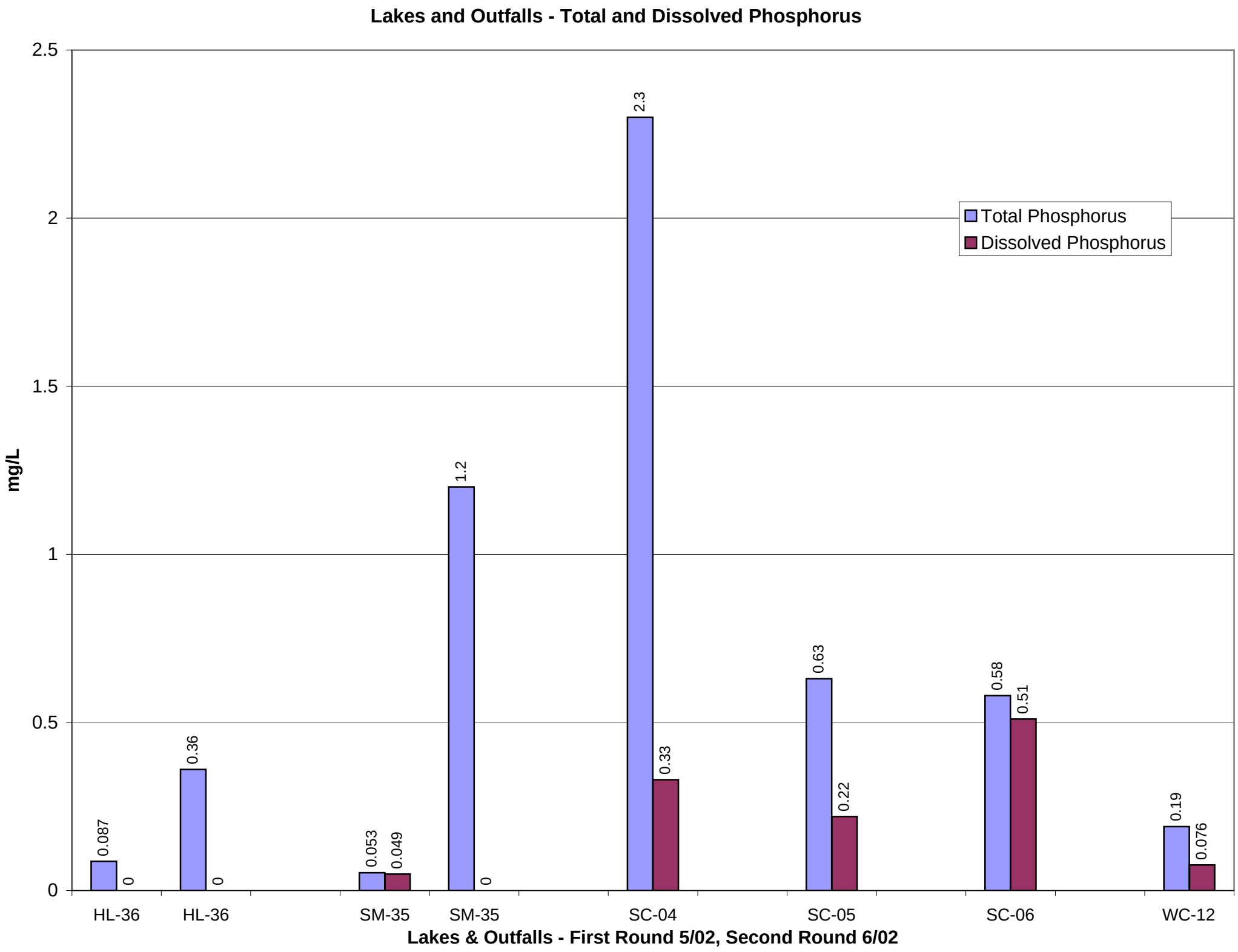

Entry Point - TSS & TRPH
20
18
16
14
12
10
8
6
4
2
0
TSS
TRPH
4.4
0
13
0
4.8
0
0 0
K2
0 0
7.6
0
0 0
19
0
6.4
2.9
12
0
0 0
K1
1.2
0
0 0
13
0
2
0
5.5
0
0 0
10
0
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
Entry Point

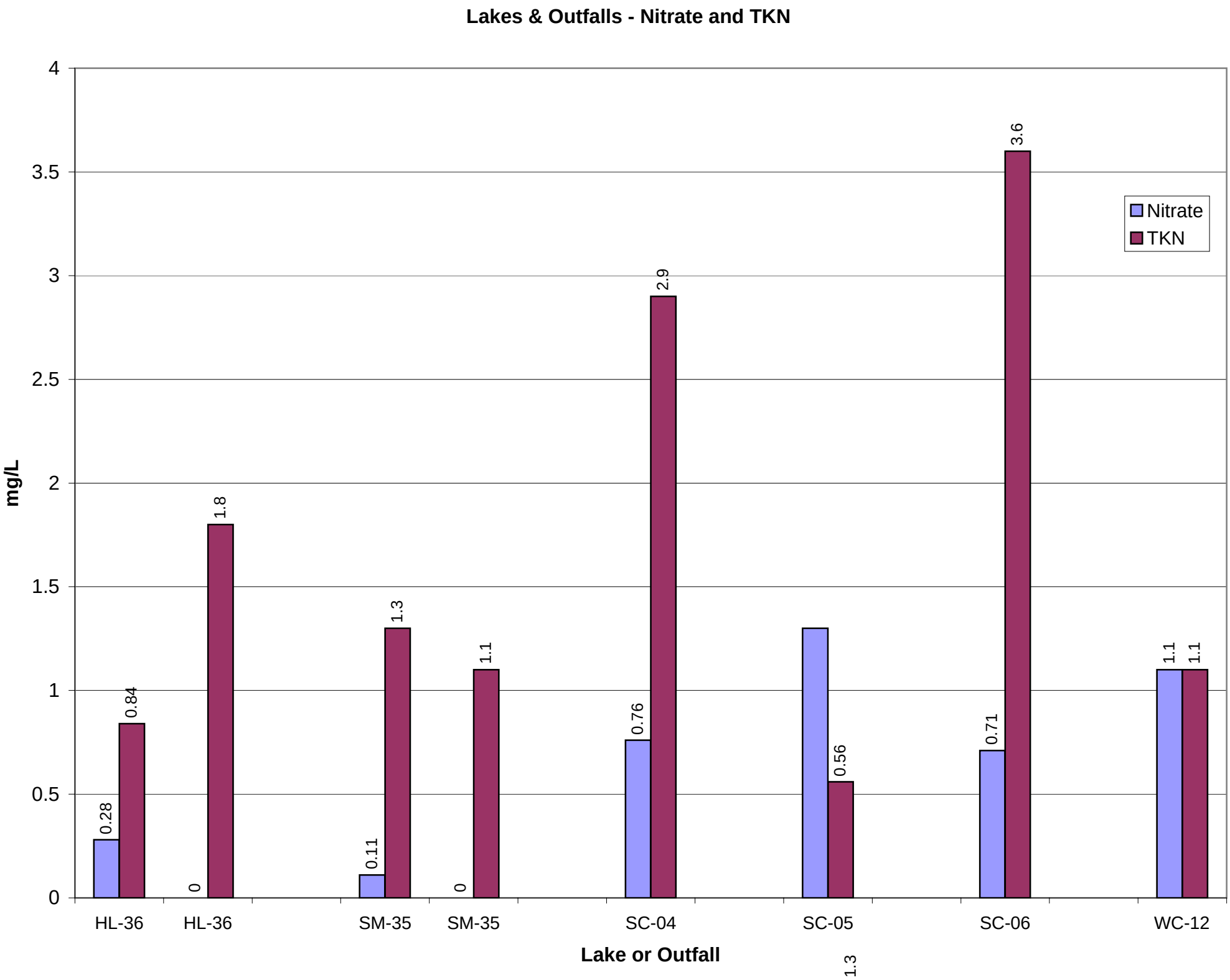

Exit Points - Total and Dissolved Phosphorus
mg/L
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Total Phosphorus
Dissolved Phosphorus
K1
K2
3.4
0.45
4
0.43
4.6
0.94
4.7
0.96
3
0.56
4.9
0.53
0.17
0
0.19
0.072
1.2
0
3.5
0.33
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
Exit Point - First Round 5/02, Second Round 6/02

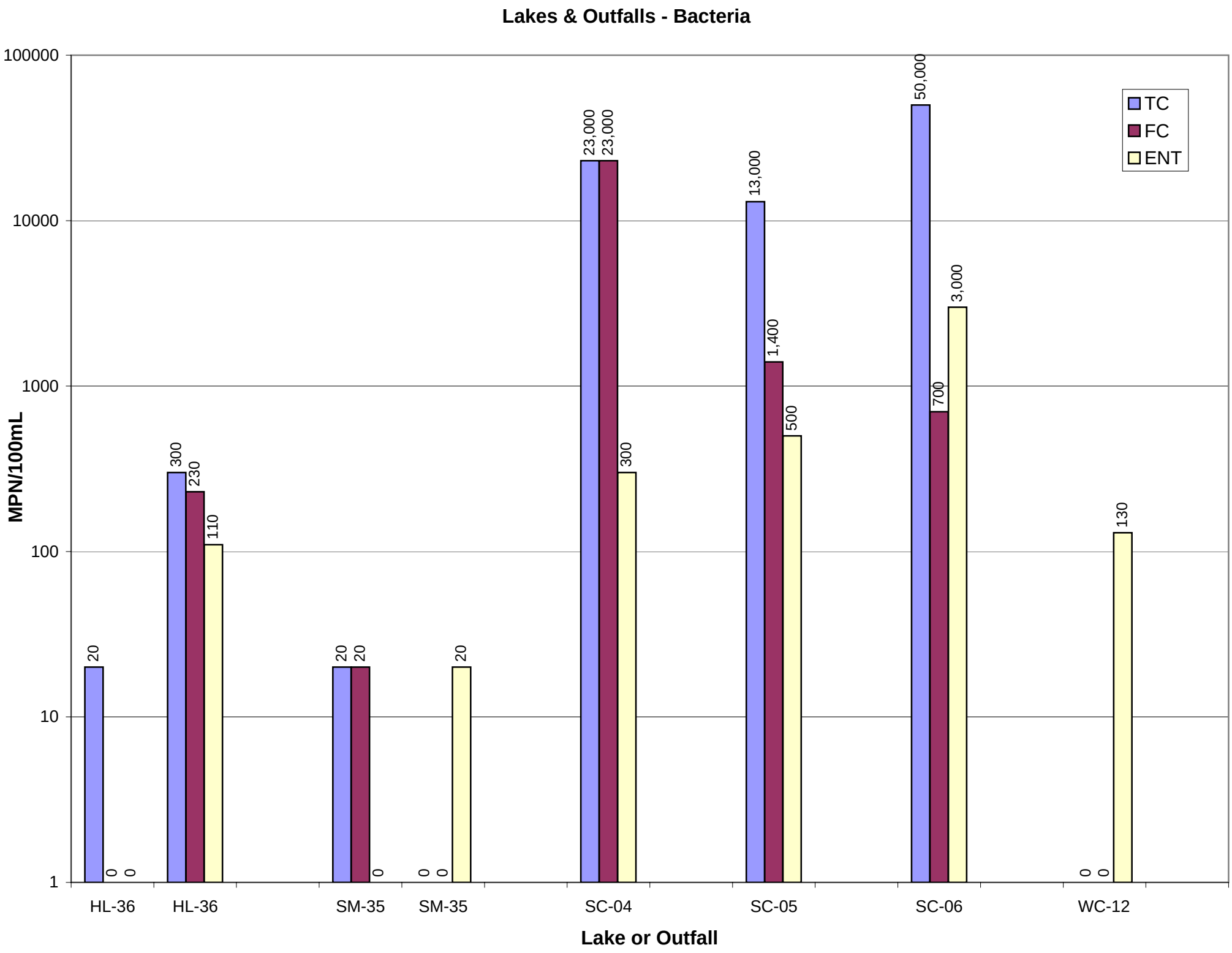

Exit Point - Nitrate and TKN
mg/L
0
1
2
3
4
5
6
K1
K2
0.32
4.3
0.24
4.8
0
5.6
0
4.9
0.88
1.7
0.75
1.8
2.8
0
1.7
0
1.5
0.69
3.6
Nitrate
TKN
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
Exit Point

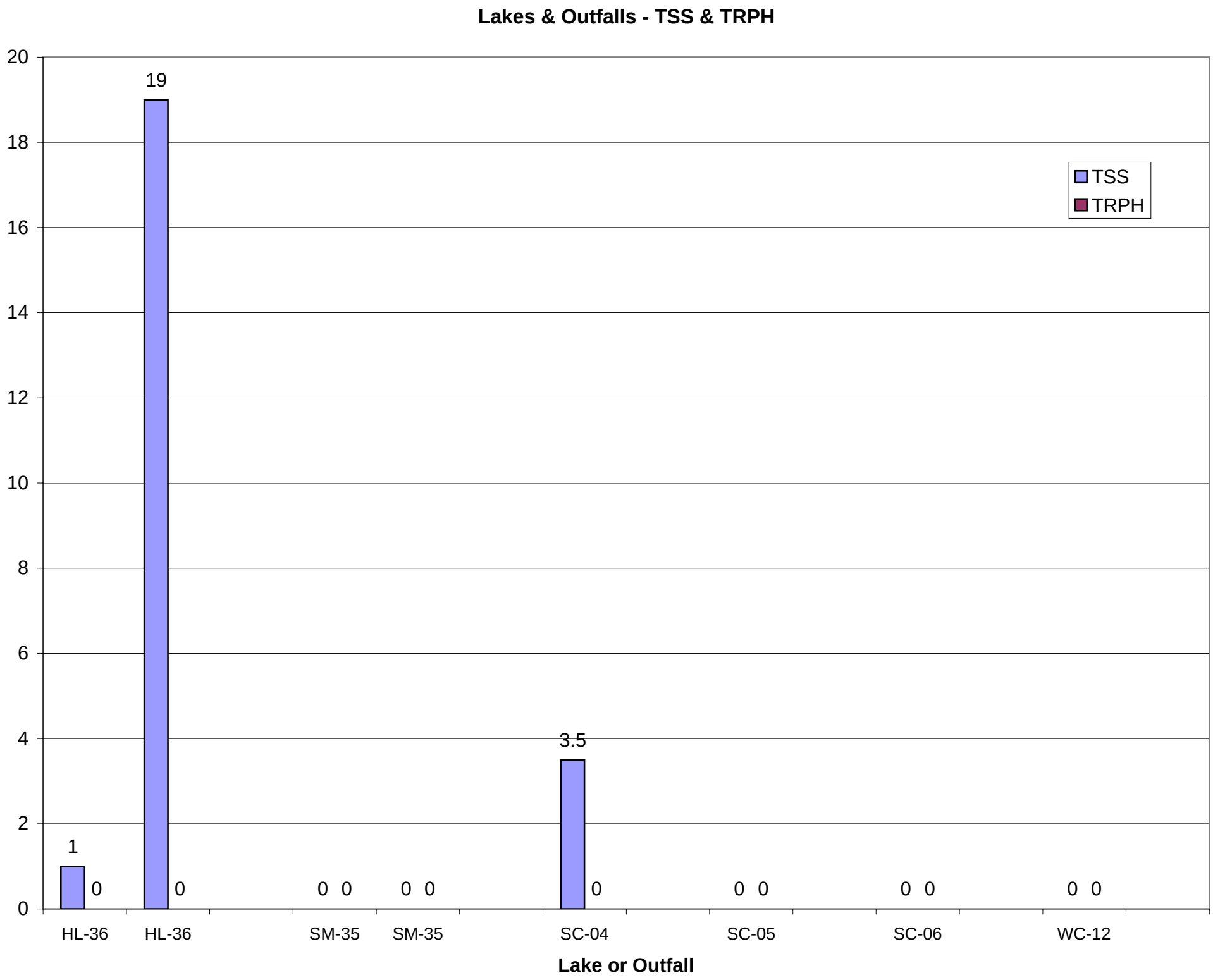

Exit Point - Bacteria
MPN/100mL
10000000
1000000
100000
10000
1000
100
10
1
TC
FC
ENT
K1
K2
240,000
50,000
5,000
170,000
170,000
1,300
1,600,000
130,000
220
1,600,000
13,000
800
2,300
500
800
7,000
300
260
70
40
80
13,000
8,000
0
0
0
0
28,000
5,000
13,000
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
Exit Point

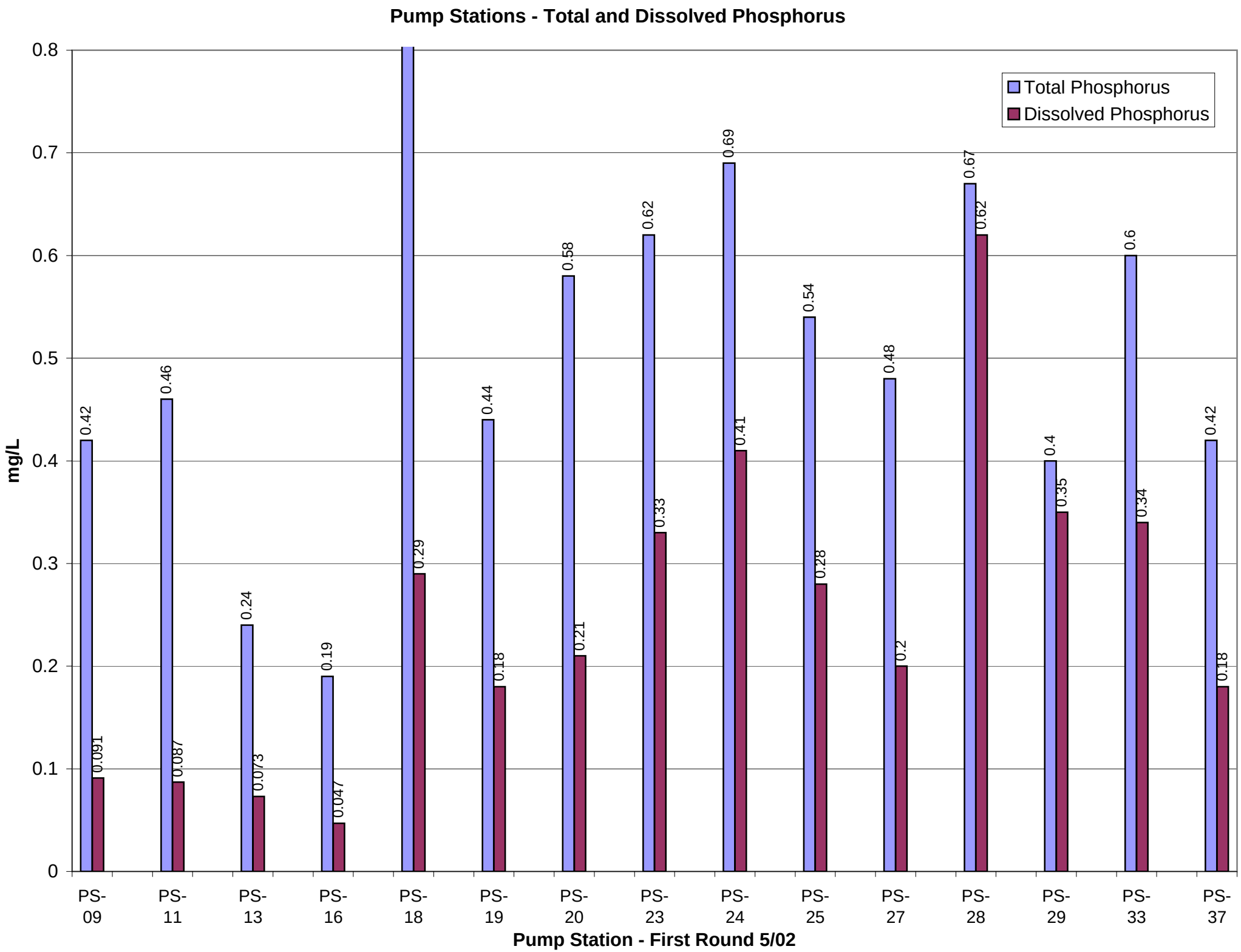

Exit Point - TSS & TRPH
100
90
80
70
60
50
40
30
20
10
0
TSS
TRPH
94
2.1
79
2
K1
39
15
37
0
K2
0
0
11
0
7.6
0
2.8
0
3.8
0
70
0
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
Exit Point

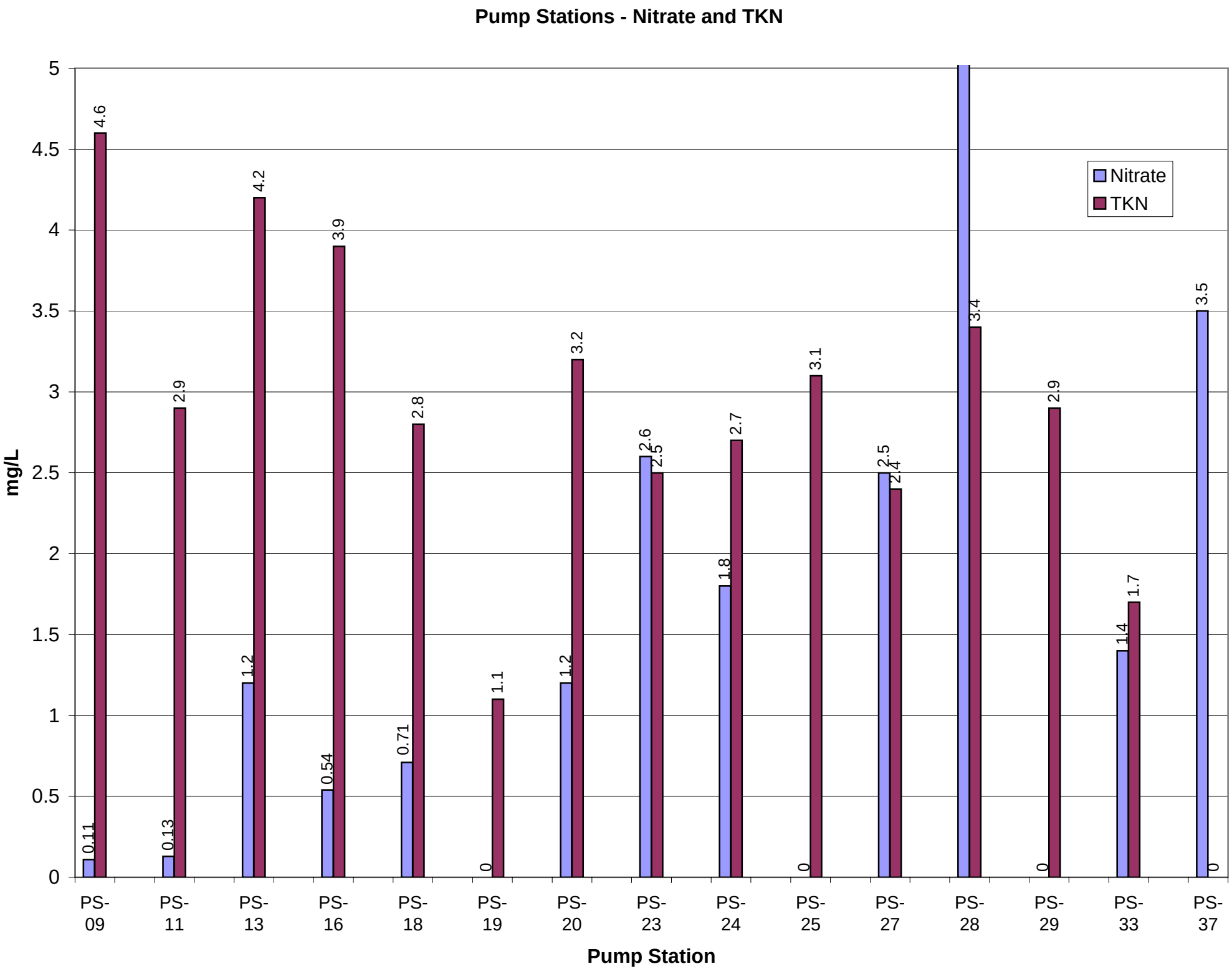

Lakes and Outfalls - Total and Dissolved Phosphorus
mg/L
2.5
2
1.5
1
0.5
0
Total Phosphorus
Dissolved Phosphorus
0.087
0
0.36
0
0.053
0.049
1.2
0
2.3
0.33
0.63
0.22
0.58
0.51
0.19
0.076
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12
Lakes & Outfalls - First Round 5/02, Second Round 6/02

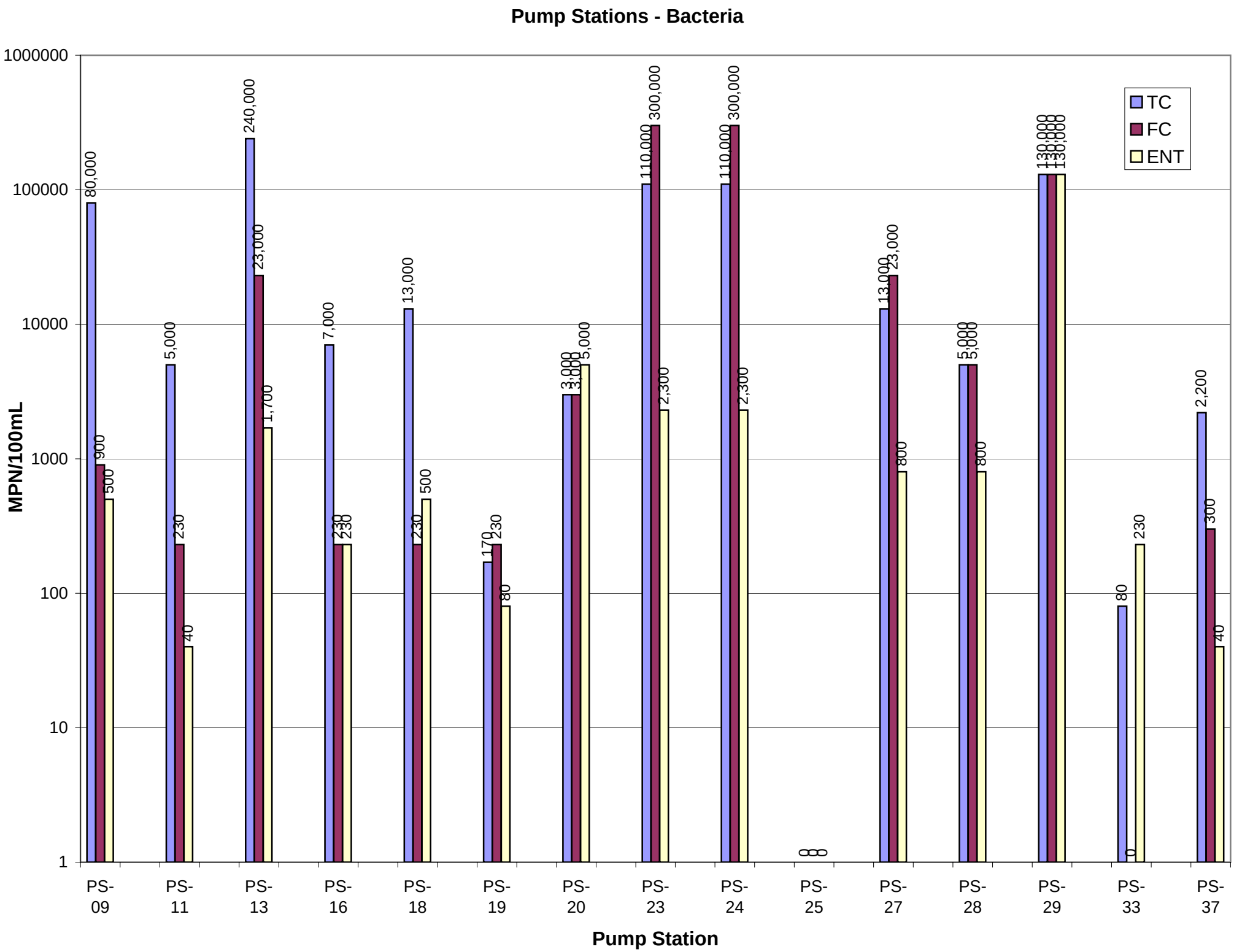

Lakes & Outfalls - Nitrate and TKN
mg/L
4
3.5
3
2.5
2
1.5
1
0.5
0
Nitrate
TKN
0.28
0.84
0
1.8
0.11
1.3
0
1.1
0.76
2.9
1.3
0.56
0.71
3.6
1.1
1.1
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12
Lake or Outfall

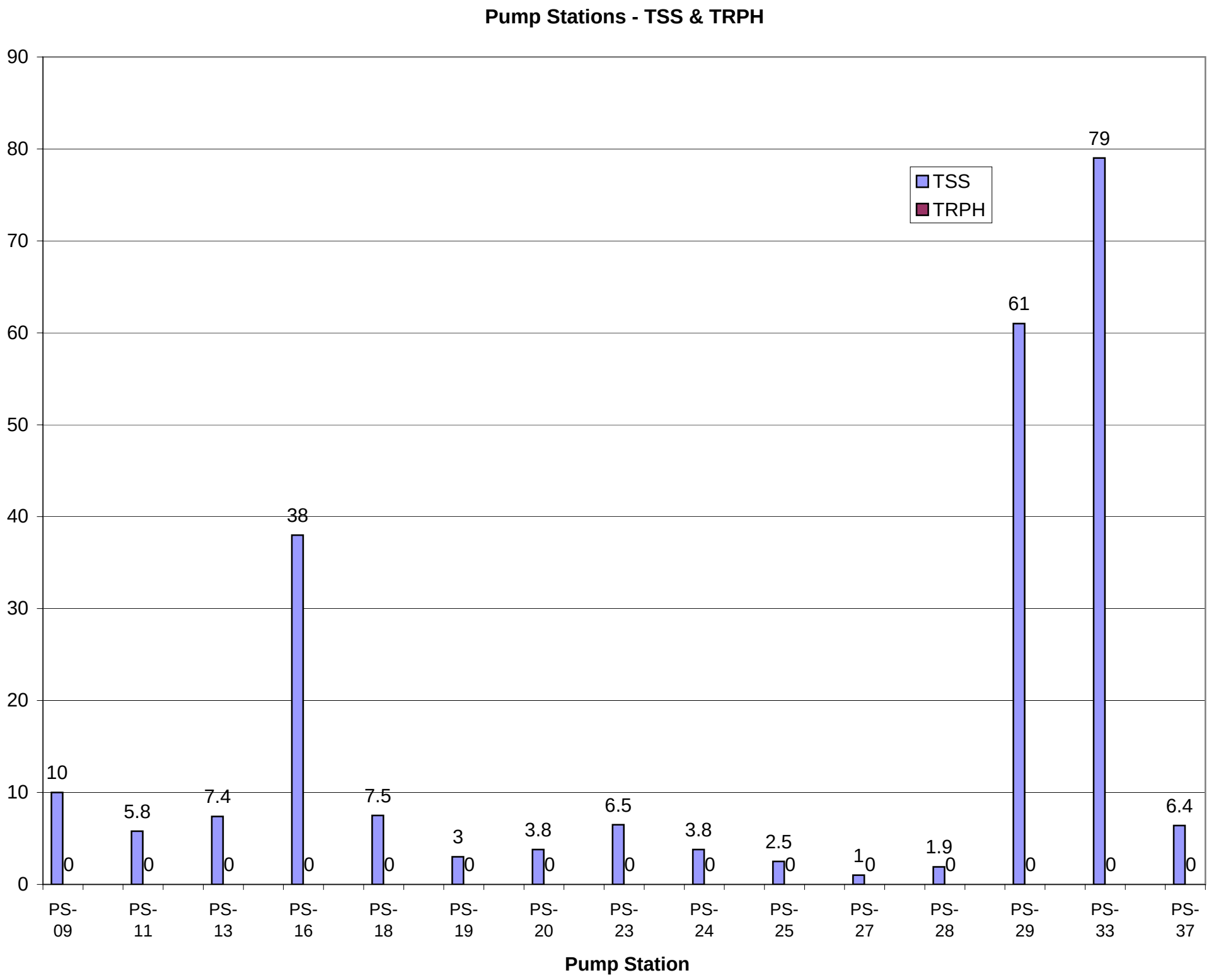

Lakes & Outfalls - Bacteria
MPN/100mL
100000
10000
1000
100
10
1
TC
FC
ENT
20
0
0
300
230
110
20
20
0
0
0
20
23,000
23,000
300
13,000
1,400
500
50,000
700
3,000
0
0
130
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12
Lake or Outfall

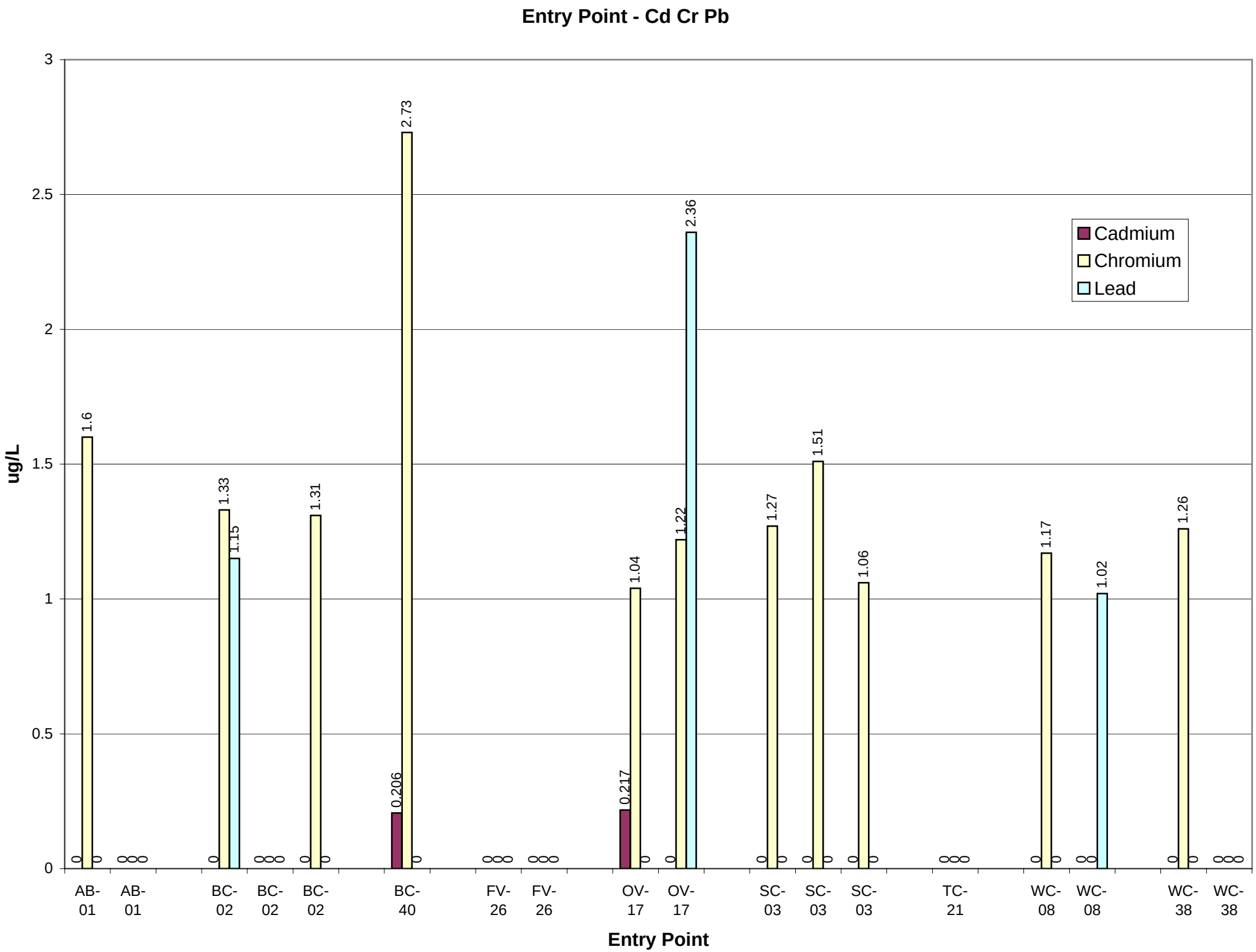

Lakes & Outfalls - TSS & TRPH
20
18
16
14
12
10
8
6
4
2
0
19
1
0
0
0 0
0 0
3.5
0
0 0
0 0
0 0
TSS
TRPH
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12
Lake or Outfall

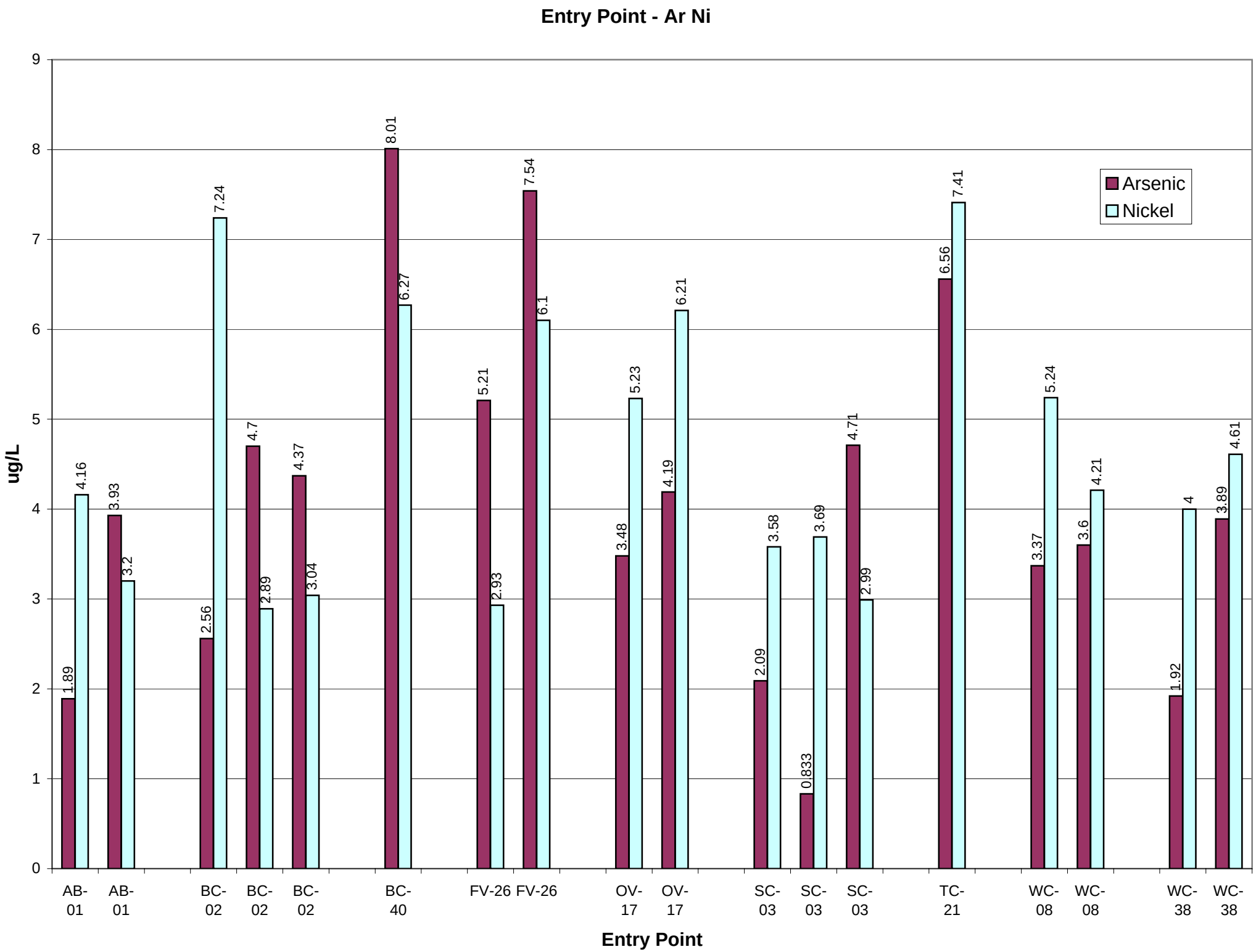

Pump Stations - Total and Dissolved Phosphorus
Total Phosphorus
Dissolved Phosphorus
mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.42
0.091
0.46
0.087
0.24
0.073
0.19
0.047
0.29
0.44
0.18
0.58
0.21
0.62
0.33
0.69
0.41
0.54
0.28
0.48
0.2
0.67
0.62
0.4
0.35
0.6
0.34
0.42
0.18
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
Pump Station - First Round 5/02

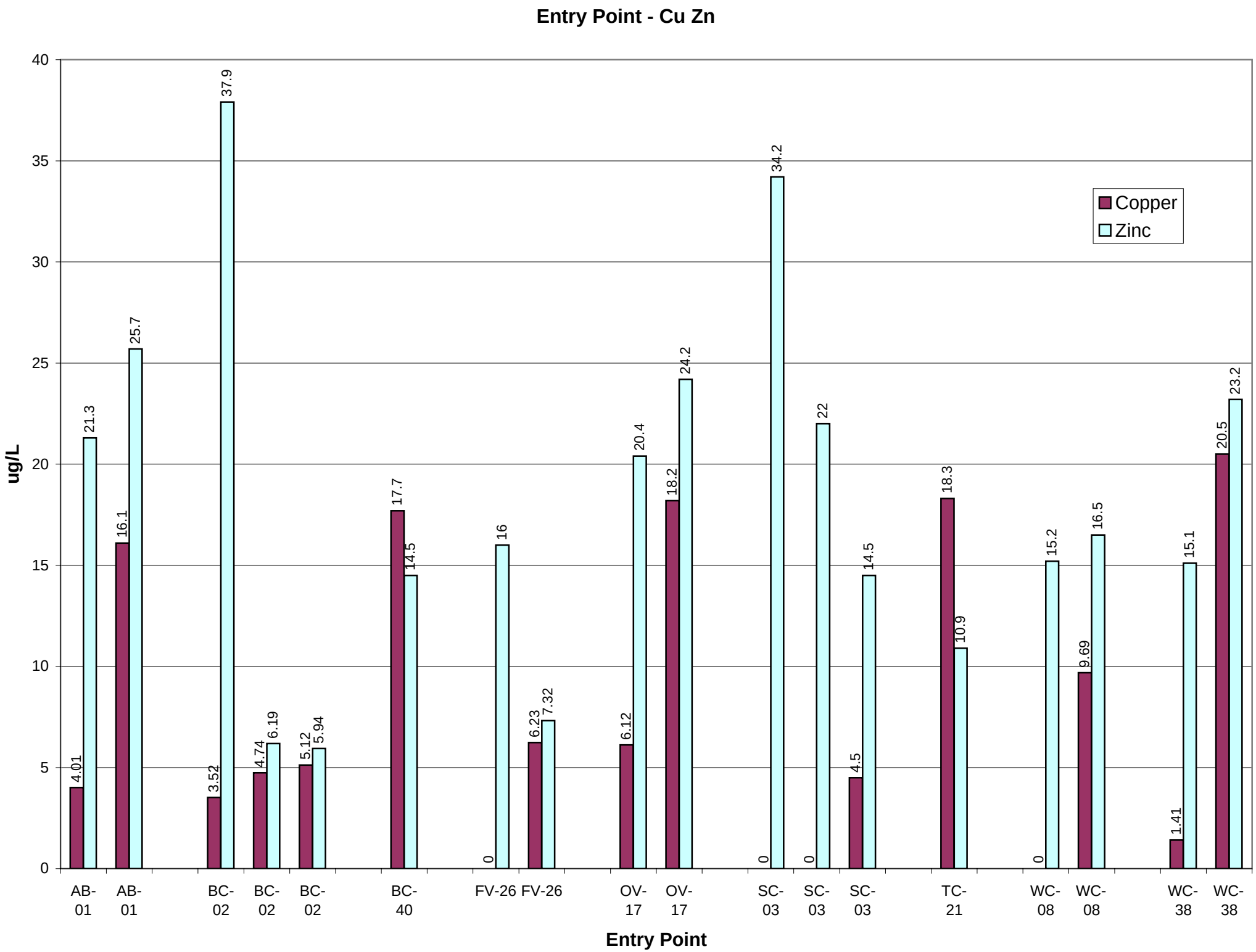

Pump Stations - Nitrate and TKN
mg/L
Pump Station
Nitrate
TKN
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
0.11
4.6
0.13
2.9
1.2
4.2
0.54
3.9
0.71
2.8
0
1.1
1.2
3.2
2.6
2.5
1.8
2.7
0
3.1
2.5
2.4
3.4
0
2.9
1.4
1.7
3.5
0

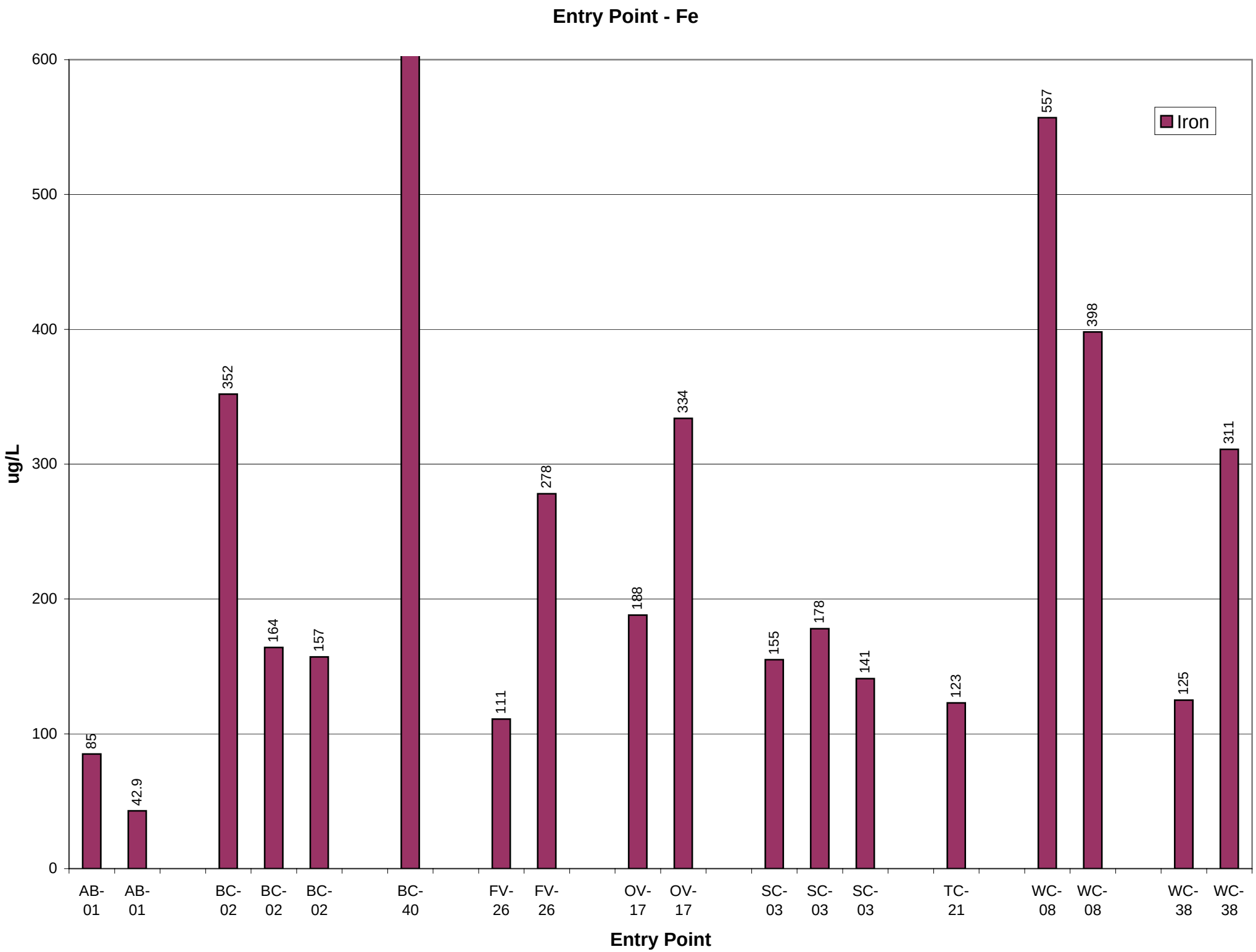

Pump Stations - Bacteria
MPN/100mL
1000000
100000
10000
1000
100
10
1
TC
FC
ENT
80,000
900
500
5,000
230
40
240,000
23,000
1,700
7,000
230
230
13,000
230
500
170
230
80
3,000
3,000
5,000
110,000
300,000
2,300
110,000
300,000
2,300
0
0
0
13,000
23,000
800
5,000
5,000
5,000
800
130,000
130,000
130,000
80
0
230
2,200
300
40
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
Pump Station

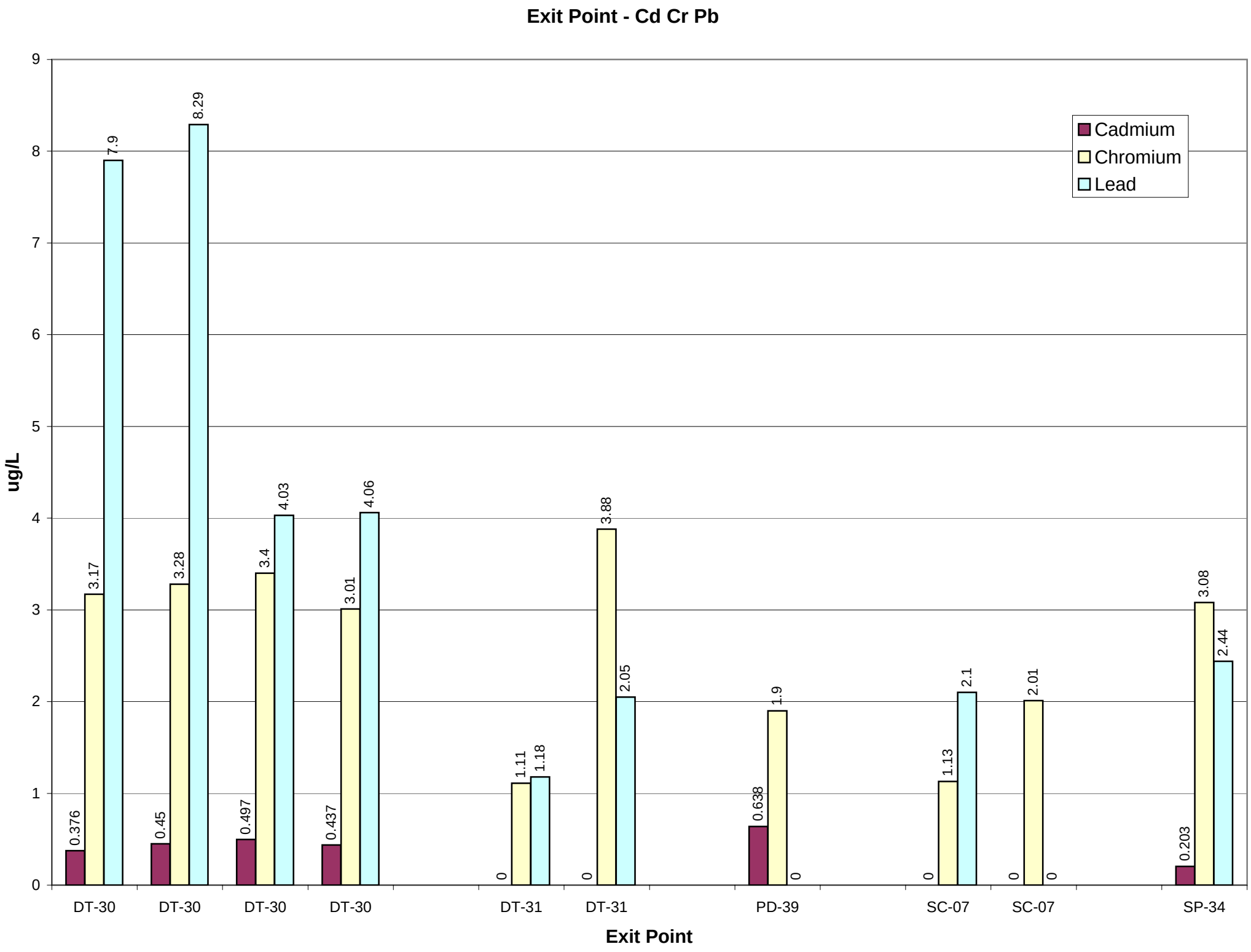

Pump Stations - TSS & TRPH
90
80
70
60
50
40
30
20
10
0
TSS
TRPH
10
0
5.8
0
7.4
0
38
0
7.5
0
3
0
3.8
0
6.5
0
3.8
0
2.5
0
1
0
1.9
0
61
0
79
0
6.4
0
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
Pump Station

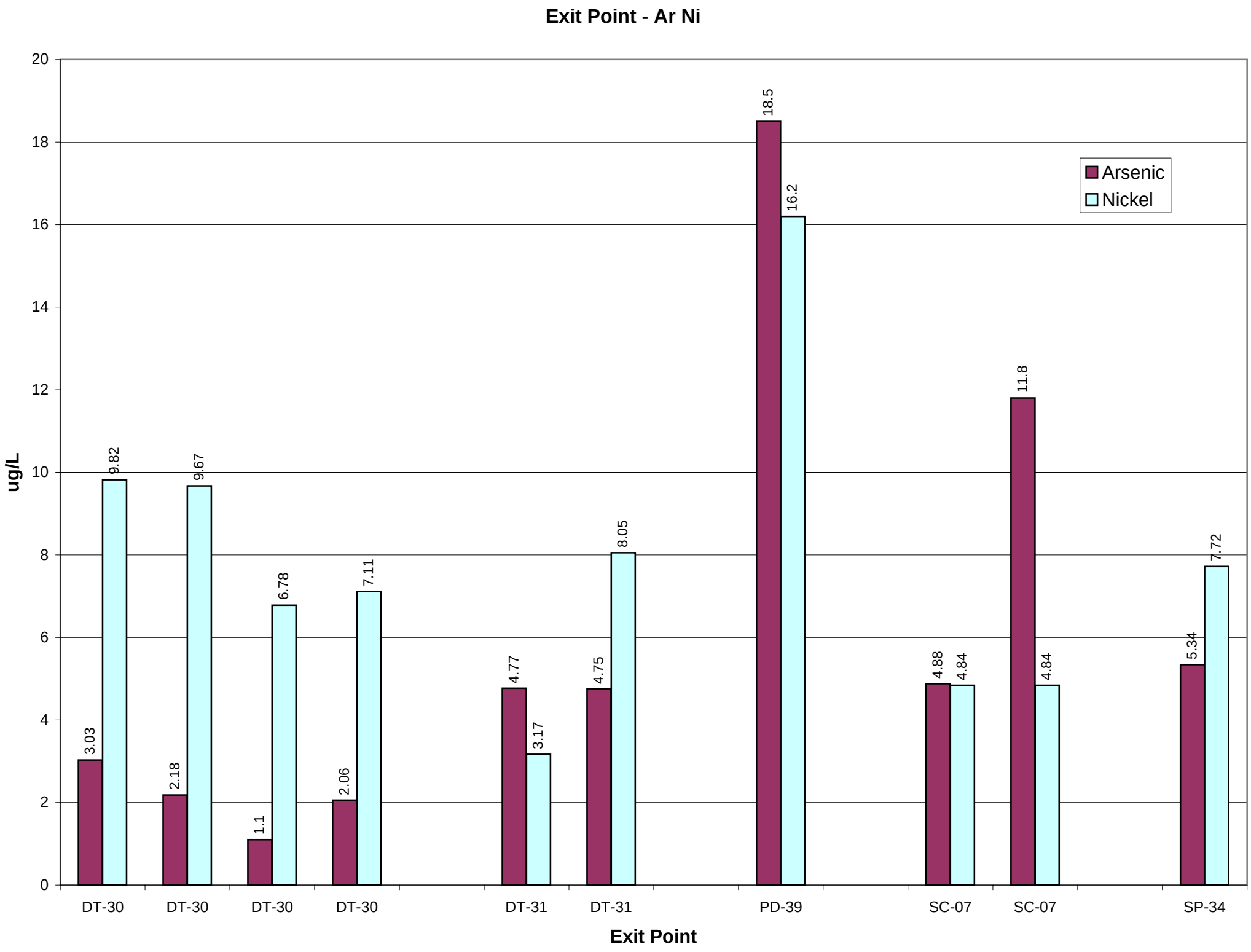

Entry Point - Cd Cr Pb
ug/L
3
2.5
2
1.5
1
0.5
0
Cadmium
Chromium
Lead
1.6
1.33
1.15
1.31
2.73
0.206
1.04
0.217
1.22
2.36
1.27
1.51
1.06
1.17
1.02
1.26
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
Entry Point

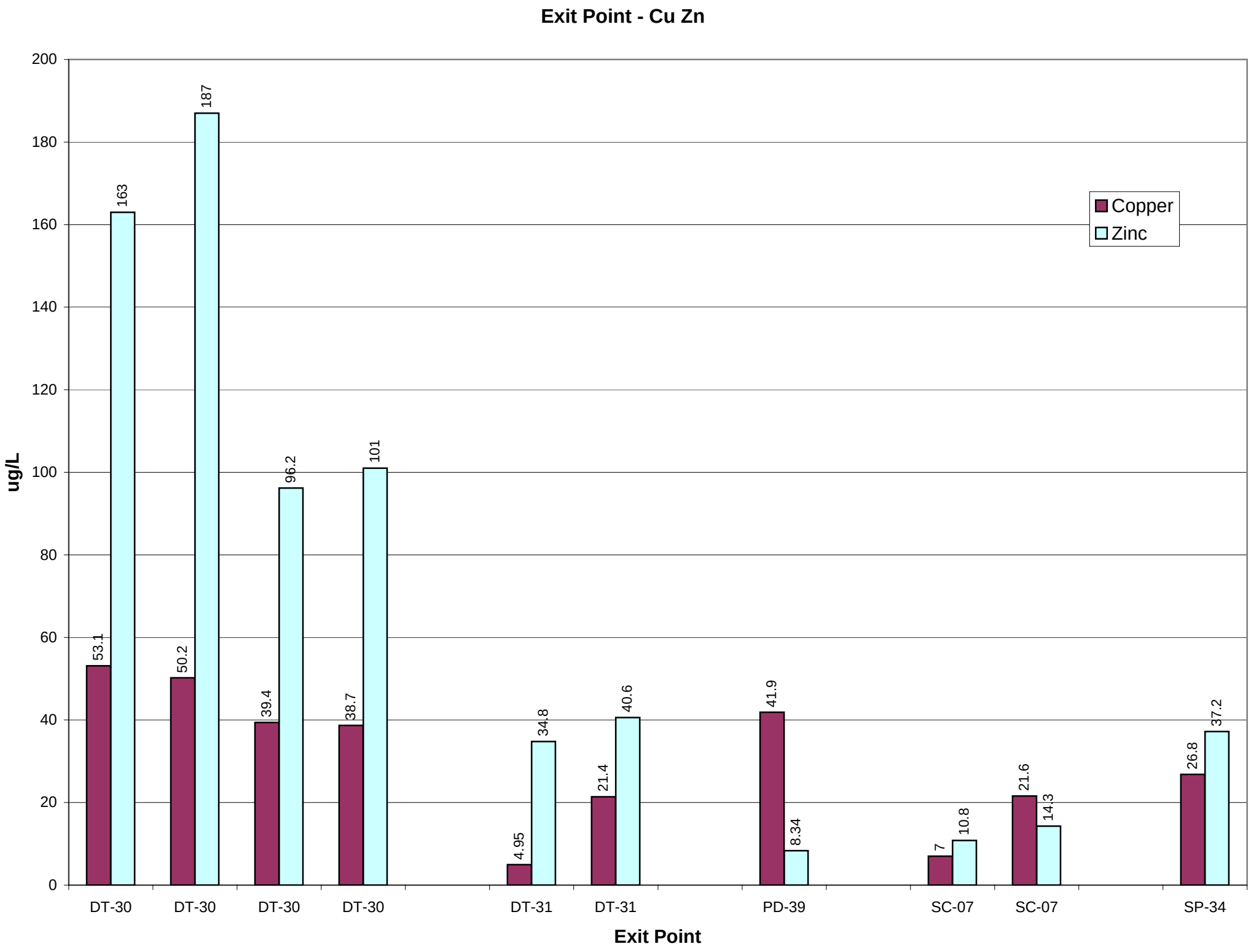

Entry Point - Ar Ni
ug/L
Entry Point
Arsenic
Nickel
0
1
2
3
4
5
6
7
8
9
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
1.89
4.16
3.93
3.2
2.56
7.24
4.7
2.89
4.37
3.04
8.01
6.27
5.21
2.93
7.54
6.1
3.48
5.23
4.19
6.21
2.09
3.58
0.833
3.69
4.71
2.99
6.56
7.41
3.37
5.24
3.6
4.21
1.92
4
3.89
4.61

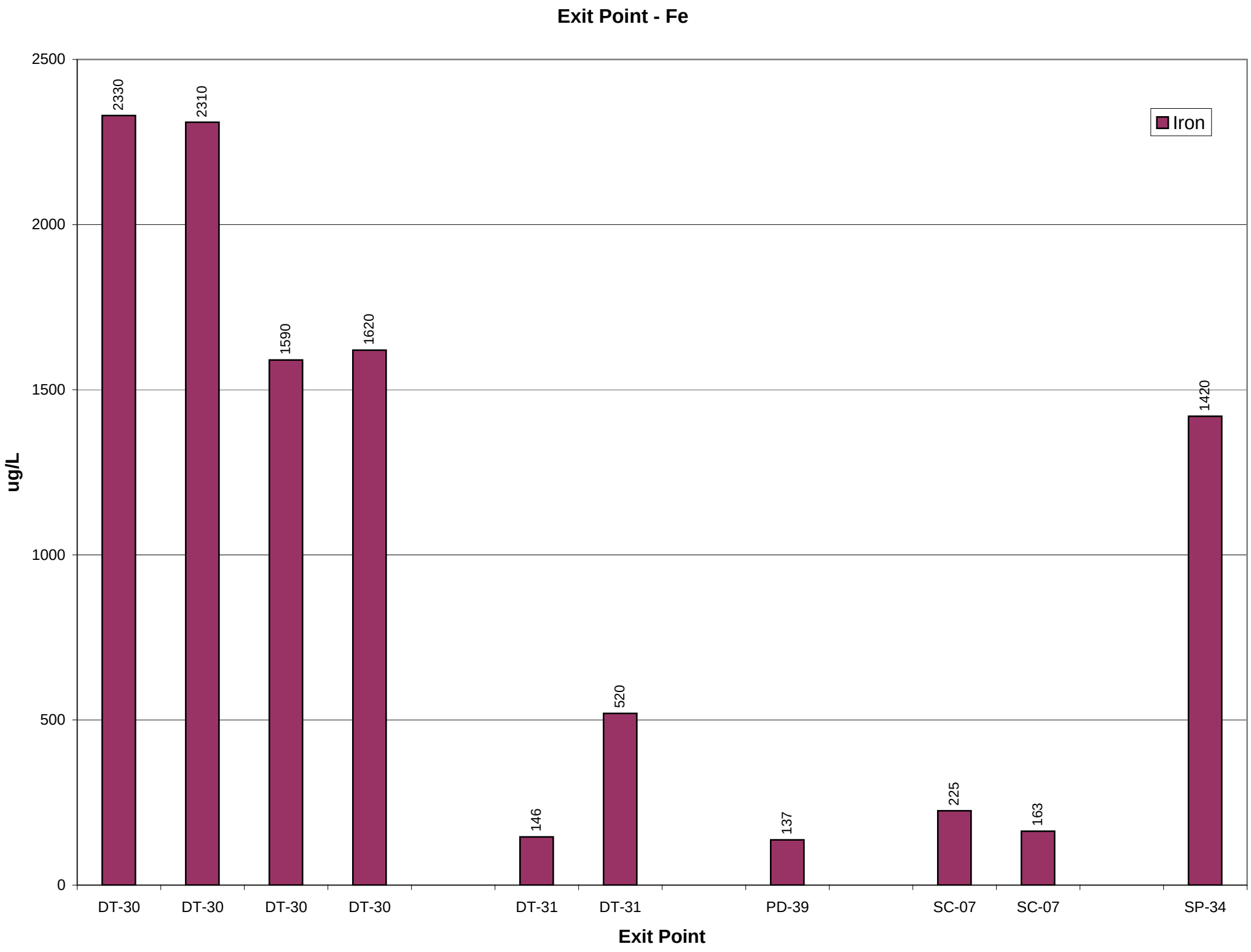

Entry Point - Cu Zn
ug/L
Entry Point
Copper
Zinc
0
5
10
15
20
25
30
35
40
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
4.01
21.3
16.1
25.7
3.52
37.9
4.74
6.19
5.12
5.94
17.7
14.5
0
16
6.23
7.32
6.12
20.4
18.2
24.2
0
34.2
0
22
4.5
14.5
18.3
10.9
0
15.2
9.69
16.5
1.41
15.1
20.5
23.2

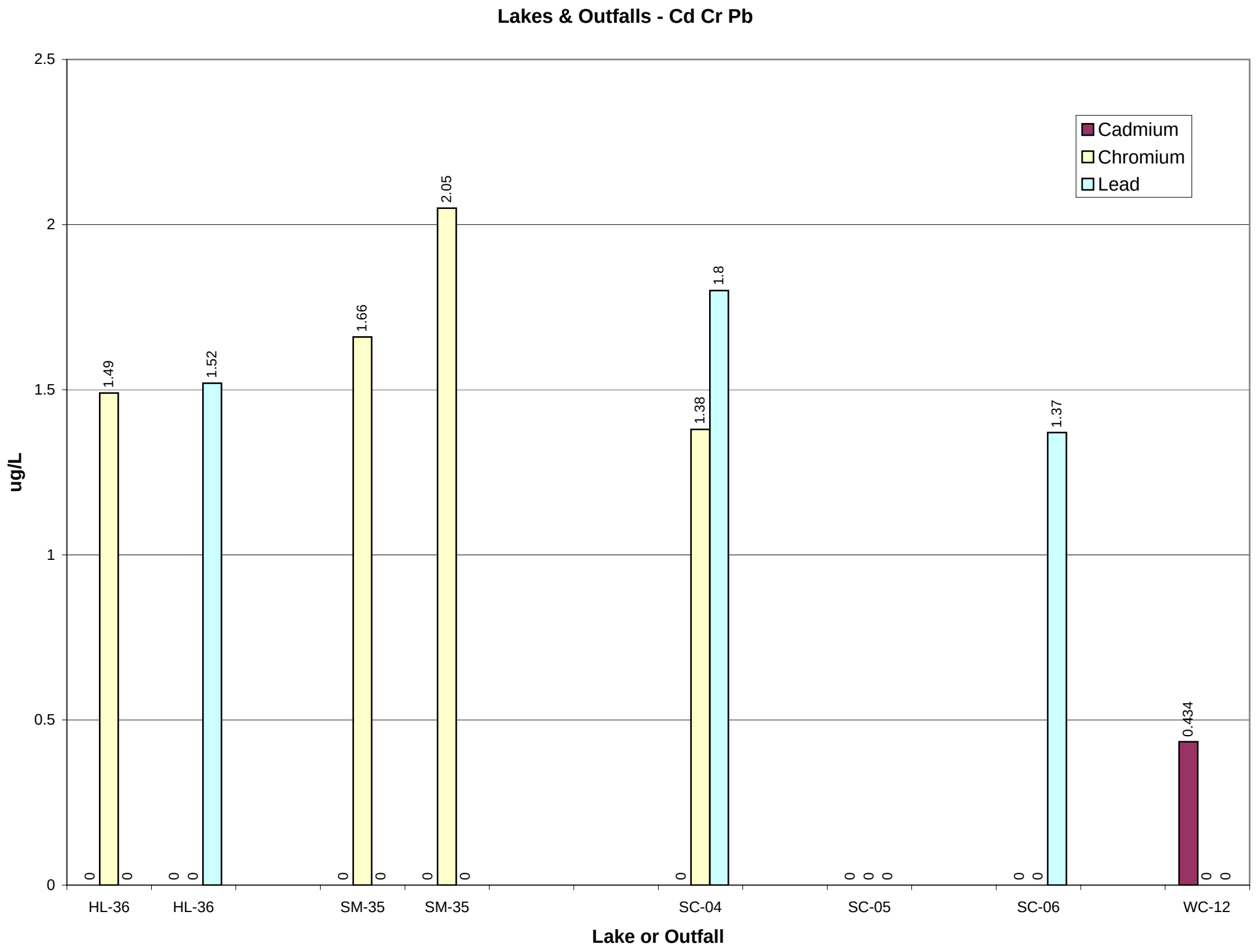

Entry Point - Fe
Iron
ug/L
600
500
400
300
200
100
0
85
42.9
352
164
157
111
278
188
334
155
178
141
123
557
398
125
311
AB-01
AB-01
BC-02
BC-02
BC-02
BC-40
FV-26
FV-26
OV-17
OV-17
SC-03
SC-03
SC-03
TC-21
WC-08
WC-08
WC-38
WC-38
Entry Point

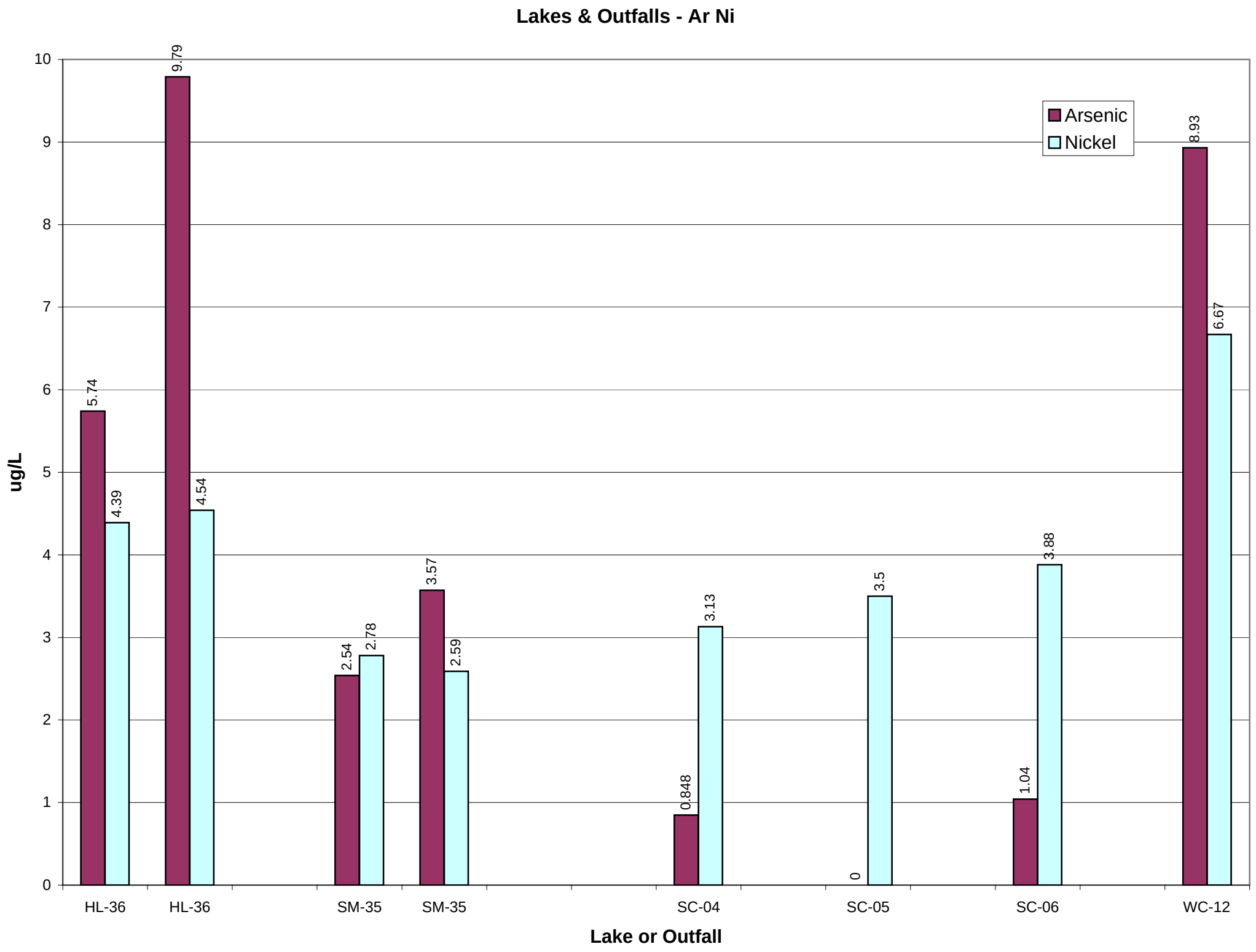

Exit Point - Cd Cr Pb
ug/L
Exit Point
Cadmium
Chromium
Lead
0
1
2
3
4
5
6
7
8
9
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
0.376
3.17
7.9
0.45
3.28
8.29
0.497
3.4
4.03
0.437
3.01
4.06
0
1.11
1.18
0
3.88
2.05
0.638
1.9
0
0
1.13
2.1
0
2.01
0
0.203
3.08
2.44

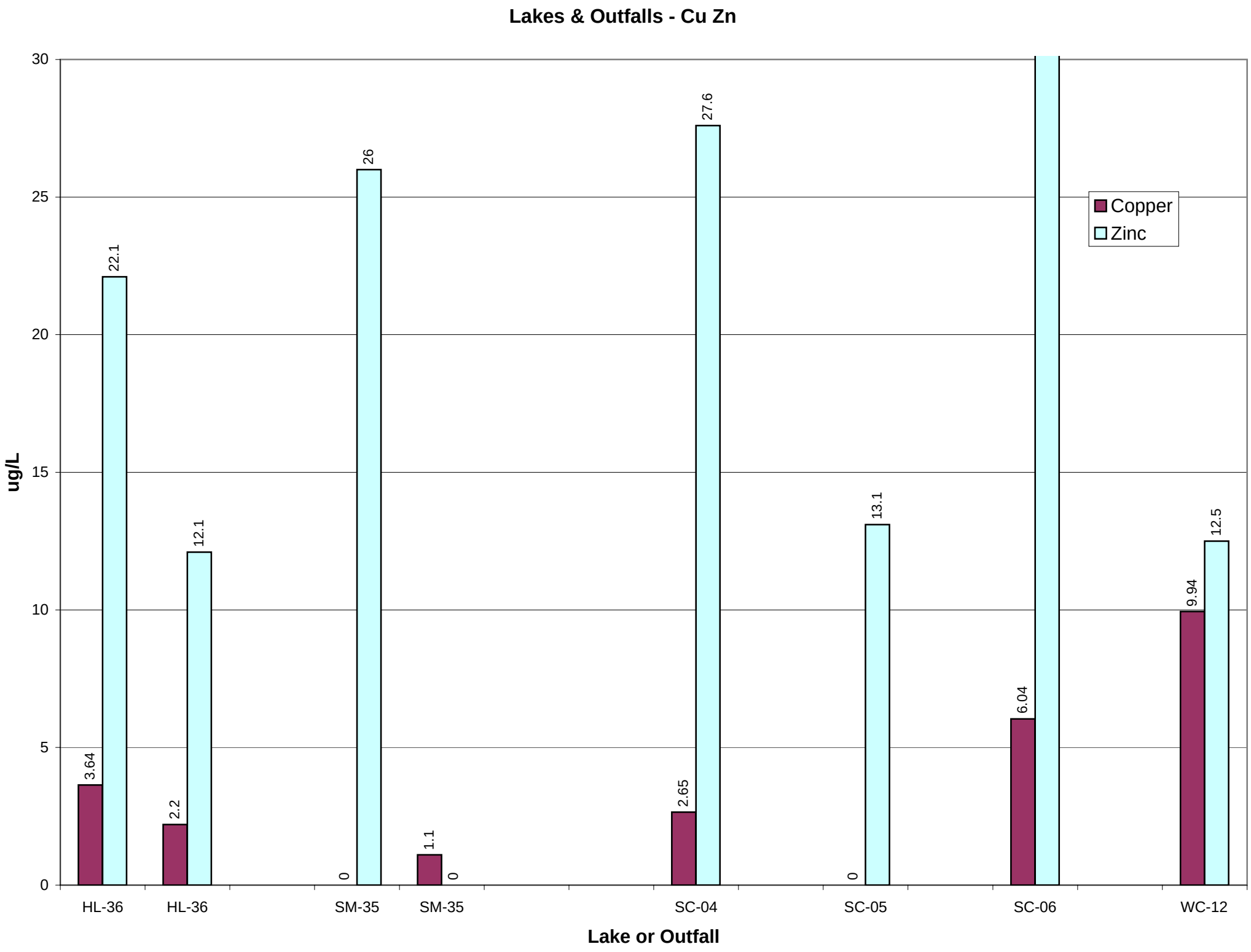

Exit Point - Ar Ni
ug/L
Exit Point
Arsenic
Nickel
0
2
4
6
8
10
12
14
16
18
20
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
3.03
9.82
2.18
9.67
1.1
6.78
2.06
7.11
4.77
3.17
4.75
8.05
18.5
16.2
4.88
4.84
11.8
4.84
5.34
7.72

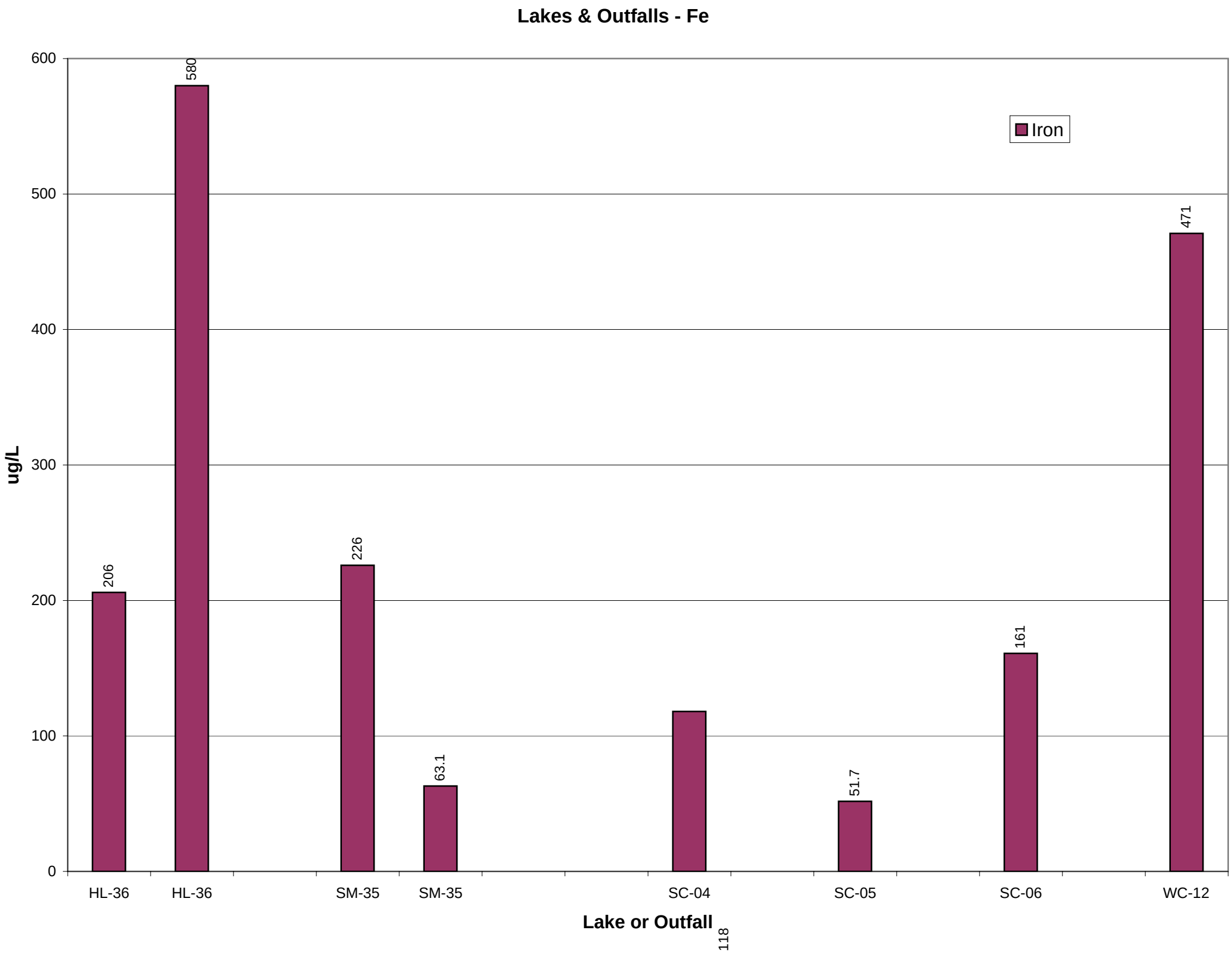

Exit Point - Cu Zn
ug/L
200
180
160
140
120
100
80
60
40
20
0
Copper
Zinc
53.1
163
50.2
187
39.4
96.2
38.7
101
4.95
34.8
21.4
40.6
41.9
8.34
7
10.8
21.6
14.3
26.8
37.2
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
Exit Point

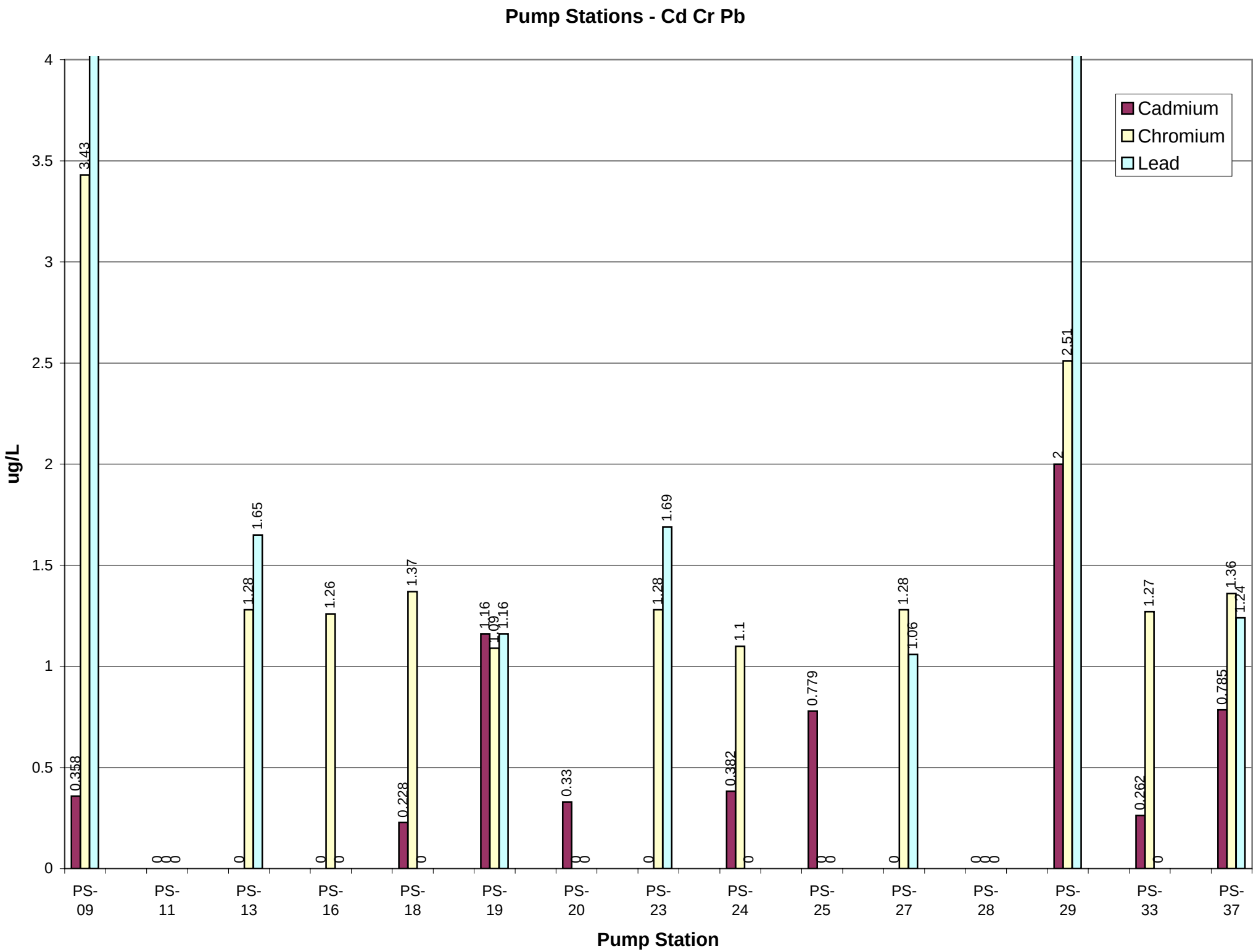

Exit Point - Fe
2500
2000
1500
1000
500
0
ug/L
2330
2310
1590
1620
146
520
137
225
163
1420
Iron
DT-30
DT-30
DT-30
DT-30
DT-31
DT-31
PD-39
SC-07
SC-07
SP-34
Exit Point

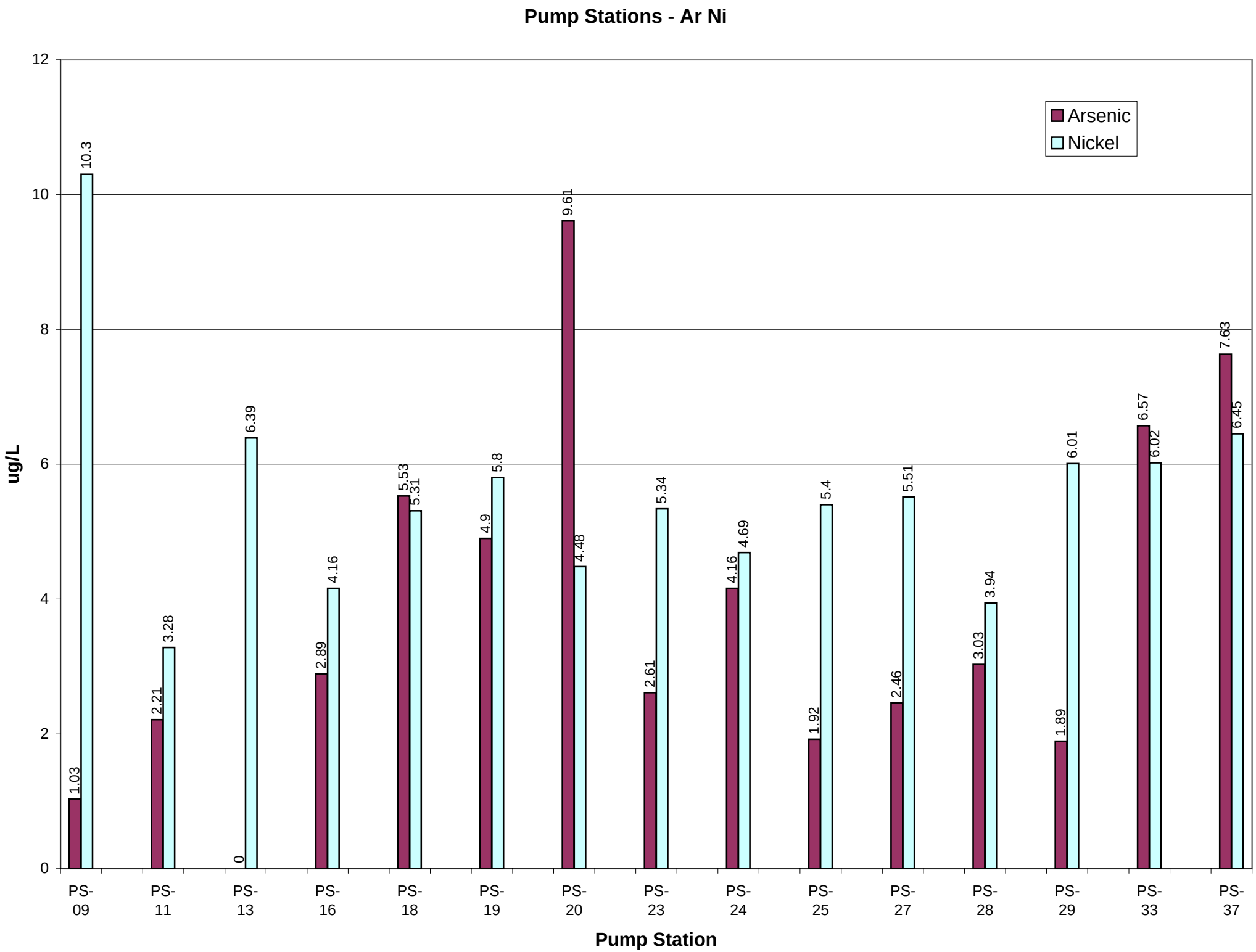

Lakes & Outfalls - Cd Cr Pb
Cadmium
Chromium
Lead
ug/L
2.5
2
1.5
1
0.5
0
1.49
1.52
1.66
2.05
1.38
1.8
1.37
0.434
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12
Lake or Outfall

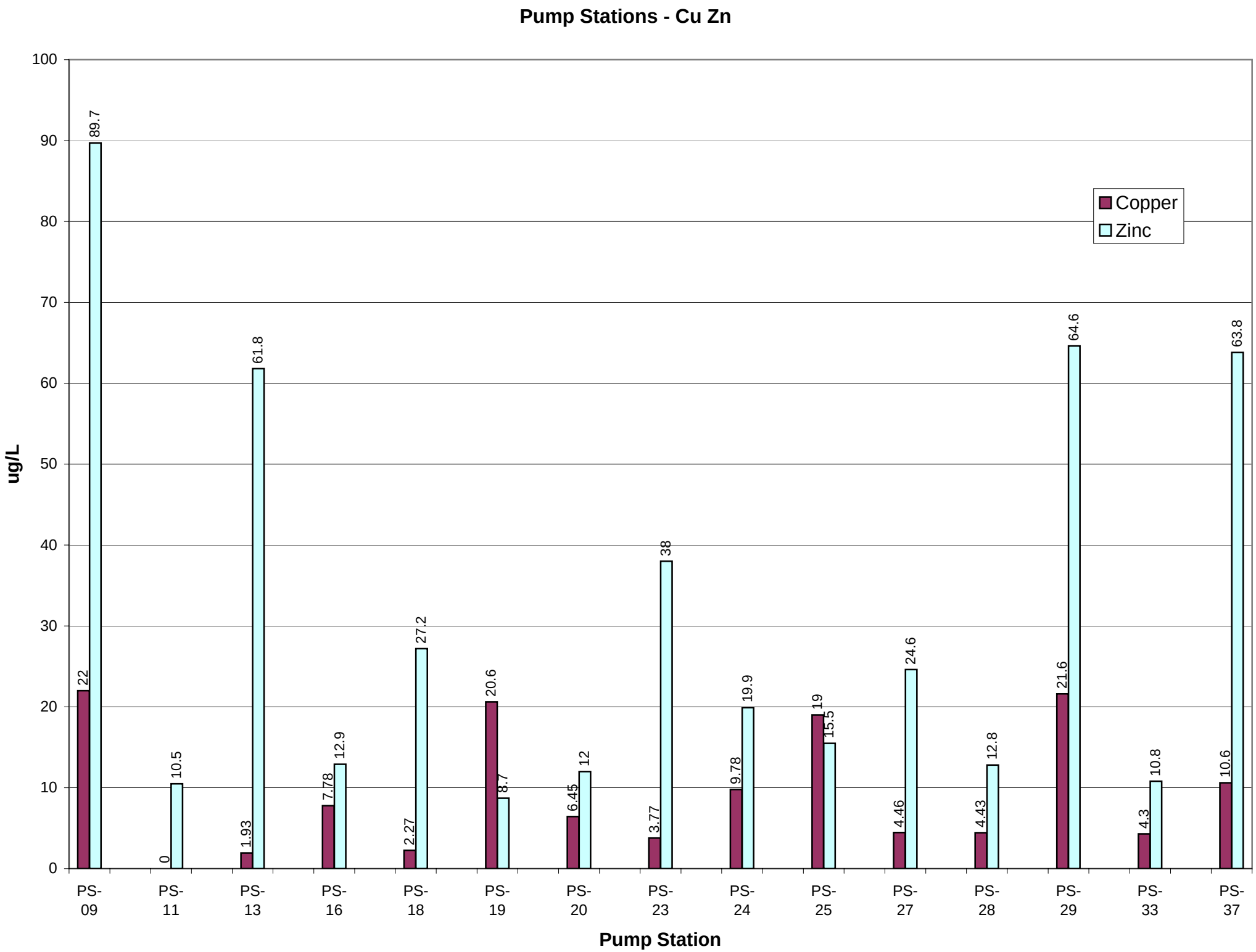

Lakes & Outfalls - Ar Ni
ug/L
Lake or Outfall
Arsenic
Nickel
0
1
2
3
4
5
6
7
8
9
10
5.74
4.39
9.79
4.54
2.54
2.78
3.57
2.59
0.848
3.13
0
3.5
1.04
3.88
8.93
6.67
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12

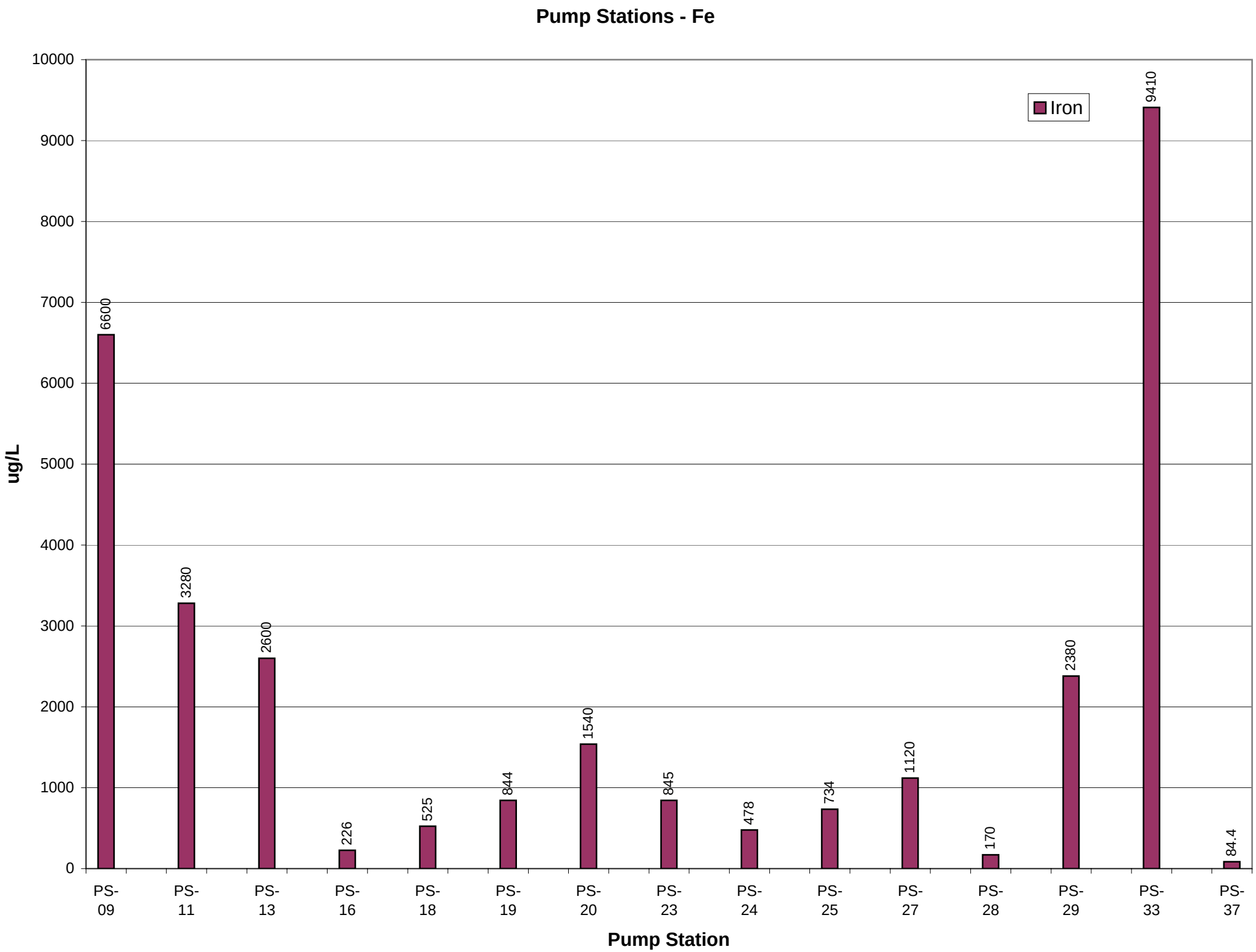

Lakes & Outfalls - Cu Zn
ug/L
30
25
20
15
10
5
0
Copper
Zinc
3.64
22.1
2.2
12.1
0
26
1.1
0
2.65
27.6
0
13.1
6.04
9.94
12.5
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12
Lake or Outfall


Lakes & Outfalls - Fe
Iron
ug/L
600
500
400
300
200
100
0
206
580
226
63.1
118
51.7
161
471
HL-36
HL-36
SM-35
SM-35
SC-04
SC-05
SC-06
WC-12
Lake or Outfall


Pump Stations - Cd Cr Pb
ug/L
Pump Station
Cadmium
Chromium
Lead
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
0.358
3.43
0.228
1.37
1.65
1.28
1.26
1.16
1.09
1.16
0.33
1.28
1.69
0.382
1.1
0.779
1.28
1.06
2
2.51
0.262
1.27
0.785
1.36
1.24


Pump Stations - Ar Ni
Arsenic
Nickel
ug/L
0
2
4
6
8
10
12
1.03
10.3
2.21
3.28
0
6.39
2.89
4.16
5.53
5.31
4.9
5.8
9.61
4.48
2.61
5.34
4.16
4.69
1.92
5.4
2.46
5.51
3.03
3.94
1.89
6.01
6.57
6.02
7.63
6.45
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
Pump Station


Pump Stations - Cu Zn
ug/L
Pump Station
Copper
Zinc
0
10
20
30
40
50
60
70
80
90
100
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
22
89.7
0
10.5
1.93
61.8
7.78
12.9
2.27
27.2
20.6
8.7
6.45
12
3.77
38
9.78
19.9
19
15.5
4.46
24.6
4.43
12.8
21.6
64.6
4.3
10.8
10.6
63.8


Pump Stations - Fe
Iron
ug/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
6600
3280
2600
226
525
844
1540
845
478
734
1120
170
2380
9410
84.4
PS-09
PS-11
PS-13
PS-16
PS-18
PS-19
PS-20
PS-23
PS-24
PS-25
PS-27
PS-28
PS-29
PS-33
PS-37
Pump Station

# Attachment A
# Quality Assurance Project Plan

# Quality Assurance Project Plan
# City of Huntington Beach
# Urban Dry Weather Runoff Study

**Version 1.0**

Prepared for:

City of Huntington Beach
Department of Public Works
Engineering Division

May 2002

*(Revised August 2003)*

Quality Assurance Project Plan
City of Huntington Beach
Urban Dry Weather Runoff Study
May 2002

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# Section 1
# Description and Organization

This Quality Assurance Project Plan describes the technical approach that will be used to characterize dry weather runoff from storm water outfalls and other drainage structures within the City of Huntington Beach (City). The following subsections provide the project description and project organization.

## 1.1 Project Description

The purpose of this monitoring effort is to characterize the quality of the dry water runoff in drainage structures and storm water outfalls located within the City of Huntington Beach (City). The characterization data will be used to prioritize proposed actions under the Water Quality Management Plan (WQMP) that the City is currently developing. This document is the Quality Assurance Project Plan (QAPP) for these monitoring activities within the City. The QAPP includes the establishment of monitoring sites, the collection of field data and observations, the collection and analysis of samples at the monitoring locations, and reporting of the results.

The Data Quality Objective (DQO) process is a planning approach, based on the scientific method that is used to prepare for a data collection activity. It provides a systematic procedure for defining the criteria that the data collection effort should satisfy. The DQO process involves determining analytes of concern; what types of samples to collect; how many samples to collect; when, where, and how to collect the samples; required levels of precision and accuracy for sample analyses; and tolerable levels of error in the analytical methods employed. These items are discussed throughout Sections 2.0 through 9.0.

## 1.2 Project Organization

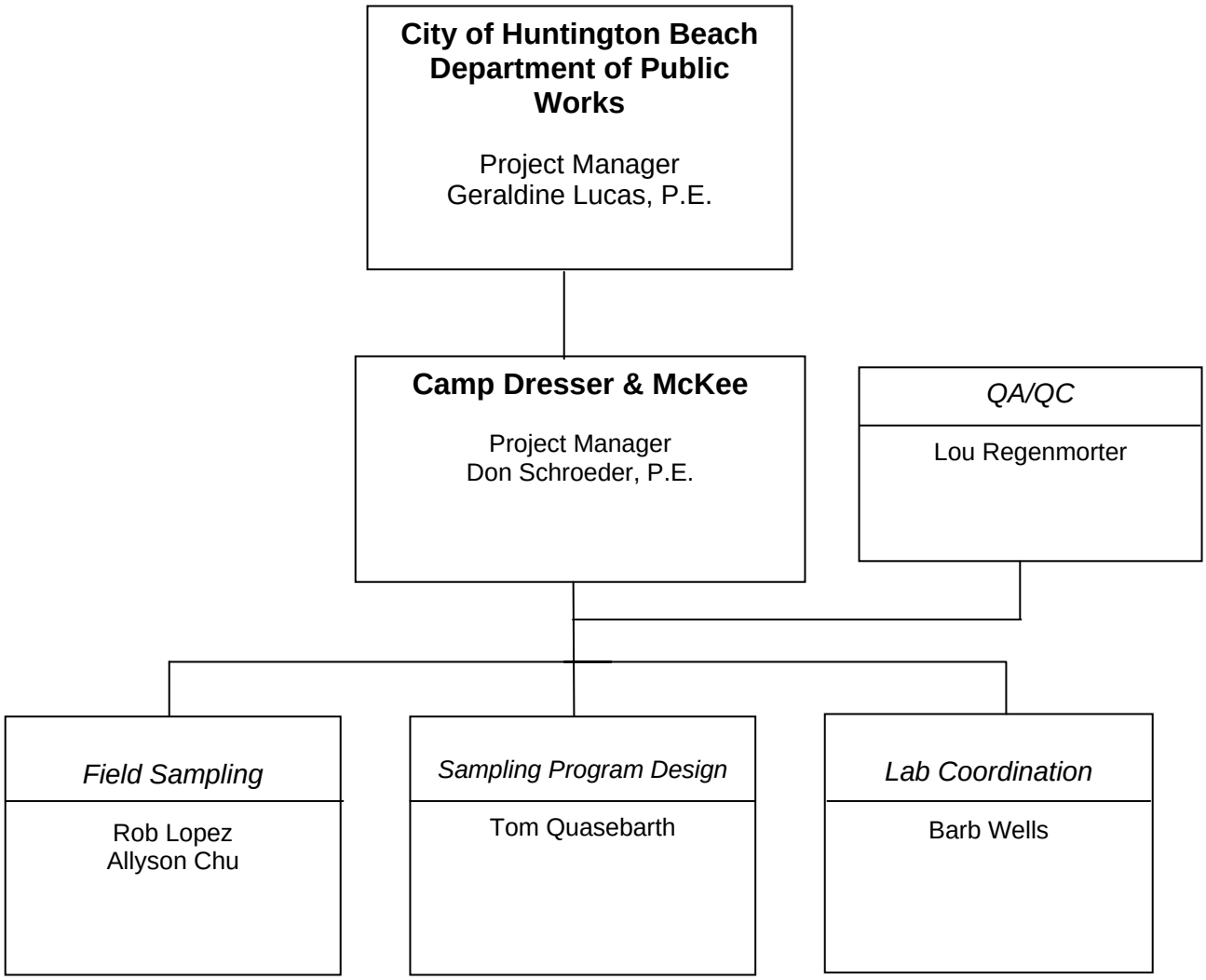
The Project Organization is summarized in Figure 1-1. The City's Project Manager is Geraldine Lucas. The Camp Dresser & McKee Project Manager is Don Schroeder. Tom Quasebarth is the Task Manager for the sampling activities. Other key personnel include Rob Lopez, Allyson Chu, Barbara Wells, and Lou Regenmorter.

## 1.3 Problem Definition Background

Over the past few years, beach advisories and closings resulting from high bacterial counts in coastal waters have heightened the environmental concerns and awareness of the importance of receiving water and urban runoff quality within the City. At the same time, regulatory pressures are increasingly focusing on non-point source pollution impacts, particularly from urban runoff from developed areas discharged through municipal storm drainage systems and from industrial, commercial, and construction sites. As urban runoff (both dry and wet weather) can be one source of bacterial contamination, the City has already initiated a dry weather diversion program in the southern part of the City to minimize the impact of dry weather runoff and extensive studies conducted by the City have indicated that sources such leaking sewers are not a significant contributor to the high bacterial counts. Additional

studies conducted by the City and others are continuing to identify sources and work toward resolving the bacterial problems. In addition, urban runoff can be a source of a number of other pollutants that can have a detrimental impact on receiving waters and discharges from the city storm drainage system is regulated under an NPDES municipal storm water permit issued to Orange County and all of the Cities.

**Figure 1-1**
**Project Organization**



# Section 2
# Data Quality Objectives

Data Quality Objectives are quantitative and qualitative statements that clarify study objectives, define the appropriate type of data, and specify the tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions. The following subsections describe each of the Data Quality Objective steps.

## 2.1 Problem Statement

The purpose of this study is to sample urban dry weather runoff throughout the City of Huntington Beach (City) and perform analysis of selected constituents using field instruments and collect water samples for subsequent laboratory analyses of selected constituents.

## 2.2 Project Objectives

- Establish baseline dry weather water quality conditions at runoff monitoring locations throughout the City
- Conduct a reconnaissance survey to identify potential "hot spot" runoff locations and observe general runoff conditions throughout the City
- Identify monitoring locations and collect initial samples to characterize inflows from upstream areas as they enter the City boundaries
- Utilize monitoring results to assist in setting priorities for actions and programs that will be implemented under the Water Quality Management Plan (WQMP)
- Identify deficiencies in the existing available monitoring data and guide the design of a long-term water quality monitoring program
- Document potential hot spots encountered during field sampling and observations of any readily identifiable sources

## 2.3 Identify the Decision

Data collection efforts are intended to help answer several key questions. These are:

- How significant is dry weather urban runoff on water quality issues of concern to the City including bacterial contamination, trash and debris accumulation and habitat protection and enhancement?
- What is the quality of dry weather urban runoff flows entering the City from upstream sources?
- Are there "hot spots" located within the City that will require special and immediate attention or higher priority attention under the WQMP?

- Can dry weather urban runoff quality impacts be reduced or eliminated?
- What is the relative distribution of dry weather flow within the City based on flow rates at sampling locations?
- Can the data assist the City with future development of TMDLs at Huntington Harbor and Anaheim Bay?

## 2.4 Data Requirements

The following data will be collected:

- Water quality and flow data for selected sites of urban runoff dry weather discharge flows. These data will be collected as grab samples (see Appendix A) at representative locations within the City boundaries, for up to 36 locations.
- General observations, site information, and QA/QC data. These data will be gathered and compiled throughout the study.

## 2.5 Study Boundaries

Study boundaries described in the following subsections are used to define spatial and temporal boundaries that are defined by the decision statement (Section 2.3).

### 2.5.1 Area Boundaries

The study area consists of the area within the boundaries of the City of Huntington Beach.

### 2.5.2 Site Selection Criteria

General site selection criteria are as follows:

- Representativeness
- Personnel Safety
- Site Access
- Equipment Security
- Flow Measurement Capability
- Potential Discharge Sources
- Site Visit

Site-specific selection criteria for this study are discussed in Chapter 3.

### 2.5.3 Temporal Constraints

Because the dry weather urban runoff may vary throughout the day, it is important to vary the sampling times the discharge during early morning, mid-morning, mid-day, mid-afternoon, and evening conditions.

For the urban dry weather runoff sampling program, up to seven (7) grab samples will be collected at locations throughout the City during late spring early summer 2002. An initial round of sampling will be conducted at selected locations throughout the City as described in Section 3. After the initial round of sampling, additional samples will be collected a various times of day (daylight hours only).

## 2.6 Data Analysis

Specific parameters will be tabulated from the recorded data. In addition, field observations will also be documented.

# Section 3
# Site Selection

The purpose of this section is to present criteria and procedures to be used in selecting sites to be sampled.

## 3.1 Site Selection Criteria

### 3.1.1 Pump Stations

Most of the area, within the City, drains through pump stations located along major flood control channels. Sample collection will particularly target pump stations because urban dry weather runoff is collected at these pump stations and periodically pumped into the flood control channels.

### 3.1.2 Tidal Influence

The extent of tidal influence also influences site selection. Initial field reconnaissance indicates that major portions of the flood control channels are tidal. Sampling for urban dry weather runoff in tidal waters will not provide a good indication of water quality impacts and tidal locations will be avoided. Urban dry weather runoff samples will target areas upstream from tidal influence.

### 3.1.3 Upstream "Entry Points"

The major channels within the City also receive significant flow from upstream areas. The sampling program will target "entry points" where the major channels enter the City boundaries conveying flow form upstream jurisdictions. These "entry point" locations will provide the City within a basis for assessing dry weather urban runoff water quality from local areas within the City versus the water quality derived from upstream areas.

## 3.2 Site Selection Process

Drainage maps of the City were initially reviewed to identify the major conveyances and the overall site selection approach. On April 18 and 19 and May 2 and May 3, 2002 a field reconnaissance inspections were conducted to locate potential sites for urban dry weather runoff sampling. Site conditions were documented using a Site Selection Inspection Form and by photographing each potential site. The results of the field inspections are presented in Appendix A. These initial field inspections revealed that final site selection for certain urban dry weather runoff sites would have to be completed by sampling crews during the initial round of sampling because of limited time and accessibility of the potential sampling sites.

## 3.3 Urban Dry Weather Runoff Sampling Sites

Sampling sites were selected to represent various locations within the City and from the points along Wintersburg Channel, Talbert Channel, Sunset Channel and Bolsa Chica Channel where the dry weather flows enter the City limits from the upstream

drainage system. In addition, potential sampling sites were identified to represent dry weather flow that discharge directly to beach areas and the Bolsa Chica wetlands.

After field evaluation and review of the proposed sites, Table 3-1 below lists the initial selected sites. A map of the locations of the selected sites is shown in Figure 3-1.

**Table 3-1**
**City of Huntington Beach - Potential Sampling Locations**

| No. | Location | Comments |
|---|---|---|
| | ***Anaheim Barber City Channel*** | |
| 1 | Entry point - near Rancho Rd./Westminster | Sampling along channel |
| | ***Bolsa Chica Channel*** | |
| 2 | Entry point - near Rancho Rd./Bolsa Chica St. | Sampling along channel |
| | ***Sunset Channel*** | |
| 3 | Entry point - near Edwards St./Bolsa Ave. | Sampling along channel |
| 4 | Outfall - near Bolsa Ave. | Sampling location to be field assessed |
| 5 | Outfall - near McFadden Ave. | Sampling location to be field assessed |
| 6 | Outfall - near Graham St. | Sampling location to be field assessed |
| 7 | Exit point - near Bolsa Chica St./Edinger Ave. | Sampling along channel |
| | ***Wintersburg Channel*** | |
| 8 | Entry point - near Beach Blvd./Heil Ave. | Sampling along channel |
| 9 | Heil Pump Station | Sampling from pump station forebay |
| 10 | Outfall/Channel tributary - west of Gothard St. | Sampling location to be field assessed |
| 11 | Marilyn Pump Station | Sampling from pump station forebay |
| 12 | Outfall - near Edwards St. | Sampling location to be field assessed |
| 13 | Shields Pump Station | Sampling from pump station forebay |
| 14 | Outfall - near Springdale St. | Sampling location to be field assessed |
| 15 | Outfall - near Graham St. | Sampling location to be field assessed |
| 16 | Slater Pump Station | Sampling from pump station forebay |
| | ***Ocean View Channel*** | |
| 17 | Entry point - near Asari Ln./ Warner Ave. | Sampling along channel |
| | ***Huntington Beach Channel*** | |
| 18 | Adams Pump Station | Sampling from pump station forebay |
| 19 | Atlanta Pump Station | Sampling from pump station forebay |
| 20 | Newland Pump Station | Sampling from pump station forebay |
| | ***Talbert Channel*** | |
| 21 | Entry point - between Magnolia and Bushard Streets on Garfield Ave. | Sampling along channel |
| 22 | Yorktown Pump Station | Sampling from pump station forebay |
| 23 | Adams Pump Station | Sampling from pump station forebay |
| 24 | Indianapolis Pump Station | Sampling from pump station forebay |
| 25 | Banning Pump Station | Sampling from pump station forebay |

**Table 3-1 (Continued)**
**City of Huntington Beach - Potential Sampling Locations**

| No. | Location | Comments |
|---|---|---|
| | ***Fountain Valley Channel*** | |
| 26 | Entry point - between Bushard and Brookhurst Streets on Garfield Ave. | Sampling along channel |
| 27 | Flounder Pump Station | Sampling from pump station forebay |
| | ***Santa Ana River*** | |
| 28 | Meredith Pump Station | Sampling from pump station forebay |
| 29 | Hamilton Pump Station | Sampling from pump station forebay |
| | ***Downtown*** | |
| 30 | 30" Outfall on beach | Sampling location to be field assessed |
| 31 | 30" Outfall on beach | Sampling location to be field assessed |
| 32 | 30" Outfall on beach | Sampling location to be field assessed |
| | ***Bolsa Chica Wetlands*** | |
| 33 | Bolsa Chica Pump Station | Sampling from pump station forebay |
| 34 | Outfall - near Seapoint Ave. | Sampling location to be field assessed |
| | ***Sully Miller Lake*** | |
| 35 | Lake Quarry | Sampling from lake |
| | ***Huntington Lake*** | |
| 36 | Exit point | Sampling from lake |

# Section 4
# Constituents

Constituents selected for the Urban Runoff Dry Weather Discharge Study are shown in Table 4-1. The analytical method, detection limits, minimum volume, preservation techniques and holding time are listed for each selected parameter.

***Table 4-1***

***Urban Dry Weather Runoff Monitoring - Constituents to be Analyzed, Sample Type, EPA Method, Bottle, Volume, Preservation, and Hold Time Requirements***

| Constituent | Sample Type/ Frequency | EPA Method | Bottle | Target Reporting Limit | Vol. (ml) | Preservation | Holding Time |
|---|---|---|---|---|---|---|---|
| ***Conventional*** | | | | | | | |
| Conductivity | Field Measurement/ All Samples | 120.1 | HDPE | 1 mg/L | 50 | 4°C | 28 days |
| Temperature | | NA | | 0.1 units | NA | None | ASAP |
| pH | | 150.1 | | 0.1 | 50 | None | 15 min. |
| Turbidity | | 180.1 | | 0.10 NTU | 50 | 4°C | 48 hrs. |
| Total Coliforms | Grab/ All Samples | SM9221B | Sterile Glass or Plastic | 2 MPN/100mL | 500 | 4°C | 12 hours |
| Fecal Coliforms | Grab/ All Samples | SM9221B | | 2 MPN/100mL | | | |
| Enterococci | Grab/ Twice per site | SM9230B | | 2 MPN/100mL | | | |
| TSS | Grab/ Twice per site | 160.2 | HDPE | 6 mg/L | 100 | 4°C | 7 days |
| TDS | | 160.1 | | 20 mg/L | 100 | 4°C | 7 days |
| Hardness as Ca $CO_3$ | | 130.2 | | 2 mg/L | 100 | 4°C | 6 mo. |
| ***Nutrients*** | | | | | | | |
| $NO_3$-N | Grab/ Twice per site | 300.0 | HDPE | 0.1 mg/L | 100 | 4°C | 48 hrs. |
| $NO_2$-N | | 300.0 | | 0.1mg/L | 100 | | 48 hrs. |
| Dissolved Ortho-P | | 365.2 | | 0.03 mg/L | 100 | | 48 hrs. |
| $NH_3$-N | | 350.3 | | 0.1mg/L | 100 | | 28 days |
| Dissolved Phosphorous | | 365.3 | | 0.03 mg/L | 100 | | 28 days |
| Total Phosphorous | | 365.3 | | 0.03 mg/L | 100 | | 28 days |
| Total Nitrogen (calculated) | | -- | | 0.1 mg/L | -- | | -- |
| TKN | | 351.3 | | 0.1 mg/L | 100 | | 28 days |
| ***Metals (total & dissolved)*** | | | | | | | |
| Arsenic (As) | Grab/ Twice per site | 200.8 | HDPE | 1 μg/L | 100 | 4°C; $HNO_3$; pH <2 | Filter for diss. & preserve 48 hrs. Analysis 6 mo. |
| Cadmium (Cd) | | 200.8 | | 1μg/L | | | |
| Chromium (Cr) | | 200.8 | | 1 μg/L | | | |
| Copper (Cu) | | 200.8 | | 1 μg/L | | | |
| Iron (Fe) | | 200.7 | | 25 μg/L | | | |
| Lead (Pb) | | 200.8 | | 1 μg/L | | | |
| Nickel (Ni) | | 200.8 | | 2 μg/L | | | |
| Zinc (Zn) | | 200.8 | | 5 μg/L | | | |
| ***Other*** | | | | | | | |
| OP Pesticides | Grab/ Twice per site | 8141 | Amber Glass | 0.05 μg/L | 500 | 4°C | 7 days |
| TRPH | Grab/ Twice per site | 418.1 | Amber Glass | 5 mg/L | 1,000 | 4°C; HCl or $H_2SO_4$; pH <2 | 28 days |

# Section 5
# Field Equipment Operation and Maintenance

The Dry Weather Urban Runoff sampling will rely on manual procedures for collecting representative samples. Details on the specific sample collection methods that will be used at each site are discussed below.

## 5.1 Sampling Equipment

Representative discharge samples will be monitored using a variety of equipment, such as:

- Manual grab samples;
- Scoops or pole sampler;
- Portable flow velocity flow meter; and

Field crews will estimate flow rates at the selected sampling locations. In certain cases, flow rates and volumes will be estimated using a container and/or other field methods to measure flow velocity and cross sectional area of the channel.

## 5.2 Flow Monitoring

### 5.2.1 Flow in Open Channels

Where field conditions will allow, flow measurements will be made using a portable flow meter. The flow velocity will be measured with acoustic Doppler technology. The flow depth and width will be measured by hand. Knowing flow velocity, depth, and channel configuration, flow rate and flow volume estimates will be calculated.

### 5.2.2 Flow in Pump Stations and Outfall Locations

At pump station sampling locations, field flow estimates will be provided on a case-by-case basis. If flow is observed entering the wet well or at the discharge of major outfall pipes to the channel, a simple volumetric method will be attempted. This method requires timing the rate that container of known volume is filled. Use of a portable flowmeter may be feasible in certain cases. If no flow measurement can be performed, field notes will describe the flow rate. The City's operation records will be used to develop a flow estimate at pump stations.

## 5.3 Other Monitoring Equipment

Temperature, pH, and specific conductivity will be measured onsite using hand-held field meters. Operation and maintenance of these meters will follow the manufacturer's procedures as presented in Appendix B.

## 5.4 Equipment Operations

There are several design specifications that will be considered for all sampling points. The place at which flow will be measured should attempt to be at least ten pipe diameters downstream and five pipe diameters upstream (or ten and five times, respectively, the maximum anticipated head height) of any outfall, obstruction, inlet, or change in direction of the conveyance. The slope of the conveyance leading to the flow measuring point should be 2 percent or less. These two requirements will insure that the flow is fully developed and not impeded at the point where flow is measured. Experienced field crews will install the equipment sensors. Sensors will be securely fastened using stainless steel brackets to secure the sensors within the pipe. Confined space procedures will be followed when accessing existing drainage structures, if necessary.

Components of each monitoring system used will undergo calibration and verification during installation and during maintenance.

## 5.5 Sampling Frequency

Multiple dry weather urban runoff samples will be collected and analyzed at all sampling locations within the City. However the actual sampling frequency will be determined only after the initial round of sampling. Since urban dry weather flows are not always constant and predictable, sampling field crews will have sufficient flexibility to collect limited additional samples. Sampling frequency will be influenced by the total number of sampling sites identified and the available budget for sample collection and laboratory analyses. All samples will be collected during daylight hours between Monday and Thursday. The frequency of laboratory analyses for specific parameters will be as shown in Table 4-1. Those analyses performed only twice per site will be performed on the initial and final sample collection rounds or based on actual field conditions.

During the initial round of sampling, samples will be collected at all "entry point" stations and pump stations. In addition, the "outfall" locations listed in Table 3-1 will be inspected to assess whether dry weather urban runoff is present. If so, samples will be collected and submitted for laboratory analyses provided sufficient flow exists to obtain the required volume within a reasonable time period. Based on the results of the initial round of sampling, subsequent rounds of sampling will be scheduled. The total number of samples will not exceed 175 based on the available funding for sample collection and laboratory analyses.

# Section 6
# Preparation and Logistics

The main objective of the monitoring study is to obtain a representative sample of the discharge. Success of the sampling effort requires careful planning to assure that representative samples are obtained at each site.

## 6.1 Staffing and Mobilization

All sampling crews will consist of at least two individuals. Prior to each sampling event the following staff, equipment and activities will be needed.

- Personnel needed for each position
  - Field Team Leaders
  - Field Team Assistants
- Equipment mobilization
- Equipment maintenance
- Communication channels

### 6.1.1 Personnel Responsibilities

Field monitoring personnel are required to know site-specific:

- Standard Operating Procedures for all field equipment
- Maps, directions, and monitoring locations
- Monitoring equipment checklist list
- Health and Safety concerns
- Health and Safety precautions
- Monitoring information including preparation, monitoring and sample collection
- Laboratory information

### 6.1.2 Equipment Mobilization and Maintenance

Equipment needed for sampling includes all field instruments, sampling containers, safety equipment, vehicles equipped with some type of mobile communication and first aid kit, and highway safety equipment (see table on next page). Necessary equipment will be loaded into the appropriate vehicle.

All monitoring and health and safety equipment shall be in good working order. Defective, cracked, or otherwise unusable equipment shall be replaced prior to mobilization or replaced immediately once identified. Meters will be cleaned and maintained as specified by the manufacturer's instructions.

Field Equipment

- Portable flow velocity meter
- Tape measures, graduated rod
- Buckets, square containers (1-5 gallon capacity)
- Water quality meter (meter to test pH, conductivity, and temperature).
- Turbidity meter
- Manufacturers Standard Procedures
- Digital Camera

Sampling Equipment

- Log books
- Paper towels
- DI (de-ionized) water squirt bottles
- Tape gun with clear tape
- Sample bottles
- Coolers and ice
- Grab sampling pole
- DI water (3-gallon jug)
- Spare sample labels
- QAPP
- Field Forms (on water-resistant paper)
- Clipboard
- Rite-n-rain pens
- Disposable gloves
- Utility knife

Safety Equipment

- Cones (where required)
- Orange safety vests
- Flashing warning light (where required)
- Hard hats (always required)
- Hospital map or directions
- First Aid kit
- Drinking water
- Confined space equipment (where required)
- Two-way radio or cellular phone
- Life vests
- Rope

## 6.2 Manual Sampling

Field technicians will collect samples from a well mixed location in the center of the discharge flow path. Sufficient sample volume is required to complete all laboratory analyses. Refer to Figure 6-1 for the number and volume of aliquot samples to collect.

### 6.2.1 General Inspection

A brief physical inspection of the equipment will be made to make certain that there are no obvious problems. If needed, the sampling point will be cleared of debris. Debris will only be cleared if flow measurements are hindered.

### 6.2.2 Site Visit Documentation

Upon each site visit, records of the visit will be accurately recorded on the Field Data Log Sheet (Figure 6-1).

### 6.2.3 Sampling Documentation

For sampling events, additional data will be recorded on the Field Data Log Sheet (Figure 6-1). The following data are uniform for each station:

- Sample Time: The time (24-hour time) when each sample aliquot was collected.

- pH (pH units): The result of field instrument measurement of pH of the aliquot sample.
- Conductivity (µS/cm): The result of field instrument measurement of specific conductance of the sample aliquot.
- Temperature (°C): The measure of temperature of the sample aliquot.
- Other observations of the discharge (odor, color, sheen, etc) and/or information on readily observable potential sources.

**Figure 6-1**
**Field Data Log Sheet**
**City of Huntington Beach**

| **GENERAL INFORMATION:** | | | |
|---|---|---|---|
| Date: | | Time in: | Time out: |
| Team leader's initial: | | Field Team: | |
| Sampling Location: | | | |
| Sampling visit or maintenance visit (check one): ☐ Sampling event ☐ Maintenance visit | | | |

**WATER QUALITY:**

| Site # | Location | Time (hh:mm) | Conductivity (µS/cm) | pH (pH Units) | Temp. (°C) | Turbidity |
|---|---|---|---|---|---|---|
| | | | | | | |

**COMMENTS:**

# Section 7
# Sample Collection

Manual grab samples will be collected for this study as discussed below.

## 7.1 Sampling Procedures

Specific conductivity, pH, turbidity, and temperature will be measured for each sample using field equipment (in accordance with the manufacturers' instructions) and results recorded in the designated spaces on the Field Data Log Sheet.

Sites have been selected for manual sample collection and will be monitored by portable flowmeter, where possible, or by manual flow estimates. Each meter and gage will be checked for performance upon arrival of the Field Team.

Manual samples will be collected by inserting the sample container under or down current of the discharge, with the container opening facing upstream. Less accessible sampling points may require the use of poles and buckets to collect samples. To ensure that manual samples are representative of the discharge, the following procedures will be followed:

- Sample containers will be labeled prior to the sampling event.
- Samples will be promptly put into a cooler with ice at 4 °C.
- Samples will be taken from the horizontal and vertical center of the channel.
- Sampling will not stir up any sediments at the bottom of a channel.
- The inside of the sampling container will not be touched.
- Uncharacteristic floating debris will not be collected.
- Safety precautions will be taken.

Refer to Table 4-1 for the appropriate bottle type, volume, and preservatives of each sample collected.

## 7.2 Sample Tracking and Handling

Water samples will be kept properly chilled and transferred to the analytical laboratory within holding times to achieve the highest quality data possible. To ensure proper tracking and handling of the samples, documentation will accompany the samples from the initial pickup to the final extractions and analysis. This documentation will include the Chain-of-Custody (COC) Form (see Figure 7-1 for an example). The COC form will be used to track and handle samples.

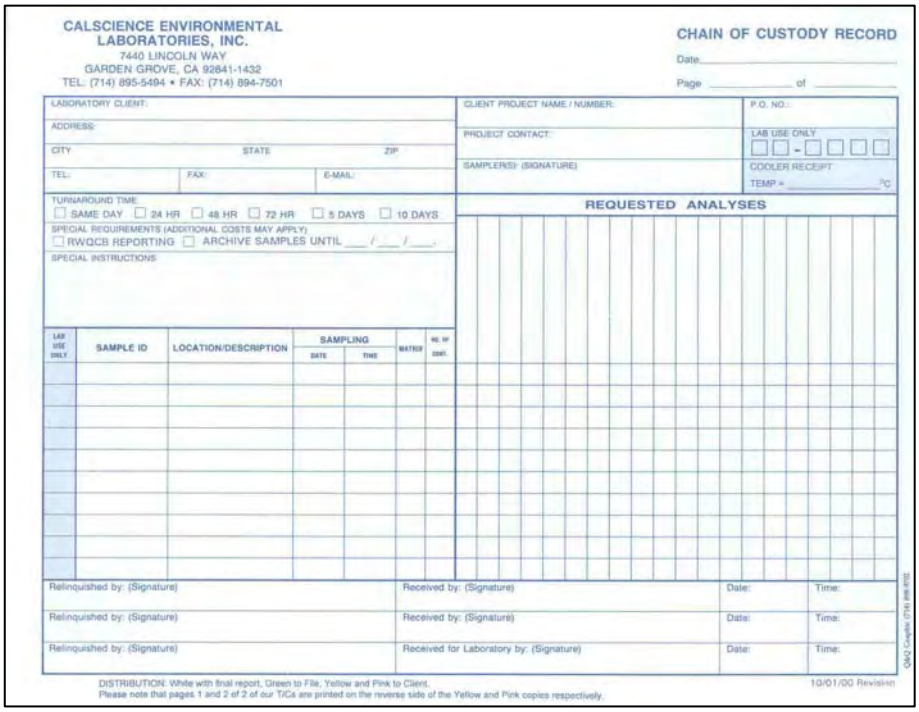
All samples collected, including the composite containers, will be labeled with the following information:

- Project name
- Date
- Time
- Site name and number
- Collector's initials
- Sample I.D. number

A duplicate QA/QC sample will be selected at a frequency of 1 in every 10 samples. Duplicate and QA/QC samples will be prepared from the combined volume of the sample collected (i.e., from each of the aliquot samples) at the selected duplicate and QA/QC station. Duplicate and QA/QC sample bottles will be labeled, recorded on the COC form, and transported to the analytical laboratory. Furthermore, additional sample volume will be collected at approximately 20 percent of the sites. The additional volume will be collected for laboratory matrix spike/matrix spike duplicate analyses.

The sample bottles for composite samples are transferred at the end of the stampling event. All samples will be properly logged on the Chain-of-Custody Form and kept chilled in coolers. There will also be a field duplicate and a field blank for QA/QC samples. The sampling stations will be selected by the consultant.

**Figure 7-1**
**Chain-of-Custody Form**


CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD
Date:
Page ____ of ____

LABORATORY CLIENT:
ADDRESS:
CITY STATE ZIP
TEL: FAX: E-MAIL:
TURNAROUND TIME
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS
SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ___/___/___
SPECIAL INSTRUCTIONS

CLIENT PROJECT NAME / NUMBER:
PROJECT CONTACT:
SAMPLER(S): (SIGNATURE)
P.O. NO.:
LAB USE ONLY
COOLER RECEIPT
TEMP = ____ °C

REQUESTED ANALYSES

| LAB USE ONLY | SAMPLE ID | LOCATION/DESCRIPTION | SAMPLING DATE | SAMPLING TIME | MATRIX | NO. OF CONT. |
|---|---|---|---|---|---|---|
| | | | | | | |

| | | | |
|---|---|---|---|
| Relinquished by: (Signature) | Received by: (Signature) | Date: | Time: |
| Relinquished by: (Signature) | Received by: (Signature) | Date: | Time: |
| Relinquished by: (Signature) | Received for Laboratory by: (Signature) | Date: | Time: |

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Yellow and Pink copies respectively.
10/01/00 Revision

## 7.3 Sample Identification

All sample bottles should be pre-labeled on the bottle rather than the cap to identify the sample for laboratory analysis. Sample labels should include type of sample (composite), type of QC sample (i.e. field splits), sampler's name, date, time, and location. Sample identification will use the following format:

Sample Numbering Scheme:

S#YYMMDDHHmmTT

Where:

| | | |
|---|---|---|
| S# | = | station number (# = 01-25) |
| YY | = | last two digits of the year (01) |
| MM | = | month (01-12) |
| DD | = | day (01-31) |
| HH | = | hour of the sample (00-24) |
| mm | = | minute of the sample collection (00-60) |
| TT | = | type of sample (Note: # denotes sample number, series, or set) |
| C# | = | discrete sample |

All grab sample bottles should be pre-labeled to the extent possible before each dry weather monitoring event. Pre-labeling sample bottles simplifies field activities, leaving only date, time, sample number, and sampling personnel names to be filled out in the field. Basic bottle labels are available pre-printed with space to pre-label by hand writing or typing. Custom bottle labels may be produced using blank labels, labeling software, and waterproof ink. The bottle label should include the following information, with other items as appropriate:

Project Name _____

Station Name_____

Sample Code_____(see below for sample code development)

Date _____ Time_____

Sample __ of __. Type _(grab/composite)__

Collected by _____

Preservative _____ Analysis _____

Each sample bottle label shall include a sample identification code as shown below.

SSSS-YYMMDD-HHmm-TT##

Where:

| | | |
|---|---|---|
| SSSS | = | station name and number (WB01, WB02…) |
| | | Winterburg Channel = WC) |
| | | Talbert Channel = TC |
| | | Bolsa Chica Channel = BC |
| | | Sunset Channel = SC |
| | | Huntington Beach =HB (direct beach runoff) |
| | | Huntington Harbor = (HH) |
| | | Pump Station = PS |
| YY | = | last two digits of the year (01) |
| MM | = | month (01-12) |
| DD | = | day (01-31) |
| HH | = | hour of the last sample collected (00-23) |
| mm | = | minute of the last sample collected (00-59) |
| TT | = | Type or QA/QC Identifier (if applicable) |
| G | = | Grab |
| EB | = | equipment blank |
| FS | = | field split |
| ## | = | bottle number |

Note: Day, hour, and minute represent the day and time when the rain ended.

All sample bottles should be labeled on the bottle rather than the cap to identify the sample for laboratory analysis. Sample labels should include type of sample, type of QC sample (i.e. field splits), sampler's name, date, time, and location. For an urban runoff sample collected at site #2 along Talbert Channel TC02 collected at 4:15 PM on May 15, 2002, the sample number will be as follows:

TC02-020515-1615-G01

Bottles should be labeled in a dry environment prior to field crew mobilization. Attempting to apply labels to sample bottles after filling may cause problems, as labels usually do not adhere to wet bottles. The labels should be applied to the bottles rather than to the caps. Following labeling, clear scotch tape should be applied over the label to prevent ink from smearing.

# Section 8
# Sample Preparation and Analytical Methods

The following subsections discuss the selection of analytical laboratories, sample holding times, volumes, preservation, and project detection limits.

## 8.1 Laboratory Selection

A contract laboratory that will be used for this project must have extensive experience with water studies and has the ability to provide rapid response in order to meet holding time requirements for constituents requiring expeditious analysis. The laboratory must be able to demonstrate their ability to meet the target reporting limits specified in Table 4-1 (through method detection limit studies) and be certified by the State Department of Health Services Environmental Laboratory Accreditation Program (ELAP) to perform the required analyses.

## 8.2 Holding Time, Sample Volumes, and Preservation

The contract laboratory will be responsible for providing appropriate sample containers and sample containers that need appropriate preservatives for analysis. Table 4-1 provides a summary of sample volumes required for each analysis. Since additional volumes are necessary for laboratory QA/QC (i.e., matrix spike/matrix spike duplicate analyses), additional sample containers will be provided so that the necessary sample volume is collected to perform the analysis.

## 8.3 Project Reporting Limits

The analytical methods and laboratory reporting limits for this project are listed in Table 4-1. In some cases, reporting limits may be elevated due to limited sample volumes or potential matrix interferences. In such cases, appropriate data qualifiers will be applied to the associated area. It will be important to obtain the required sample volume (reference Table 6-1) when adequate flow is available so changes to reporting limits can be avoided.

# Section 9
# Quality Assurance/Quality Control

This Quality Assurance and Quality Control (QA/QC) Plan is an integrated component of the overall study. The procedures stated herein are to be followed for all sampling and analysis conducted under the scope of this program.

The following sections address QA/QC activities associated with both field sampling and laboratory analyses for this program. Field QA/QC samples are collected and used to evaluate potential contamination and sampling error introduced into a sample prior to its submittal to the analytical laboratory. Laboratory QA/QC activities provide information needed to assess potential laboratory contamination, analytical precision and accuracy, and representativeness.

## 9.1 Sample Tracking and Handling

Water samples will be kept properly chilled and will be transferred to the analytical laboratory within holding times to achieve the highest quality data possible. To ensure proper tracking and handling of the samples, documentation will accompany the samples from the initial collection to the final extractions and analysis. Minimum documentation includes:

- Chain-of-Custody Forms (see Figure 7-1)
- Compositing Scheme Form

These forms will be used to track and handle samples.

It is imperative to assuring quality data results that the analytical laboratory provide confirmation of each and all analytical tests to be conducted, their respective reporting limits, analytical methods, and costs before analyses are allowed to be conducted.

## 9.2 Analytical Laboratory Requirements

The following subsections describe the selection of the analytical laboratory, analytical methods and detection limits, holding times, and sample container requirements.

### 9.2.1 Laboratory Selection

A contract laboratory is required to perform the requested analyses. As mentioned previously in Section 8.1, the laboratory must have the ability to provide rapid response to meet critical holding time requirements for analytes requiring expeditious analysis. The laboratory must also be able to demonstrate their ability to meet the target reporting limits specified in Table 4-1 and be State certified through Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP).

### 9.2.2 Detection Limits, Analytical Methods, Holding Times, and Sample Bottles

**Requirements**

The laboratory will be responsible for providing appropriate sample containers and, when necessary, sample containers with preservatives for each analysis. Table 4-1 provides a summary of sample volumes required for each analysis, along with the types of containers, holding times, and preservatives. Because additional volumes are necessary for laboratory QA/QC, sample containers will also provide the volume necessary to perform these requested analyses. The volume of the water composite from each site is often the critical factor in determining the volume of sample that can be provided to the laboratory. Table 4-1 in Section 4.0 lists the suggested analysis priority rankings should the sample volume be inadequate for running all analyses, and the analytical methods and reporting limits. The highest priority will be bacteria analyses, with nutrients and metals analyses a secondary priority. The OP pesticides will be the lowest priority.

The reporting limits presented in Table 4-1 are target detection limits. In some cases, reporting limits may be elevated due to limited sample volumes or potential matrix interference. In such cases, appropriate data qualifiers will be applied to the associated data.

### 9.2.3 Laboratory Data Package Deliverables

Laboratories will be required to provide a 5-day turnaround on all deliverables. The deliverable package will include a hard copy and electronic data files. The hard copy will include standard narratives identifying any analytical or QA/QC problems and corrective actions. The electronic data files will contain all information found in the hard copy reports submitted by the laboratories and will be provided in Excel or comma-delimited format.

## 9.3 Field Quality Assurance/Quality Control

A set of QA/QC samples will be provided with each type of sample analyzed for each dry weather event. The types of field QA/QC samples that will be utilized for this study are as follows:

- **Equipment Blanks –** Equipment blanks will be collected to evaluate potential cross-contamination from sampling equipment. Equipment blanks will be collected by pouring "blank" water through the sampling equipment and then collecting the water in appropriate sample containers following equipment decontamination. Laboratory-provided, deionized water, will be used as the "blank" water for equipment blanks. Equipment blanks will be compared to, and should be less than, laboratory reporting limits. If detectable concentrations of target analytes are reported in the equipment blanks, then the blank contamination will be compared to the levels detected in the project samples. If the sample concentration is less than five times the level detected in the blank, then the sample concentration may be considered non-detectable. If the sample

concentration is greater than five times the blank concentration, then no further action is required and qualification of the sample result is not required.

- **Duplicate Analyses -** These analyses will be performed for the composite samples and will require an additional set of sample containers to be sub-sampled. The results will allow evaluation of sampling error introduced by both field sampling and laboratory analyses. Duplicate samples will be sent "blind" to the laboratories. One duplicate sample will be collected from one sampling location during each dry weather event sampled and analyzed for the full list of analytes. A limit of ± 35 percent will be used to evaluate precision between field duplicate sample results.

The blank and duplicate samples need not all be from the same station. However, per sampling event (or batch run), these field QA/QC samples will be analyzed for the standard analytes as field samples, where appropriate.

## 9.4 Laboratory Quality Assurance/Quality Control

Analytical quality assurance for this program includes the following:

- Employing analytical chemists trained in the procedures to be followed.
- Adherence to documented procedures, EPA methods, written SOPs, and other approved methods (e.g., Standard Methods).
- Calibration of analytical instruments.
- Use of Standard Reference Materials (SRMs).
- Complete documentation of sample tracking and analysis.

Internal laboratory quality control checks will include the use of method blanks, matrix spike/matrix spike duplicates, replicates, laboratory control samples and Standard Reference Materials (SRMs). These QA/QC activities are discussed below and their applicability to each analyte is summarized in Table 9-1. Quality assurance/quality control objectives for dry weather samples are summarized in Table 9-2 for each parameter.

- **Laboratory Duplicates** A laboratory duplicate (also called a laboratory split) sample is generated by the laboratory. Laboratory duplicate samples will be prepared and analyzed for specific analytical methods where other QC elements (i.e., MS/MSD or LCS samples) are not required or specified. Duplicate analyses results are evaluated by calculating the relative percent difference (RPD) between the two sets of results. This serves as a measure of the reproducibility (precision) of the sample results. Typically, duplicate results will fall within an accepted RPD range, depending upon the analysis (see Table 9-2).

- **Method Blanks** On a frequency of one per batch of 20 or fewer samples, a method blank sample will be analyzed for each analytical method. A method blank is a sample of a known matrix that has been subjected to the same complete analytical procedure as the submitted samples to determine if potential contamination has been introduced into the samples during processing. Blank analysis results will be checked against reporting limits for that analyte. Results should be less than the reporting limits for each analyte.

- **Spikes** Two different kinds of spikes will be used: matrix spikes (MS) and laboratory control (blank) spikes (LCS).

  Matrix spikes involve adding a known amount of the analyte(s) of interest to one of the submitted samples being analyzed. One sample is split into three separate portions. One portion is analyzed to determine the concentration of the analyte(s) in question in an unspiked state. The other two portions are spiked with a known concentration of the analyte(s) of interest. The recovery of the spiked samples is a measure of the accuracy of the analysis. By determining MSD recoveries, another measure of precision (RPD) can be calculated. Both the RPD values and spike recoveries are compared against accepted and known method-dependent limits. Results outside these limits are subject to corrective action. MS/MSD data are also useful in evaluating matrix interference. Additional sample volume collected during field activities for the analysis of matrix spikes and matrix spike duplicates will be clearly identified on the COC form.

  The second spike type, the LCS, involves spiking known amounts of the analyte(s) of interest into a known, clean matrix to assess laboratory performance of the method and the possible matrix effects on spike recoveries. High or low recoveries of the analytes in the matrix spikes may be caused by interferences in the sample. LCSs assess these possible matrix effects because the matrix is known to be free from interferences. Matrix spikes and LCSs are analyzed at a frequency of one per batch of 20 or fewer samples for specific methods

- **Standard Reference Materials (SRMs)** A SRM is a sample containing a known and certified amount of the analyte of interest and is typically analyzed by personnel without the knowledge of that concentration. SRMs are typically purchased from independent suppliers who prepare them and certify the analyte concentrations. Results are evaluated by comparing results obtained against the known quantity and the acceptable range of results supplied by the manufacturer. One external reference standard appropriate to the sample matrix will be analyzed at least quarterly by the laboratory. Results of this analysis will be provided to the Task Manager.

- **Corrective Action** Corrective action is taken when an analysis is deemed unreasonable for some reason. These reasons include exceeding RPD ranges and/or problems with spike recoveries or blanks. The corrective action varies somewhat from analysis to analysis, but typically involves the following:

- A check of procedures.
- A review of documents and calculations to identify possible errors.
- Correction of errors.
- Similar calculations to improve accuracy.
- A re-analysis of the sample extract, if available, to determine if results can be improved.
- A complete reprocessing and re-analysis of additional sample material, if available and if the holding time has not been exceeded.

***Table 9-1***
***Laboratory Quality Control Samples by Analyte***

| Parameter | Blanks(1) | Duplicates(2) | MS/MSDs(3) | LCS(4) | SRMs(5) |
|---|---|---|---|---|---|
| Total Coliforms | — | — | — | — | — |
| Fecal Coliforms | — | — | — | — | — |
| Enterococci | — | — | — | — | — |
| TSS | — | ✓ | — | — | — |
| TDS | — | ✓ | — | — | — |
| Hardness as Ca $CO_3$ | — | ✓ | — | — | — |
| $NO_3$-N | ✓ | — | ✓ | ✓ | ✓ |
| $NO_2$-N | ✓ | — | ✓ | ✓ | ✓ |
| Dissolved Ortho-P | ✓ | — | ✓ | ✓ | ✓ |
| $NH_3$-N | ✓ | — | ✓ | ✓ | ✓ |
| Dissolved Phosphorous | ✓ | — | ✓ | ✓ | ✓ |
| Total Phosphorous | ✓ | — | ✓ | ✓ | ✓ |
| TKN | ✓ | — | ✓ | ✓ | ✓ |
| Arsenic (As) | ✓ | — | ✓ | ✓ | ✓ |
| Cadmium (Cd) | ✓ | — | ✓ | ✓ | ✓ |
| Chromium (Cr) | ✓ | — | ✓ | ✓ | ✓ |
| Copper (Cu) | ✓ | — | ✓ | ✓ | ✓ |
| Iron (Fe) | ✓ | — | ✓ | ✓ | ✓ |
| Lead (Pb) | ✓ | — | ✓ | ✓ | ✓ |
| Nickel (Pb) | ✓ | — | ✓ | ✓ | ✓ |
| Zinc (Zn) | ✓ | — | ✓ | ✓ | ✓ |
| OP Pesticides | ✓ | — | ✓ | ✓ | ✓ |
| TRPH | ✓ | — | ✓ | ✓ | ✓ |

(1) Method Blanks – results must be below laboratory reporting limit
(2) Laboratory duplicates
(3) Matrix Spike/Matrix Spike Duplicates
(4) Laboratory Control Sample
(5) Standard Reference Materials

***Table 9-2***
***Control Limits for Precision and Accuracy for Water Samples***

| Constituent | EPA Method | Maximum Allowable RPD (MS/MSD or Laboratory Duplicates) | Recovery Lower Limit (MS/MSD/LCS) | Recovery Upper Limit (MS/MSD/LCS) |
|---|---|---|---|---|
| ***Conventional*** | | | | |
| Total Coliforms | SM9221B | n/a | n/a | n/a |
| Fecal Coliforms | SM9221B | n/a | n/a | n/a |
| Enterococci | SM9230B | n/a | n/a | n/a |
| TSS | 160.2 | 20% | 80% | 120% |
| TDS | 160.1 | 20% | 80% | 120% |
| Hardness as Ca $CO_3$ | 130.2 | 20% | 80% | 120% |
| ***Nutrients*** | | | | |
| $NO_3$-N | 300.0 | 20% | 80% | 120% |
| $NO_2$-N | 300.0 | 20% | 80% | 120% |
| Dissolved Ortho-P | 365.2 | 20% | 80% | 120% |
| $NH_3$-N | 350.3 | 20% | 80% | 120% |
| Dissolved Phosphorous | 365.3 | 20% | 80% | 120% |
| Total Phosphorous | 365.3 | 20% | 80% | 120% |
| TKN | 351.3 | 20% | 80% | 120% |
| ***Metals (total & dissolved)*** | | | | |
| Arsenic (As) | 200.8 | 20% | 75% | 125% |
| Cadmium (Cd) | 200.8 | 20% | 75% | 125% |
| Chromium (Cr) | 200.8 | 20% | 75% | 125% |
| Copper (Cu) | 200.8 | 20% | 75% | 125% |
| Iron (Fe) | 200.7 | 20% | 75% | 125% |
| Lead (Pb) | 200.8 | 20% | 75% | 125% |
| Nickel (Pb) | 200.8 | 20% | 75% | 125% |
| Zinc (Zn) | 200.8 | 20% | 75% | 125% |
| ***Total Petroleum Hydrocarbons*** | | | | |
| OP Pesticides | 8141 | 30% | 30% | 130% |
| TRPH | 418.1 | 20% | 75% | 120% |

n/a = not applicable to the method

# Section 10
# Data Management and Reporting Procedures

## 10.1 Data Management

The Project Manager will be responsible for tracking the analytical process to assure that laboratories are meeting the required turnaround times and are providing a complete deliverable package. The Project Manager will receive the original hard copy from the laboratory, verify completeness and log the date of receipt. After the data has been checked, the Project Manager will file all other original project documentation in order to maintain complete project records.

Laboratories will provide data in both hard copy and electronic formats. The form of electronic submittals will be consistent with file specifications for electronic data deliverables (EDD) and will be provided to the laboratory prior to project startup to ensure that the files can be imported into an MSExcel© spreadsheet table with a minimum of editing. Prior to submittal to CDM, the laboratory will be required to check each EDD. Once submitted to CDM, each EDD will be validated. A validation report will be generated for each EDD and attached to the hard copy analytical report.

Files from the laboratory will also be stored in MSExcel© spreadsheet files.

## 10.2 Reporting Procedures

A technical memorandum (TM) will be submitted. The TM will include a brief description of site characteristics, sample collection times and volumes, flow data, laboratory procedures, and a summary of laboratory results for each site sampled.

Tabular data summaries will also be prepared.

# Appendix B
# Water Quality Standards Excerpts

Excerpt from
California Ocean Plan
California State Water Resources Control Board
December 3, 2001

Section II Water Quality Objectives

## II. WATER QUALITY OBJECTIVES

A. General Provisions

1. This chapter sets forth limits or levels of water quality characteristics for ocean* waters to ensure the reasonable protection of beneficial uses and the prevention of nuisance. The discharge of waste* shall not cause violation of these objectives.

2. The Water Quality Objectives and Effluent Limitations are defined by a statistical distribution when appropriate. This method recognizes the normally occurring variations in treatment efficiency and sampling and analytical techniques and does not condone poor operating practices.

3. Compliance with the water quality objectives of this chapter shall be determined from samples collected at stations representative of the area within the waste field where initial* dilution is completed.

B. Bacterial Characteristics

1. Water-Contact Standards

a. Within a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas outside this zone used for water contact sports, as determined by the Regional Board, but including all kelp* beds, the following bacterial objectives shall be maintained throughout the water column:

(1) Samples of water from each sampling station shall have a density of total coliform organisms less than 1,000 per 100 ml (10 per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 per 100 ml (10 per ml), and provided further that no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 per 100 ml (100 per ml).

(2) The fecal coliform density based on a minimum of not less than five samples for any 30-day period, shall not exceed a geometric mean of 200 per 100 ml nor shall more than 10 percent of the total samples during any 60-day period exceed 400 per 100 ml.

b. The “Initial* Dilution Zone” of wastewater outfalls shall be excluded from designation as "kelp* beds” for purposes of bacterial standards, and Regional Boards should recommend extension of such exclusion zone where warranted to the SWRCB (for consideration under Chapter III.H.). Adventitious assemblages of kelp plants on waste discharge structures (e.g., outfall pipes and diffusers) do not constitute kelp* beds for purposes of bacterial standards.

* See Appendix I for definition of terms.

2. Shellfish* Harvesting Standards

   a. At all areas where shellfish* may be harvested for human consumption, as determined by the Regional Board, the following bacterial objectives shall be maintained throughout the water column:

      (1) The median total coliform density shall not exceed 70 per 100 ml, and not more than 10 percent of the samples shall exceed 230 per 100 ml.

C. Physical Characteristics

1. Floating particulates and grease and oil shall not be visible.

2. The discharge of waste* shall not cause aesthetically undesirable discoloration of the ocean* surface.

3. Natural* light shall not be significantly* reduced at any point outside the initial* dilution zone as the result of the discharge of waste*.

4. The rate of deposition of inert solids and the characteristics of inert solids in ocean* sediments shall not be changed such that benthic communities are degraded*.

D. Chemical Characteristics

1. The dissolved oxygen concentration shall not at any time be depressed more than 10 percent from that which occurs naturally, as the result of the discharge of oxygen demanding waste* materials.
2. The pH shall not be changed at any time more than 0.2 units from that which occurs naturally.
3. The dissolved sulfide concentration of waters in and near sediments shall not be significantly* increased above that present under natural conditions.
4. The concentration of substances set forth in Chapter II, Table B, in marine sediments shall not be increased to levels which would degrade* indigenous biota.
5. The concentration of organic materials in marine sediments shall not be increased to levels that would degrade* marine life.
6. Nutrient materials shall not cause objectionable aquatic growths or degrade* indigenous biota.
7. Numerical Water Quality Objectives

   a. Table B water quality objectives apply to all discharges within the jurisdiction of this Plan.

   b. Table B Water Quality Objectives

* See Appendix I for definition of terms.

**TABLE B**
**WATER QUALITY OBJECTIVES**

| | Units of Measurement | Limiting Concentrations 6-Month Median | Daily Maximum | Instantaneous Maximum |
|---|---|---|---|---|
| OBJECTIVES FOR PROTECTION OF MARINE AQUATIC LIFE | | | | |
| Arsenic | ug/l | 8. | 32. | 80. |
| Cadmium | ug/l | 1. | 4. | 10. |
| Chromium (Hexavalent) (see below, a) | ug/l | 2. | 8. | 20. |
| Copper | ug/l | 3. | 12. | 30. |
| Lead | ug/l | 2. | 8. | 20. |
| Mercury | ug/l | 0.04 | 0.16 | 0.4 |
| Nickel | ug/l | 5. | 20. | 50. |
| Selenium | ug/l | 15. | 60. | 150. |
| Silver | ug/l | 0.7 | 2.8 | 7. |
| Zinc | ug/l | 20. | 80. | 200. |
| Cyanide (see below, b) | ug/l | 1. | 4. | 10. |
| Total Chlorine Residual (For intermittent chlorine sources see below, c) | ug/l | 2. | 8. | 60. |
| Ammonia (expressed as nitrogen) | ug/l | 600. | 2400. | 6000. |
| Acute* Toxicity | TUa | N/A | 0.3 | N/A |
| Chronic* Toxicity | TUc | N/A | 1. | N/A |
| Phenolic Compounds (non-chlorinated) | ug/l | 30. | 120. | 300. |
| Chlorinated Phenolics | ug/l | 1. | 4. | 10. |
| Endosulfan | ug/l | 0.009 | 0.018 | 0.027 |
| Endrin | ug/l | 0.002 | 0.004 | 0.006 |
| HCH* | ug/l | 0.004 | 0.008 | 0.012 |
| Radioactivity | Not to exceed limits specified in Title 17, Division 1, Chapter 5, Subchapter 4, Group 3, Article 3, Section 30253 of the California Code of Regulations. Reference to Section 30253 is prospective, including future changes to any incorporated provisions of federal law, as the changes take effect. | | | |

* See Appendix I for definition of terms.

**Table B Continued**

| Chemical | 30-day Average (ug/l) Decimal Notation | Scientific Notation |
|---|---|---|
| OBJECTIVES FOR PROTECTION OF HUMAN HEALTH – NONCARCINOGENS | | |
| acrolein | 220. | $2.2 \times 10^{2}$ |
| antimony | 1,200. | $1.2 \times 10^{3}$ |
| bis(2-chloroethoxy) methane | 4.4 | $4.4 \times 10^{0}$ |
| bis(2-chloroisopropyl) ether | 1,200. | $1.2 \times 10^{3}$ |
| chlorobenzene | 570. | $5.7 \times 10^{2}$ |
| chromium (III) | 190,000. | $1.9 \times 10^{5}$ |
| di-n-butyl phthalate | 3,500. | $3.5 \times 10^{3}$ |
| dichlorobenzenes* | 5,100. | $5.1 \times 10^{3}$ |
| diethyl phthalate | 33,000. | $3.3 \times 10^{4}$ |
| dimethyl phthalate | 820,000. | $8.2 \times 10^{5}$ |
| 4,6-dinitro-2-methylphenol | 220. | $2.2 \times 10^{2}$ |
| 2,4-dinitrophenol | 4.0 | $4.0 \times 10^{0}$ |
| ethylbenzene | 4,100. | $4.1 \times 10^{3}$ |
| fluoranthene | 15. | $1.5 \times 10^{1}$ |
| hexachlorocyclopentadiene | 58. | $5.8 \times 10^{1}$ |
| nitrobenzene | 4.9 | $4.9 \times 10^{0}$ |
| thallium | 2. | $2. \times 10^{0}$ |
| toluene | 85,000. | $8.5 \times 10^{4}$ |
| tributyltin | 0.0014 | $1.4 \times 10^{-3}$ |
| 1,1,1-trichloroethane | 540,000. | $5.4 \times 10^{5}$ |
| OBJECTIVES FOR PROTECTION OF HUMAN HEALTH – CARCINOGENS | | |
| acrylonitrile | 0.10 | $1.0 \times 10^{-1}$ |
| aldrin | 0.000022 | $2.2 \times 10^{-5}$ |
| benzene | 5.9 | $5.9 \times 10^{0}$ |
| benzidine | 0.000069 | $6.9 \times 10^{-5}$ |
| beryllium | 0.033 | $3.3 \times 10^{-2}$ |
| bis(2-chloroethyl) ether | 0.045 | $4.5 \times 10^{-2}$ |
| bis(2-ethylhexyl) phthalate | 3.5 | $3.5 \times 10^{0}$ |
| carbon tetrachloride | 0.90 | $9.0 \times 10^{-1}$ |
| chlordane* | 0.000023 | $2.3 \times 10^{-5}$ |
| chlorodibromomethane | 8.6 | $8.6 \times 10^{0}$ |

* See Appendix I for definition of terms.

**Table B Continued**

| Chemical | 30-day Average (ug/l) Decimal Notation | Scientific Notation |
|---|---|---|
| OBJECTIVES FOR PROTECTION OF HUMAN HEALTH – CARCINOGENS | | |
| chloroform | 130. | $1.3 \times 10^{2}$ |
| DDT* | 0.00017 | $1.7 \times 10^{-4}$ |
| 1,4-dichlorobenzene | 18. | $1.8 \times 10^{1}$ |
| 3,3'-dichlorobenzidine | 0.0081 | $8.1 \times 10^{-3}$ |
| 1,2-dichloroethane | 28. | $2.8 \times 10^{1}$ |
| 1,1-dichloroethylene | 0.9 | $9 \times 10^{-1}$ |
| dichlorobromomethane | 6.2 | $6.2 \times 10^{0}$ |
| dichloromethane | 450. | $4.5 \times 10^{2}$ |
| 1,3-dichloropropene | 8.9 | $8.9 \times 10^{0}$ |
| dieldrin | 0.00004 | $4.0 \times 10^{-5}$ |
| 2,4-dinitrotoluene | 2.6 | $2.6 \times 10^{0}$ |
| 1,2-diphenylhydrazine | 0.16 | $1.6 \times 10^{-1}$ |
| halomethanes* | 130. | $1.3 \times 10^{2}$ |
| heptachlor | 0.00005 | $5 \times 10^{-5}$ |
| heptachlor epoxide | 0.00002 | $2 \times 10^{-5}$ |
| hexachlorobenzene | 0.00021 | $2.1 \times 10^{-4}$ |
| hexachlorobutadiene | 14. | $1.4 \times 10^{1}$ |
| hexachloroethane | 2.5 | $2.5 \times 10^{0}$ |
| isophorone | 730. | $7.3 \times 10^{2}$ |
| N-nitrosodimethylamine | 7.3 | $7.3 \times 10^{0}$ |
| N-nitrosodi-N-propylamine | 0.38 | $3.8 \times 10^{-1}$ |
| N-nitrosodiphenylamine | 2.5 | $2.5 \times 10^{0}$ |
| PAHs* | 0.0088 | $8.8 \times 10^{-3}$ |
| PCBs* | 0.000019 | $1.9 \times 10^{-5}$ |
| TCDD equivalents* | 0.0000000039 | $3.9 \times 10^{-9}$ |
| 1,1,2,2-tetrachloroethane | 2.3 | $2.3 \times 10^{0}$ |
| tetrachloroethylene | 2.0 | $2.0 \times 10^{0}$ |
| toxaphene | 0.00021 | $2.1 \times 10^{-4}$ |
| trichloroethylene | 27. | $2.7 \times 10^{1}$ |
| 1,1,2-trichloroethane | 9.4 | $9.4 \times 10^{0}$ |
| 2,4,6-trichlorophenol | 0.29 | $2.9 \times 10^{-1}$ |
| vinyl chloride | 36. | $3.6 \times 10^{1}$ |

* See Appendix I for definition of terms.

Table B Notes:

a) Dischargers may at their option meet this objective as a total chromium objective.

b) If a discharger can demonstrate to the satisfaction of the Regional Board (subject to EPA approval) that an analytical method is available to reliably distinguish between strongly and weakly complexed cyanide, effluent limitations for cyanide may be met by the combined measurement of free cyanide, simple alkali metal cyanides, and weakly complexed organometallic cyanide complexes. In order for the analytical method to be acceptable, the recovery of free cyanide from metal complexes must be comparable to that achieved by the approved method in 40 CFR PART 136, as revised May 14, 1999.

c) Water quality objectives for total chlorine residual applying to intermittent discharges not exceeding two hours, shall be determined through the use of the following equation:

$$\log y = -0.43 (\log x) + 1.8$$

where: y = the water quality objective (in ug/l) to apply when chlorine is being discharged;
x = the duration of uninterrupted chlorine discharge in minutes.

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E. Biological Characteristics

1. Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded*.

2. The natural taste, odor, and color of fish, shellfish*, or other marine resources used for human consumption shall not be altered.

3. The concentration of organic materials in fish, shellfish* or other marine resources used for human consumption shall not bioaccumulate to levels that are harmful to human health.

F. Radioactivity

1. Discharge of radioactive waste* shall not degrade* marine life.

* See Appendix I for definition of terms.

California Department of Health Services' (DHS')
Regulations for Public Beaches and Ocean Water Contact Sports Areas
Developed in Response to Requirements of
Health and Safety Code §115880
(Assembly Bill 411, Statutes of 1997, Chapter 765)

# Regulations for Public Beaches and Ocean Water-Contact Sports Areas

Last Update: March 28, 2000

The California Department of Health Services' (DHS') regulations for public beaches and ocean water-contact sports areas include those developed in response to requirements of Health and Safety Code §115880 *(*Assembly Bill 411, Statutes of 1997, Chapter 765). The text of AB 411 is included in Appendix A to DHS' beaches guidance documents.

The AB 411-implementing regulations, which follow, are described and explained in the regulation's Statement of Reasons**.**

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## Title 17 of the California Code of Regulations

## Group 10. Sanitation, Healthfulness and Safety of Ocean Water-Contact Sports Areas

## Article 2. Definitions

### 7956. Storm Drain.

"Storm drain" means a conveyance through which water flows onto or adjacent to a public beach and includes rivers, creeks, and streams, whether in natural or in man-made channels.

NOTE: Authority cited: Sections 100275, 115880, and 116075, Health and Safety Code. Reference: Sections 115880, 116075, and 116080, Health and Safety Code.

HISTORY:

1. New section filed 7-26-99 as an emergency; operative 7-26-99 (Register 99, No. 31). A Certificate of Compliance must be transmitted to OAL by 11-23-99 or emergency language will be repealed by operation of law on the following day.

2. Certificate of Compliance as to 7-26-99 order transmitted to OAL 10-15-99 and filed 11-30-99 (Register 99, No. 49).

## Article 4. Healthfulness

### 7957. Physical Standard.

No sewage, sludge, grease, or other physical evidence of sewage discharge shall be visible at any time on any public beaches or water-contact sports areas.

NOTE: Authority cited: Sections 208, and 24156, Health and Safety Code. Reference: Sections 24156, Health and Safety Code.

HISTORY:

1. New NOTE filed 3-20-84 (Register 84, No. 12).

**7958. Bacteriological Standards.**

(a) The minimum protective bacteriological standards for waters adjacent to public beaches and public water-contact sports areas shall be as follows:

(1) Based on a single sample, the density of bacteria in water from each sampling station at a public beach or public water contact sports area shall not exceed:

(A) 1,000 total coliform bacteria per 100 milliliters, if the ratio of fecal/total coliform bacteria exceeds 0.1; or

(B) 10,000 total coliform bacteria per 100 milliliters; or

(C) 400 fecal coliform bacteria per 100 milliliters; or

(D) 104 enterococcus bacteria per 100 milliliters.

(2) Based on the mean of the logarithms of the results of at least five weekly samples during any 30-day sampling period, the density of bacteria in water from any sampling station at a public beach or public water contact sports area, shall not exceed:

(A) 1,000 total coliform bacteria per 100 milliliters; or

(B) 200 fecal coliform bacteria per 100 milliliters; or

(C) 35 enterococcus bacteria per 100 milliliters.

(b) Water samples shall be submitted for bacteriological analyses to a laboratory certified by the Environmental Laboratory Accreditation Program, California Department of Health Services in microbiology for methods for the analysis of the sample type.

NOTE: Authority cited: Sections 100275, 115880, and 116075, Health and Safety Code. Reference: Sections 115880, 116075, and 116080, Health and Safety Code.

HISTORY:

1. Amendment filed 7-15-85; effective thirtieth day thereafter (Register 85, No. 29).

2. Repealer and new section and amendment of Note filed 7-26-99 as an emergency; operative 7-26-99 (Register 99, No. 31). A Certificate of Compliance must be transmitted to OAL by 11-23-99
or emergency language will be repealed by operation of law on the
following day.

3. Certificate of Compliance as to 7-26-99 order transmitted to OAL 10-15-99 and filed 11-30-99 (Register 99, No. 49).

**7959. Bacteriological Sampling.**

(a) In order to determine that the bacteriological standards specified in Section 7958 above are being met in a water-contact sports area designated by a Regional Water Quality Control Board in waters affected by a waste discharge, water samples shall be collected at such sampling stations and at such frequencies as may be specified by said board in its waste discharge requirements.

(b) In waters of a public beach or water-contact sports area that has not been so designated by a Regional Water Quality Control Board, water samples shall be collected at such frequencies as may be determined by the local health officer or Department. Local health officers shall be responsible for the proper collection and analysis of water samples in such areas.

NOTE: Authority cited: Sections 208, and 24156, Health and Safety Code. Reference: Sections 24156 and 24157, Health and Safety Code.

HISTORY:

1. Amendment filed 7-15-85; effective thirtieth day thereafter (Register 85, No. 29).

**7960. Corrective Action.**

(a) When a public beach or public–water-contact sports area fails to meet any of the standards as set forth in Section 7957 or 7958 above, the local health officer or the Department, after taking into consideration the causes therefor, may at his or its discretion close, post with warning signs, or otherwise restrict use of said public beach or public water-contact sports area, until such time as corrective action has been taken and the standards as set forth in 7957 and 7958 above are met.

NOTE: Authority cited: Sections 208, and 24156, Health and Safety Code. Reference: Sections 24156 and 24157, Health and Safety Code.

HISTORY:

1. Amendment filed 7-15-85; effective thirtieth day thereafter (Register 85, No. 29).

**7961. Public Beaches Visited by More than 50,000 People Annually and Adjacent to Storm Drains.**

(a) Waters adjacent to a public beach shall be tested for bacteria identified in Section 7958 on at least a weekly basis from April 1 to October 31, inclusive, if the beach is

(1) Visited by more than 50,000 people annually, and

(2) Located adjacent to a storm drain that flows in the summer.

(b) Water samples shall be taken from locations that include areas affected by storm drains. Samples shall be taken in ankle- to knee-deep water, approximately 4 to 24 inches below the water surface.

(c) When testing reveals that the waters adjacent to a public beach fail to meet any of the standards set forth in Section 7958(a)(1), the local health officer shall post the beach pursuant to

Health and Safety Code Section 115915, and shall use the standards of Sections 7958(a)(1) and (2) in determining the necessity to restrict the use of or close the public beach or portion thereof.

(d) In the event of a known release of untreated sewage into waters adjacent to a public beach, the local health officer shall:

(1) Immediately post and close the beach or a portion thereof, or otherwise restrict its use until the source of the sewage release is eliminated;

(2) Sample the affected waters; and

(3) Continue closure or restriction of the beach or a portion thereof and posting the beach until testing results establish that the standards of Sections 7958(a)(1) are satisfied.

NOTE: Authority cited: Sections 100275, 115880, and 116075, Health and Safety Code. Reference: Sections 115880, 116075, and 116080, Health and Safety Code.

HISTORY:

1. New section filed 7-26-99 as an emergency; operative 7-26-99 (Register 99, No. 31). A Certificate of Compliance must be transmitted to OAL by 11-23-99 or emergency language will be repealed by operation of law on the following day.

2. Certificate of Compliance as to 7-26-99 order transmitted to OAL 10-15-99 and filed 11-30-99 (Register 99, No. 49).

**7962. Duties Imposed on a Local Public Officer or Agency.**

(a) Pursuant to Health and Safety Code Sections 115880(h), 115885(g), and 115915(c), any duty imposed upon a local public officer or agency by Section 7961 shall be mandatory only during a fiscal year in which the Legislature has appropriated sufficient funds, as determined by the State Director of Health Services, in the annual Budget Act or otherwise for local agencies to cover the costs to those agencies associated with performance of these duties.

NOTE: Authority cited: Section 100275, Health and Safety Code. Reference: Sections 115880, 115885, and 115915, Health and Safety Code.

HISTORY:

1. New section filed 7-26-99 as an emergency; operative 7-26-99 (Register 99, No. 31). A Certificate of Compliance must be transmitted to OAL by 11-23-99 or emergency language will be repealed by operation of law on the following day.

2. Certificate of Compliance as to 7-26-99 order transmitted to OAL 10-15-99 and filed 11-30-99 (Register 99, No. 49).

# Appendix C
# Drainage Maps

Under Separate Cover