UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region IX
75 Hawthorne Street
San Francisco, CA 94105

City of San Diego's E. W. Blom Point Loma Metropolitan Wastewater Treatment Plant and Ocean Outfall Application for a Modified NPDES Permit Under Sections 301(h) and (j)(5) of the Clean Water Act	Tentative Decision of the Regional Administrator Pursuant to 40 CFR Part 125, Subpart G

I have reviewed the attached evaluation analyzing the merits of the application of the City of San Diego's request for the E.W. Blom Point Loma Metropolitan Wastewater Treatment Plant and Ocean Outfall variance from secondary treatment requirements of the Clean Water Act (the Act), pursuant to section 301(h). It is my tentative decision that the Point Loma Wastewater Treatment Plant and Ocean Outfall be granted a variance in accordance with the terms, conditions, and limitations of the attached evaluation, based on sections 301(h) and (j)(5) of the Act.

My decision is based on available information specific to this particular discharge. It is not intended to assess the need for secondary treatment in general, nor does it reflect on the necessity for secondary treatment by other publicly owned treatment works discharging to the marine environment. This decision and the National Pollutant Discharge Elimination System (NPDES) permit implementing this decision are subject to revision on the basis of subsequently acquired information relating to the impact of the less-than-secondary discharge on the marine environment.

Under the procedures of the Permit Regulations, 40 CFR Part 124, public notice and comment regarding this tentative decision and accompanying draft NPDES permit will be made available to interested persons. Following the public comment period on this tentative decision and draft permit, a final decision and permit will be issued under the procedures in 40 CFR Part 124.

This tentative decision is issued without prejudice to the rights of any party to address the legal issue of the applicability of 33 U.S.C. section 1311(j)(5) to the City's future NPDES permits.

Date: __________ ______________________________.

Alexis Straus
Acting Regional Administrator

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INTRODUCTION

The City of San Diego, California (the applicant or City) is requesting a renewal of its variance (sometimes informally called a “waiver” or “modification”) under section 301(h) of the Clean Water Act (the Act, CWA), 33 U.S.C. section 1311(h), and the Ocean Pollution Reduction Act of 1994, 33 U.S.C. section 1311(j)(5), from the secondary treatment requirements contained in section 301(b)(1)(B) of the Act, U.S.C. section 1311(b)(1)(B). The City submitted its renewal application to the U.S. Environmental Protection Agency, Southwest Region (the EPA Region 9 or EPA), on December 10, 2007.

The variance is being sought for the E.W. Blom Point Loma Metropolitan Wastewater Treatment Plant and Ocean Outfall, a publicly owned treatment works (POTW). The applicant is seeking a 301(h) variance to discharge wastewater receiving less-than-secondary treatment to the Pacific Ocean. Secondary treatment is defined in the regulations (40 CFR Part 133) in terms of effluent quality for total suspended solids (TSS), biochemical oxygen demand (BOD), and pH. The secondary treatment requirements for effluent TSS, BOD, and pH are listed below:

TSS: (1) The 30-day average shall not exceed 30 mg/l.
(2) The 7-day average shall not exceed 45 mg/l.
(3) The 30-day average percent removal shall not be less than 85 percent.

BOD: (1) The 30-day average shall not exceed 30 mg/l.
(2) The 7-day average shall not exceed 45 mg/l.
(3) The 30-day average percent removal shall not be less than 85 percent.

pH: At all times, shall be maintained within the limits of 6.0 to 9.0 units.

40 CFR 125.58(c) defines a large applicant as serving a population of 50,000 or more, or having a discharge flow of 5 million gallons per day (mgd) or more. The City meets the criteria for a large applicant. The City is requesting a modification for only TSS and BOD. (A modification for pH is not requested.) The applicant’s proposed alternative effluent limits for TSS and BOD are either shown in the application (2015) or based on facility performance data provided as supplemental information (2016) to the application, consistent with California Ocean Plan, Table 2 and require:

TSS: (1) The monthly average system-wide percent removal shall not be less than 80% percent (computed in accordance with Order No. R9-2017-0007, NPDES No. CA0107409).
(2) The monthly average treatment plant effluent concentration shall not be more than 60 mg/l.
(3) The annual treatment plant loading to the ocean shall not be more than 12,000 metric tons per year during years one through four of the permit and not more than 11,999 metric tons per year during year five of the permit. Mass emission

limits for TSS apply only to discharges from POTWs owned and operated by the Discharger and the Discharger's wastewater generated in the San Diego Metropolitan Sewerage System (Metro System) service area, excluding TSS contributions from Metro System flows treated in the City of Escondido and South Bay WRP flows discharged to the South Bay Ocean Outfall. If the Discharger is requested to accept wastewater originating in Tijuana, Mexico, treated or untreated, such acceptance would be contingent upon an agreement acceptable to the USEPA, RWQCB and Discharger. The TSS contribution from that flow would not be counted toward any mass emission limit(s).

BOD: The annual average system-wide percent removal shall not be less than 58 percent (computed in accordance with Addendum No. 1 to Order No. R9-2009-0001, NPDES No. CA0107409).

A concentration effluent limit for BOD (in mg/l) has not been requested by the applicant or required in NPDES permits for the 4.5 mile Point Loma Ocean Outfall. The alternative effluent limits requested by the applicant satisfy sections 301(h) and (j)(5) of the Act. The application is based on an “improved” discharge, as defined at 40 CFR 125.58(i). Facilities improvements proposed by the applicant during the period of the renewed NPDES permit (2016-2021) are enhanced solids removal and additional reuse studies. Volume III, Large Applicant Questionnaire of the January 2015 permit application.

This document presents the findings, conclusions, and recommendations of EPA Region 9, as to whether the applicant’s proposed discharge complies with the criteria set forth in sections 301(h) and (j)(5) of the Act, as implemented by regulations at 40 CFR 125, Subpart G.

DECISION CRITERIA

Under section 301(b)(1)(B) of the Act, U.S.C. section 1311(b)(1)(B), POTWs in existence on July 1, 1977, were required to meet effluent limits based on secondary treatment as defined by the Administrator of EPA (the Administrator). Secondary treatment is defined by the Administrator in terms of three parameters: TSS, BOD, and pH. Uniform national effluent limitations for these pollutants were promulgated and included in National Pollutant Discharge Elimination System (NPDES) permits for POTWs issued under section 402 of the Act. POTWs were required to comply with these limitations by July 1, 1977.

Congress subsequently amended the Act, adding section 301(h) which authorizes the Administrator, with State concurrence, to issue NPDES permits which modify the secondary treatment requirements of the Act with respect to certain discharges. P.L. 95-217, 91 Stat. 1566, as amended by P.L. 97-117, 95 Stat. 1623; and section 303 of the Water Quality Act of 1987. Section 301(h) provides that:

> The Administrator, with the concurrence of the State, may issue a permit under section 402 [of the Act] which modifies the requirements of

subsection (b)(1)(B) of this section [the secondary treatment requirements] with respect to the discharge of any pollutant from a publicly owned treatment works into marine waters, if the applicant demonstrates to the satisfaction of the Administrator that:

(1) there is an applicable water quality standard specific to the pollutant for which the modification is requested, which has been identified under section 304(a)(6) of this Act;

(2) such modified requirements will not interfere, alone or in combination with pollutants from other sources, with the attainment or maintenance of that water quality which assures protection of public water supplies and the protection and propagation of a balanced, indigenous population (BIP) of shellfish, fish and wildlife, and allows recreational activities, in and on the water;

(3) the applicant has established a system for monitoring the impact of such discharge on a representative sample of aquatic biota, to the extent practicable, and the scope of the monitoring is limited to include only those scientific investigations which are necessary to study the effects of the proposed discharge;

(4) such modified requirements will not result in any additional requirements on any other point or nonpoint source;

(5) all applicable pretreatment requirements for sources introducing waste into such treatment works will be enforced;

(6) in the case of any treatment works serving a population of 50,000 or more, with respect to any toxic pollutant introduced into such works by an industrial discharger for which pollutant there is no applicable pretreatment requirement in effect, sources introducing waste into such works are in compliance with all applicable pretreatment requirements, the applicant has in effect a pretreatment program which, in combination with the treatment of discharges from such works, removes the same amount of such pollutant as would be removed if such works were to apply secondary treatment to discharges and if such works had no pretreatment program with respect to such pollutant;

(7) to the extent practicable, the applicant has established a schedule of activities designed to eliminate the entrance of toxic pollutants from nonindustrial sources into such treatment works;

(8) there will be no new or substantially increased discharges from the point source of the pollutant into which the modification applies above that volume of discharge specified in the permit;

> (9) the applicant at the time such modification becomes effective will be discharging effluent which has received at least primary or equivalent treatment and which meets the criteria established under section 304(a)(1) of the Clean Water Act after initial mixing in the waters surrounding or adjacent to the point at which such effluent is discharged.
>
> For the purposes of this subsection the phrase "the discharge of any pollutant into marine waters" refers to a discharge into deep waters of the territorial sea or the waters of the contiguous zone, or into saline estuarine waters where there is strong tidal movement and other hydrological and geological characteristics which the Administrator determines necessary to allow compliance with paragraph (2) of this subsection, and section 101(a)(2) of this Act. For the purposes of paragraph (9), "primary or equivalent treatment" means treatment by screening, sedimentation and skimming adequate to remove at least 30 percent of the biochemical oxygen demanding material and of the suspended solids in the treatment works influent, and disinfection, where appropriate. A municipality which applies secondary treatment shall be eligible to receive a permit pursuant to this subsection which modifies the requirements of subsection (b)(1)(B) of this section with respect to the discharge of any pollutant from any treatment works owned by such municipality into marine waters. No permit issued under this subsection shall authorize the discharge of sewage sludge into marine waters. In order for a permit to be issued under this subsection for the discharge of a pollutant into marine waters, such marine waters must exhibit characteristics assuring that water providing dilution does not contain significant amounts of previous discharged effluent from such treatment works. No permit issued under this subsection shall authorize the discharge of any pollutant into marine estuarine waters which at the time of application do not support a balanced, indigenous population of shellfish, fish and wildlife, or allow recreation in and on the waters or which exhibit ambient water quality below applicable water quality standards adopted for the protection of public water supplies, shellfish and wildlife, or recreational activities or such other standards necessary to assure support and protection of such uses. The prohibition contained in the preceding sentence shall apply without regard to the presence or absence of a causal relationship between such characteristics and the applicant's current or proposed discharge. Notwithstanding any of the other provisions of this subsection, no permit may be issued under this subsection for discharge of a pollutant into the New York Bight Apex consisting of the ocean waters of the Atlantic Ocean westward of 73 degrees 30 minutes west longitude and westward of 40 degrees 10 minutes north latitude.

EPA regulations implementing section 301(h) provide that a 301(h)-modified NPDES permit may not be issued in violation of 40 CFR 125.59(b) which requires, among other things, compliance with the provisions of the Coastal Zone Management Act (16 U.S.C. 1451 et seq.), the Endangered Species Act (16 U.S.C. 1531 et seq.), the Marine Protection Research and Sanctuaries Act (16 U.S.C. 1431 et seq.), and any other applicable provisions of State or federal law or Executive Order.

In addition, under the Ocean Pollution Reduction Act of 1994, 33 U.S.C. section 1311(j)(5)(B) and (C):

> An application under this paragraph shall include a commitment by the applicant to implement a waste water reclamation program that, at minimum, will –
>
> (i) achieve a system capacity of 45,000,000 gallons of reclaimed waste water per day by January 1, 2010; and
>
> (ii) result in a reduction in the quantity of suspended solids discharged by the applicant into the marine environment during the period of the modification.
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> The Administrator may not grant a modification pursuant to an application submitted under this paragraph unless the Administrator determines that such modification will result in removal of not less than 58 percent of the biological oxygen demand (on an annual average) and not less than 80 percent of total suspended solids (on a monthly average) in the discharge to which the application applies.

In the following discussion, data submitted by the applicant are analyzed in the context of the statutory and regulatory criteria.

SUMMARY OF FINDINGS

Based upon review of the data, references, and empirical evidence furnished in the application and other relevant sources, EPA Region 9 makes the following findings with regard to the statutory and regulatory criteria:

1. The applicant's proposed discharge will comply with primary treatment requirements. [CWA section 301(h)(9); 40 CFR 125.60]

2. The applicant's proposed 301(h)-modified discharge will comply with the State of California's water quality standards for natural light and dissolved oxygen. (A modification for pH is not requested.) The applicant has sent a letter to the San Diego Regional Water Quality Control Board (Regional Water Board) requesting determination that the proposed discharge complies with applicable State law including water quality standards. In 1984, a Memorandum of Understanding was signed by EPA Region 9 and the State of California to jointly administer discharges that are granted modifications from secondary treatment standards.

The joint issuance of a NPDES permit which incorporates both the federal 301(h) variance and State permit requirements will serve as the State's certification/concurrence that the modified discharge will comply with applicable State law and water quality standards. A draft 301(h)-modified permit has been jointly developed by the Regional Water Board and EPA Region 9. [Section 301(h)(1); 40 CFR 125.61]

3. The applicant has demonstrated it can consistently achieve State water quality standards and federal 304(a)(1) water quality criteria beyond the zone of initial dilution. [CWA section 301(h)(9); 40 CFR 125.62(a)]

4. The applicant's proposed discharge, alone or in combination with pollutants from other sources, will not adversely impact public water supplies or interfere with the protection and propagation of a balanced, indigenous population (BIP) of fish, shellfish and wildlife, and will allow for recreational activities. [CWA section 301(h)(2); 40 CFR 125.62(b), (c), (d)]

5. The applicant has a well-established monitoring program and has demonstrated it has adequate resources to continue the program. The applicant has proposed to add sediment toxicity monitoring (starting Summer 2016) to its existing monitoring program to be consistent with the aquatic life toxicity monitoring requirements in the California Ocean Plan (updated 2012). EPA Region 9 and the Regional Water Board will review the applicant's existing monitoring program, along with the proposed sediment toxicity monitoring plan, and revise it, as appropriate. These revisions will be included in the 301(h)-modified permit, as conditions for monitoring the impact of the discharge. [CWA section 301(h)(3); 40 CFR 125.63]

6. The applicant has sent a letter to the Regional Water Board requesting determination that the proposed discharge will not result in any additional treatment requirements on any other point or nonpoint sources. The adoption by the Regional Water Board of a NPDES permit which incorporates both the federal 301(h) variance and State permit requirements will serve as the State's determination, pursuant to 40 CFR 125.59(f)(4), that the requirements under 40 CFR 125.64 are achieved. [CWA section 301(h)(4); 40 CFR 125.64]

7. The applicant's existing pretreatment program was approved by EPA Region 9 on June 29, 1982, and remains in effect. [CWA section 301(h)(5); 40 CFR 125.66 and 125.68]

8. The applicant has complied with urban area pretreatment requirements by demonstrating that it has an applicable pretreatment requirement in effect for each toxic pollutant introduced by an industrial discharger. The Urban Area Pretreatment Program was submitted to EPA Region 9 and the Regional Water Board in August 1996. This program was approved by the Regional Water Board

on August 13, 1997 and EPA on December 1, 1998. [CWA section 301(h)(6); 40 CFR 125.65]

9. The applicant will continue to develop and implement both its existing nonindustrial source control program, in effect since 1985, and existing comprehensive public education program to minimize the amount of toxic pollutants that enter the treatment system from nonindustrial sources. [CWA section 301(h)(7); 40 CFR 125.66]

10. There will be no new or substantially increased discharges from the point source of the pollutants to which the 301(h) variance applies above those specified in the permit. [CWA section 301(h)(8); 40 CFR 125.67]

11. The applicant has sent letters to the U.S. Fish and Wildlife Service and NOAA National Marine Fisheries Service requesting determinations that the proposed discharge complies with applicable federal and State laws. The applicant has prepared a letter to the California Coastal Commission requesting a determination that the proposed discharge complies with applicable federal and State laws; this request will be transmitted to the California Coastal Commission after the 301(h) modified permit is adopted by the Regional Water Board. The issuance of a final 301(h)-modified permit is contingent upon receipt of determinations that the issuance of such permit does not conflict with applicable provisions of federal and State laws. [40 CFR 125.59]

12. In its operation of the Point Loma WTP, the applicant will continue to: achieve a monthly average system-wide percent removal for TSS of not less than 80 percent and an annual average system-wide percent removal for BOD of not less than 58 percent; and has implemented a water reclamation program that will result in a reduction in the quantity of suspended solids discharged into the marine environment during the period of the 301(h) modification. The applicant has constructed a system capacity of 45 mgd of reclaimed water, thereby meeting this January 1, 2010 requirement. [CWA section 301(j)(5)]

CONCLUSION

EPA Region 9 concludes that the applicant's proposed discharge will satisfy CWA sections 301(h) and (j)(5) and 40 CFR 125, Subpart G.

RECOMMENDATION

It is recommended that the applicant be granted a CWA section 301(h) variance in accordance with the above findings, contingent upon satisfaction of the following conditions:

1. The determination by the Regional Water Board that the proposed discharge will comply with applicable provisions of State law, including water quality standards, in accordance with 40 CFR 125.61(b)(2). The adoption by the Regional Water Board of a NPDES permit which incorporates both the federal 301(h) variance and State permit requirements will serve as the State's certification/concurrence, pursuant to 40 CFR Parts 124.53 and 124.54, that the requirements under 40 CFR 125.61(b)(2) are achieved.

2. The determination by the Regional Water Board that the proposed discharge will not result in any additional treatment requirements on any other point or nonpoint sources, in accordance with 40 CFR 125.64. The adoption by the Regional Water Board of a NPDES permit which incorporates both the federal 301(h) variance and State permit requirements will serve as the State's determination, pursuant to 40 CFR 125.59(f)(4), that the requirements under 40 CFR 125.64 are achieved.

3. The draft permit contains the applicable terms and conditions required by 40 CFR 125.68, for establishment of a monitoring program.

4. The determination by the California Coastal Commission that issuance of a 301(h)-modified permit does not conflict with the Coastal Zone Management Act, as amended.

5. The determination by the U.S. Fish and Wildlife Service that issuance of a 301(h)-modified permit does not conflict with applicable provisions of the federal Endangered Species Act, as amended.

6. The determination by the NOAA National Marine Fisheries Service that issuance of a 301(h)-modified permit does not conflict with applicable provisions of the federal Endangered Species Act, as amended, and the Magnuson-Stevens Fishery Conservation and Management Act, as amended.

7. Issuance of the 301(h)-modified permit assures compliance with all applicable requirements of 40 CFR 122 and 40 CFR 125, Subpart G.

DESCRIPTION OF TREATMENT SYSTEM

Treatment System

The City's treatment system is described in Volume III, Large Applicant Questionnaire section II.A, and Volume IV, Appendix A, of the application. The San Diego Metropolitan Sewage System (Metro System) provides for the conveyance, treatment, reuse, and disposal of wastewater within a 450-square mile service area for the City of San Diego and regional participating agencies (Figure A-1). Metro System facilities include wastewater collection interceptors and pump stations, wastewater treatment and water recycling plants, sludge pipelines and solids handling facilities, and two land/ocean outfall systems. Metro System facilities are owned by the City of San Diego and are managed and operated by the City's Metropolitan Wastewater Department. The City administers and executes contracts with each participating agency, monitors flows to the Metro System, bills and collects payments from participating agencies, and disburses all monies spent in connection with the Metro System. Wastewater collection systems that discharge to the Metro System are owned and operated by respective participating agencies. Current wastewater flows from the City comprise approximately 70 percent of the total Metro System flows. Remaining Metro System wastewater flows are contributed by the 12 Metro System participating agencies. Participating agency input to Metro System planning and operation is provided through the San Diego Metropolitan Wastewater Commission.

The following five groups of facilities comprise the Metro System: wastewater conveyance facilities; the Point Loma Wastewater Treatment Plant and Ocean Outfall; the North City Water Reclamation Plant; the Metro Biosolids Center and sludge conveyance facilities; and the South Bay Water Reclamation Plant and Ocean Outfall.

There have been improvements to Metro System facilities since 1995. These include bringing online the North City Water Reclamation Plant (NCWRP) and recycled water users in its' service area. Bringing the Metro Biosolids Center (MBC) online to process biosolids from Pt. Loma WTP and the NCWRP. And bringing the South Bay Water Reclamation Plant (SBWRP) and Ocean Outfall online, as well as recycled water users within that service area. Figure A-2 presents a schematic of existing Metro System treatment and solids handling facilities which include the: Point Loma Wastewater Treatment Plant and Ocean Outfall, North City Water Reclamation Plant, South Bay Water Reclamation Plant and Ocean Outfall, and the Metro Biosolids Center. Waste solids from the South Bay Water Reclamation Plant (WRP) are conveyed to Point Loma WTP for treatment. Waste solids from Point Loma WTP and North City WRP are conveyed to the Metro Biosolids Center for dewatering and disposal.

Pump Station No. 2 is the largest and most important pump station within the Metro System. It is a reinforced concrete structure equipped with eight dry pit pumping units. With one pump serving as a standby unit, the pumping capacity is approximately 432 million gallons per day (mgd). All influent wastewater delivered to the Point Loma WTP is pumped through Pump Station No. 2 which also provides preliminary treatment in the form of coarse screening (4 units) and chemical addition. Hydrogen peroxide is added for odor control and to assist in coagulation/sedimentation at Point Loma WTP via the regeneration of iron salts.

Point Loma WTP operates as a chemically-assisted primary treatment plant and is the terminal treatment facility discharging to the Point Loma Ocean Outfall (PLOO) and Pacific Ocean. The plant has rated capacities (with one sedimentation tank out of service) of 240 mgd annual average daily flow and 432 mgd peak wet weather flow. Point Loma WTP receives a blend of excess recycled water (during irrigation season), secondary treated effluent (during non-irrigation season), and waste plant streams from the 30 mgd North City WRP, return solids from the 15 mgd South Bay WRP, and untreated sewage from all other parts of the Metro System. The applicant states that of the approximately 140 to 160 mgd of wastewater treated, the estimated contribution from industrial users of the Metro System is 2.5 percent (Volume VII, Appendix K, of the application). The applicant states that inflow and infiltration is approximately 4 to 5 percent of the total flow into the treatment works (Volume II, EPA Form 3510-2A, of the application).

Point Loma WTP unit process and design criteria and loadings are provided in Table A-2 of Volume IV, Appendix A, of the application. Unit processes at the Point Loma WTP include: preliminary treatment with 15-millimeter mesh mechanical self-cleaning climber screens (5 units) to remove rags, paper, and other floatable material; chemical addition (ferric chloride) to screened wastewater and influent flow measurement at the Parshall flumes; aerated grit removal (6 units) including grit tanks, separators and washers; chemical addition (anionic synthetic polymer and hydrogen peroxide) at sedimentation basin entrances to enhance settling of solids and assist in stabilization and odor control; sedimentation basins (12 units) where flocculated solids (sludge) settle to the bottom and scum floats to the surface; and sludge and scum removal facilities. From the sedimentation basins, treated wastewater enters the effluent channel.

The following outfall conveyance facilities allow the treated effluent to be discharge to the PLOO through: (1) a direct connection with the sedimentation basins; (2) a throttling valve which regulates water surface levels in the outfall diversion structure; or (3) a bypass valve which can divert the effluent to the outfall via a vortex structure. The 7,154-meter PLOO extends approximately 7.24 kilometers (4.5 miles or 3.9 nautical miles) offshore to the edge of the mainland shelf and discharges at a depth of approximately 95 meters (312 feet). The outfall terminates in a “Y”-shaped diffuser, the center of which is located at: north latitude 32 degrees, 39 minutes, 55 seconds, and longitude 117 degrees west, 19 minutes, 25 seconds. From the outfall terminus, each leg of the diffuser extends approximately 805 meters (0.5 miles). Effluent discharge commenced at this location in November 1993.

Point Loma WTP provides onsite digestion of waste solids from the sedimentation basins with six anaerobic digesters. Biogas produced by the digesters is used for fueling an onsite cogeneration facility. Digested solids are pumped to the Metro Biosolids Center for dewatering and disposal. Dewatered solids are beneficially used as an alternate daily cover at a landfill or as a soil amendment. Screenings, grit, and scum are trucked to a landfill for disposal.

The City's recycled water operations are regulated by water reclamation requirements established by the San Diego Regional Water Board: Order No. R9-2015-0091 and addenda thereto for the 30 mgd North City WRP and Order No. R9-2013-0006 for the 15 mgd South Bay WRP. The South Bay WRP secondary effluent discharge to the South Bay Ocean Outfall (SBOO) is regulated by Regional Board Order No. R9-2013-0006 as amended by R9-2014-0071, NPDES No. CA0109045. Waste solids from North City WRP are directed to the Metro Biosolids Center for digestion and dewatering. Waste solids from the South Bay WRP are discharged to the sewer system for transport to Point Loma WTP for treatment and removal.

Improved Discharge

The City's 2015 application is based on an "improved" discharge, as defined at 40 CFR 125.58(i). Increases in Metro System flow (hydraulic) and load (suspended solids and biochemical oxygen demand) projections for long term facilities planning are projected at approximately 0.9 percent per year over the next 20 years (starting with the year 2008 projection).

During the next 5-year permit cycle, the applicant has proposed the following improvements to the Metro System. Volume III, Large Applicant Questionnaire section II.A.2, of the application. These improvements are: (1) comprehensive renovation/upgrade of Point Loma grit removal facilities; (2) better reliability of Pump Station No. 2; (3) chemical additions via peroxide regenerated iron sulfide control to enhance settling and solids removal; and (4) continuous monitoring of chlorine residual. The applicant has successfully implemented disinfection to reduce effluent pathogen concentrations and ensure compliance with receiving water body contact recreational standards established in Order R9-2009-0001. Also, the applicant will continue its ongoing program to bring additional recycled water users online to reduce dry-weather North City WRP flows discharged downstream to the Point Loma WTP and PLOO and South Bay WRP flows discharged to the SBOO.

As documented in Volume III, Large Applicant Questionnaire section II.A.3, of the application, the City has constructed 45 mgd of recycled water treatment capacity; during the period of the existing permit, the applicant has consistently achieved 80% removal of TSS and 58% removal of BOD; and reduced TSS mass emissions during the period of the 301(h) modification (in Tables II.A-3 and II.A-4 and Figure II.A-1, Volume III of the application). Except for a slight reduction in year five of the renewed permit, the City is not requesting any change in the mass emission rate effluent limits for TSS, the concentration effluent limit for TSS, or the percent removal effluent limits for TSS and BOD, from those in the existing permit (in Tables II.A-2 and II.A-5, Volume III of the application). "System-wide" percent removal is computed as specified in Addendum No. 1 to Order No. R9-2002-0025, NPDES No. CA0107409. Tables II.A-3 and II.A-4 include the contribution from South Bay WRP which is neither identified in amended Order No. R9-2002-0025, nor included in the computation of “system-wide” percent removal.

The applicant has completed three planning studies as part of the *Pure Water San Diego* program. The *2012 Metropolitan Wastewater Plan* evaluates the System-wide collection and treatment facilities and presents guidance on Capital Improvement Projects (CIP) required for future Metro System flows and loads. The *2012 Recycled Water Study*, which included stakeholder participation and public participation process, evaluated potential non-potable reuse via groundwater recharge and surface water augmentation. The study concludes that only limited opportunities exist for expanding the current 12 MGD annual average of non-potable reuse within the service areas of the North City WRP and the South Bay WRP. Surface water augmentation to several City of San Diego reservoirs (Miramar, San Vincente or Otay) were deemed viable candidates for creating new local water supply as well as improving water quality (reduced salinity levels) within each reservoir.

This reuse option would improve the reliability of water supplies within the San Diego Region, reduce the need for imported water, decrease salinity concentrations in the regional water supply, and reduce wastewater discharges to the ocean. Concurrent with the Recycled Water Study, the applicant initiated the multi-year Water Purification Demonstration Project to evaluate the feasibility of implementing a full-scale potable reuse project that would augment water supplies and improve water quality in local reservoirs. The Water Purification Demonstration Project featured the installation and operation of a 1 mgd demonstration Advanced Water Purification facility and the implementation of a comprehensive monitoring program to evaluate the quality of the purified water supply. The Water Purification Demonstration Project also convened an Independent Advisory Panel to provide expert review and feedback, and evaluated such potable reuse issues as source control, treatment performance and reliability, energy use, reservoir storage and regulatory compliance. The City’s 2013 Water Purification Demonstration Project Report concluded that full-scale potable reuse is safe and feasible, that purified water supplies will meet all applicable regulatory requirements. Supplemental studies to assess these findings and to refine the proposed Pure Water facilities are currently underway. These studies will provide valuable information to the applicant, Metro System Participating agencies and regional stakeholders for future planning and decisions for the Pure Water San Diego water and wastewater facilities.

DESCRIPTION OF RECEIVING WATERS

Volume III, Large Applicant Questionnaire section II.B, of the application presents general information describing receiving waters for the Point Loma discharge. Volume VIII, Appendix N, of the application presents a detailed characterization of seasonal circulation patterns in the vicinity of the Point Loma discharge which was originally provided in the 1995 application. This characterization includes descriptions of regional and local bathymetry, regional currents, and currents and stratification in the Point Loma shelf area. (For reference, 1 meter is about 3.281 feet; 1 kilometer is 1,000 meters, or about 0.6214 statute miles or 0.5397 nautical miles; 1 statute mile is about 0.8684 nautical miles.)

Bathymetry

The waters of the Southern California Bight (SCB) overlie the continental borderland of southern California. The outer edge of the borderland lies about 250 to 300 kilometers offshore and is defined by a sharp change of slope at 1000 meters. The continental borderland consists of a number of offshore islands, submerged banks, submarine canyons, and deep basins. The result is an unusually narrow mainland shelf, which averages 3 kilometers in width (ranging from 1 to 20 kilometers) and ends in waters of 200 meters depth. The narrowness of the mainland shelf in the SCB makes it particularly susceptible to human activities. Shiff et al., 2000.

The mainland shelf off Point Loma is about 6.5 kilometers wide. Within this region, a narrow rocky shelf runs parallel to the coast and extends from the shoreline to water depths of about 17 to 20 meters. The outer edge of this rocky shelf is marked by the outer edge of kelp beds where the sea floor drops sharply by about 3 to 18 meters and terminates in a relatively smooth, gently sloping plain that extends seaward. This plain continues to gently slope seaward to water depths of about 90 to 95 meters, with only minor variations in direction and width for at least 15 kilometers north and south of the PLOO. The outer edge of the mainland shelf breaks at water depths of about 110 meters, as the bottom slopes sharply downward into the Loma Sea Valley. The PLOO discharges at the outer edge of this mainland shelf. The Loma Sea Valley axis lies about 15 kilometers offshore of Point Loma at a water depth of about 370 meters.

Currents

The local ocean current circulation in the vicinity of the PLOO occurs within the larger circulation of the California Current (the major southward-flowing surface current far offshore); the Southern California Counter Current (the inner northward-flowing leg of the counter-clockwise circulating gyre between the California Current and the coast); and the California Undercurrent (a northward flow beneath the Southern California Countercurrent at depths in excess of 100 meters).

Volume III and Volume VIII, Appendix N, of the application provide the following general characterization of the mainland shelf currents off the coast of Point Loma: the net subsurface flow (at a depth of 40 meters at the 60 meter contour) is upcoast at approximately 3 cm/sec; the net surface flow is downcoast at approximately 6 cm/sec; the net flow 1 to 2 meters above the ocean bottom has a strong offshore component that can exceed the longshore flow velocity; more than half the variations in longshore currents occur on time intervals longer than tidal periods; variations in cross-shore currents are dominated by tidal cycles; typical transport distances associated with tidal cycles are approximately 1 to 3 kilometers; waters along the nearshore shelf are dispersed with offshore waters on time scales of weeks; and long-term variability in currents can equal or exceed the seasonal variability. (For reference 1 cm/sec is about 0.6 m/min, or 1.1969 ft/min.)Table II.B-1 in Appendix III of the application summarizes 10th percentile, 50th percentile (median), and 90th percentile current speeds within the typical depth range of the PLOO wastefield (60 to 80 meters). Tenth percentile current speeds are typically 2 to 3 cm/sec and median current speeds are on the order of 7 to 10 cm/sec.

Stratification

The water column above the Point Loma outfall diffuser is density stratified by gradients in temperature and salinity. Salinity gradients are small for water temperatures above 11 to 12 degrees C, but they make an important contribution to the density gradients of lower temperature waters. The strongest density gradients exist during the summer in the upper portion of the water column due to the formation of a seasonal thermocline at depths that range from a few meters to tens of meters (typically around 5 to 20 meters). Surface water temperatures may reach 18 to 23 degrees C. Water temperatures are generally lowest in the late winter, when surface temperatures can fall to about 12 to 14 degrees C. During this time, the seasonal thermocline may disappear and the density gradients may be minimal. At water column depths in excess of about 45 meters, the strongest density gradients occur during the winter (typically in January). Although these density gradients are weak in comparison with the gradients existing in the upper portion of the water column during the summer, they are sufficient to trap the wastefield from the Point Loma discharge at depths of 30 meters, or more, below the surface. Modeling and receiving water monitoring data indicate that the wastefield is typically confined to the water depth interval between 55 and 87 meters (Volume III, Large Applicant Questionnaire section III.A.3, of the application).

PHYSICAL CHARACTERISTICS OF THE DISCHARGE

Outfall/Diffuser and Initial Dilution

40 CFR 125.62(a) requires that the proposed outfall and diffuser must be located and designed to provide adequate initial dilution, dispersion, and transport of wastewater to meet all applicable water quality standards and criteria at and beyond the boundary of the zone of initial dilution (ZID). This evaluation is based on conditions occurring during periods of maximum stratification and during other periods when discharge characteristics, water quality, biological seasons, or oceanographic conditions indicate

more critical situations may exist. The physical characteristics of the PLOO (including diffuser) are summarized in Volume III, Large Applicant Questionnaire section II.A.8, of the application.

In the 2015 application and supplemental information provided to EPA in early 2016, the Metro System service area projected annual average flow for 2016 is 158 mgd and the peak flow is 273 mgd. The Metro System end-of-permit projected annual average flow for 2022 is 157 mgd and the peak flow is 284 mgd. This represents an average annual growth rate of 0.8 percent. For comparison, population within the Metro System service area increased at an annual growth rate of 1.07 percent from 1990 to 2000. By year 2025, the applicant projects the portion of Metro System flows directed to Point Loma WTP during inclement weather periods, when no recycled water use occurs, to approach 240 mgd.

The 1995 application for the Point Loma WTP was based on an end-of-permit projected flow of 205 mgd. The 2001 application was based on an end-of-permit projected flow of 195 mgd; in 2007 flow was projected to be 202 mgd. For the 2015 application, the Point Loma WTP end-of-permit (2022) projected annual average flow is 157 mgd. Actual and projected effluent flow rates for the Point Loma WTP during the period of the existing and proposed permit are shown in Table 1.

Because the Point Loma WTP end-of-permit projected flow of 157 mgd is less than the end-of-permit projected flow of 205 mgd evaluated by EPA in the 1995 and 2001 and 2007 applications, EPA believes that the projected flow of 205 mgd continues to be a reasonable estimate for evaluating initial dilutions in the 2015 application.

Chapter III of the California Ocean Plan requires that “Waste effluents shall be discharged in a manner which provides sufficient initial dilution to minimize the concentrations of substances not removed in the treatment.” This plan defines the “minimum initial dilution (Dm)” as the “… lowest average initial dilution within any single month of the year.” and specifies that “Dilution estimates shall be based on observed waste flow characteristics, observed receiving water density structure, and the assumption that no currents, of sufficient strength to influence the initial dilution process, flow across the discharge structure.”

The applicant has continued to provide two sets of initial dilution calculations employing flows of 205 mgd and 240 mgd. For the TDDs, EPA has only reviewed predictions based on an end-of-permit projected annual average flow of 205 mgd, because it is appropriate to the end of the five-year permit period.

Table 1. Actual and projected annual average and maximum daily/peak hour flows (mgd) for the Point Loma Ocean Outfall from 2001 through 2022.

Year	Observed Flows		Project Flows	
	Annual Average Flow[1]	Maximum Daily Flow[1]	Projected Annual Average Flow[2,4,5,6,7]	Maximum Projected Daily Flow[3,8]
2001	175	222	---	---
2002[4]	169	189	---	---
2003	170	223	---	---
2004	174	295	---	---
2005	183	325	---	---
2006	170	224	---	---
2007	161	206	---	---
2008	162	233	---	---
2009	153	209	---	---
2010	157	394	---	---
2011	156	220	---	---
2012	148	191	---	---
2013	144	187	---	---
2014	139	181	---	---
2015	132	163	---	---
2016			158	273
2017			158	275
2018			158	277
2019			157	279
2020			157	281
2021			157	283
2022			157	284

[1] Data from monthly reports submitted to the Regional Water Board and EPA for 2008-2015. Maximum daily flow is the highest daily PLOO flow observed during the listed year.
[2] Average annual PLOO flow projections based on Metro System flow projections for long-term facilities planning. These flows are based on once in ten year wet weather event flows to the system. The flow projections for long-term facilities planning are conservative (overestimates that employ a factor of safety) to ensure that adequate future system capacity is maintained. Average annual PLOO flows will vary depending on hydrologic conditions, recycled water demands at the NCWRP and SBWRP and SBOO flows. This flow projection methodology is also used for Pure Water San Diego Project projections.
[3] Maximum projected daily wet-weather flow for a 10-year wet weather event.
[4] South Bay WRP is brought online.
[5] First increment of potable reuse brought online by Dec. 31, 2023. (15 MGD).
[6] Second increment of potable reuse brought online by Dec. 31, 2027. (15 MGD for a total of 30 MGD).

[7] Final increment of potable reuse brought online by Dec. 31, 2035. (53 MGD for a total of 83 MGD).
[8] The City continues to assess wet-weather flow projections. As part of this assessment, the City is evaluating the need to add equalization storage at Pump Station Nos. 1 and 2 (or implementing alternative peak-flow management options) to increase the ability of Metro System conveyance facilities to handle potential maximum flows.

The 1995 application for the Point Loma WTP was based on an end-of-permit projected annual average flow of 205 mgd. For this flow rate, the 50th percentile, flux-averaged initial dilution was predicted as 365:1 with currents and 300:1 without currents; the 5th percentile, flux-averaged initial dilution was predicted as 215:1 with currents and 194:1 without currents (based on time series data). For the water quality objectives in Table B of the California Ocean Plan, the lowest 30-day average initial dilution was predicted as 204:1 without currents (based on hydrocast data). Volume VIII, Appendix O, of the application. As reported in the 1995, 2002 and 2009 TDDs, EPA verified the City's estimate of initial dilution for the California Ocean Plan (204:1) by obtaining the modified RSB model and raw data used by the applicant; EPA's result for the minimum monthly average initial dilution was 195:1, for zero currents. This same initial dilution (195:1) was obtained by EPA using a selected set of model runs and EPA's version of RSB. Using EPA's UMERGE model, EPA's result for the minimum monthly average initial dilution was 179:1, for zero currents. Taken together, these independent modeling efforts by the applicant and EPA produced estimates for minimum monthly average initial dilution of 204:1, 195:1, and 179:1. The 1995 TDD concluded these values were similar given the inherent uncertainties associated with modeling and that each would provide a conservative estimate of initial dilution for evaluating compliance with Table B water quality objectives. EPA continues to use 204:1 for evaluating compliance with Table B water quality objectives in the California Ocean Plan and EPA's 304(a)(1) toxics water quality criteria for aquatic life which lack Table B objectives.

The 1995 TDD also evaluated the critical initial dilution with the applicant's modified RSB model and the EPA's RSB and UMERGE models using: peak 2-3 hour effluent flows (generally estimated to be 4/3 the average monthly effluent flow), all density profiles in the given month, and zero currents. This evaluation of critical initial dilution differs from the evaluation of the lowest average initial dilution within any single month specified for Table B water quality objectives in the California Ocean Plan. The combination yielding the lowest initial dilution was used as EPA's estimate for worst-case initial dilution. The worst-case initial dilution estimate was: 143:1 for the applicant's modified RSB model, 134:1 for EPA's RSB model, and 99:1 for the UMERGE model. This TDD continues to use the initial dilution of 99:1 to assess worst-case conditions for TSS and BOD.

Finally, the 1995 TDD calculated a long-term average initial dilution of 328:1 for evaluating compliance with EPA's toxics water quality criteria for human health (organisms only); this TDD continues to use the initial dilution of 328:1 to evaluate compliance with EPA's toxics water quality criteria for human health which lack Table B objectives in the California Ocean Plan.

Application of Initial Dilution to Water Quality Standards and Criteria

Based on the information summarized in the previous section, EPA concludes that: (1) the outfall and diffuser system are well designed and achieve a high degree of dilution; (2) the minimum monthly average initial dilution value of 204:1 provides a conservative estimate of initial dilution for evaluating compliance with applicable State water quality standards in Table B of the California Ocean Plan and EPA toxics water quality criteria for aquatic life; and (3) the long-term effective dilution value of 328:1 provides an appropriate estimate for evaluating compliance with EPA toxics water quality criteria for human health (organisms only) based on long-term exposure. As in the 1995 and 2002 TDDs, this evaluation uses the initial dilution value of 99:1 to assess worst-case conditions for suspended solids and dissolved oxygen concentrations following initial dilution. The application of these initial dilution values is summarized in Table 2.

Table 2. Initial dilution values for evaluating compliance with applicable State water quality standards and EPA's 304(a)(1) water quality criteria.

Initial Dilution Type	Initial Dilution Value	Source	Applicable Water Quality Standard 40 CFR 125.62(a)
Minimum monthly average initial dilution (1995 and 2002)	204:1	California Ocean Plan	Table B objectives
Minimum monthly average initial dilution	204:1	Amended 301(h) Technical Support Document	304(a)(1) criteria for acute and chronic aquatic life with no Table B objectives
Long-term effective dilution	328:1	Amended 301(h) Technical Support Document	304(a)(1) criteria for human health (organisms only) with no Table B objectives
Worst-case (critical) initial dilution	99:1	Amended 301(h) Technical Support Document	Suspended solids and dissolved oxygen

Zone of Initial Dilution

No modifications to the PLOO have been implemented since its construction that would affect the dimensions of the zone of initial dilution. Consequently, the PLOO zone of initial dilution remains unchanged from the City's three prior applications. The zone of initial dilution extends 93.5 meters (307 feet) on either side of the PLOO diffuser legs. Volume VIII, Appendix O, of the application presents estimates of distances associated with completion of initial dilution at the PLOO's design average dry weather flow of 240 mgd; Table III.A-3 in Volume III of the application, presents a statistical breakdown of computed horizontal downstream distances from outfall ports to the completion of the initial dilution process.

As previously described, the outfall terminates in a “Y”-shaped diffuser, the center of which is located at: north latitude 32 degrees, 39 minutes, 55 seconds, and longitude 117 degrees west, 19 minutes, 25 seconds. For reference, near-ZID stations F30 (for water quality monitoring) and E14 (for sediment monitoring) are located on the 98 meter (320 foot) depth contour at: north latitude 32 degrees, 39 minutes, 94 seconds, and longitude 117 degrees west, 19 minutes, 49 seconds; or 300 meters (984 feet) west of the diffuser wye. See Figures A-3 and A-4 for maps of water quality stations and sediment monitoring stations, respectively.

Dilution Water Recirculation

The effect of re-entrainment of the wastefield is to reduce the volumetric initial dilutions for the discharged effluent within the zone of initial dilution. Under CWA section 301(h)(9), in order for a 301(h) permit to be issued for the discharge of a pollutant into marine waters, such marine waters must exhibit characteristics assuring that water providing dilution does not contain significant amounts of previously discharged effluent from the treatment works.

This requirement was addressed by the City in the 1995 application. To estimate the potential for re-entrainment effects on the 30-day average concentration, the applicant made the assumption that receiving waters around the outfall contain all the wastewater discharged during a 30-day period (205 mgd for a total volume of 1.3×10^8 cubic meters). This is a very conservative assumption, as physical oceanographic models indicate the residence time for wastewater within the 30 by 12 kilometer (19 by 7.5 miles) area around the outfall is about 4.5 days. For the effluent flow of 205 mgd, the largest reductions for computed volumetric initial dilutions were around 12 percent, occurring in July and September; the smallest reductions were around 4 percent, occurring in January and February.

Based on EPA’s review of 2008 through 2013 effluent data for toxics concentrations to exceed California Ocean Plan Table B water quality objectives and EPA water quality criteria for aquatic life and human health, these predicted reductions for initial dilution due to re-entrainment are not expected to affect discharge compliance with applicable water quality objectives and criteria.

APPLICATION OF STATUTORY AND REGULATORY CRITERIA

A. Compliance with Federal Primary Treatment, California Ocean Plan Table A, and CWA section 301(j)(5) Requirements

Under CWA section 301(h)(9) and 40 CFR 125.60, the applicant’s wastewater effluent must be receiving at least primary treatment at the time the 301(h) variance becomes effective. 40 CFR 125.58(r) specifies that primary treatment means treatment by screening, sedimentation, and skimming adequate to remove at least 30 percent of the biological oxygen demanding material and other suspended solids in the treatment works influent, and disinfection, where appropriate. In Table A of the California Ocean Plan, publicly owned treatment works must, as a 30-day average, remove 75 percent of suspended solids from their influent stream before discharging wastewaters to the ocean. Turbidity in the effluent must not exceed 75 NTU as a 30-day average, 100 NTU as a 7-day average, and 225 NTU at any time. Settleable solids in the effluent must not exceed 1.0 Ml/l as a 30-day average, 1.5 Ml/l as a 7-day average, and 3.0 Ml/l at any time. There are no Table A effluent requirements for biochemical oxygen demand. Finally, CWA section 301(j)(5) specifies that the applicant must implement a wastewater reclamation program that will result in a reduction in the quantity of suspended solids discharged by the applicant into the marine environment during the period of the 301(h) modification. In addition, such modification must result in removal of not less than 80 percent of total suspended solids (on a monthly average) and not less than 58 percent of biochemical oxygen demand (on an annual average).

1. Total Suspended Solids

To comply with these requirements, the applicant has proposed the following effluent limits for total suspended solids:

TSS: (1) The monthly average system-wide percent removal shall not be less than 80% percent (computed in accordance with Order No. R9-2017-0007, NPDES No. CA0107409).
(2) The monthly average treatment plant effluent concentration shall not be more than 60 mg/l.
(3) The annual treatment plant loading to the ocean shall not be more than 12,000 metric tons per year during years one through four of the permit and not more than 11,999 metric tons per year during year five of the permit. Mass emission limits for TSS apply only to discharges from POTWs owned and operated by the Discharger and the Discharger's wastewater generated in the San Diego Metropolitan Sewerage System (Metro System) service area, excluding TSS contributions from Metro System flows treated in the City of Escondido and South Bay WRP flows discharged to the South Bay Ocean Outfall. If the Discharger is requested to accept wastewater originating in Tijuana, Mexico, treated or untreated, such acceptance would be contingent upon an agreement acceptable to the USEPA, RWQCB and Discharger. The TSS contribution from that flow would not be counted toward any mass emission limit(s).

(For reference, 1 metric ton is 1,000 kilograms which is approximately 2,205 pounds.)

EPA reviewed influent and effluent data for Point Loma WTP provided in the application and supplemental information provided by applicant to EPA in 2016. The data for total suspended solids, turbidity, and settleable solids are summarized, as follows.

Table 3. Monthly average and annual average influent concentrations for total suspended solids (mg/L) at Point Loma WTP.

Month	2008	2009	2010	2011	2012	2013	2014	2015
January	245	279	284	312	363	313	342	345
February	239	263	306	298	354	320	341	353
March	265	303	305	283	351	350	342	360
April	292	317	323	322	375	360	359	376
May	283	324	343	342	347	379	362	377
June	304	330	351	348	361	384	350	380
July	301	317	344	351	394	387	344	372
August	295	326	336	379	357	346	343	359
September	285	323	340	346	361	340	351	358
October	277	308	323	350	349	333	356	348
November	284	306	314	342	326	337	351	352
December	255	300	305	311	311	340	338	348
Annual Average	277	308	323	332	354	349	348	361
Maximum Month	304	330	351	379	394	387	362	380
Minimum Month	239	263	284	283	311	313	338	345

Table 4. Monthly average and annual average effluent concentrations for total suspended solids (mg/l) at Point Loma WTP.

Month	2008	2009	2010	2011	2012	2013	2014	2015
January	39	30	35	41	46	35	27	29
February	34	29	36	37	44	39	32	25
March	38	31	36	35	38	37	26	29
April	37	29	37	38	38	36	25	26
May	36	32	34	42	34	38	23	30
June	38	30	39	41	32	38	26	27
July	29	31	36	44	39	50	25	29
August	28	34	34	46	36	27	29	28
September	24	33	37	46	36	24	29	30
October	24	31	39	47	34	25	29	32
November	31	32	37	42	35	26	30	36
December	30	36	45	39	35	27	28	35
Annual Average	32	32	37	42	37	34	27	30
Maximum Month	39	36	45	47	46	50	32	36
Minimum Month	24	29	34	35	32	24	23	25

Table 5. Monthly average and annual average percent removals for total suspended solids (%) at Point Loma WTP.

Month	2008	2009	2010	2011	2012	2013	2014	2015
January	84.1	89.2	87.7	86.9	87.3	88.8	92.1	91.5
February	85.8	89	88.2	87.6	87.6	87.8	90.6	92.9
March	85.7	89.8	88.2	87.6	89.2	89.4	92.4	91.9
April	87.3	90.9	88.5	88.2	89.9	90	93	92.9
May	87.3	90.1	90.1	87.7	90.2	90	93.6	92.1
June	87.5	90.9	88.9	88.2	91.1	90.1	92.6	92.8
July	90.4	90.2	89.5	87.5	90.1	87.1	92.7	92
August	90.5	89.6	89.9	87.9	89.9	92.2	91.5	92.2
September	91.6	89.8	89.1	86.7	90	92.9	91.7	91.5
October	91.3	89.9	87.9	86.6	90.3	92.5	91.9	90.7
November	89.1	89.5	88.2	87.7	89.3	92.3	91.5	89.7
December	88.2	88	85.2	87.5	88.7	92.1	91.7	89.8
Annual Average	88.2	89.7	88.5	87.5	89.5	90.4	92.1	91.7
Maximum Month	91.6	90.9	90.1	88.2	91.1	92.9	93.6	92.9
Minimum Month	84.1	88.0	85.2	86.6	87.3	87.1	90.6	89.7

Table 6. Monthly average and annual average effluent concentrations for turbidity (NTU) at Point Loma WTP.

Month	2008	2009	2010	2011	2012	2013	2014	2015
January	34	36	37	33	43	37	34	33
February	34	32	36	36	39	41	33	32
March	38	35	34	34	37	38	33	36
April	37	33	36	34	39	38	34	34
May	38	39	37	38	40	43	38	37
June	36	35	40	39	44	47	44	37
July	36	39	41	43	51	58	44	40
August	37	43	41	44	53	44	44	39
September	35	41	40	46	46	38	46	37
October	36	43	39	43	39	36	40	40
November	39	43	38	38	39	35	37	39
December	36	37	37	41	36	34	33	35
Annual Average	36	38	38	39	42	41	38	37
Maximum Month	39	43	41	46	53	58	46	40
Minimum Month	34	32	34	33	36	34	33	32

Table 7. Monthly average and annual average effluent concentrations for setteable solids (ml/l) at Point Loma WTP.

Month	2008	2009	2010	2011	2012	2013	2014	2015
January	0.7	0.1	0.1	0.4	0.4	0.2	<0.1	0.2
February	0.4	<0.1	0.2	0.3	0.4	0.2	0.1	<0.1
March	0.2	0.1	0.2	0.2	0.2	0.3	0.1	0.1
April	0.3	0.2	0.2	0.1	0.2	0.2	<0.1	0.1
May	0.4	0.3	0.2	0.3	0.1	0.1	0.1	0.2
June	0.3	0.4	0.4	0.4	0.2	0.3	0.1	0.2
July	0.3	0.4	0.4	0.4	0.3	0.5	0.1	0.2
August	0.3	0.5	0.6	0.4	0.3	0.1	0.3	0.2
September	0.2	0.3	0.5	0.4	0.3	0.1	0.4	0.2
October	0.2	0.5	0.4	0.5	0.1	0.1	0.3	0.2
November	0.3	0.4	0.4	0.6	0.2	ND	0.3	0.3
December	0.2	0.1	0.4	0.2	0.2	0.1	0.2	0.2
Annual Average	0.3	0.3	0.3	0.4	0.2	0.2	0.2	0.2
Maximum Month	0.7	0.5	0.6	0.6	0.4	0.5	0.4	0.3
Minimum Month	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1

As shown in Table 5, the monthly average percent removals for total suspended solids meet both federal primary treatment requirements and California Ocean Plan Table A requirements for the Point Loma WTP. As shown in Table 4, the proposed monthly average limit of 60 mg/l for the Point Loma WTP effluent will also be met, although lower concentrations for suspended solids in the effluent are achievable. As shown in Table 6 and based on EPA's review of the effluent data, the turbidity limits for the Point Loma WTP effluent will be met. As shown in Table 7 and based on EPA's review of the effluent data and the City's response to permit violations which occurred in November 2011 and February 2012, the settleable solids limits for the Point Loma WTP effluent will be met.

In contrast to federal primary treatment and California Ocean Plan requirements, the percent removal requirement for total suspended solids specified under CWA section 301(j)(5) is applied on a "system-wide" basis and computed in accordance with the existing permit.

Table 8. Monthly average and annual average system-wide percent removals for total suspended solids (%).

Month	2008	2009	2010	2011	2012	2013	2014	2015
January	85	89	83	88	88	89	93	92
February	87	90	87	88	88	88	91	93
March	87	90	88	88	90	90	93	92
April	88	91	89	89	90	90	93	94
May	88	90	90	88	91	90	94	93
June	88	91	89	88	91	90	93	93
July	91	87	90	88	90	87	93	93
August	91	90	91	88	90	92	92	93
September	92	90	90	87	91	93	92	92
October	91	91	89	87	91	93	92	91
November	88	90	89	88	90	93	92	91
December	88	87	85	88	89	92	92	91
Annual Average	89	90	88	88	90	91	93	92
Maximum Month	92	91	91	89	91	93	94	94
Minimum Month	85	87	83	87	88	87	91	91

As shown in Table 8, the monthly average system-wide percent removals for total suspended solids meet the CWA section 301(j)(5) requirement of not less than 80 percent.

To comply with the CWA section 301(j)(5) requirement to implement a wastewater reclamation program that will result in a reduction in the quantity of suspended solids discharged by the applicant into the marine environment during the period of the 301(h) modification, the applicant has brought online the 30 mgd North City WRP and the 15 mgd South Bay WRP and, as part of its "improved" discharge, has committed to bring additional recycled water users online to reduce dry-weather flows to both the South Bay Ocean Outfall and Point Loma WTP and Ocean Outfall. Evidence for reductions in the quantity of suspended solids discharged by the applicant during the period of the 301(h) modification are provided in the application (Volume III) which shows the actual reduction in Point Loma WTP effluent mass emissions for total suspended solids from 1995 through 2022. The application and supplemental information also provides projections for total suspended solids loadings from the Point Loma WTP during the period of the proposed 301(h) modification. See Table 9 below and Figure 1.

Table 9. Point Loma WTP actual and projected flows (MGD) and total suspended solids loadings (MT/year) during the terms of the existing and proposed permits. This table reflects the total off-loading as a result of producing 83 MGD of potable reuse water by December 31, 2035.

Year	Actual Annual Average Discharge[1]	Actual TSS Mass Emissions[1,2]	Projected Annual Average Discharge[6,7,8,9]	Projected TSS Mass Emissions[9]
1995	188	11,060	---	---
1996	179	10,718	---	---
1997[2]	189	10,255	---	---
1998[3]	194	10,627	---	---
1999	175	9,130	---	---
2000[4]	174	9,036	---	---
2001	175	10,256	---	---
2002[5]	169	10,184	---	---
2003	170	9,862	---	---
2004	174	10,300	---	---
2005	183	10,229	---	---
2006	170	8,248	---	---
2007	161	7,588	---	---
2008	162	7,272	---	---
2009	153	6,658	---	---
2010	157	8,172	---	---
2011	156	8,848	---	---
2012	148	7,162	---	---
2013	144	6,674	---	---
2014	139	5,270	---	---
2015	132	5,466	---	---
2016	---	---	158	9424
2017	---	---	158	9445
2018	---	---	158	9467
2019	---	---	157	9488
2020	---	---	157	9509
2021	---	---	157	9530
2022			157	9530

[1] Flow and mass emissions data from annual reports submitted to the Regional Water Board and EPA for 1995-2015.

[2] North City WRP is brought online.
[3] Metro Biosolids Center is brought online.
[4] International Boundary and Water Commission International Wastewater Treatment Plant is brought online and Tijuana wastewater flows to Metro System are terminated.
[5] South Bay WRP is brought online
[6] In 2024, Point Loma discharge flows and loads are anticipated to decline through implementation of 15 MGD of upstream potable reuse. Based on targeted Pure Water San Diego potable reuse implementation goal for Dec. 31, 2023.
[7] In 2028, Point Loma discharge flows and loads are anticipated to decline through implementation of an additional 15 MGD of upstream potable reuse. Based on targeted Pure Water San Diego potable reuse implementation goal for Dec. 31, 2027. Total potable reuse production is now 30 MGD.
[8] In 2036, Point Loma discharge flows and loads are anticipated to decline through implementation of an additional 30 MGD of upstream potable reuse. Based on targeted Pure Water San Diego potable reuse implementation goal for Dec. 31, 2035. Total potable reuse production now is 83 MGD.
[9]The flow and TSS mass emission projections for long-term facilities planning are conservative (over estimates that employ a factor of safety) to ensure that adequate future system capacity is maintained. Mass emission limits for TSS apply only to discharges from publicly-owned treatment works (POTW s) owned and operated by the Discharger and the Discharger's wastewater generated in the San Diego Metropolitan Sewerage System (Metro System) service area, excluding TSS contributions from Metro System flows treated in the City of Escondido and South Bay WRP flows discharged to the South Bay Ocean Outfall. If the Discharger is requested to accept wastewater originating in Tijuana, Mexico, treated or untreated, such acceptance would be contingent upon an agreement acceptable to the USEPA, RWQCB and Discharger. The TSS contribution from that flow would not be counted toward any mass emission limit(s).

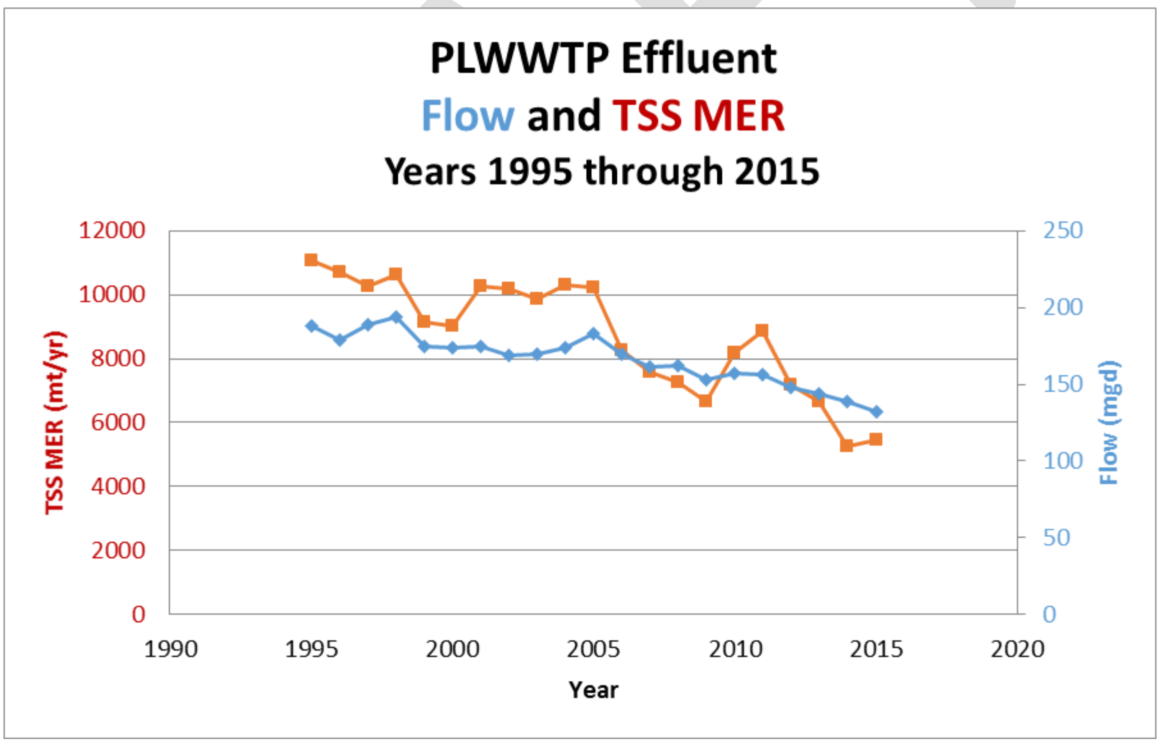
The applicant's projections in Table 9 and the proposed annual mass emissions limits for total suspended solids (see Table 27) satisfy section 301(j)(5)(B)(ii) of the Act, except that footnotes regarding wastewater generated outside the Metro system are not included in TSS or other mass limits calculations and are appropriately retained from the existing permit.

Table 27 footnotes on TSS calculations are consistent with footnotes 6 and 7 in Table 5 of the proposed modified permit and identify the potential for new sources of total suspended solids to be included in the Point Loma discharge, but these footnotes clarify that such new sources of total suspended solids would be excluded from the determination of compliance with these mass emission limits. EPA cannot determine compliance with CWA section 301(j)(5)(B)(ii) if these provisions are changed to allow additional total suspended solids loadings to be excluded from the mass emission requirements for total suspended solids. Maintaining the existing requirements in these footnotes ensures that the mass emission loadings are measured on a comparable basis so that EPA can determine that the permit requires the necessary reduction in suspended solids loadings.

Based on Table 9, EPA believes that a total suspended solids mass emission rate of 12,000 metric tons per year would be achievable during all five years of the proposed 301(h) modification. During this period, EPA recognizes that reductions in mass emissions resulting from increased water reclamation are likely to be seasonal and anticipates the potential for corresponding higher mass emission rates during wet weather months. In the future, the City needs to pursue additional water reclamation and reuse projects, including those which demand a year-round supply of reclaimed water so as to maintain long-term compliance with the decision criteria.

The mass emission limitations for TSS in the existing permit are based on the effluent limitations requested by the applicant in the 2015 301(h) application which were evaluated by USEPA. The applicant requested TSS mass emission limitations of 12,000 mt/yr for years 1 through 4 of the permit (e.g., October 1, 2016 to September 30, 2020), and 11,999 mt/yr in year 5 of the permit (e.g., October 1, 2020 to September 30, 2021). This represents a 1,598 mt/yr reduction during years 1 through 4 of the permit, and 1,599 mt/yr reduction in year 5 of the permit, from the current mass emission limitation of 13,598 mt/yr. These mass reductions are consistent with the applicant's proposed plan to reduce mass emissions to 11,500 mt/yr by 2026, and to 9,942 mt/yr by 2028. An annual reduction down to 9,942 mt/yr is equivalent to levels that would have occurred if the 240-MGD Facility were to achieve secondary treatment TSS concentration standards, 30 mg/L, which is consistent with secondary treatment standards.

Figure 1. Point Loma WTP average annual discharge flow rates (MGD) and TSS mass emission rates (metric tons/year) from 1995 through 2015. During this same time period, the population increased in the Metro System by 16 percent. Current performance of TSS mass emission rate (MER) is approximately 6000 mt/yr.



2. Biochemical Oxygen Demand

To comply with federal primary treatment and CWA section 301(j)(5) requirements for biochemical oxygen demand, the applicant has proposed the following effluent limit:

BOD: The annual average system-wide percent removal shall not be less than 58 percent (computed in accordance with Addendum No. 1 to Order No. R9-2002-0025, NPDES No. CA0107409).

EPA reviewed influent and effluent data for Point Loma WTP provided in Volume III, Appendix A, of the application. The data for biochemical oxygen demand are summarized, as follows.

Table 10. Monthly average and annual average influent concentrations for biochemical oxygen demand (mg/l) at Point Loma WTP.

Month	2008	2009	2010	2011	2012	2013	2014	2015
January	251	272	287	261	297	286	324	328
February	248	256	280	266	290	294	319	324
March	288	290	301	254	295	304	317	328
April	296	292	305	278	303	323	344	331
May	290	292	312	291	316	317	348	347
June	288	309	300	300	328	341	319	342
July	292	292	290	308	325	329	307	324
August	295	298	294	307	319	321	334	335
September	281	296	283	287	298	298	327	328
October	292	303	265	285	293	313	326	335
November	282	310	273	286	313	308	346	338
December	251	289	256	296	298	321	304	324
Annual Average	280	292	287	285	306	313	326	332
Maximum Month	296	310	312	308	328	341	348	347
Minimum Month	248	256	256	254	290	286	304	324

Table 11. Monthly average and annual average effluent concentrations for biochemical oxygen demand (mg/l) at Point Loma WTP.

Month	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
January	86	101	105	105	118	118	109	107
February	93	97	106	107	114	122	116	108
March	102	100	104	104	115	117	104	112
April	102	94	108	102	117	119	112	107
May	102	103	106	106	118	115	121	107
June	93	98	105	110	116	124	106	105
July	94	95	105	114	122	134	104	109
August	96	102	105	114	117	113	110	109
September	92	97	104	112	110	99	108	108
October	96	102	100	107	108	105	109	124
November	101	106	102	101	124	108	110	116
December	95	110	95	114	115	111	100	102
Annual Average	96	100	104	108	116	115	109	110
Maximum Month	102	110	108	114	124	134	121	124
Minimum Month	86	94	95	101	108	99	100	102

Table 12. Monthly average and annual average percent removals for biochemical oxygen demand (%) at Point Loma WTP.

Month	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
January	65.7	62.9	63.4	59.8	60.3	58.7	66.4	67.4
February	62.5	62.1	62.1	59.8	60.7	58.5	63.6	66.7
March	64.6	65.5	65.4	59.1	61.0	61.5	67.2	65.9
April	65.5	67.8	64.6	63.3	61.4	63.2	67.4	67.7
May	64.8	64.7	66.0	63.6	62.7	63.7	65.2	69.2
June	67.7	68.3	65.0	63.3	64.6	63.6	66.8	69.3
July	67.8	67.5	63.8	63.0	62.5	59.3	66.1	66.4
August	67.5	65.8	64.3	62.9	63.3	64.8	67.1	67.5
September	67.3	67.2	63.3	61.0	63.1	66.8	67.0	67.1
October	67.1	66.3	62.3	62.5	63.1	66.5	66.6	63.0
November	64.2	65.8	62.6	64.7	60.4	64.9	68.2	65.7
December	62.2	61.9	62.9	61.5	61.4	65.4	67.1	68.5
Annual Average	65.6	65.5	63.8	62.0	62.0	63.1	66.6	67.0
Maximum Month	67.8	68.3	66	64.7	64.6	66.8	68.2	69.3
Minimum Month	62.2	61.9	62.1	59.1	60.3	58.5	63.6	63.0

As shown in Table 12, the monthly average percent removals for biochemical oxygen demand meet the federal primary treatment requirement.

In contrast to the federal primary treatment requirement, the percent removal requirement for biochemical oxygen demand specified under CWA section 301(j)(5) is applied on a "system-wide" basis and computed in accordance with the existing permit.

Table 13. Monthly average and annual average system-wide percent removals for biochemical oxygen demand (%).

Month	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
January	68	65	65	63	63	62	69	70
February	65	64	64	62	63	61	66	70
March	67	67	67	62	64	64	69	68
April	68	70	67	66	64	66	70	71
May	67	67	68	66	66	66	67	72
June	70	71	67	65	67	65	69	72
July	70	68	67	65	65	61	69	70
August	69	69	68	65	65	67	70	71
September	69	70	67	63	66	69	70	70
October	69	69	66	65	66	69	69	66
November	66	68	66	67	63	67	71	69
December	65	64	63	64	65	68	70	71
Annual Average	68	68	66	65	65	65	69	70
Maximum Month	70	71	68	67	67	69	71	72
Minimum Month	65	64	63	62	63	61	66	66

As shown in Table 13, the annual average system-wide percent removals for biochemical oxygen demand meet the CWA section 301(j)(5) requirement of not less than 58 percent.

3. 301(h)-modified Permit Effluent Limits for TSS and BOD

Based on EPA's review of the 301(h) and (j)(5) decision criteria, the effluent limits in Table 14 will be incorporated into the 301(h)-modified permit:

Table 14. Effluent limits based on CWA sections 301(h) and (j)(5).

Effluent Constituent	Units	Annual Average	Monthly Average
TSS	% removal[1]	---	≥80
	mg/l	---	60[4]
	metric tons/year	12,000[2]	---
		11,999[3]	---
BOD5	% removal[1]	≥58	---

[1] To be calculated on a system-wide basis, as provided section VII.G of this Order/Permit, which is carried over from Addendum No. 1 to Order No. R9-2009-0001.
[2] To be achieved on permit effective date through end of fourth year of permit; e.g., September 30, 2020. Applies only to TSS discharges from POTWs owned and operated by the Discharger and the Discharger's wastewater generated in the Metro System service area; does not apply to wastewater (and the resulting TSS) generated in Mexico which, as a result of upset or shutdown, is treated at and discharged from Point Loma WTP.
[3] To be achieved on beginning of the fifth year of permit; e.g., October 1, 2020. Applies only to TSS discharges from POTWs owned and operated by the Discharger and the Discharger's wastewater generated in the Metro System service area; does not apply to wastewater (and the resulting TSS) generated in Mexico which, as a result of upset or shutdown, is treated at and discharged from Point Loma WTP.
[4] Based on average monthly performance data (2008 through 2015) for the Point Loma WTP provided by the Discharger (Supplemental Information, 2016).

B. Attainment of Water Quality Standards for TSS and BOD

Under 40 CFR 125.61(a) which implements CWA section 301(h)(1), there must be a water quality standard applicable to the pollutants for which the modification is requested; under 125.61(b)(1), the applicant must demonstrate that the proposed modified discharge will comply with these standards. The applicant has requested modified requirements for total suspended solids, which can affect natural light (light transmissivity) and biochemical oxygen demand which can affect dissolved oxygen concentration.

1. Natural Light

In relation to the effects of total suspended solids, the California Ocean Plan specifies that: "Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste." Regional Water Boards may determine reduction of natural light by measurement of light transmissivity or total irradiance, or both. Compliance with this water quality objective is determined from samples collected at stations representative of the area within the wastefield where initial dilution is completed. The typical depth range of the PLOO wastefield is 60 to 80 meters below the surface which is well below the euphotic zone.

In the 1995 TDD, EPA predicted a maximum increase in total suspended solids of 0.5 mg/l, in the immediate area of the Point Loma discharge, based on an effluent concentration of 53 mg/l and the worst-case initial dilution of 99:1. Applying this initial dilution value to the total suspended solids effluent values in Table 4 and the applicant's estimate for ambient total suspended solids (depth-averaged over a complete tidal cycle) of 7 mg/l, the maximum increase in total suspended solids at the boundary of the zone of initial dilution should be on the order of 0.45 to 0.24 mg/l, or about 6 to 3 percent. While these estimates are larger than the applicant's estimates, the increases predicted by the mass balance model are not considered substantial given the range of natural variability in total suspended solids (2.2 to 11.2 mg/l) historically observed in the area of the discharge.

EPA also reviewed available receiving water data to assess whether or not natural light is significantly reduced by the drifting wastefield.

Under its existing NPDES permit, the City conducts the required quarterly monitoring for bacteria indicators (enterococcus, fecal coliforms, and total coliforms), at depths of 1, 25, 60, 80 and 98 meters below the surface, at a grid of 33 offshore stations located along the 98, 80 and 60 meter contours (Figure A-3). This data is used by the applicant and EPA to help identify the location of the drifting wastefield. EPA evaluated the applicant's monitoring results from January 2008 through December 2013. Bacteria indicator data indicative of the PLOO wastefield are variably found along the 98, 80, and 60 meter contours, generally at depths from 60 to 98 meters.

Under its existing NPDES permit, the City conducts the required quarterly monitoring for light transmittance, throughout the water column, at a grid of 33 offshore stations located along the 98, 80 and 60 meter contours. EPA evaluated the applicant's monitoring results from January 2008 through December 2013. As shown in Table B-1 and Figure A-5, long-term averages and standard deviations for percent transmissivity at different water depths at the near-ZID boundary and nearfield stations (F30, F29, F31) are similar to those observed for the same water depth, at farfield stations located on the 98 meter contour. Long-term averages for percent transmissivity are lower and more variable at water depths closer to the surface and at the bottom, in comparison to water depths below the euphotic zone which are frequented by the drifting wastefield. Generally, percent transmissivity is lower at stations closer to the coast, due to shoreline influences and sediment resuspension at the bottom. Based on this evaluation, EPA concludes that the Point Loma discharge does not result in a significant reduction in natural light in areas within the wastefield where initial dilution is completed.

2. Dissolved Oxygen

In relation to the effects of biochemical oxygen demand, the California Ocean Plan specifies that: "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." Compliance with this water quality objective is determined from samples collected at stations representative of the area within the wastefield where initial dilution is completed. The typical depth range of the PLOO wastefield is 60 to 80 meters below the surface which is well below the euphotic zone.

The 1995 application used a modeling approach to predict the effect of the Point Loma WTP discharge on ambient dissolved oxygen concentrations. In the 1995 TDD, EPA evaluated these efforts and conducted similar modeling, using a worst-case (critical) initial dilution of 99:1, to verify the City's predictions. EPA's modeling results were slightly higher, but comparable to the applicant's results. The results of these modeling efforts are still valid for this review, as the assumptions for discharge flow (240 mgd), total suspended solids (48 mg/l), and biochemical oxygen demand (121 mg/l) remain conservative model inputs, with respect to the 2015 application. A summary of the applicant's analyses are found in the Large Applicant Questionnaire section of the application. The results of the applicant's and EPA's modeling efforts are summarized, below. EPA's analyses are found in the administrative record for the 1995 TDD.

Both the applicant and EPA use modeling efforts to evaluate the potential for: (1) dissolved oxygen depression following initial dilution during the period of maximum stratification (or other critical period); (2) farfield dissolved oxygen depression associated with biochemical oxygen demand exertion in the wastefield; (3) dissolved oxygen depression associated with steady-state sediment oxygen demand; and (4) dissolved oxygen depression associated with the resuspension of sediments (Table 15). For these calculations, the applicant uses an initial dilution of 202:1 while EPA uses the worst-case initial dilution of 99:1.

Table 15. Predicted worst-case dissolved oxygen (DO) depressions (mg/l) and percent reductions (%) performed by San Diego (1995) and EPA (1995).

Sources of Potential Oxygen Demand	San Diego	EPA
DO depression upon initial dilution (and % reduction)	0.05 (<1%)	0.08 (1.7%)
DO depression due to BOD exertion in the farfield (and % reduction)	0.14 (2.4%)	0.23 (5.9%)
DO depression due to steady-state sediment oxygen demand (and % reduction)	0.045 (1.7%)	0.16 (4.7%)
DO depression due to abrupt sediment resuspension (and % reduction)	0.077 (2.4%)	0.12 (3.5%)

EPA has compared these model predictions to the most recent water quality data to assess the potential for the discharge to result in dissolved oxygen depressions more than 10 percent from that which occurs naturally. Under its existing NPDES permit, the City conducts the required quarterly monitoring for dissolved oxygen, throughout the water column, at a grid of 33 offshore stations located along the 98, 80 and 60 meter contours. EPA evaluated the applicant's monitoring results from January 2008 through December 2013. At water depths frequented by the drifting wastefield, the long-term average concentrations for dissolved oxygen are around 4 to 5 mg/l. As shown in Table B-2 and Figure A-6, the long-term average concentration for dissolved oxygen at the near-ZID boundary station (F30) is similar to long-term average concentrations measured at nearfield and farfield stations. Dissolved oxygen depression associated with sediment demand should be compared to bottom waters at the outfall depth which, on average, show dissolved oxygen concentrations around 3 mg/l. This evaluation supports the conclusion that the Point Loma discharge does not result in more than a 10 percent reduction in dissolved oxygen concentrations, in areas within the wastefield where initial dilution is completed, from that which occurs naturally.

Based on the model predictions and receiving water monitoring results, EPA concludes it is unlikely that the dissolved oxygen concentration will be depressed more than 10 percent from that which occurs naturally outside the initial dilution zone, as a result of the wastewater discharge.

C. Attainment of Other Water Quality Standards and Impact of the Discharge on Shellfish, Fish and Wildlife; Public Water Supplies; and Recreation

CWA section 301(h)(2), implemented under 40 CFR 125.62, requires the modified discharge to not interfere, either alone or in combination with other sources, with the attainment or maintenance of that water quality which assures protection of public water supplies; protection and propagation of a balanced indigenous population (BIP) of shellfish, fish, and wildlife; and allows recreational activities in and on the water. In addition, CWA section 301(h)(9), implemented under 40 CFR 125.62(a), requires that the modified discharge meet all applicable EPA-approved State water quality standards and, where no such standards exist, EPA's 304(a)(1) aquatic life criteria for acute and chronic toxicity and human health criteria for carcinogens and noncarcinogens, after initial mixing in the waters surrounding or adjacent to the outfall.

1. Attainment of Other Water Quality Standards and Criteria

40 CFR 125.62(a) requires that the applicant's outfall and diffuser be located and designed to provide adequate initial dilution, dispersion, and transport of wastewater such that the discharge does not exceed, at and beyond the zone of initial dilution, all applicable State water quality standards. Where there are no such standards, individual 304(a)(1) aquatic life criteria and human health criteria must not be exceeded by the discharge. For this review, the applicable water quality standards and criteria are analyzed in four categories: pH, toxics, whole effluent toxicity, and sediment quality.

a. pH

The applicant is not requesting a 301(h) modification for pH, but the modified discharge must still meet the water quality standard for pH. The California Ocean Plan specifies that in ocean water: "The pH shall not be changed at any time more than 0.2 units from that which occurs naturally." Compliance with this water quality objective is determined from samples collected at stations representative of the area within the wastefield where initial dilution is completed. The typical depth range of the PLOO wastefield is 60 to 80 meters below the surface. Also, Table A in the California Ocean Plan has the effluent limit for pH: "Within the limit of 6.0 to 9.0 at all times." This requirement for pH is the same as that found in the secondary treatment regulation (40 CFR Part 133).

The City's 1995 application computed projected effects for a 240 mgd discharge on receiving water pH and a maximum change of 0.02 pH units was estimated.

Under its existing NPDES permit, the City conducts the required quarterly monitoring for pH, throughout the water column, at a grid of 33 offshore stations located along the 98, 80 and 60 meter contours. EPA evaluated the applicant's monitoring results from January 2008 through December 2013. At water depths frequented by the drifting wastefield, the long-term average for pH ranges from 7.9 to 7.8 units. As shown in Table B-3 and Figure A-7, the long-term average for pH measured at the near-ZID boundary station (F30) is similar to long-term averages measured at nearfield and farfield stations.

Under its existing NPDES permit, the City conducts the required continuous monitoring for pH in the Point Loma WTP effluent. Table III.B-12 in Volume III of the application summarizes daily pH data for the effluent during 2009 through 2013. During this period, the maximum daily value for pH was 7.83 units and the minimum daily value was 6.82 units. These levels achieve the technology based effluent limits required in both Table A of the California Ocean Plan and federal secondary treatment standards.

Based on the model predictions and receiving water monitoring results, it is unlikely that pH will be depressed more than 0.2 units from that which occurs naturally outside the initial dilution zone, as a result of the wastewater discharge. Also, EPA expects that technology based effluent limits for pH will be met by the applicant.

b. Toxics and Whole Effluent Toxicity

Under its existing NPDES permit, the City conducts the required effluent monitoring for the priority toxic and non-conventional pollutants listed in Table B of the California Ocean Plan and "remaining priority pollutants". Table B parameters for the protection of marine aquatic life are monitored weekly, except for chronic toxicity which is monitored monthly and acute toxicity which is monitored semi-annually. Table B parameters for the protection of human heath (noncarcinogens) are monitored monthly. Table B parameters for the protection of human health (carcinogens) are monitored monthly, except for aldrin and dieldrin, chlordane, DDT, PCBs, and toxaphene which are monitored weekly. "Remaining priority pollutants" are monitored monthly.

Toxics

The City submitted Point Loma WTP effluent data for metals, ammonia, and toxic organic chemicals from 2009 through 2013 in electronic format, as part of the application. Table B-4 provides a summary list of the monitored chemical parameters in this submission.

EPA screened this data using both the maximum method detection limit (MDL) and maximum effluent value reported by the applicant. Parameters never detected in the effluent were set aside. The remaining parameters were screened to determine which exceeded an applicable California Ocean Plan Table B water quality objective, or if no such objective exists, any applicable EPA 304(a)(1) water quality criterion. For Table B objectives, this screening was conducted using the 1995 and 2002 minimum monthly average initial dilution value of 204:1.

Table B-5 provides a summary list of parameters detected at least once in the effluent from 2009 through 2013. No parameters exceeded applicable State water quality standards, or EPA's 304(a)(1) water quality criteria for protection of aquatic life and human health. Thus the applicant achieved 100% compliance with applicable State water quality standards as well as EPA's water quality criteria for toxics. Large Applicant Questionnaire, Volume III-B.

EPA reviewed the sensitivity of analytical methods used by the applicant to evaluate effluent compliance with California Ocean Plan Table B water quality objectives after initial dilution. To do this, EPA reviewed the maximum method detection limits (MDLs) and maximum effluent concentrations for all Table B parameters monitored during 2009 through 2013. For Table B parameters which are always reported as "not detected", EPA calculated estimated effluent wasteload allocations by multiplying Table B objectives by the respective initial dilution value. These estimated wasteload allocations are then compared to the applicant's maximum MDLs during 2009 through 2013. Based on these comparisons, EPA has determined that the MDLs for aldrin, benzidine, chlordane, DDT, 3,3-dichlorobenzidine, dieldrin, heptachlor, heptachlor epoxide, PAHs, PCBs, TCDD equivalents, and toxaphene are generally not low enough to evaluate effluent quality in relation to the applicable water quality objective after initial dilution (i.e., the MDL is greater than the estimated effluent wasteload allocation). EPA determined that the applicant is using MDLs as sensitive as those prescribed under 40 CFR 136, except for aldrin, PCBs, and TCDD equivalents, where the applicant's MDLs need to be lowered in order to achieve 40 CFR 136 levels.

Whole Effluent Toxicity

The City provided Point Loma WTP effluent data for chronic toxicity and acute toxicity from 2009 through 2015 in electronic format, at EPA's request.

EPA reviewed these chronic toxicity data, along with the summary results for chronic toxicity provided in Volume III, Large Applicant Questionnaire section III.B.7, of the application to determine if any test results exceeded the Table B chronic toxicity objective of 1.0 TUc (= 100/NOEC). In accordance with the existing permit, the applicant conducted sensitivity screening using *Atherinops affinis* (topsmelt), *Haliotis rufescens* (red abalone), and *Macrocystis pyrifera* (giant kelp) and concluded that the red abalone and giant kelp were the most sensitive organisms for chronic toxicity testing. EPA's review of the 58 red abalone larval development test results from 2009 through 2015 shows no exceedances of the chronic toxicity objective using the minimum monthly initial dilution value of 204:1. EPA's review of the giant kelp germ tube length test results from January 2009 through May 2015 shows three exceedances (July 8, 2013, May 12, 2015, and June 2, 2015) of the chronic toxicity objective which is a very low failure rate. In response to the exceedance, the City conducted accelerated toxicity testing as required by the existing permit; these follow-up toxicity tests demonstrated compliance with the objective. The applicant reports that concentrations of toxic inorganic and organic constituents in the Point Loma WTP effluent at the time of the noncompliant toxicity test were at normal values and the cause of the toxicity is unknown. The existing permit limit is 205 TUc and the critical effluent concentration is 0.49 percent effluent.

EPA reviewed these acute toxicity data, along with the summary results for acute toxicity provided in Volume III, Large Applicant Questionnaire section III.B.7, of the application to determine if any test results exceeded the Table B acute toxicity objective of 0.3 TUa (= 100/LC50). In accordance with the existing permit, the applicant conducted sensitivity screening both using *Atherinops affinis* (topsmelt) and *Mysidopsis bahia* (shrimp) and concluded that the shrimp was the more sensitive organism for acute toxicity testing. EPA's review of the 10 test results from 2009 through 2015 shows no exceedance of the acute toxicity objective, using the minimum monthly initial dilution value of 20.4:1 for acute toxicity. The existing permit limit is 6.5 TUa and the critical effluent concentration is 15.5 percent effluent.

Toxics Mass Emission Benchmarks and Antidegradation

In the 1995, 2003 and 2009 permits, EPA and the Regional Water Board established annual mass based performance goals for California Ocean Plan Table B parameters based on Point Loma WTP effluent data from 1990 through April 1995. For most Table B parameters, the numerical benchmarks are set below the levels prescribed for water quality based effluent limits. The benchmarks are designed to provide an early measure of changes in effluent quality which may substantially increase the mass of toxic pollutants discharged to the marine environment. Consistent with State and federal antidegradation policies, these benchmarks are intended to serve as triggers for antidegradation analyses during renewal of the permit.

Under 40 CFR 131.12, State antidegradation polices and implementation practices must ensure that: (1) existing uses and the level of water quality necessary to protect such uses are maintained and protected (Tier I requirement); and (2) where water quality is better than necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water, the level of water quality shall be maintained and protected unless the permitting authority finds that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located; existing uses are fully protected; and the highest statutory and regulatory requirements are achieved for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control (Tier II requirement).

An analysis of compliance with the mass emission benchmarks in the existing permit is presented in Volume II, Part 3, of the application. During 2008 through 2013, the City achieved compliance with all enforceable effluent concentration and mass emission limitations within Order R9-2009-0001 for phenol. However, the PLOO discharge exceeded the non-enforceable benchmark for non-chlorinated phenols. Phenol is regularly detected in the Point Loma WTP effluent. According to the applicant, phenol is a common chemical used in industrial and nonindustrial applications as solvents, disinfectants and cleaning compounds; it is also a constituent in paints, inks, and photographic chemicals. Phenol has a variety of household uses including medical and household disinfectants, pharmaceuticals, solvents and cleaners, paints, inks, and photo supplies. It is identified by the applicant as a pollutant of concern, but does not have an existing local pretreatment limit. Industrial discharges of phenols to the sewer system are regulated by the City. Federal categorical industrial dischargers, hospitals, and laboratories are regulated by the applicant's "toxic organic management plans". Electroplating and metal finishing industries are regulated by federal total toxic organics limits. The applicant states that these existing practices are effective in limiting industrial discharges of phenol from electroplating and metal finishing industries, hospitals, laboratories, and other significant industrial users.

Point Loma WTP influent and effluent data presented in Table 2-4 and 2-5 of Volume II, Part 3, of the application demonstrate that the upward trend in non-chlorinated phenol mass emissions is consistent and not an artifact of a few high concentrations in a limited number of samples. Historical annual average mass emissions for phenol are: 2.2 MT/yr (1990-1995), 3.3 MT/yr (1996-2001), 2.7 MT/yr (2002-2006) and 3.8 MT/yr (2010-2013). During these periods, the average percent removal for phenol has improved: 17 percent (1990-1995), 20 percent (1996-2001), 27 percent (2002-2006) and 27% (2007-2009) until most recent years of 16% (2010-2013). During this timeframe, the average concentrations for phenol in the effluent are: 8.2 ug/l (1990-1995), 13.4 ug/l (1996-2001), 11.5 ug/l (2002-2006), 13.0 ug/l (2007-2009) and 17.8 ug/l (2010-2013). Influent concentrations have also increased in the most recent years, 17.7 ug/l (2007-2009) vs. 21.2 ug/l (2010-2013). The applicant has not requested changes to the mass emission benchmark or the water quality based effluent limits for phenolic compounds in the existing permit.

In 2009, EPA concluded that a full antidegradation analysis justifying that the continued increase in effluent loading of phenolic compounds (non-chlorinated) to a Tier II waterbody was necessary. Because the effluent load for phenolic compounds appeared likely to continue to increase during the permit term, the permit proposed that the applicant conduct a thorough analysis of the projected effluent load above the mass emission benchmark level, the resulting impact to receiving water quality of the total effluent load, and opportunities for effluent load reduction through additional treatment or controls, including local limits, and pollution prevention.

The applicant's antidegradation analysis is provided within Volume II, Part 3 of the 2015 permit application. In part, the applicant pursued sources of phenolic compounds within the Metro System, including a specific survey of industrial sources, and concluded that phenol mass emissions from Metro System SIUs are small compared to PLOO influent loads. Table 2-9 provide summary results of a study of phenols in key collection system service areas, which show a range of average phenol concentrations (6.1 to 19.1 for 2007-2014) with occasional elevated values in each service area where each sampling location registered at least one transitory occurrence greater than 30ug/l. Additional information is provided and suggests that increases in phenol mass emissions result from population increases coupled with slightly increasing phenol per capita contributions from household and personal care products. This increase in influent phenol concentrations also results from regional water conservation efforts during most recent drought years (2010-2014). The recent increase in influent contaminant concentrations and the presumption due to water conservation gains has also been reported by other large municipal wastewater treatment plants in the State.

As noted in the antidegradation analysis, the *California Ocean Plan* establishes a 6-month median receiving water standard of 30 µg/l for non-chlorinated phenolic compounds (to be achieved upon completion of initial dilution). As shown in Table 3-5 (page 3-7), at the assigned PLOO minimum month initial dilution of 204:1, the *California Ocean Plan* 6-month median phenol concentration standard of 30 µg/l translates to an effluent standard of 6,120 µg/l. Therefore the Point Loma WTP effluent phenol concentrations would need to be maintained below 3,060 µg/l in order to achieve continued compliance with the "level of significance" criteria (not exceeding 50 percent of the allowable *California Ocean Plan* receiving water standard). Even if future Point Loma WWTP nonchlorinated phenol concentrations were to increase by fifty percent above current values to 30 µg/l, the PLOO discharge would maintain compliance with this Tier 1 fifty percent threshold requirement by two orders of magnitude. This is consistent with Provision VI.C.2.e of Order No. R9-2017 0--17-0001 that establishes a level of significance test where water quality impacts are deemed "not significant" if projected receiving water quality beyond the zone of initial dilution is less than 50 percent of the *California Ocean Plan* receiving water standard.

As described immediately above the applicant's antidegradation analysis demonstrated in Chapter 3, the existing PLOO discharge complies with this "significance" test by two orders of magnitude (102) or more for non-chlorinated phenolic compounds. In addition to complying with *California Ocean Plan* receiving water standards, the PLOO discharge ensures compliance with federal water quality criteria for the protection of human health (consumption of organisms).

On this basis, the existing PLOO discharge complies with Tier 1 antidegradation regulations, and no Tier 2 socioeconomic analysis is required for non-chlorinated phenolic compounds. By complying with NPDES permit concentration and mass emission limits and *California Ocean Plan* receiving water standards, the PLOO discharge is consistent with maintaining the existing high quality of water necessary to support beneficial use, and the PLOO discharge will not unreasonably affect present or anticipated beneficial uses. The PLOO discharge is thus in conformance with antidegradation provisions established within State Board Resolution No. 68-16.

Large Applicant's Questionnaire – III. B-42. As shown in the Antidegradation Study, the City achieved compliance with all NPDES mass emission benchmarks during 2010-2013 except for non-chlorinated phenolic compounds. Analyses presented in Part 3 of Volume II demonstrates that the mass emissions of non-chlorinated phenol from the PLOO are in compliance with Tier I antidegradation regulations and that no Tier II analysis is required.

The existing annual mass emission benchmarks will be retained in the reissued permit as a basis for evaluating future changes in effluent quality and mass loading.

EPA concludes that the modified discharge will attain applicable water quality standards and criteria for toxics and whole effluent toxicity, based on the very low rates of effluent excursions above water quality objectives for toxics and chronic toxicity. Consistent with State policy, appropriate requirements for toxics and whole effluent toxicity will be included in the permit. Water quality based effluent limits will be established for all California Ocean Plan Table B parameters where effluent data show the reasonable potential to exceed water quality objectives for toxics and whole effluent toxicity. The effluent will be monitored for all Table B parameters and other priority pollutants following the regular schedule set in the existing permit. The results of the effluent monitoring program will be evaluated against the annual mass emission benchmarks to protect the Point Loma WTP headworks and achieve permit compliance with water quality standards.

In accordance with 40 CFR 125.62, EPA concludes that the modified discharge will allow for the attainment or maintenance of water quality which assures protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife.

c. Sediment Quality

Accumulation of solids in and beyond the vicinity of the discharge can have adverse effects on water usage and biological communities. 40 CFR 125.62(a) requires that following initial dilution, the diluted wastewater and particles must be dispersed and transported such that water use areas and areas of biological sensitivity are not adversely affected.

In relation to solids, Chapter II of the California Ocean Plan contains the following water quality objective for physical characteristics of marine sediments: "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." In addition, Chapter II of the California Ocean Plan contains the following water quality objectives for chemical characteristics of marine sediments: "The concentration of organic materials in marine sediments shall not be increased to levels that would degrade marine life."; "Nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota."; and "The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions."

Applicants must predict seabed accumulation due to the discharge of suspended solids into the receiving water. The approach for large dischargers needs to consider the process of sediment deposition, decay of organic materials, and resuspension and anticipated mass emissions for the permit term.

In 1995, the applicant used a sediment deposition model (SEDPXY) to predict the rates of suspended solids and organic matter deposition and accumulation around the outfall. The model was run under two scenarios, assuming effluent flow rates of 205 (end-of-permit for 1995 application) and 240 mgd (design capacity) and solids mass emission rates of 14,073 and 16,476 MT/yr, respectively. In the 1995 TDD, EPA estimated sediment deposition using a modified version of the *Amended Section 301(h) Technical Support Document* (EPA 842-B-94-007, September 1994; ATSD) sediment deposition model which was run assuming an effluent flow rate of 205 mgd and a solids mass emission rate of 13,600 MT/yr. In the 2002 TDD, EPA adjusted its modeling for the solids mass emission rate of 15,000 MT/yr.

The predictions generated using the ATSD model are likely to be different from the applicant's SEDPXY model due to differences in the use of current meter data, bathymetry, trapping depth distributions, the size and resolution of the modeling grid, and the use of different assumptions regarding the rate which effluent particles settle (e.g., the settling velocities used by EPA were about two times higher than those used by the applicant). As a result of these differences, the ATSD model predicts a greater number of particles settling over a smaller area and is the more conservative result. These data are summarized in Table 16.

Table 16. Results of sediment deposition modeling performed by San Diego (1995) and EPA (1995 and 2002).

Parameter	San Diego	EPA
Effluent flow rate (mgd)	205 – 240	205 – 240
Mass of particles (MT/yr)	14,073 – 16,476	13,600 – 15,000
Mass of particles (lbs/day)	85,000 – 99,512	n/a
Area modeled (km^2)	360	200
Percent of particles settling in area modeled (%)	8.3 – 8.1	12
Area modeled around the diffuser (km^2)	0.01	0.25
Annual solids deposition rate ($g/m^2/yr$)	152 – 174	254 – 280
Critical 90-day solids deposition rate (g/m^2/90-day)	45 – 51	72 – 79
Annual organic deposition rate ($g/m^2/yr$)	122 – 139	203 – 224
Critical 90-day organic deposition rate (g/m^2/90-day)	37 – 57	58 – 64
Steady-state organic accumulation (g/m^2)	33 – 38	56 – 62

Modeled estimates for annual solids deposition rate ranged from 152 to 280 $g/m^2/yr$ and the critical 90-day solids deposition rate ranged from 45 to 79 $g/m^2/yr$.

Although a portion of the settled solids is inert, the organic fraction of the settled solids is a primary concern around outfalls. Assuming that effluent solids are 80% organic matter (USEPA, 1994), modeled estimates for annual organic deposition rate ranged from 122 to 224 $g/m^2/yr$ and the critical 90-day solids deposition rate ranged from 37 to 64 $g/m^2/yr$. Although not strictly comparable, a reasonable estimate of organic carbon flux from the water column associated with primary and secondary production in Southern California is 26 to 62 g $C/m^2/yr$ (Nelson et al., 1987).

Estimates of steady-state organic accumulation ranged from 33 to 62 g/m^2, over the area modeled. The steady-state accumulation of organic matter in sediments is a function of the rate that organic matter is deposited and the rate at which it decays. Both the applicant and EPA used the conservative assumption that there is no resuspension or transport of solids to outside the area modeled and the typical default decay rate of 0.01/day. This tends to overestimate the actual accumulation of outfall deposits in sediments. For instance, Hendricks and Eganhouse (1992) estimated a background accumulation rate for solids of 103 $g/m^2/yr$, about one-sixth of their estimate for solids deposition. Applying this ratio to the model results in Table 16 for annual organic deposition rate ($g/m^2/yr$), yields estimates for organic accumulation rate ranging from 20 to 37 $g/m^2/yr$ and steady-state organic accumulation rate ranging from 5 to 10 g/m^2. Empirical evidence suggests that steady-state organic accumulations less than 50 g/m^2 have minimal effects on benthic communities (USEPA, 1982).

To both evaluate whether significant accumulation is actually occurring in the area of the outfall and identify trends, EPA examined sediment monitoring data for pre-discharge (1991-1993) and discharge monitoring surveys (1994-2006) conducted during July, at the depth of the outfall along the 98 meter contour (Figure A-4). (Under its existing NPDES permit, the City conducts the required semi-annual monitoring, during January and July, at 12 primary stations located along the 98 meter contour and a total of 10 secondary stations located along the 88 and 116 meter contours.) For perspective, values from the 98 meter stations are compared with San Diego's regional surveys (Volume IV, Appendix E, of the application) and the Southern California Bight regional survey conducted in 2003 (Schiff et al., 2006).

Sediment Grain Size Characteristics

Information about sediment grain size characteristics (e.g., particle size, percent fines) and the dispersion of sediment particles at a survey sight is indicative of hydrodynamic regimes and allows for better interpretation of chemical and biological data collected at the sight. The mean particle size for all 98 meter stations during the pre-discharge and discharge periods is 0.061 millimeters (mm) and 0.069 mm, respectively. During these two periods, the mean particle size at near-ZID station E14 is 0.062 mm and 0.102 mm, respectively. The percentage of fine sediments (silt and clay) for all 98 meter stations during the pre-discharge and discharge periods has a mean of about 40 percent and 37 percent, respectively. During these two periods, percent fines at near-ZID station E14 is about 40 percent and 30 percent, respectively.

The applicant reports that the slight increase in mean particle size observed at near-ZID station E14 is likely related to the movement of ballast material supporting the outfall pipe and the presence of patchy sediments in the area. The applicant also notes that sediments at northern reference station B12 are frequently characterized by the presence of very course material (shell hash and gravel) which distinguishes this station from other 98 meter stations. Consequently, this review uses northern reference station B9 as the primary reference station for making comparisons.

The mean particle size at station B9 during the pre-discharge and discharge periods is 0.054 mm and 0.060 mm, respectively. During these two periods, percent fines at station B9 is about 42 percent and 40 percent, respectively. For mid-shelf sediments (30-120 meters) summarized for the Southern California Bight regional survey in 2003, the area-weighted mean and 95% confidence interval for fine sediments is 45$\pm$8.4 percent. Figure C.1-2 in Volume V, Appendix C, of the application summarizes percent fines in sediments for the San Diego Coastal region during the period of the discharge (1991-2013).

Overall, there appears to be little change over time in sediment grain size characteristics relative to the outfall. The year-to-year variation in sediment grain size characteristics observed at station E14 are likely due to the movement of outfall ballast material.

Organic Indicators

Concentrations of total organic carbon, total volatile solids, total nitrogen, biochemical oxygen demand, and sulfides are measured as indicators of organic enrichment in sediments. Total organic carbon and total volatile solids represent more direct measurements of carbon imported as fine particulate matter.

Total Organic Carbon. Total organic carbon is a direct measure of the amount of organic carbon in sediments. Figure A-9 summarizes percent total organic carbon in sediment at each 98 meter station, during July, from 1991 through 2013. There does not appear to be a spatial trend in percent total organic carbon at these stations; however, during 2005 and 2006, there is a slight increase in percent total organic carbon at all 98 meter stations which does not appear to be related to the outfall. For January and July surveys, the mean percent total organic carbon for all 98 meter stations during the pre-discharge (1993) and most recent discharge period (2009-2013) is about 0.5 percent and 0.6 percent, respectively. During these two periods, the mean percent total organic carbon at near-ZID station E14 is about 0.5 percent and 0.5 percent, respectively, while levels at northern reference station B9 are about 0.6 percent and 0.6 percent, respectively. For mid-shelf sediments summarized for the 2008 Southern California Bight regional survey, the area-weighted mean and 95% confidence interval for total organic carbon is 0.75 ± 0.19 percent. These data do not suggest an outfall related effect. Figure C.1-4 in Volume V, Appendix C, of the application summarizes percent total organic carbon in sediments for the San Diego Coastal region during the period of the discharge (1991-2013).

Total Volatile Solids. Total volatile solids is a measure of organic carbon and nitrogenous matter in sediments. Figure A-10 summarizes percent total volatile solids in sediment at each 98 meter station, during July, from 1991 through 2013. At these stations, discharge period levels are slightly higher than pre-discharge levels and there appears to be a weak spatial trend where levels slightly increase with distance from the outfall. For January and July surveys, the mean percent total volatile solids for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) is about 2.2 percent and 2.4 percent, respectively. During these two periods, the mean percent total volatile solids at near-ZID station E14 is about 2.1 percent and 2.0 percent, respectively, while levels at northern reference station B9 are about 2.4 percent and 3.2 percent, respectively. These data do not suggest an outfall-related effect. Figure C.1-5 in Volume V, Appendix C, of the application summarizes percent total volatile solids in sediments for the San Diego Coastal region during the period of the discharge (1991-2013).

Biochemical Oxygen Demand. Biochemical oxygen demand is an indirect measure of organic enrichment in sediments. Figure A-11 summarizes biochemical oxygen demand concentrations in sediment at each 98 meter station, during July, from 1991 through 2013. At these stations, discharge period levels are slightly higher than pre-discharge levels and year-to-year concentrations measured at each station are quite variable. For January and July surveys, the mean biochemical oxygen demand concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) are 270 parts per million (ppm) and about 320 ppm, respectively. During these two periods, the mean biochemical oxygen demand concentrations at near-ZID station E14 are about 250 ppm and 470 ppm, respectively, while concentrations at northern reference station B9 are about 300 ppm and 310 ppm, respectively. These data suggest that a small amount of organic enrichment is occurring close to the outfall diffuser. Figure C.1-7 in Volume V, Appendix C, of the application summarizes BOD concentrations in sediments for the San Diego Coastal region during the period of the discharge (1991-2013).

Sulfides. Sulfides are a byproduct of anaerobic digestion of organic material by sulfur bacteria. Figure A-12 summarizes sulfide concentrations in sediment at each 98 meter station, during July, from 1991 through 2013. At these stations, discharge period levels are generally higher than pre-discharge levels and year-to-year concentrations measured at stations close to the outfall (E17, E14, E11) are distinctly higher and quite variable. (Station E14 is located about 120 meters from the center of the diffuser legs and stations E17 and E11 are located about 250 to 300 meters from the ends of the diffuser legs.) For January and July surveys, the mean sulfide concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2001-2006) are 1.2 ppm and 3.9 ppm, respectively. During these two periods, the mean sulfide concentrations at near-ZID station E14 are 1.7 ppm and 16.2 ppm, respectively, while concentrations at northern reference station B9 are 0.5 ppm and 1.2 ppm, respectively. These data suggest that a small amount of organic enrichment is occurring close to the outfall diffuser. Figure C.1-8 in Volume V, Appendix C, of the application summarizes sulfide concentrations in sediments for the San Diego Coastal region during the period of the discharge (1991-2013).

Total Nitrogen. Figure A-13 summarizes percent total nitrogen in sediment at each 98 meter station, during July, from 1991 through 2013. At these stations, discharge period levels are slightly higher than pre-discharge levels and there appears to be a weak spatial trend where levels slightly increase with distance from the outfall. For January and July surveys, the mean percent total nitrogen for all 98 meter stations during the pre-discharge (1993) and most recent discharge period (2009-2013) is about 0.04 percent and 0.05 percent, respectively. During these two periods, the mean percent total nitrogen at near-ZID station E14 is about 0.03 percent and 0.05 percent, respectively, while during these two periods, levels at northern reference station B9 are about 0.05 percent and 0.06 percent, respectively. For mid-shelf sediments summarized for the 2008 Southern 2008 Southern California Bight regional survey, the area-weighted mean and 95% confidence interval for total nitrogen is 0.05±0.01 percent. These data do not suggest an outfall-related effect. Figure C.1-6 in Volume V, Appendix C, of the application summarizes percent total nitrogen in sediments for the San Diego Coastal region during the period of the discharge (1991-2013).

Modeling predictions indicate that deposition and accumulation rates associated with the Point Loma Ocean Outfall are not likely to have negative effects on benthic communities beyond the zone of initial dilution. Monitoring results for sediment parameters associated with organic enrichment suggest a mixed picture relative to the potential for biological effects close to the outfall diffuser. Only biochemical oxygen demand and sulfides are elevated at near-ZID station E14; sulfides are variably elevated at nearfield stations E17 and E11. However, as described below, monitoring results for biological indicators of organic enrichment lead EPA to conclude that significant effects on the benthic macrofauna community are not occurring in areas beyond the zone of initial dilution. EPA also concludes that the modified discharge complies with applicable California Ocean Plan water quality objectives for chemical characteristics of marine sediments.

Trace Metals and Toxic Organics

Chapter II of the California Ocean Plan contains the following water quality objective for chemical characteristics in marine sediments: "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."

To both evaluate whether trace metals and toxic organic compounds are found at elevated concentrations in the area of the outfall and identify trends, EPA examined sediment monitoring data for pre-discharge (1991-1993) and discharge monitoring surveys (1994-2013) conducted during July, at the depth of the outfall along the 98 meter contour (Figure A-4). Ten metals, total DDTs, total PCBs, and total PAHs were reviewed. For perspective, parameter concentrations from the 98 meter stations are compared with non-regulatory NOAA sediment quality guidelines developed for the National Status and Trends Program (NOAA, 1999) and area-weighted means and 95% confidence intervals for mid-shelf (30-120 meters) sediments summarized for the Southern California Bight regional survey in 2003 (Table 17). The sediment quality guideline concentrations provided by NOAA represent the 10^{th} percentile (or Effects Range-Low) and 50^{th} percentile (or Effects Range-Median) of a toxicological effects database that has been compiled by NOAA for each parameter. The ERL is indicative of the concentrations below which adverse effects rarely occur and the ERM is representative of the concentrations above which effects frequently occur. The method detection limits (MDLs) for parameters monitored in sediments at the 98 meter stations are presented in the City's annual receiving water monitoring reports for the Point Loma Ocean Outfall.

Table II.A-13 in Volume III of the application includes summary data for trace metals monitored in the Point Loma WTP effluent during calendar year 2013, which the applicant selected as the representative year for data record between 2010 and 2013. Known or suspected industrial and nonindustrial sources for pollutants of concern found in the Point Loma WTP effluent are summarized in Table III.H-7 and H-8, Volume III of the application. Table 2-1 in Volume II of the application estimates 2010 through 2013 mean annual mass emissions (in metric tons per year) for California Ocean Plan Table B parameters discharged from the Point Loma Ocean Outfall; for this calculation, the applicant multiplies the annual average effluent concentration by the annual average discharge flow; effluent results of “not detected” are assumed by the applicant to have a concentration equal to or less than one-half the method detection limit. Table K.5-2 in Volume VIII of the application summarizes Point Loma WTP effluent mass emissions for cadmium, chromium, copper, lead, nickel, silver, and zinc, beginning in 1979 through 2006. (For reference, 1 metric ton is 1,000 kilograms which is approximately 2,205 pounds.)

Table 17. NOAA sediment quality guidelines, area-weighted means and 95% confidence intervals for mid-shelf (30-120 meters) sediments summarized for the Southern California Bight regional survey in 2008, and the applicant’s method detection limits during 2013.

Parameter	NOAA ERL	NOAA ERM	Bight ’08	MDL in 2013
Arsenic (ppm)	8.2	70	6.1±2.2	0.33
Cadmium (ppm)	1.2	9.6	0.32±0.09	0.01
Chromium (ppm)	81	370	31±4.2	0.016
Copper (ppm)	34	270	10.7±1.7	0.028
Lead (ppm)	46.7	218	7.8±1.8	0.142
Mercury (ppm)	0.15	0.71	0.05±0.02	0.003
Nickel (ppm)	20.9	51.6	12±3.4	0.036
Selenium (ppm)	---	---	0.72±0.26	0.24
Silver (ppm)	1.0	3.7	0.24±0.12	0.013
Zinc (ppm)	150	410	46+7.9	0.052
Total DDTs (ppt)	1,580	46,100	16,000±6,400	See annual report.
Total PCBs (ppt)	22,700	180,000	1,300±330	
Total PAHs (ppb)	4,022	44,792	179±40	

Arsenic. The applicant reports that arsenic is detected in 52 of 52 effluent samples during the representative year 2013. Identified sources are pest control poisons. The 2013 mean annual mass emission rate for the Point Loma WTP discharge is <0.20 metric tons per year; the annual mass emissions for arsenic have remained relatively constant.

Figure A-14 summarizes arsenic concentrations in sediment at each 98 meter station, during July, from 1991 through 2013 and arsenic levels in sediment are also presented in Figure C.1-10 in Volume V, Appendix C, of the application. At these stations, discharge period levels are slightly higher than pre-discharge levels; these increases are most pronounced at near-ZID station E14 and northern reference station B9. For January and July surveys, the mean arsenic sediment concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2008-2013) are 2.4 ppm and 3.1 ppm, respectively. During these two periods, the mean arsenic concentrations at near-ZID station E14 are 2.2 ppm and 3.2 ppm, respectively, while concentrations at northern reference station B9 are 2.1 ppm and 3.7 ppm, respectively. These concentrations are below the ERL threshold and similar to the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey.

Cadmium. The applicant reports that cadmium is detected in 2 of 52 effluent samples during the representative year 2013. Identified sources are metal plating, metalworking and metal alloys, electronics, and batteries. The 2013 mean annual mass emission rate for the Point Loma WTP discharge is <0.11 metric tons per year; the annual mass emissions for cadmium have generally decreased.

Cadmium concentrations in sediment at each 98 meter station, during July, from 1991 through 2013 are provided in Figure C.1-12 in Volume V, Appendix C of the application. At these stations, discharge period levels are much lower than pre-discharge levels; the elevated and variable levels recorded during the pre-discharge period are no longer observed and the applicant explains that the frequent detections which begin during the most recent discharge period are due to an improved method detection limit. For January and July surveys, the mean cadmium concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 1.3 ppm and 0.2 ppm, respectively. During these two periods, the mean cadmium concentrations at near-ZID station E14 are 1.1 ppm and 0.2 ppm, respectively, while concentrations at northern reference station B9 are 1.3 ppm and 0.15 ppm, respectively. Concentrations for the most recent discharge period are below the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey.

Chromium. The applicant reports that chromium is detected in 29 of 52 effluent samples during the representative year 2013. Identified sources are metal plating, shipbuilding, and metalworking and metal alloys. The 2013 mean annual mass emission rate for chromium (III) in the Point Loma WPT discharge is 0.39 metric tons per year; the annual mass emissions for chromium have decreased.

Chromium concentrations in sediment at each 98 meter station, during July, from 1991 through 2013 are provided in Figure C.1-13 in Volume V, Appendix C of the application. At these stations, discharge period levels are similar to pre-discharge levels. For January and July surveys, the mean chromium concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 17.3 ppm and 16.8 ppm, respectively. During these two periods, the mean chromium concentrations at near-ZID station E14 are 15.8 ppm and 13.4 ppm, respectively, while concentrations at northern reference station B9 are 21.8 ppm and 21.8 ppm, respectively. These concentrations are below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey.

Copper. The applicant reports that copper is detected in 52 of 52 effluent samples during the representative year 2013. Identified sources are metal plating, electronics, tool manufacturing, electroplating, semiconductor manufacturing, shipbuilding, metalworking, and water pipe corrosion. The 2013 mean annual mass emission rate for copper in the Point Loma WPT discharge is 3.6 metric tons per year; the annual mass emissions for copper have generally decreased.

Figure A-15 summarizes copper concentrations in sediment at each 98 meter station, during July, from 1991 through 2013. At these stations, discharge period levels are slightly higher than pre-discharge levels; levels at southern reference station E2 (near the LA-5 dredge materials disposal site) are generally elevated when compared to other 98 meter stations. For January and July surveys, the mean copper concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 7.4 ppm and 7.7 ppm, respectively. During these two periods, the mean copper concentrations at near-ZID station E14 are 6.7 ppm and 6.8 ppm, respectively; while concentrations at northern reference station B9 are 6.8 ppm and 7.3 ppm, respectively. These concentrations are below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey. Concentrations at southern farfield station E2 are below the ERL threshold, but slightly higher than the average background level for the Southern California Bight survey.

Lead. The applicant reports that lead is detected in 8 of 52 effluent samples during the representative year 2013. Identified sources are metal plating, metalworking, paints, and batteries. The 2013 mean annual mass emission rate for lead in the Point Loma WPT discharge is <0.44 metric tons per year; the annual mass emissions for lead have generally decreased.

Lead concentrations in sediment at each 98 meter station, during July, from 1991 through 20013 are provided in Figure C.1-16 in Volume V, Appendix C. At these stations, the discharge period levels appear higher than pre-discharge levels; however, this may be due, in part, to improved method detection limit beginning in 2003. For January and July surveys, the mean lead concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 1.8 ppm and 7.0 ppm, respectively. During these two periods, the mean lead concentrations at near-ZID station E14 are 1.0 ppm and 4.5 ppm, respectively, while concentrations at northern reference station B9 are 1.2 ppm and 6.1 ppm, respectively. These concentrations are below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey.

Mercury. The applicant reports that mercury is detected in 52 of 52 effluent samples during the representative year 2013. Identified sources are orthodontics, thermostats, and thermometers. The 2013 mean annual mass emission rate for mercury in the Point Loma WPT discharge is <0.002 metric tons per year; the annual mass emissions for mercury have continually decreased.

Figure A-16 summarizes mercury concentrations in sediment at each 98 meter station, during July, from 1991 through 2013. At these stations, discharge period levels are higher than pre-discharge levels and quite variable from year-to-year; levels at southern reference station E2 (near the LA-5 dredge materials disposal site) are generally elevated when compared to other 98 meter stations. For January and July surveys, the mean mercury concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 0.011 ppm and 0.029 ppm, respectively. During these two periods, the mean mercury concentrations at near-ZID station E14 are 0.006 ppm and 0.019 ppm, respectively, while concentrations at northern reference station B9 are 0.002 ppm and 0.027 ppm, respectively. These concentrations are below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey. Concentrations at southern farfield station E2 are below both the ERL threshold and the average background level for the Southern California Bight survey.

Nickel. The applicant reports that nickel is detected in 52 of 52 effluent samples during the representative year 2013. Identified sources are metal plating, metalworking, and metal alloys. The 2013 mean annual mass emission rate for nickel in the Point Loma WPT discharge is 1.7 metric tons per year; the annual mass emissions for nickel have remained relatively constant.

Nickel concentrations in sediment at each 98 meter station, during July, from 1991 through 2013 are provided in Figure C.1-19 in Volume V, Appendix C. At these stations, discharge period levels are similar to pre-discharge levels. For January and July surveys, the mean nickel concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 6.6 ppm and 7.5 ppm, respectively. During these two periods, the mean nickel concentrations at near-ZID station E14 are 5.7 ppm and 6.9 ppm, respectively, while concentrations at northern reference station B9 are 7.3 ppm and 8.6 ppm, respectively. These concentrations are below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey.

Selenium. The applicant reports that selenium is detected in 52 of 52 effluent samples during the representative year 2013. Identified sources are water supply. The 2013 mean annual mass emission rate for selenium in the Point Loma WPT discharge is 0.23 metric tons per year; the annual mass emissions for selenium have remained relatively constant.

Selenium concentrations in sediment at each 98 meter station, during July, from 1991 through 2013 are provided in Figure C.1-20 in Volume V, Appendix C. At these stations, discharge period levels are much lower than pre-discharge levels. The elevated and variable levels recorded during the pre-discharge period are no longer observed; however, the infrequent detections and resulting lower average concentrations for the most recent discharge period are likely due, in part, to use of a less sensitive method detection limit which began in 2003. For January and July surveys, the mean selenium concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 0.2 ppm and 0.4 ppm, respectively. During these two periods, the mean selenium concentrations at near-ZID station E14 are 0.2 ppm and 0.4 ppm, respectively, while concentrations at northern reference station B9 are 0.3 ppm and 0.6 ppm, respectively. These concentrations are well below the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey. There is no ERL threshold for selenium.

Silver. The applicant reports that silver is detected in 9 of 52 effluent samples during the representative year 2013. Identified sources are photo processing. The 2013 mean annual mass emission rate for silver in the Point Loma WPT discharge is <0.87 metric tons per year; the annual mass emissions for silver have remained relatively constant.

Silver concentrations in sediment at each 98 meter station, during July, from 1991 through 2013 are provided in Figure C.1-21 in Volume V, Appendix C. At these stations, silver is rarely detected, but EPA notes that the detections which begin during the most recent discharge period (2001-2006) are likely due to an improved method detection limit beginning in 2003. For January and July surveys, the mean silver concentration for all 98 meter stations during the most recent discharge period (2009-2013) is 1.7 ppm. During this period, the mean silver concentration at near-ZID station E14 is 0.99 ppm, while the concentration at northern reference station B9 is 1.01 ppm. During the most recent discharge period, all silver concentrations are below the ERL threshold. During the most recent discharge period, except in 2006, all silver concentrations are generally below the average background level for mid-depth sediments summarized for the 2008 Southern 2008 Southern California Bight survey.

Zinc. The applicant reports that zinc is detected in 52 of 52 effluent samples during the representative year 2013. Identified sources are metalworking, electronics, tool manufacturing, electroplating, circuit printing, shipbuilding, metalworking, research institutions, and water pipe corrosion. The 2013 mean annual mass emission rate for zinc in the Point Loma WPT discharge is 6.4 metric tons per year; the annual mass emissions for zinc have remained relatively constant.

Figure A-17 summarizes zinc concentrations in sediment at each 98 meter station, during July, from 1991 through 2013. At these stations, discharge period levels are similar to pre-discharge levels. For January and July surveys, the mean zinc concentrations for all 98 meter stations during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) are 28.0 ppm and 30.3 ppm, respectively. During these two periods, the mean zinc concentrations at near-ZID station E14 are 25.2 ppm and 24.8 ppm, while concentrations at northern reference station B9 are 31.6 ppm and 36.4 ppm, respectively. These concentrations are below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey.

Total DDTs. DDT and its derivatives are pesticides that were banned for most uses in the U.S. in 1972, but still allowed as partial active ingredient in some actively used pesticides. The applicant reports that DDT and its derivatives are generally not detected in effluent samples. (In 2013, the method detection limits for DDT and its derivatives in effluent ranged from 1 to 4 ng/l.) The 2013 mean annual mass emission rate for the Point Loma WTP discharge is “not detected”.

Figure A-18 summarizes concentrations in sediment for total DDTs at each 98 meter station, during July, from 1991 through 2013; since 1997, concentrations are detected less frequently. For January and July surveys, the mean concentration for total DDTs at all 98 meter stations during the most recent discharge period (2009-2013) is 509 parts per trillion (ppt). (In 2013, the method detection limits for DDT and its derivatives in sediment ranged from 400 to 700 ppt.) During this period, the mean concentration is 479 ppt at near-ZID station E14 and 2271 ppt at northern reference station B9. During the most recent discharge period, individual station concentrations are well below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey, except at nominal northern reference station B9 and southern farfield station E2, where concentrations higher than the ERL threshold are reported in 2001.

Total PCBs. PCBs are synthetic organic chemicals used as coolants and lubricants in transformers and capacitors; they were banned from industrial use in the U.S. in 1977 but are still allowed as partial ingredient for some current use compounds. The applicant reports that PCBs are generally not detected in effluent samples. (In 2013, the method detection limit for PCBs in effluent was 18 ng/l). The 2013 mean annual mass emission rate for the Point Loma WTP discharge is “not detected”.

Total PCBs concentrations in sediment at each 98 meter station, during July, from 1998 through 2013 are provided in Figure C.1-24 in Volume V, Appendix C; concentrations are only rarely detected at these stations. For January and July surveys, the mean concentration for total PCBs at all 98 meter stations during the most recent discharge period (2009-2013) is 3284 ppt. (In 2013, the method detection limit for all but three of the 41 monitored PCB congeners is 700 ppt.) During this period, the mean concentration at near-ZID station E14 is 400ppt and northern reference station B9 is 2271 ppt. During the most recent discharge period, all individual station concentrations are well below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey, including southern farfield station E5 (in 2001) and southern farfield station E2 (in 2002, 2004 and 2006) where PCBs detections are reported.

Total PAHs. PAHs are a group of 100 different chemicals formed during the incomplete burning of coal, oil and gas, garbage, or other organic substance. They are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides. The applicant reports that PAHs are generally not detected in effluent samples. (In 2013, the method detection limit for PAHs in effluent was 3 ug/l). The 2013 mean annual mass emission rate for the Point Loma WTP discharge is “not detected”.

Figure A-19 summarizes concentrations in sediment for total PAHs at each 98 meter station, during July, from 1991 through 2013. At these stations, pre-discharge and discharge period levels are almost always “not detected”, until 2003 when method detection limits are improved; subsequently, PAHs are usually detected at each station (Figure A-25). For January and July surveys, the mean concentration for total PAHs at all

98 meter stations during the most recent discharge period (2009-2013) is 83 parts per billion (ppb). During this period, the mean concentration is 10.6 ppb at near-ZID station E14 and 9.4 ppb at northern reference station B9. During the most recent discharge period, all individual station concentrations are well below both the ERL threshold and the average background level for mid-depth sediments summarized for the 2008 Southern California Bight survey.

Based on this review, EPA concludes that the chemical characteristics in sediments beyond the zone of initial dilution are not changed by the modified discharge such that toxic substances in Table B of the California Ocean Plan are increased to levels which would degrade indigenous biota.

2. Impact of the Discharge on Public Water Supplies

Implementing CWA section 301(h)(2), 40 CFR 125.62(b) specifies that the discharge must allow for the attainment and maintenance of water quality that assures protection of public water supplies. Appendix III, Large Applicant Questionnaire section III.C, of the application describes a planned seawater desalination facility in San Diego County that is located about 30 miles north of the PLOO discharge (Regional Water Board Order No. R9-2006-0065, NPDES No. CA0109233). Based on the expected ability of the Point Loma WTP discharge to meet water quality standards and the distance to the nearest desalination facility, EPA concludes that the applicant's proposed modified discharge will have no effect on the protection of public water supplies and will not interfere with the use of planned or existing public water supplies.

3. Impact of the Discharge on Shellfish, Fish, and Wildlife

Implementing CWA section 301(h)(2), 40 CFR 125.62(c)(1) through (3) specify that the modified discharge must allow for the attainment or maintenance of water quality which assures protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife. A balanced indigenous population must exist immediately beyond the zone of initial dilution of the applicant's modified discharge; and in all other areas beyond the zone of initial dilution where marine life is actually or potentially affected by the discharge. Conditions within the zone of initial dilution must not contribute to extreme adverse biological impacts, including, but not limited to, the destruction of distinctive habitats of limited distribution, the presence of disease epicenters, or the stimulation of phytoplankton blooms which have adverse effects beyond the zone of initial dilution. The term "balanced indigenous population" is defined at 40 CFR 125.58 and means an ecological community which exhibits characteristics similar to those of nearby, healthy communities existing under comparable but unpolluted environmental conditions; or may reasonably be expected to become re-established in the polluted water body segment from adjacent waters if sources of pollution were removed. Also, Chapter II of the California Ocean Plan contains the following water quality objective for biological characteristics of ocean waters: "Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded." For this review, biological data collected by the applicant are analyzed in three categories: phytoplankton, benthic infauna, and fish and epibenthic invertebrates.

a. Phytoplankton

Wastewater discharges from ocean outfalls may influence the abundance and distribution of plankton in two important ways. Effluent particulates may rise into the euphotic zone (generally less than 20 meter water depths) and inhibit light penetration, thereby reducing phytoplankton primary productivity. Also, nutrient loading can cause an increase in the abundance of undesirable species. The California Ocean Plan specifies that in ocean water: "Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste." and "Nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota." There are no numerical water quality objectives for nutrients in the California Ocean Plan. Compliance with these water quality objectives are determined from samples collected at stations representative of the area within the wastefield where initial dilution is completed. The typical depth range of the PLOO wastefield is 60 to 80 meters below the surface which is well below the euphotic zone. Under its existing NPDES permit, the City is not required to monitor plankton or ammonia. Therefore, EPA has reviewed parameters monitored by the applicant that relate to phytoplankton productivity and standing stock, such as effluent total suspended solids, light transmittance, effluent ammonia, and chlorophyll a. Attachment T1 in Volume XIII, Appendix T, of the 1995 application describes the plankton communities found in waters off San Diego County and summarizes studies on phytoplankton conducted on a regional scale in the Southern California Bight.

Based on the water quality modeling result for total suspended solids concentrations at the completion of initial dilution under worst case conditions and monitoring data for light transmittance throughout the water column, EPA concludes that the Point Loma discharge does not result in a significant reduction in natural light in areas within the wastefield where initial dilution is completed. This indicates that the discharge of total suspended solids should not result in a significant change in the productivity or standing stock of phytoplankton.

Total ammonia-nitrogen (NH_4^+-N and NH_3-N) in an effluent discharge may affect phytoplankton productivity and standing stock because nitrogen is a limiting nutrient in coastal waters of the Southern California Bight. Under its existing NPDES permit, the City conducts the required weekly effluent monitoring for ammonia (expressed as nitrogen). Effluent data for ammonia-nitrogen are summarized, as follows.

Table 18. Monthly average and annual average effluent concentrations for total ammonia-nitrogen (mg/l) at Point Loma WTP.

Month	2008	2009	2010	2011	2012	2013	2014	2015
Annual Average	30.0	31.5	31.3	31.3	35.2	35.6	34.5	37.8
Maximum Month	32.8	36.4	34.7	33.6	38.1	40.4	36.1	40.1
Minimum Month	28.9	26.0	21.7	22.5	32.4	30.5	33.3	35.9

Based on the effluent concentrations in Table 18 and the minimum monthly average initial dilution of 204:1 estimates for ammonia at the completion of initial dilution range from 0.1 to 0.2 mg/l. Such concentrations in the euphotic zone have the potential to stimulate phytoplankton productivity around an outfall, as natural background concentrations for ammonia within the euphotic zone of the Southern California Bight are typically an order of magnitude lower (Eppley et al., 1979). Based on the applicant's dilution modeling using time series data, the height-of-rise to the average level of minimum dilution varies from about 20 to 31 meters above the bottom, corresponding to water depths of 62 to 74 meters. The height-of-rise to the average top of the wastefield varies from about 30 to 40 meters above the bottom, corresponding to water depths of about 54 to 64 meters. The maximum height-of-rise to the top of the wastefield during a month varies from about 50 to 64 meters above the bottom, corresponding to water depths of about 30 to 44 meters. Both dilution modeling and bacteria monitoring data at offshore stations support the conclusion that the wastewater plume is trapped below the euphotic zone most of the time. Consequently, the influence of wastefield ammonia concentrations on phytoplankton should be minimal.

Under its existing NPDES permit, the City conducts the required quarterly monitoring for chlorophyll a, throughout the water column, at a grid of 33 offshore stations located along the 98, 80 and 60 meter contours. EPA evaluated the applicant's monitoring results from January 2008 through December 2013. At water depths frequented by the drifting wastefield, the long-term average for chlorophyll a ranges from 0.5 to 1.5 ug/l. As shown in Table B-6 and Figure A-8, the long-term average for chlorophyll a measured at the near-ZID boundary station (F30) is similar to long-term averages measured at nearfield and farfield stations.

Based on the water quality modeling results for total suspended solids and ammonia concentrations at the completion of initial dilution and monitoring data for light transmittance and chlorophyll a throughout the water column evaluated in this review, EPA concludes that total suspended solids and nutrient materials in the Point Loma discharge will not result in a significant change in the productivity or standing stock of phytoplankton, will not cause natural light to be significantly reduced beyond the initial dilution zone, and will not cause objectionable aquatic growths or degrade indigenous biota.

b. Benthic Macrofauna

Organisms with limited mobility that live in bottom sediments are used as indicators of the condition of marine environments because they respond to many different types of environmental stress and their responses integrate environmental conditions over time. Under its existing NPDES permit, the City conducts the required semi-annual monitoring, during January and July, at 12 primary stations located at the depth of the outfall along the 98 meter contour and a total of 10 secondary stations located along the 88 and 116 meter contours.

To evaluate the condition of the benthic macrofauna community in the area of the outfall and identify trends, EPA examined benthic macrofauna monitoring data for pre-discharge (1991-1993) and discharge monitoring surveys (1994-2013) conducted during July, at the depth of the outfall along the 98 meter contour (Figure A-4). EPA agreed with the applicant's approach to compare near-ZID station E-14 (nearfield site) to stations B-9 and E-26 (farfield sites). Station E-14 is closest to the diffuser and most likely to be impacted by the wastewater discharge. Stations B-9 and E-26 are farthest from the outfall and considered reference or control sites.

Statistics and trends for species richness, species diversity, total abundance of all taxa, and a Southern California Bight benthic index are reviewed and summarized below. Results for three pollutant tolerant indicator taxa: *Euphilomedes* spp., *Parvilucina tenuisculpta*, and *Capitella* "*capitata*" (a species complex) are provided (further below) since these three taxa combined make up approximately 82% of total infauna taxa collected in sediment samples. EPA agreed with much of the evaluation provided in the application and some graphs and tables are replicated in this TDD.

Table B-18 [adapted from Application Table C.1-30] provides summary values for benthic infauna abundance, species richness (no. of species), Swartz dominance, diversity (H'), and benthic response index (BRI) values for the Point Loma Ocean Outfall benthic stations. Data are presented for pre-discharge conditions (1991−1993) vs. post-discharge conditions (2009-2013). Mean values for all stations are presented for direct comparison with mean values for near-ZID station E-14 and reference site B-9. For both E-14 and B-9, the mean values for four indicators – species richness, Swartz dominance, Diversity and BRI increase from pre-discharge conditions to most recent post-data conditions; this suggests more influence due to regional effects than potential impacts only near-ZID station E-14.

Species Richness

One potential indicator of environmental degradation would be reduction in benthic species diversity near an outfall; this can be examined by species richness values. The species richness mean value increases from 66 to 103 and 89 for E-14 and B-9 respectively. However, comparing mean values for all stations within same timeframe shows nearly equivalent increases; 67 for all sites in 1991-1993 and 90 for all sites in

2009-2013. This comparison suggests that benthic species diversity is increasing at all sites since 1993, including the reference site as well as the 'impacted' site nearest outfall.

Dominance.

Another potential indicator of environmental degradation would be dominance by a certain few benthic species, indicated by decreasing dominance or diversity values at each site over time. Dominance actually decreased (index values increased) off Point Loma after the initiation of wastewater discharge. Swartz Dominance mean values in pre-discharge dates were 19 or 20 for all sites, whereas recent post-discharge (2009-2013) mean values are 32 for all sites, 30 for near ZID station E-14 and 34 for control station B-9. Thus post-discharge benthic communities in the region were characterized by more even distribution of species than prior to the discharge. Diversity (H') values show similar trends to Swartz Dominance values. It is clear the benthic infaunal communities around the Point Loma outfall at station E-14 are not being numerically dominated by a few pollution tolerant species.

Benthic Response Index

The Benthic Response Index (BRI) is an index developed by the Southern California Coastal Water Research Project as part of the Southern California Bight Pilot Project (Smith et al., 2001). Index values below 25 suggest "reference condition" and those in the range of 25 to 33 represent a "minor deviation from reference condition". A "loss in biodiversity" is set at an index value of 34. Index values greater than 44 indicate a "loss in community function". "Defaunation" is set at an index value of 72. Validation has shown that the BRI is most accurate from water depths of 31 to 200 meters which includes the middle and outer continental shelf (Ranasinghe, 2007) and the water depth of the Point Loma outfall.

Figure A-20 (adapted from Application Figure C.1-30) provides a trend analysis of BRI values at three sites between 1991 and 2013. Overall, BRI values have remained below 25 at all sites except near-ZID station E14. The highest BRI occurred at station E14 nearest the outfall, where values have become elevated relative to sites B-9 and E-26 since 1994. While BRI values at station E14 have steadily increased over time, most values have still been less than 25 and are considered characteristic of reference conditions for the Southern California Bight. The few higher BRI values at station E14 between 25 and 28.5 reported over the past few years (2010 and 2012) represent only "minor deviation from reference condition" that is not indicative of degraded benthic habitats. Although these data suggest an outfall related pattern, the effect is minor and is restricted to this ZID boundary site.

Pollution Tolerant Indicator Taxa

For this review, EPA examined three pollution tolerant indicator taxa used to evaluate organic enrichment around outfalls.

Euphilomedes spp. Crustaceans known to be tolerant of organic enrichment are ostracods in the genus, *Euphilomedes* spp. (comprised of *E. carcharodonta*, *E. producta*, *E. longiseta*, and *E.* sp.).

Figure A-21 (replicated from Figure C.1-41 of Volume IV, Attachment C of application) summarizes the average abundance of *Euphilomedes* spp. per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2013. At these stations, the discharge period mean is similar to the pre-discharge mean and year-to-year averages generally trend lower with distance from the outfall. Mean abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) is 17.3 and 25.8, respectively. During these two periods, mean abundance at near-ZID station E14 is 18.1 and 1.7, respectively, while mean abundance at northern reference station B9 is 21.2 and 7.7, respectively.
The applicant notes that *Euphilomedes* spp. abundances above the upper tolerance bound of the abundance tolerance interval are frequently observed at other 98 meter stations and suggests this may be due to region-wide influences unrelated to the outfall. (Figure C.1-41 in Attachment C.1 of Volume IV, Appendix C, of the application). EPA agrees that while an outfall related pattern appears to occur at near-ZID station E14, cyclical patterns in abundance suggest other factors may be influencing *Euphilomedes* spp. at 98 meter stations beyond the zone of initial dilution.

Parvilucina tenuisculpta. A mollusc known to be tolerant of organic enrichment is the bivalve, *Parvilucina tenuisculpta*. It is found in high abundances in areas of moderate organic enrichment.

Figure A-22 (replicated from Figure C.1-45 of Volume IV, Attachment C of application) summarizes the average abundance of *Parvilucina tenuisculpta* per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2013. At these stations, the discharge period mean is similar to the pre-discharge mean and year-to-year averages at near-ZID station E14 are generally elevated when compared to other 98 meter stations. Mean abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2009-2013) is 3.2 and 0.8, respectively. During these two periods, mean abundance at near-ZID station E14 is 1.0 and 3.8, respectively, while mean abundance at northern reference station B9 is 4.6 and 0.45, respectively.

Capitella "*telata*" Species Complex. A polychaete known to be tolerant of organic enrichment and other disturbances is *Capitella* "*telata*". According to the applicant, background abundances are generally near zero, in the Southern California Bight, but may reach densities of 100 per 0.1 m^2 in areas of excessive organic deposits.

Figure A-23 (replicated from Figure C.1-36 of Volume IV, Attachment C of application) summarizes the average abundance of *Capitella* "*capitata*" per 0.1 m^2 at each 98 meter station, during July, from 1991 through 2013. At these stations, the discharge period mean is higher than the pre-discharge mean and year-to-year averages at near-ZID station E14 are generally much higher when compared to other 98 meter stations. Mean abundance for all 98 meter stations in July during the pre-discharge (1991-1993) and most recent discharge period (2009-13) is 0.0 and 0.8, respectively. During these two periods, mean abundance at near-ZID station E14 is 0.0 and 30.7, respectively, while mean abundance at northern reference station B9 is 0.1 and 0.0, respectively. This increase in abundance is likely due to organic enrichment around the outfall.

A comparison of pre-discharge and post-discharge data for the Point Loma region indicates some general trends.

- Patterns of species richness and infauna abundances suggest an overall increase in number of species at all stations across the San Diego Region.
- Polychaetes continue to account for the greatest number of species and individuals. This has been observed throughout the southern California benthos, including mainland shelf depths along the San Diego coastal region.
- Patterns of change in populations of the polychaete *Capitella*, the bivalve *Parvilucina* and ostracods of the *Euphilomedes* suggest an organic enrichment effect near the outfall; however, densities of these organisms are still within the range of natural variation for the Southern California Bight.
- Benthic infauna communities are not numerically dominated by a few pollutant tolerant species as would be expected if there were an adverse environmental impact.

The shifts in community composition that have occurred over time probably represent variation in southern California assemblages related to such things as large scale oceanographic events, (e.g. El Nino/La Nina conditions), stochastic natural events, or natural population fluctuations.

In conclusion, there appear to be no impacts to benthic macrofauna associated with the accumulation of toxic substances discharged from the outfall. Based on the evidence described in this section, EPA concludes that conditions beyond the zone of initial dilution are not degraded in compliance with the California Ocean Plan and support an ecological community which exhibits characteristics similar to those of nearby, healthy communities existing under comparable but unpolluted environmental conditions.

Demersal Fish

Chapter II of the California Ocean Plan contains the following water quality objective for biological characteristics of ocean waters: "Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded." Demersal (bottom dwelling) fish communities are inherently variable due to their mobility and the influences of natural and anthropogenic factors. Under its existing NPDES permit, the City conducts the required semi-annual monitoring, during January and July, at six stations in trawl zones located at the depth of the outfall along the 98 meter contour. Nearfield stations SD12 and SD10 are within 1.2 kilometers of the outfall. Northern farfield stations SD14 and SD13 are located approximately 8 kilometers north of the outfall and southern farfield stations SD8 and SD7 are located approximately 9 kilometers south of the outfall. Station SD8 is located within a couple of kilometers of EPA-designated dredge materials disposal site LA-5 while station SD7 is located within one kilometer of non-active dredge materials disposal site LA-4 (Figure A-24).

EPA did not reanalyze the raw data for demersal fish submitted with the application. Rather, to evaluate the condition of demersal fish in the area of the outfall and identify trends, EPA reviewed the applicant's analyses of monitoring data for pre-discharge (1991-1993) and discharge monitoring surveys (1994-2006), conducted during January and July, along the 98 meter contour.

Table 19 summarizes two indicator parameters of fish community structure calculated by the applicant. The average number of fish species (species richness) collected per trawl over the 16 year monitoring period ranges from 7 to 26. Over the pre-discharge and discharge periods, the average number of species has increased from 13 to 15 in the nearfield and 14 to 15 in the farfield. Year-to-year fish abundances (total catch) are quite variable and have increased in both the nearfield and farfield, since discharge began. The applicant reports that much of this variability is due to fluctuations in the populations of dominant species (e.g., Pacific sanddab) and sporadically common species (e.g., halfbanded rockfish). Figures E-36 through E-38 in Volume IV, Appendix E, of the application. Values for species richness and total abundance are within the range of natural variability observed for the Southern California Bight regional surveys and suggest no outfall-related trends. Table E-9 in Volume VI, Appendix E, of the application.

Table 19. Applicant's summary for total number of species and total abundance of demersal fishes at trawl zone stations during the pre-discharge (1991-1993) and discharge (1994-2013) periods. Data are expressed as means with ranges in parentheses.

Indicator Parameter	Pre-discharge Period		Discharge Period	
	Nearfield	Farfield	Nearfield	Farfield
Species Richness	13 (8-19)	14 (9-22)	15 (7-20)	15 (9-26)
Total Abundance	208 (63-399)	214 (51-453)	440 (44-2,322)	310 (50-695)

As shown in Table 20, the applicant reports that, generally, the same fish species are present and abundant during the pre-discharge and discharge periods. These species represent 90-95% of the total abundance of fishes caught from 1991 through 2013. Overall, the demersal fish assemblage in the area of the outfall is dominated by Pacific sanddab which is common in soft-bottom habitats of the Southern California Bight mainland shelf.

Table 20. Applicant's summary for percent abundance of demersal fish species at all trawl zone stations during pre-discharge (1991-1993) and discharge (1994-2013) periods. Data are expressed as the percent of total abundance per trawl.

Common Name	Pre-discharge Period Percent Abundance	Discharge Period Percent Abundance
Pacific sanddab	55	48
Plainfin midshipman	10	3
Yellowchin sculpin	6	11
Stripetail rockfish	4	3
Dover sole	4	5
Longspine combfish	4	7
Longfin sanddab	3	3
Pink seaperch	3	1
Halfbanded rockfish	2	8
Shortspine combfish	2	1
California tonguefish	1	1

The City's analysis in the application shows that Pacific sanddab comprise a slightly smaller proportion of the nearfield fish assemblage during the discharge period, than prior to the discharge, while the proportion of Pacific sanddab remains similar over time in the farfield. In contrast, yellowchin sculpin comprise a larger proportion of both the nearfield and farfield fish assemblages during the discharge period, than prior to the discharge. The applicant suggests that these changes may be due, in part, to cyclic population fluctuations and region-wide increases in water temperature observed during El Nino years. Ordination and classification analysis of fish abundance data from 1991 through 2013 seem to confirm that the differences in local fish assemblages over time appear in large part related to region-wide changes in water temperature, even though some cluster groups are in proximity to the two dredge materials disposal sites.

The applicant reports that evidence of parasitism or physical abnormalities (fin rot, discoloration, skin lesions, tumors) in fish populations off Point Loma has remained low, since monitoring began in 1991. The copepod eye parasite occurs in Pacific sanddab at a low percentage. An ecoparasitic cymothioid isopod is observed loose in some trawls and is known to be especially common on sanddab in southern California waters.

EPA concludes there are no apparent spatial or temporal trends in the total number of fish species or abundances of fishes that suggest an outfall-related impact.

4. Impact of the Discharge on Recreational Activities

This section describes the impact of the modified discharge on recreational activities. Under 40 CFR 125.62(d), the applicant's modified discharge must allow for the attainment or maintenance of water quality which allows for recreational activities beyond the zone of initial dilution, including, without limitation, swimming, diving, boating, fishing, and picnicking, and sports activities along shorelines and beaches. The requirement to protect recreational activities applies beyond the zone of initial dilution, in both federal and State waters. Both the bioaccumulation of toxic pollutants in fish tissues (liver or muscle) and water contact recreational activities and compliance with bacteriological water quality standards and criteria are discussed. The applicant's monitoring data are reviewed to assess whether the discharge will protect recreational activities.

a. Bioaccumulation and Fish Consumption

Chapter II of the California Ocean Plan contains the following water quality objectives for the biological characteristics of ocean waters: "The natural taste, odor, and color of fish, shellfish, or other marine resources used for human consumption shall not be altered." and "The concentrations 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."

Bioaccumulation is a process by which chemical contaminants undergo uptake and retention in organisms via various pathways of exposure. For example, fishes can accumulate contaminants through adsorption and absorption of dissolved chemicals in the water or through ingestion or assimilation of contaminants in food. Once a contaminant is incorporated into the tissues of an organism, it may resist metabolic excretion and accumulate. Higher trophic level organisms may then feed on contaminated prey and further concentrate the contaminant in their tissues. This process can lead to concentrations of contaminants in fish tissue that are of ecological and human health concern.

Under its existing NPDES permit, the City conducts the required semi-annual monitoring at six stations in four trawl zones during January and July and the required annual monitoring at two rig (hook and line) fishing stations during October. The stations are located at the depth of the outfall along the 98 meter contour. The bioaccumulation monitoring program has two components: (1) liver tissue is analyzed for trawl-caught fish and (2) muscle tissue is analyzed for hook and line-caught fish.

Fish collected in trawls are representative of the general demersal fish community and certain species are targeted for analysis based on their prevalence in the community. Chemical analysis of liver tissue in these fishes indicates which contaminants may be bioaccumulating through this community. For bioaccumulation analyses, the six trawl fishing stations are grouped into four trawl zones. Trawl zone 1 (TZ1) represents the nearfield and is defined as the area within a 1 kilometer radius of stations SD12 and

SD10; both stations are within 1.2 kilometers of the outfall. Trawl zone 2 (TZ2) represents the northern farfield and is defined as the area within a 1 kilometer radius of stations SD14 and SD13; both stations are approximately 8 kilometers north of the outfall. Trawl zone 3 (TZ3) represents the southern farfield and is defined as the area centered within a 1 kilometer radius of station SD8. Station SD8 is located within a couple of kilometers of EPA-designated dredge materials disposal site LA-5. Trawl zone 4 (TZ4) represents the southernmost farfield and is defined as the area centered within a 1 kilometer radius of station SD7. Station SD7 is located within one kilometer of non-active dredge materials disposal site LA-4. Both stations SD8 and SD7 are within approximately 9 kilometers of the outfall.

Fish species collected by rig fishing represent a typical sport fisher's catch and are considered of recreational and commercial importance. Fish muscle tissue is analyzed because it is the tissue most often consumed by humans and may have public health implications. There are two rig fishing locations. Station RF1 is located in the nearfield close to the northern end of the diffuser leg while station RF2 is located in the northern farfield.

The applicant reports all tissue sample values in terms of milligrams per kilogram wet weight (mg/kg ww), or microgram per kilogram wet weight (ug/kg ww).

Fish Liver

To evaluate bioaccumulation in the area of the outfall and identify trends, EPA examined toxics concentrations in the liver tissue of trawl-caught fish species that were sampled in October during the discharge period (1995-2013) (Figure A-24). Table B-7 shows the five flatfish species (bigmouth sole, Dover sole, English sole, hornyhead turbot, longfin sanddab, and Pacific sanddab) examined over this period by EPA. During this period, 18 single parameters were detected in at least 10 percent of the averaged replicate composite samples: aluminum (70 percent), antimony (10 percent), arsenic (82 percent), barium (100 percent), beryllium (15 percent), cadmium (86 percent), chromium (63 percent), copper (100 percent), hexachlorobenzene (55 percent), iron (100 percent), lead (17 percent), manganese (96 percent), mercury (88 percent), nickel (23 percent), selenium (100 percent), silver (36 percent), tin (37 percent), and zinc (100 percent). Total chlordane, total DDT, and total PCBs are also reviewed.

Arsenic. Figure A-25 summarizes the average concentration of arsenic in flatfish livers, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in arsenic concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of arsenic is 3.39 mg/kg ww at nearfield station TZ1, 6.18 mg/kg ww at northern farfield station TZ2, and 4.03 mg/kg ww and 3.85 mg/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Mercury. Figure A-26 summarizes the average concentration of mercury in flatfish livers, during October, from 1995 through 2006. The applicant began using a slightly less sensitive method detection limit (0.012 ug/l changed to 0.03 ug/l) in 2003. There is no spatial or temporal pattern in mercury concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of mercury is 0.083 mg/kg ww at nearfield station TZ1, 0.047 mg/kg ww at northern farfield station TZ2, and 0.068 mg/kg ww and 0.058 mg/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Selenium. Figure A-27 summarizes the average concentration of selenium in flatfish liver, during October, from 1995 through 2006. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in selenium concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of selenium is 1.36 mg/kg ww at nearfield station TZ1, 1.47 mg/kg ww at northern farfield station TZ2, and 1.09 mg/kg ww and 1.25 mg/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Hexachlorobenzene. Figure A-28 summarizes the average concentration of hexachlorobenzene in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in hexachlorobenzene concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of hexachlorobenzene is 3.25 ug/kg ww at nearfield station TZ1, 4.19 ug/kg ww at northern farfield station TZ2, and 5.09 ug/kg ww and 3.83 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Total Chlordane. Figure A-29 summarizes the average concentration of total chlordane in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in total chlordane concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of total chlordane is 14.10 ug/kg ww at nearfield station TZ1, 15.42 ug/kg ww at northern farfield station TZ2, and 18.27 ug/kg ww and 13.29 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively.

Total DDT. Figure A-30 summarizes the average concentration of total DDT in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in total DDT concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of total DDT is 424 ug/kg ww at nearfield station TZ1, 516 ug/kg ww at northern farfield station TZ2, and 611 ug/kg ww and 558 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively. During the period 1995 through 2006, total TTD concentrations in flatfish livers at all trawl zone stations appear to be decreasing over time.

Total PCBs. Figure A-31 summarizes the average concentration of total PCBs in flatfish livers, during October, from 1995 through 2006. There is no spatial or temporal pattern in total PCB concentrations in liver that suggests an outfall-related effect. During the most recent discharge period (2001-2006), the mean concentration of total PCBs is 263.9 ug/kg ww at nearfield station TZ1, 340.0 ug/kg ww at northern farfield station TZ2, and 742.2 ug/kg ww and 335.2 ug/kg ww at southern farfield stations TZ3 and TZ4, respectively.

EPA notes that on average, total PCB concentrations in sanddab livers are an order of magnitude higher than in other flatfish species analyzed by the applicant (Table F-26 in Volume IV, Appendix E, of the application). During the period 1995 through 2002, total PCB concentrations in flatfish livers at southern farfield station TZ3 (near the active dredge materials disposal site, LA-5) are noticeably higher than at other trawl zone stations during most years, but appear to be decreasing over time.

Because there are no noticeable effects of the outfall for these chemicals, the contributions of the discharge are minimal.

Fish Muscle

To evaluate bioaccumulation in the area of the outfall and identify trends, EPA examined toxics concentrations in the muscle tissue of rig-caught fish species that were sampled in October during the discharge period (1995-2013) (Figure A-24). Table B-8 shows the twelve fish species (rockfish and scorpionfish) examined over this period by EPA. Total arsenic, mercury, selenium, total chlordane, total DDT, and total PCBs are reviewed. To address public health concerns, pollutant concentrations for these detections were compared to available U.S. EPA recommended screening values for recreational fishers and California Office of Health Hazard Assessment fish contaminant goals for sport fish.

U.S. EPA has developed recommended target analyte screening values for recreational fishers (USEPA, 2000). These screening values are defined as concentrations of analytes in fish or shellfish tissue that are of potential public health concern and are used as threshold values against which levels of contamination in similar tissues collected from the ambient environment can be compared (Table 21). Exceedance of these screening values should be taken as an indication that more intensive site-specific monitoring and/or evaluation of human health risk should be conducted.

Table 21. Selected U.S. EPA recommended target analyte screening values for recreational fishers. Based on fish consumption rate of 17.5 grams per day, 70 kilograms body weight (all adults), and, for carcinogens, 10^{-5} risk level, and 70-year lifetime.

Target Analyte	Screening Values (mg/kg)	
	Noncarcinogens	Carcinogens (RL=10^{-5})
Arsenic (inorganic)	1.2	0.026
Mercury (methylmercury)	0.3[1]	---
Selenium	20	---
Total chlordane (sum of cis- and trans-chlordane, cis- and trans-nonachlor; and oxychlordane)	2.0	0.114
Total DDT (sum of 4,4'- and 2,4'- isomers of DDT, DDE, and DDD)	2.0	0.117
Total PCBs (sum of congeners or Aroclors)	0.08	0.02

[1] Based on EPA's tissue-based 304(a)(1) water quality criterion for human health (USEPA, 2001).

The California Office of Environmental Health Hazard Assessment (OEHHA) is the agency solely responsible for evaluating the potential public health risks of chemical contaminants in sport fish and issuing State advisories, when appropriate. EPA is unaware of any sport fish advisories in the area off Point Loma issued by OEHAA. OEHAA has developed both advisory tissue levels and fish contaminant goals for seven common contaminants in California sport fish (Klasing and Brodberg, 2008). Fish contaminant goals are estimates of contaminant levels in fish that pose no significant health risk to individuals consuming sport fish as a standard consumption rate of eight ounces per week (32 grams per day), prior to cooking, over a lifetime (Table 22). Unlike advisory tissue levels, these goals are based solely on public health considerations relating to exposure to each individual contaminant, without regard to economic considerations, technical feasibility, or the counterbalancing effects of fish consumption.

Table 22. Selected Fish Contaminant Goals for selected fish contaminants based on cancer and non-cancer risk using an 8 ounce per week (prior to cooking) consumption rate (32 grams per day).

Contaminant	Fish Contaminant Goal (ug/kg, wet weight)
Chlordane [$(mg/kg/day)^{-1}$]	5.6
DDTs [$(mg/kg/day)^{-1}$]	21
Methylmercury (mg/kg-day)	220
PCBs [$(mg/kg/day)^{-1}$]	3.6
Selenium (mg/kg-day)	7,400

Arsenic. Figure A-32 summarizes the average concentration of total arsenic in rockfish and scorpionfish muscle, during October, from 1995 through 2013. There is no spatial or temporal pattern in arsenic concentrations in muscle that suggests an outfall-related effect. The applicant began using a more sensitive method detection limit in 2003. During the most recent discharge period (2008-2013), the annual average concentration of total arsenic ranged from 0.545 to 2.17 mg/kg ww at nearfield station RF1 (total n=9) and 0.43 to 2.22 mg/kg ww at farfield station RF2 (total n=9). These total arsenic concentrations cannot be directly compared to the EPA screening values, since those screening values (1.2 and 0.026 mg/kg) are for inorganic arsenic tissue concentrations. Studies have shown inorganic arsenic is approximately 10% of total arsenic in finfish muscle (Schoof, et. al, 1999). There is no OEHHA fish contaminant goal for arsenic.

Mearns et al. (1991) reported that in the Southern California Bight, arsenic occurs in the edible tissues of fish, squid, lobster, and crab and the liver of some fish in concentrations ranging from about 0.1 to over 50 mg/kg ww and tissue concentrations were the same or higher in remote areas compared to urban areas. The authors concluded that the source of arsenic to these organisms is probably "natural", due to hydrothermal springs, and further research was necessary to assess health risks to humans that consume seafood at such levels.

From 2002 through 2006, arsenic concentrations in the Point Loma WTP effluent generally range between 0.4 and 2.7 ug/l; these concentrations will meet EPA's 304(a)(1) water quality criterion for human health, 0.14 ug/l, at the boundary of the zone of initial dilution. Because there is no noticeable effect of the outfall, the contribution of the discharge is minimal.

Mercury. Because analysis of total mercury is less expensive than that for methylmercury, total mercury is analyzed and assumed to be 100 percent methylmercury for the purpose of risk assessment. Figure A-33 summarizes the average concentration of mercury in rockfish and scorpionfish muscle, during October, from 1995 through 2013. The applicant began using a slightly less sensitive method detection limit (0.012 ug/l changed to 0.03 ug/l) in 2003.There is no spatial or temporal pattern in mercury concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2008-2013), the annual average concentration of mercury ranged from 0.038 to 0.339 mg/kg ww at nearfield station RF1 (total n=9) and 0.006 to 0.223 mg/kg ww at farfield station RF2 (total n=9). In some years, average concentrations are above the EPA screening value of 0.3 mg/kg and the OEHHA fish contaminant goal of 0.220 mg/kg ww for methylmercury. Average concentrations are sometimes above OEHHA advisory tissue levels based on non-cancer risk using an 8 ounce serving size (prior to cooking) once or more per week (Klasing and Brodberg, 2008).

Mearns et al. (1991) has identified mercury as a contaminant of concern in the Southern California Bight, but concludes that since the highest levels of mercury are seen in fish from areas located far from known sources, it does not appear that mercury from coastal waste discharges is responsible for the concentrations observed in fish.

In 2009, the applicant switched to more sensitive analytical methods for detecting mercury in effluent, this resulted in lower detection levels (ML = 9 ng/L in 2009; ML = 0.05 ng/L in 2011 – 2013). The mercury concentrations range from 2- 14 ng/L and these effluent results are low enough to evaluate the applicant's ability to achieve compliance, following initial dilution, with California Ocean Plan Table B water quality objectives for mercury. Because there is no noticeable effect of the outfall, the contribution of the discharge is minimal.

Selenium. Figure A-34 summarizes the average concentration of selenium in rockfish and scorpionfish muscle, during October, from 1995 through 2013. The applicant began using a more sensitive method detection limit in 2003. There is no spatial or temporal pattern in selenium concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2008-2013), the annual average concentration of selenium ranged from 0.28 to 0.69 mg/kg ww at nearfield station RF1 (total n=9) and 0.23 to 0.43 mg/kg ww at farfield station RF2 (total n=9). Annual average concentrations are below the EPA screening value of 20 mg/kg and the OEHHA fish contaminant goal of 7.4 mg/kg ww.

Total Chlordane. Figure A-35 summarizes the average concentration of total chlordane in rockfish and scorpionfish muscle, during October, from 1995 through 2006. There is no spatial or temporal pattern in total chlordane concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2008-2013), the annual average concentration of total chlordane ranged from 0.00 to 0.56 ug/kg ww at nearfield station RF1 (total n=18) and all non-detect ww at farfield station RF2 (total n=16). These concentrations are below the EPA screening values of 2,000 and 114 ug/kg ww and the OEHHA fish contaminant goal of 5.6 ug/kg ww.

Total DDT. Figure A-36 summarizes the average concentration of total DDT in rockfish and scorpionfish muscle, during October, from 1995 through 2013. There is no spatial or temporal pattern in total DDT concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2008-2013), the annual average concentration of total DDT ranged from 2.13 to 33.1 ug/kg ww at nearfield station RF1 (total n=9) and 3.87 to 17 ug/kg ww at farfield station RF2 (total n=9). These concentrations are below the EPA screening values of 2,000 and 117 ug/kg ww, are rarely above the OEHHA fish contaminant goal of 21 ug/kg ww. These values are below all OEHHA advisory tissue levels based on non-cancer risk using an 8 ounce serving size (prior to cooking) once or more per week (Klasing and Brodberg, 2008).

From 2009-2013, total DDT concentrations in the Point Loma WTP effluent generally are reported as "not detected" (228 of 228 samples), although the metabolite homologue, p,p'-DDD, was reported as 0.020 ug/l in one sample. The method detection limits for the homologues of DDT and its metabolites range from 0.020 to 0.1 ug/l. EPA's recommended minimum quantitation levels for the homologues of DDT and its metabolites are 0.1 ug/l using EPA method 608; Appendix II of the California Ocean Plan requires dischargers to achieve more stringent minimum levels.

Because there is no noticeable effect of the outfall, the contribution of the discharge is minimal.

Total PCBs. Figure A-37 summarizes the average concentration of total PCBs in rockfish and scorpionfish muscle, during October, from 1995 through 2013. There is no spatial or temporal pattern in total PCB concentrations in muscle that suggests an outfall-related effect. During the most recent discharge period (2008-2013), the annual average concentration of total PCBs ranged from 0.7 to 18.4 ug/kg ww at nearfield station RF1 (total n=18) and 0.8 to 7.5 ug/kg ww at farfield station RF2 (total n=16). These concentrations are generally below the EPA screening values of 80 and 20 ug/kg ww, and rarely above the OEHHA fish contaminant goal of 3.6 ug/kg ww. These values are usually below OEHHA advisory tissue levels based on non-cancer risk using an 8 ounce serving size (prior to cooking) once or more per week (Klasing and Brodberg, 2008).

From 2009-2013, total PCB concentrations in the Point Loma WTP effluent are reported as "not detected" (228 of 228 samples) where the method detection limit ranges from 2 to 4 ug/l, based on the measured Arochlor. EPA concludes that these method detection limits need to be lowered in order to achieve 40 CFR 136 levels and to further quantify actual mass emissions of PCBs from the PLOO to the region. However, neither the applicant's nor EPA's method detection limits are low enough to evaluate the applicant's ability to achieve compliance, following initial dilution, with California Ocean Plan Table B water quality objectives for total PCBs.

Because there is no noticeable effect of the outfall, the contribution of the discharge is minimal.

Based on this review of fish liver and muscle tissues, EPA finds that the improved modified discharge will comply with California Ocean Plan water quality objectives for biological characteristics of ocean waters. EPA concludes that the improved modified discharge will allow for the attainment or maintenance of water quality which allows for recreational activities (fishing) beyond the zone of initial dilution.

b. Water Contact Recreation

Under 40 CFR 125.62(d), the applicant's modified discharge must allow for the attainment or maintenance of water quality which allows for recreational activities beyond the zone of initial dilution. The requirement to protect recreational activities applies beyond the zone of initial dilution, in both federal and State waters. This section of the TDD discusses the EPA-approved water quality standards that apply in State waters and the recreational activities and 304(a)(1) water quality criteria that apply in federal waters beyond the zone of initial dilution. The applicant's monitoring and laboratory data are reviewed to assess whether the improved modified discharge will protect recreational activities.

State Waters

Within State waters off Point Loma, most water contact recreational activities are centered around the Point Loma kelp beds and in nearshore waters. The shoreline along the southern portion of Point Loma is predominantly on a military reservation (Fort

Rosecrans) and the extreme southern portion of the peninsula is within the Cabrillo National Monument. Shoreline access in these areas is limited to designated tidepool areas within the boundaries of the national monument.

The State Water Resources Control Board (State Water Board) has established bacteriological standards in ocean waters of the State used for water contact recreation. Ocean waters are the territorial marine waters of the State as defined by California law. The outer limit of territorial seas generally extends offshore to 3 nautical miles. “Water Contact Recreation” or “REC-1” is a beneficial use of the State and is defined to include uses of water for recreational activities involving body contact with water where ingestion of water is reasonably possible; these uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, and use of natural hot springs. “REC-1” is designated as an existing beneficial use of coastal waters named the Pacific Ocean, in the California Ocean Plan and Regional Water Quality Control Plan for the San Diego Region (San Diego RWQCB, 1994).

CWA sections 303(i) and 502(21), together require the adoption of water quality criteria for all coastal waters designated by States for use for swimming, bathing, surfing, or similar water contact activities, even if, as a factual matter, the waters designated for swimming are not frequently or typically used for swimming (69 Fed. Reg. 67219-20, 67222, November 16, 2004). Consistent with this requirement, on November 16, 2004, EPA promulgated recreational water quality criteria for coastal waters in cases where States had failed to do so; these criteria apply where States have designated coastal waters for water contact recreation, but do not have in place EPA-approved bacteria criteria that are as protective as EPA’s 1986 recommended 304(a)(1) criteria for bacteria (69 Fed. Reg. 67218, November 16, 2004). This promulgation applies the criteria at 40 CFR 131.41(c)(2) to waters designated marine coastal recreational waters in California, excluding the Los Angeles Regional Water Quality Control Board (69 Fed. Reg. 67243, November 16, 2004). In 2005, the State Water Board adopted revised bacteria criteria for ocean waters of the State. Effective February 14, 2006, the revised California Ocean Plan specifies that within the zone bounded by the shoreline and 1,000 feet from the shoreline or the 30-foot depth contour (whichever is further) and in areas outside this zone used for water contact sports as determined by the Regional Water Board (i.e., waters designated as REC-1), including kelp beds, the bacterial objectives in Table 23 shall be maintained throughout the water column. The State has excluded the initial dilution zone for wastewater outfalls.

Table 23. Bacterial water quality objectives in the California Ocean Plan for State waters designated REC-1.

Indicator	30-day Geometric Mean (per 100 ml)	Single Sample Maximum (per 100 ml)
Total coliform	1,000	10,000
Fecal coliform	200	400
Total coliform when fecal coliform:total coliform ratio > 0.1		1,000
Enterococcus	35	104

Federal Waters

EPA has developed 304(a)(1) ambient water quality criteria for bacteria which are recommended to protect people from gastrointestinal illness for primary contact recreation, or similar full body contact activities, in marine recreational waters (*Ambient Water Quality Criteria for Bacteria—1986*, EPA 440/5-84-002, 1986), but EPA has not directly promulgated water quality standards for marine recreational activities in federal waters located offshore beyond 3 nautical miles. For these waters, the water use is defined by the CWA section 101(a)(2) interim goal to provide water quality for recreation in and on the water, wherever attainable. EPA describes the "primary contact recreation" use as protective when the potential for ingestion of, or immersion in, water is likely. Activities usually include swimming, water-skiing, skin-diving, surfing, and other activities likely to result in immersion (*Water Quality Standards Handbook*, EPA-823-B-94-005a, 1994). Therefore, EPA has reviewed the actual uses of federal waters surrounding the Point Loma Ocean Outfall to determine where such activities occur. Where such uses occur, they are protected by EPA's water quality criteria for bacteria in Table 24.

Table 24. 304(a)(1) ambient water quality criteria for bacteria in federal waters where primary contact recreation occurs.

Indicator	30-day Geometric Mean (per 100 ml)	Single Sample Maximum (per 100 ml)
Enterococci	35	104 for designated bathing beach
		158 for moderate use
		276 for light use
		501 for infrequent use

Volume VII, Appendix I, of the application describes water contact recreational activities occurring in ocean waters off Point Loma and at shoreline, kelp bed, and offshore water quality monitoring stations. Appendix I.2shows where water contact recreation takes place off Point Loma, based on the City's recreational use assessment and record of visual observations during monitoring events. In the vicinity of the Point Loma discharge, the applicant has documented no federally-defined primary contact recreational activities occurring in waters beyond 3 nautical miles; therefore, EPA has determined that federal waters beyond the zone of initial dilution are not currently required to achieve the 304(a)(1) water quality criteria for bacteria. However, within 3 nautical miles of the shoreline, the applicant's improved modified discharge must achieve California Ocean Plan bacteriological standards for water contact recreation throughout the water column.

Data Assessment

Under its existing NPDES permit, the City conducts the required monitoring for bacteria indicators (enterococcus, fecal coliforms, and total coliforms) at 52 stations shown in Figure A-3. Quarterly monitoring is conducted at a grid of 33 offshore stations located along the 98, 80, and 60 meter contours (at depths of 1, 25, 60, 80 and 98 meters below the surface); and at 3 offshore stations located along the 18 meter contour (at depths of 1, 12 and 18 meters). Five times per month, monitoring is conducted at 5 kelp bed stations located along the 18 meter contour (at depths of 1, 12 and 18 meters) and at 3 kelp bed stations located along the 9 meter (30 foot) contour (at depths of 1, 3 and 9 meters). Weekly monitoring is conducted at 8 shoreline stations. EPA evaluated only the enterococcus monitoring results, since enterococcus is the most sensitive bacteria indicator of three species mentioned above. That is, some enterococcus exceedances occurred when other coliform results did not exceed criteria and enterococcus exceedances co-occurred with fecal or total coliform exceedances. EPA evaluated results from January 2008 through December 2015 for shoreline, kelp bed stations, and offshore stations.

The water depth at the outer edge of the kelp bed lying inshore from the Point Loma outfall is about 16 to 17 meters and the water depth at the outer edge of the San Diego bight (along an extension of the Point Loma coastline) is about 40 to 45 meters. Based on dilution modeling for the wastewater plume using time series data, the height-of-rise to the average level of minimum dilution varies from about 20 to 31 meters above the bottom, corresponding to water depths of 62 to 74 meters. The height-of-rise to the average top of the wastefield varies from about 30 to 40 meters above the bottom, corresponding to water depths of about 54 to 64 meters. The maximum height-of-rise to the top of the wastefield during a month varies from about 50 to 64 meters above the bottom, corresponding to depths of about 30 to 44 meters. Figure O-16 in Volume VIII, Appendix O, of the application.

As shown in Table B-9, single sample maximum bacterial objectives at shoreline stations exhibit low exceedance rates (2 percent). As shown in Tables B-10, geometric mean bacterial objectives at shoreline stations exhibit low exceedance rates (less than 1 percent). The applicant attributes these exceedances to surface runoff rather than the outfall plume. EPA agrees with this conclusion because of the lack of elevated concentrations at stations in the kelp bed and because modeling and monitoring results indicate that the outfall plume remains submerged in the offshore zone.

As shown in Tables B-11 through B-14, single sample maximum enterococcus objectives at kelp bed stations exhibit very low exceedance rates at all depths (less than 1 percent).

As shown in Tables B-15 through B-17, geometric mean bacterial objectives at kelp bed stations exhibit low exceedance rates at all depths (less than 1 percent). Exceedances are more likely observed at or within 3 meters of the surface rather than at the bottom, or at outer kelp bed station mid-depths. The applicant attributes most of these exceedances to storm events, rather than the outfall plume. EPA agrees with this conclusion because modeling and monitoring results indicate that the outfall plume remains submerged in the offshore zone, generally at water depths greater than 20 meters.

The 4.5 mile long PLOO discharges beyond the 3 nautical mile outer limit of the territorial seas. In Volume VII, Appendix I, of the application, Table I.2-14 summarizes bacteriological data from offshore stations within State waters that are not located in the Point Loma kelp bed. As summarized by the applicant, these offshore stations (at all water depths) achieved compliance with recreational water contact standards from 96 to 99 percent of the time, with exceedances typically limited to samples collected from water depths below 40 meters.

EPA also evaluated the raw data for bacteria indicators submitted with the application. As shown in Tables B-18 through B-21, single sample maximum enterococcus objectives at offshore stations within State waters exhibit a low summary exceedance rate (less than 2 percent). At the subset of offshore stations in State waters located along the 80 and 60 meter contours, exceedances are limited to water depths below 25 meters. As shown in Tables B-22 through B-24, geometric mean enterococcus objectives at offshore stations within State waters exhibit a summary exceedance rate of less than 3 percent. At the subset of offshore stations in State waters located along the 80 and 60 meter contours, exceedances are limited to water depths below 25 meters

The 2015 application is based on an improved discharge and continued effluent disinfection to achieve these California Ocean Plan standards in State waters prior to permit reissuance. On November 13, 2007, the City submitted a request to the Regional Water Board to initiate operation of prototype effluent disinfection facilities to achieve compliance with bacteriological water quality standards in State waters. On August 13, 2008, the Regional Water Board approved modifications associated with operation of the City's proposed prototype effluent disinfection facilities at Point Loma WTP. The City began adding sodium hypochlorite to the effluent discharge on September 3, 2008.

Based on this review, EPA finds that the improved modified discharge, as defined at 40 CFR 125.58(i) will meet bacterial water quality standards in State waters. EPA also finds that federal waters are not required to achieve the 304(a)(1) water quality criteria for bacteria because federally-defined primary contact recreational activities are not occurring in waters beyond 3 nautical miles. The reissued permit will require the City to record and report any primary contact recreational activities observed in federal waters, during offshore water quality monitoring surveys. The Regional Water Board and EPA conduct routine reviews of the City's discharge monitoring reports to assess compliance with the existing permit and water quality standards. EPA concludes that the improved modified discharge will allow for the attainment or maintenance of water quality which allows for recreational activities beyond the zone of initial dilution, including, without limitation, swimming, diving, picnicking, and sports activities along shorelines and beaches.

5. Additional Requirements for Improved Discharge

Under 40 CFR 125.62(e), an application for a 301(h)-modified permit on the basis of an improved discharge must include a demonstration that such improvements have been thoroughly planned and studied and can be completed or implemented expeditiously; detailed analyses projecting changes in average flow rates and composition of the discharge which are expected to result from proposed improvements; an assessment of the current discharge required by 40 CFR 125.62(a) through (d); and a detailed analysis of how the planned improvements will comply with 40 CFR 125.62(a) through (d).

Under Part A.11 of EPA Form 3510-A2, Description of Treatment, the applicant states that effluent disinfection is being implemented and will continue to be operational during the renewal timeframe of the NPDES permit. The applicant also states that dechlorination is not necessary, as chlorine residual is consumed during outfall transport. Under Part B.5 of EPA Form 3510-A2, the applicant explains that chlorination is being implemented to ensure compliance with California Ocean Plan recreational body-contact standards throughout the water column in State-regulated waters.

Volume IV (Appendix B) of the application describe the City's proposal for an improved discharge. The City is proposing to upgrade grit removal facilities, improve pump station 2 surge control protection, continue with phased implementation of chemical addition systems, and continue to disinfect via sodium hypochlorite addition. The City initiated disinfection in August 2008 and has demonstrated that dosage rates were effective at achieving a 2.1 log reduction of bacterial indicator and that levels of chlorination byproducts and whole effluent toxicity meet California Ocean Plan requirements.

Based on preliminary information provided in the updated application, EPA concludes that the applicable requirements under 40 CFR 125.62(e) have been met.

D. Establishment of a Monitoring Program

Under 40 CFR 125.63 which implements CWA section 301(h)(3), the applicant must have a monitoring program that is designed to provide data to evaluate the impact of the modified discharge on the marine biota; demonstrate compliance with applicable water quality standards or criteria, as applicable; measure toxic substances in the discharge; and have the capability to implement these programs upon issuance of the 301(h)-modified permit. The frequency and extent of the monitoring program are to be determined by taking into consideration the applicant's rate of discharge, quantities of toxic pollutants discharged, and potentially significant impacts on receiving water, marine biota, and designated water uses.

The applicant has a well-established monitoring program. The existing monitoring program was developed jointly by the Regional Water Board, EPA, and the applicant. The program is described in Volume VII, Appendix L, of the application. The City has consistently implemented the agreed upon program.

The applicant has proposed to add sediment toxicity monitoring to its existing program. EPA and the Regional Water Board will review the applicant's existing monitoring program and revise it, as appropriate. These revisions will be included in the 301(h)-modified permit, as conditions for monitoring the impact of the discharge. EPA finds that the applicant has proposed a monitoring program which meets CWA section 301(h) requirements and has the resources to implement the program.

E. Impact of Modified Discharge on Other Point and Non-Point Sources

Under 40 CFR 125.64 which implements CWA section 301(h)(4), the applicant's proposed modified discharge must not result in the imposition of additional treatment requirements on any other point or non-point sources. For previous applications, the Regional Water Board has determined that the Point Loma discharge will not have an effect on any other point or non-point source discharges. There are a number of point and non-point source discharges within the San Diego Region; however, the PLOO is the only deep water discharge in the San Diego Region. All other San Diego Region discharges are to depths of 36 meters or less. The nearest discharge to the PLOO is the South Bay Ocean Outfall located approximately 18 kilometers southwest of the PLOO at a depth of 28 meters. For the 2015 application, the City has submitted a letter to Regional Water Board requesting the required determination. The granting of the 301(h) variance by EPA's Regional Administrator is contingent upon a determination by the Regional Water Board that the proposed discharge will not result in any additional treatment requirements on any other point or nonpoint sources.

F. Toxics Control Program

In accordance with 40 CFR 125.66, the applicant must design a toxics control program to identify and ensure control of toxic pollutants and pesticides discharged in the effluent. The applicant's Industrial Wastewater Control Program (for industrial toxics control) and the Household Hazardous Waste Program (for nonindustrial toxics control) are described, below.

1. Chemical Analysis

Under 40 CFR 125.66(a)(1), the applicant is required to submit chemical analyses of its current discharge for all toxic pollutants and pesticides defined in 40 CFR 125.58(aa) and (p). The analyses must be performed on two 24-hour composite samples (one dry weather and one wet weather). The City conducts influent and effluent monitoring following sampling schedules specified in the existing permit. Effluent samples are collected and analyzed on a weekly basis for metals, cyanide, ammonia, chlorinated pesticides, phenolic compounds, and PCBs. Analyses for organophosphate pesticides, dioxin, purgeable (volatile) compounds, acrolein and acrylonitrile, base/neutral compounds, and butyl tins are performed on a monthly basis. Influent and effluent monitoring data have been previously reported in monthly, quarterly, and annual reports to the Regional Water Board and EPA. The City submitted Point Loma WTP effluent data from 2008 through 2013 in electronic format, as part of the application. Based on influent and effluent data from 2013, the applicant indicates that there are no significant differences or evident trends in effluent quality between wet weather and dry weather conditions. These data are summarized by the City in Volume III, Large Applicant Questionnaire. Table 25 lists the commonly detected toxic inorganic and organic constituents in the Point Loma WTP effluent during 2013.

Table 25. Commonly detected toxic inorganic and organic constituents in the Point Loma WTP effluent during 2013.

Inorganic Toxic Constituent	Organic Toxic Constituent
Antimony	1,4-dichlorobenzene
Arsenic	2-butanone
Barium	Acetone
Beryllium	Bromodichloromethane (Dichlorobromomethane)
Cadmium	Chloroform (trichloromethane)
Chromium	Dibromochloromethane (chlorodibromomethane)
Cobalt	Diethyl phthalate
Copper	Ethylbenzene
Lead	Malathion
Lithium	Methyl tertiary butyl ether (MTBE)
Mercury	Methylene chloride
Molybdenum	Phenol
Nickel	Toluene
Selenium	
Silver	
Thallium	
Vanadium	
Zinc	
Cyanide	

Based on this information, EPA concludes that the applicant has met the requirement at 40 CFR 125.66(a)(2).

2. Toxic Pollutant Source Identification

Under 40 CFR 125.66(b), the applicant must submit an analysis of the known or suspected sources of toxic pollutants and pesticides identified in 40 CFR 125.66(a) and, to the extent practicable, categorize the sources according to industrial and nonindustrial types. As part of the City's industrial source control program, industries that may potentially discharge toxic organic or inorganic constituents into the Metro System are surveyed, discharge permits are issued, and industrial discharges are monitored. The applicant also performs an annual system-wide nonindustrial toxics survey program to further identify sources of toxic constituents within the Metro System. A summary of identified or suspected sources, sorted by categorical industries or non-categorical industrial/commercial facilities, for effluent pollutants of concern are listed in Volume III of the application.

Based on this information, EPA concludes that the applicant has met the requirement at 40 CFR 125.66(b).

3. Industrial Pretreatment Requirements

Under 40 CFR 125.66(c), an applicant that has known or suspected industrial sources of toxic pollutants must have an approved pretreatment program, in accordance with 40 CFR 403. EPA approved the City's industrial pretreatment program, called the Industrial Wastewater Control Program, on June 29, 1982. The City's pretreatment program is summarized in Volume IX, Appendix N, of the application. Of the approximately 170 to 180 mgd of wastewater treated, the estimated contribution from Metro System industrial users is 3.4 percent. The program's active permit inventory includes: 41 categorical industrial users subject to federal categorical pretreatment standards and 34 additional significant industrial users subject to federal reporting requirements and local limits (i.e., 74 significant industrial users); 37 facilities with federally regulated processes where zero discharge is confirmed annually; and 1,320 non-categorical industrial users subject to applicable best management practices. The effectiveness of the Industrial Wastewater Control Program in reducing influent pollutant loadings is summarized in Appendix N. Local limits are reviewed annually and Attachment N1 contains the applicant's 2014 local limits update for Point Loma WTP. This review notes that the City's current local limits methodology facilitates a proactive planning approach to controlling pollutants which may become a problem in the future for the Point Loma WTP headworks and permit.

Based on this information, EPA concludes that the applicant has met the requirement at 40 CFR 125.66(c).

4. Nonindustrial Source Control Program

Under 40 CFR 125.66(d), implementing CWA section 301(h)(7), the applicant must submit a proposed public education program and implementation schedule designed to minimize the entrance of nonindustrial toxic pollutants and pesticides into its POTW; and develop and implement additional nonindustrial source control programs, at the earliest possible schedule. These programs and schedules are subject to revision by the Regional Administrator during permit review and reissuance and throughout the term of the permit.

The applicant proposes to continue implementing and improving its nonindustrial source control program that has been in effect since 1982. The aim of this program is to reduce the introduction of nonindustrial toxic pollutants into the sewer system. Key elements of this program include: a Household Hazardous Waste Program; a public education program; development and implementation of Discharger permits and/or Best Management Practice Discharge Authorization requirements for select commercial sectors; and ongoing surveys to identify contaminant sources. Detailed descriptions of these program elements are presented in Volume VII, Appendices N3, of the application.

Based on this information, EPA concludes that the applicant has met the requirement at 40 CFR 125.66(d).

G. Urban Area Pretreatment Program

Under 40 CFR 125.65, implementing CWA section 301(h)(6), applicants serving a population of 50,000 or more and having one or more toxic pollutants introduced into the POTW by one or more industrial dischargers must comply with urban area pretreatment program requirements. A POTW subject to these requirements must demonstrate it either has in effect a program that achieves secondary equivalency, as described at 40 CFR 125.65(d), or that industrial sources introducing waste into the treatment works are in compliance with all applicable pretreatment requirements, including numerical standards set by local limits, and that it will enforce these requirements. The applicant is subject to this regulation.

In the 1995 application, the City indicated it would comply with urban area pretreatment program requirements by demonstrating that it has applicable pretreatment requirements in effect. The City submitted its Urban Area Pretreatment Program to EPA in 1996; the program was approved by the Regional Water Board on August 13, 1997 and by EPA on December 1, 1998.

As explained the preamble to the revised CWA section 301(h) regulations (59 Fed. Reg. 40642, August 9, 1994):

> "EPA intends to determine a POTW's continuing eligibility for a 301(h) waiver under section 301(h)(6) by measuring industrial user compliance and POTW enforcement activities against existing criteria in the Agency's National Pretreatment Program. … In 1989, EPA established criteria for determining POTW compliance with pretreatment implementation obligations. One element of these criteria is the level of significant noncompliance of the POTW's industrial users. The General Pretreatment Regulations (part 403) identify the circumstances when industrial user noncompliance is significant. The industrial user significant noncompliance (SNC) criteria are set out in 40 CFR 403.8(f)(2)(vii) and address both effluent and reporting violations.

> For pretreatment purposes, a POTW's enforcement program is considered adequate if no more than 15 percent of its industrial users meet the SNC criteria in a single year. … In addition, a POTW is also considered in SNC if it fails to take formal appropriate and timely enforcement action against any industrial user, the wastewater from which passes through the POTW or interferes with the POTW operations.
>
> In enforcing the pretreatment programs, POTWs are expected to respond to respond to industrial user noncompliance using local enforcement authorities in accordance with an approved enforcement response plan (ERP) which is required of all approved pretreatment programs (see 40 CFR 403.5). POTWs including 301(h) POTWs, with greater than 15 percent of their users in SNC, or which fail to enforce appropriately against any single industrial user causing pass through or interference, are deemed to be failing to enforce their pretreatment program. …
>
> … EPA believes that the combination of industrial user compliance and POTW enforcement provides an appropriate measure of the POTW's eligibility for the 301(h) waiver under section 301(h)(6)."

The "1989 criteria" discussed in the preamble are found in a September 27, 1989 memorandum, from James R. Elder to EPA Regional Water Division Directors, entitled "FY 1990 Guidance for Reporting and Evaluating POTW Noncompliance with Pretreatment Implementation Requirements" (Elder, 27 September 1989 memorandum).

Although the 1994 preamble for the urban area pretreatment program refers to "industrial users" when discussing the 15 percent noncompliance criteria, the "1989 criteria" only apply to "significant industrial users". This term is defined at 40 CFR 403.3(t) and includes all industrial users subject to categorical standards and other industrial users designated by the POTW. Also, the Agency has issued clarifying guidance explaining that the significant noncompliance criteria at 40 CFR 403(f)(2)(vii) apply to only significant industrial users, rather than all industrial users. Consequently, in the context of the urban area pretreatment program, EPA views the 15 percent noncompliance criteria to include only significant industrial users in significant noncompliance which have not received at least one formal enforcement action from the POTW. EPA believes that the combination of industrial user compliance and POTW enforcement provides an appropriate measure of a POTW's eligibility for a variance under CWA section 301(h)(6).

The City's Enforcement Response Plan is described in Volume IX, Appendix N Section N.3, of the application. The second level of formal enforcement is an Administrative Notice and Order which may be issued when an industrial user: fails to take any significant action to establish compliance within 30 days of receiving a Notice of Violation; fails to establish full compliance, beginning on the 91st day after receiving a Notice of Violation; is in significant noncompliance status; or violates a Compliance Findings of Violation and Order.

EPA recognizes that a specific enforcement response to a violation must be decided on a case-by-case basis; however, for most cases, EPA believes that an administrative notice and order, as described in the City's Enforcement Response Plan, are appropriate when significant industrial users are in significant noncompliance.

The local limits approved by EPA as part of the City's urban area pretreatment program were included in all industrial discharge permits by December 1997. As a consequence of any new local limits, some significant industrial users may need time to come into compliance. In such cases, EPA expects the City to issue a Compliance Findings of Violation and Order which is the first level of formal enforcement in the City's Enforcement Response Plan. The order shall contain a schedule for achieving compliance with the new local limits. Significant industrial users receiving such orders will not be included in the 15 percent noncompliance criteria.

Table 26 provides summary statistics regarding the applicant's compliance rates with respect to significant industrial users and how the applicant had applied the definition of significant noncompliance to significant industrial users failing to achieve compliance with all applicable regulations. The summary statistics in Table 28 indicate the applicant is meeting the 15 percent noncompliance criteria.

Table 26. Summary of significant industrial users (SIUs) in significant noncompliance (SNC) percentage status.

Parameter	2008	2009	2010	2011	2012	2013
Number of SIU Permitted Outfalls	116	113	125	122	122	118
Number of Outfalls in Consistent Compliance	83	85	112	104	104	99
Number of Outfalls in Inconsistent Compliance	21	18	9	10	15	11
Number of Outfalls in SNC	12	10	4	8	3	8
Percentage (%) of Total Number of SIUs in SNC	10.3% (12/116)	8.8%	3.2%	6.6%	2.5%	6.8%

Federal pretreatment regulations at 40 CFR 403.8(f)(5) require the City to develop and implement an enforcement response plan. This plan must contain procedures indicating how the City will investigate and respond to instances of industrial user noncompliance. The City has an enforcement response plan and is applying that plan as required by federal regulations. The City is taking enforcement actions as necessary and the rate of significant noncompliance among significant industrial users is less than the 15 percent criterion.

EPA finds that the applicant's urban area pretreatment program is acceptable, in the context of applicable 301(h) requirements. The 301(h)-modified permit will require an annual rate of significant noncompliance for significant industrial users that is no more than 15 percent of the total number of the applicant's significant industrial users. In addition, the applicant reported no instances of interference or pass-through. Consequently, enforcement against industrial users regarding those problems was not necessary.

Based on this information, EPA concludes that the applicant has met the requirement at 40 CFR 125.65.

H. Increase in Effluent Volume or Amount of Pollutants Discharged

Under 40 CFR 125.67, which implements CWA section 301(h)(8), no modified discharge may result in any new or substantially increased discharges of the pollutant to which the modification applies above the discharge specified in the 301(h)-modified permit. In addition, the applicant must provide projections of effluent volume and mass loadings for any pollutants to which the modification applies, in five year increments, for the design life of the facility.
CWA section 301(j)(5) requires the City to remove not less than 58 percent of the biochemical oxygen demand (on an annual average) and not less than 80 percent of total suspended solids (on a monthly average). The City must also implement a wastewater reclamation program that, at minimum, will result in a reduction in the quantity of suspended solids discharged into the marine environment during the period of the modification. The projected end-of-permit (2022) annual average effluent flow is 157 mgd. The draft NPDES permit proposes the following effluent limits for total suspended solids and biochemical oxygen demand (Table 27).

Table 27. Effluent limits based on CWA sections 301(h) and (j)(5).

Effluent Constituent	Units	Annual Average	Monthly Average
TSS	% removal[1]	---	$\geq$80
	mg/l	---	60[4]
	Metric tons/year	12,000[2]	---
		11,999[3]	---
BOD5	% removal[1]	$\geq$58	---

[1] To be calculated on a system-wide basis, as provided in section VII.G of this Order/Permit, which is consistent with Addendum No. 1 to Order No. R9-2009-0001.
[2] To be achieved on permit effective date through end of fourth year; e.g., September 30, 2020. Mass emission limits for TSS apply only to discharges from POTWs owned and operated by the Discharger and the Discharger's wastewater generated in the San Diego Metropolitan Sewerage System (Metro System) service area, excluding TSS contributions from Metro System flows treated in the City of Escondido and South Bay WRP flows discharged to the South Bay Ocean Outfall. If the Discharger is requested to accept wastewater originating in Tijuana, Mexico, treated or untreated, such acceptance would be contingent upon

an agreement acceptable to the USEPA, RWQCB and Discharger. The TSS contribution from that flow would not be counted toward any mass emission limit(s).
[3] To be achieved on beginning of fifth year of permit; e.g., October 1, 2020. Mass emission limits for TSS apply only to discharges from POTW owned and operated by the Discharger and the Discharger's wastewater generated in the San Diego Metropolitan Sewerage System (Metro System) service area, excluding TSS contributions from Metro System flows treated in the City of Escondido and South Bay WRP flows discharged to the South Bay Ocean Outfall. If the Discharger is requested to accept wastewater originating in Tijuana, Mexico, treated or untreated, such acceptance would be contingent upon an agreement acceptable to the USEPA, RWQCB and Discharger. The TSS contribution from that flow would not be counted toward any mass emission limit(s).
[4] Based on average monthly performance data (2008 through 2015) for the Point Loma WTP provided by the Discharger in supplemental information (2016).

According to the applicant, the design life of Metro System treatment facilities varies among the treatment components. Onsite mechanical equipment may have a design life of 20 years, while concrete structures may last for 50 years or more. In responding to 40 CFR 125.67, the applicant uses a design life of 20 years to project flow and mass loads. Table II.A-21 in Volume III of the application provides projections for Metro System flow and mass loads for total suspended solids and biochemical oxygen demand, in one year increments, through 2027. This table also provides flow and total suspended solids load projections for the PLOO discharge. Table 28 summarizes these projections for the term of the proposed permit (2017-2022).

Table 28. Point Loma Ocean Outfall flows (mgd) and total suspended solids loadings (MT/yr) projections for long-term facilities planning during the term of the proposed permit and proposed total suspended solids mass emission effluent limits.

Year	Projected Annual Average Flow	Projected TSS Mass Emissions	Proposed TSS Mass Emission Effluent Limits
2009	193	11,500	15,000
2010	194	11,800	15,000
2011	195	11,700	15,000
2012	197	11,800	15,000
2013	199	11,900	15,000
2014	202	12,100	13,598
2015	132	5466	13,598
2016	158	9424	13,598
2017	158	9445	12,000
2018	158	9467	12,000
2019	157	9488	12,000
2020	157	9509	12,000
2021	157	9530	11,999
2022	157	9552	11,999

The applicant's projections in Table 28 and proposed effluent limits in Table 27 satisfy the applicable requirements. Based on Table 30, EPA believes that a total suspended solids mass emission rate of 12,000 metric tons per year for first four years and 11,999 metric tons per fifth year would be achievable during the five years of the proposed

301(h) modification. During this period, EPA recognizes that reductions in mass emissions resulting from increased water reclamation are likely to be seasonal and anticipates the potential for corresponding higher mass emission rates during wet weather months. In the future, the City needs to pursue additional water reclamation and reuse projects, including those which demand a year-round supply of reclaimed water so as to maintain long-term compliance with this decision criterion.

I. Compliance with Other Applicable Laws

Under 40 CFR 125.59(b)(3), a 301(h)-modified permit shall not be issued where such issuance would conflict with applicable provisions of State, local, or other federal laws or Executive Orders.

1. Coastal Zone Management

A 301(h)-modified permit shall not be issued where such issuance would conflict with the federal Coastal Zone Management Act, as amended. In accordance with this law, an applicant must receive State certification that the modified discharge complies with applicable portions of the approved State coastal zone management program, or the State waives such certification.

Upon adoption of the 301(h)-modified NPDES permit by the Regional Water Board, the applicant will transmit correspondence requesting a determination from the California Coastal Commission, San Diego Coast Region, that the existing and proposed Point Loma WTP discharge are consistent with applicable coastal zone management requirements. The issuance of a 301(h)-modified permit for the Point Loma WTP discharge is contingent upon the California Coastal Commission certification.

2. Marine Sanctuaries

A 301(h)-modified permit shall not be issued where such issuance would conflict with the federal Marine Protection, Research and Sanctuaries Act, as amended. In accordance with this law, a 301(h)-modified permit may not be issued for a discharge located in a marine sanctuary designated pursuant to Title III, if the regulations applicable to the sanctuary prohibit issuance of such a permit.

The PLOO is not located in a marine sanctuary, although more than a dozen protected marine areas exist within San Diego County. Two of these areas (San Diego-La Jolla Ecological Reserve and San Diego Marine Life Refuge), located approximately 21 to 22 kilometers north of the discharge point, have been designated by the State Water Board as “Areas of Special Biological Significance”. The discharge of wastewater to these zones is prohibited by the California Ocean Plan. A detailed description of protected areas in the vicinity of the PLOO is found in Volume V, Appendix G, of the application. EPA believes that given the distance to protected areas, pollutants discharged from the

PLOO will be diluted to background levels by the time the wastefield approaches any of these protected areas.

3. Endangered or Threatened Species

A 301(h)-modified permit shall not be issued where such issuance would conflict with the federal Endangered Species Act, as amended. This law is administered by the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service (collectively, the Services).

According to the applicant, 24 listed and candidate species may occur in the vicinity of Point Loma. Operation of the PLOO could affect these species by altering physical, chemical, or biological conditions, including: habitat suitability, water quality, biological integrity, food web dynamics, or the health of organisms. However, long-term monitoring conducted by the City shows no evidence of significant effects from operation of the PLOO on environmental conditions or biological communities. The applicant has reported to the Services that maintaining the existing discharge through the PLOO should not have an adverse impact on listed species or threaten their critical habitat.

By letters dated December 10, 2014, the applicant has requested determinations by the Services that the modified discharge is consistent with the federal Endangered Species Act. The issuance of a 301(h)-modified permit for the Point Loma WTP discharge is contingent upon determinations by the Services.

4. Fishery Conservation and Management

A 301(h)-modified permit shall not be issued where such issuance would conflict with the federal Magnuson-Stevens Fishery Conservation and Management Act, as amended (the MSA).

According to the applicant, the marine environment in the vicinity of Point Loma supports a wide variety of commercial fisheries that are protected and managed through the "Essential Fish Habitat" provisions of the MSA. The fisheries management plans (FMPs) for species that could occur in the Point Loma area are the Pacific Groundfish FMP (83 species), the Coastal Pelagic Species FMP (6 species), and the U.S. West Coast Fisheries for Highly Migratory Species (13 species). According to the applicant, the PLOO could have two types of effects on fisheries: physical impacts associated with the presence of the pipeline and diffusers on the ocean bottom, and biological impacts associated with the discharge of treated wastewater. Based on long-term monitoring results, the applicant has reported to the National Marine Fisheries Service that maintaining the existing discharge through the PLOO should not have an adverse effect on Essential Fish Habitat or Managed Species.

By letter dated December 10, 2014, the applicant has requested a determination by the National Marine Fisheries Service that the modified discharge is consistent with the

Magnuson-Stevens Fishery Conservation and Management Act. The issuance of a 301(h)-modified permit for the Point Loma WTP discharge is contingent upon the NMFS' determination.

J. State Determination and Concurrence

In accordance with 40 CFR 125.59(i)(2), no 301(h)-modified permit shall be issued until the appropriate State certification/concurrence is granted or waived, or if the State denies certification/concurrence, pursuant to 40 CFR 124.54.

The PLOO discharges beyond the 3 nautical mile State waters limit, into federal waters. Therefore, EPA has primary regulatory responsibility for the discharge. However, in May 1984, a Memorandum of Understanding was signed between EPA and the State of California to jointly administer discharges that are granted 301(h) modifications from federal secondary treatment standards. Under California's Porter-Cologne Water Quality Control Act, the Regional Water Boards issue waste discharge requirements which serve as NPDES permits. The joint issuance of a 301(h)-modified NPDES permit for the Point Loma WTP discharge which incorporates both the federal 301(h) variance and State waste discharge requirements will serve as the State's concurrence, pursuant to 40 CFR 124.54.

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REFERENCES

City of San Diego. 2016. Supplemental information (monitoring results updated to 2015) to Application for Renewal of NPDES CA0107409 and 301(h) Modified Secondary Treatment Requirements, Point Loma Ocean Outfall. San Diego Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division emails to Peter Kozelka, U.S. Environmental Protection Agency in 2016.

City of San Diego. 2015. Application for Renewal of NPDES CA0107409 and 301(h) Modified Secondary Treatment Requirements, Point Loma Ocean Outfall. Volumes I-VIII. Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA. Submitted to: U.S. Environmental Protection Agency. January 2015. http://www.sandiego.gov/mwwd/environment/reports.shtml.

City of San Diego. 2014. Annual Receiving Waters Monitoring Report for the Point Loma Ocean Outfall. City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

Elder, J.R. September 27, 1989. Memorandum to EPA Regional Water Management Division Directors titled: FY 1990 Guidance for Reporting and Evaluating POTW Noncompliance with Pretreatment Implementation Requirements. U.S. Environmental Protection Agency, Washington D.C.

Eppley, R.W., E.H. Renger, W.G. Harrison, and J.J. Cullen. 1979. Ammonium distribution in Southern California coastal waters and its role in the growth of phytoplankton. Limnol. Oceanogr., 24(3):495-509.

Hendricks, T.J. and R. Eganhouse. 1992. Modification and verification of sediment deposition models. Technical Report 265. Prepared for California State Water Resources Control Board, Contract 7-192-250-0. Southern California Coastal Water Research Project, Long Beach, CA. 331 pp.

Klasing, S. and R. Brodberg. 2008. Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Sacramento, CA. http://oehha.ca.gov/fish/gtlsv/pdf/FCGsATLs27June2008.pdf.

Mearns, A.J., M. Matta, G. Shigenaka, D. MacDonald, M. Buchman, H. Harris, J. Golas, and G. Lauenstein. 1991. Contaminant Trends in the Southern California Bight:

Inventory and Assessment. NOAA Technical Memorandum NOS ORCA 62. National Oceanic and Atmospheric Administration, Seattle, WA.

Nelson, J.R., J.R. Beers, R.W. Eppley, G.A. Jackson, J.J. McCarthy, and A. Souter. 1987. A particle flux study in the Santa Monica – San Pedro Basin off Los Angeles: Particle flux, primary production, and transmissometer survey. Cont. Shelf Res. 7:307-328.

NOAA. 1999. Sediment Quality Guidelines developed for the National Status and Trends Program (6/12/1999). 12 pp. http://response.restoration.noaa.gov/book_shelf/121_sedi_qual_guide.pdf.

Ranasinghe, J.A., A.M. Barnett, K. Schiff, D.E. Montagne, C. Brantley, C. Beegan, D.B. Cadien, C. Cash, G.B. Deets, D.R. Diener, T.K. Mikel, R.W. Smith, R.G. Velarde, S.D. Watts, and S.B. Weisberg. 2007. Southern California Bight 2003 Regional Monitoring Program: III. Benthic Macrofauna. Technical Report 529. Southern California Coastal Water Research Project, Costa Mesa, CA. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/529_B03_Benthic.pdf.

San Diego RWQCB. 1994. Water Quality Control Plan for the San Diego Basin (Basin Plan). California Regional Water Quality Control Board, San Diego Region, San Diego, CA. http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml.

San Diego RWQCB. June 2009. National Pollutant Discharge Elimination System Permit No. CA0107409, City of San Diego, E.W. Blom Point Loma Metropolitan Wastewater Treatment Plant and Ocean Outfall. http://www.waterboards.ca.gov/sandiego/board_decisions/adopted_orders/2009/R9-2009-0001/SanDiego301(h)_Permit-Complete_Final.pdf.

Schiff, K.C., M.J. Allen, E.Y. Zeng, and S.M. Bay. 2000. Southern California. Marine Pollution Bulletin 41(1-6):76-93. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/JournalArticles/329_scb.pdf.

Schiff, K., K. Maruya, and K. Christenson. 2006. Southern California Bight 2003 Regional Monitoring Program: II. Sediment Chemistry. Technical Report 492. Southern California Coastal Water Research Project, Westminster, CA. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/492_B03_sed_chem.pdf.

Schoof, RA, and LJ Yost, J Eickhoff, EA Crecilius, DW Cragin, DM Meacher, and DB Menzel. (1999) *A Market Basket Survey of Inorganic Arsenic in Food*. Food and Chem. Toxic. 37: 839—846.

Smith, R.W., M. Bergen, S.B. Weisberg, D. Cadien, A. Dalkey, D. Montagne, J. Stull, and R.G. Velarde 2001. Benthic response index for assessing infaunal communities on the Southern California mainland shelf. Ecological Applications 11(4):1073-1087.

SWRCB. 2005. Water Quality Control Plan, Ocean Waters of California (California Ocean Plan). California State Water Resources Control Board, Sacramento, CA. http://www.waterboards.ca.gov/water_issues/programs/ocean/docs/oplans/oceanplan2005.pdf.

USEPA. 1982. Revised Section 301(h) Technical Support Document. EPA 430/9-82-011. U.S. Environmental Protection Agency, Office of Water Operations, Washington, D.C.

USEPA. 1994. Discharges into Marine Waters; Modification of Secondary Treatment Requirements; Final Rule. U.S. Environmental Protection Agency, Washington, D.C. Federal Register: August 9, 1994, Vol. 59, No. 152, pp. 40642-40669.

USEPA. 1994. Amended Section 301(h) Technical Support Document. EPA 842-B-94-007. U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds, Washington, D.C.

USEPA. 1995. Tentative decision document: City of San Diego's application for 301(h) discharge from the E.W. Blom Metropolitan Wastewater Treatment Plant and Ocean Outfall. U.S. Environmental Protection Agency, Region IX, San Francisco.

USEPA. 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories. Volume 1: Fish Sampling and Analysis. Third Edition. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. http://www.epa.gov/waterscience/fish/advice/volume1/index.html.

USEPA. 2001. Water Quality Criteria: Notice of Availability of Water Quality Criterion for the Protection of Human Health: Methylmercury; Final Rule. U.S. Environmental Protection Agency, Washington, D.C. Federal Register: January 8, 2001, Vol. 66, No. 5, pp 1344-1359. http://www.epa.gov/fedrgstr/EPA-WATER/2001/January/Day-08/w217.htm.

USEPA. 2002. Tentative decision document: City of San Diego's application for 301(h) discharge from the E.W. Blom Metropolitan Wastewater Treatment Plant and Ocean Outfall. U.S. Environmental Protection Agency, Region IX, San Francisco.

USEPA, 2004. Water Quality Standards for Coastal and Great Lakes Recreation Waters; Final Rule. U.S. Environmental Protection Agency, Washington D.C. Federal Register: November 16, 2004, Vol. 69, No. 220. pp. 67217-67243. http://www.epa.gov/fedrgstr/EPA-WATER/2004/November/Day-16/w25303.htm.

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APPENDIX A – FIGURES

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Figure A-1. Map of the San Diego Metropolitan Sewage System service area.

Figure A-2. Schematic of the existing Metro System treatment and solids handling facilities.

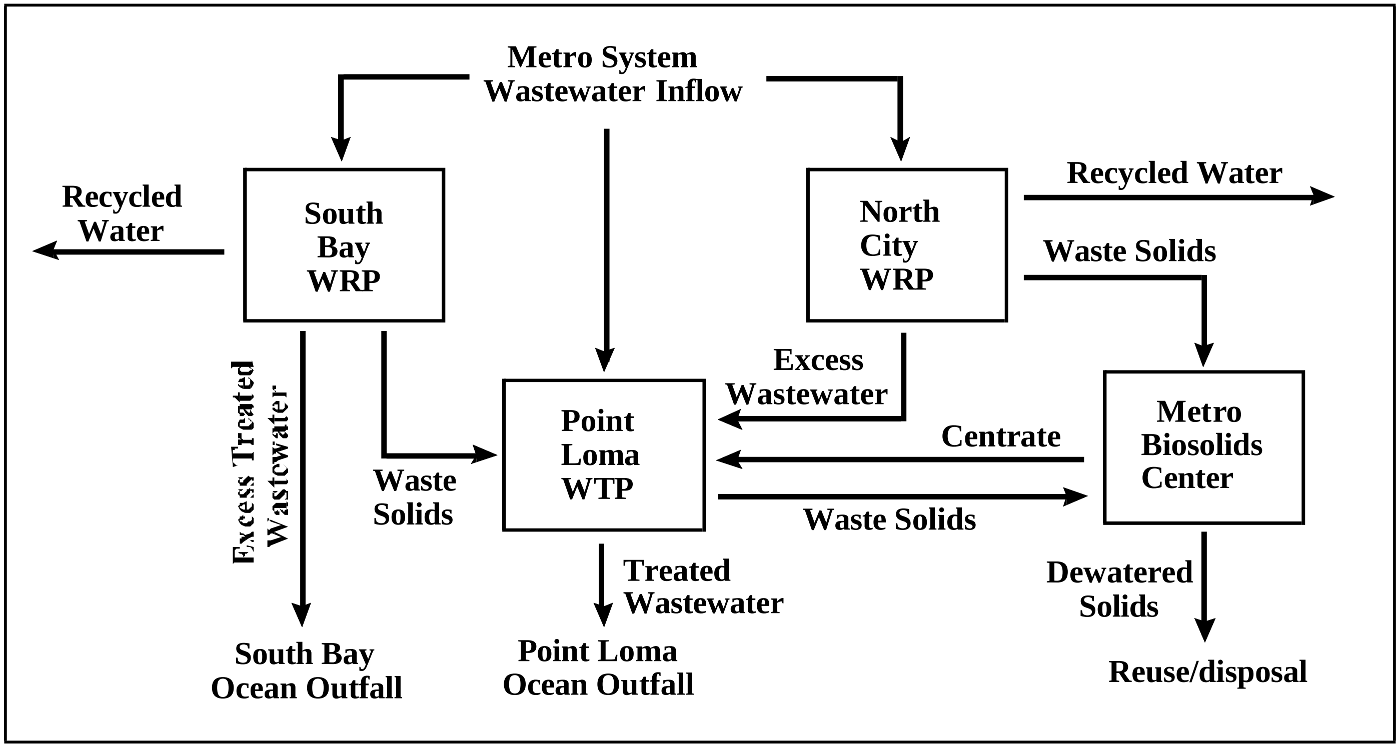


Figure A-3. Map of water quality monitoring station locations in offshore, kelp bed, and shoreline areas.

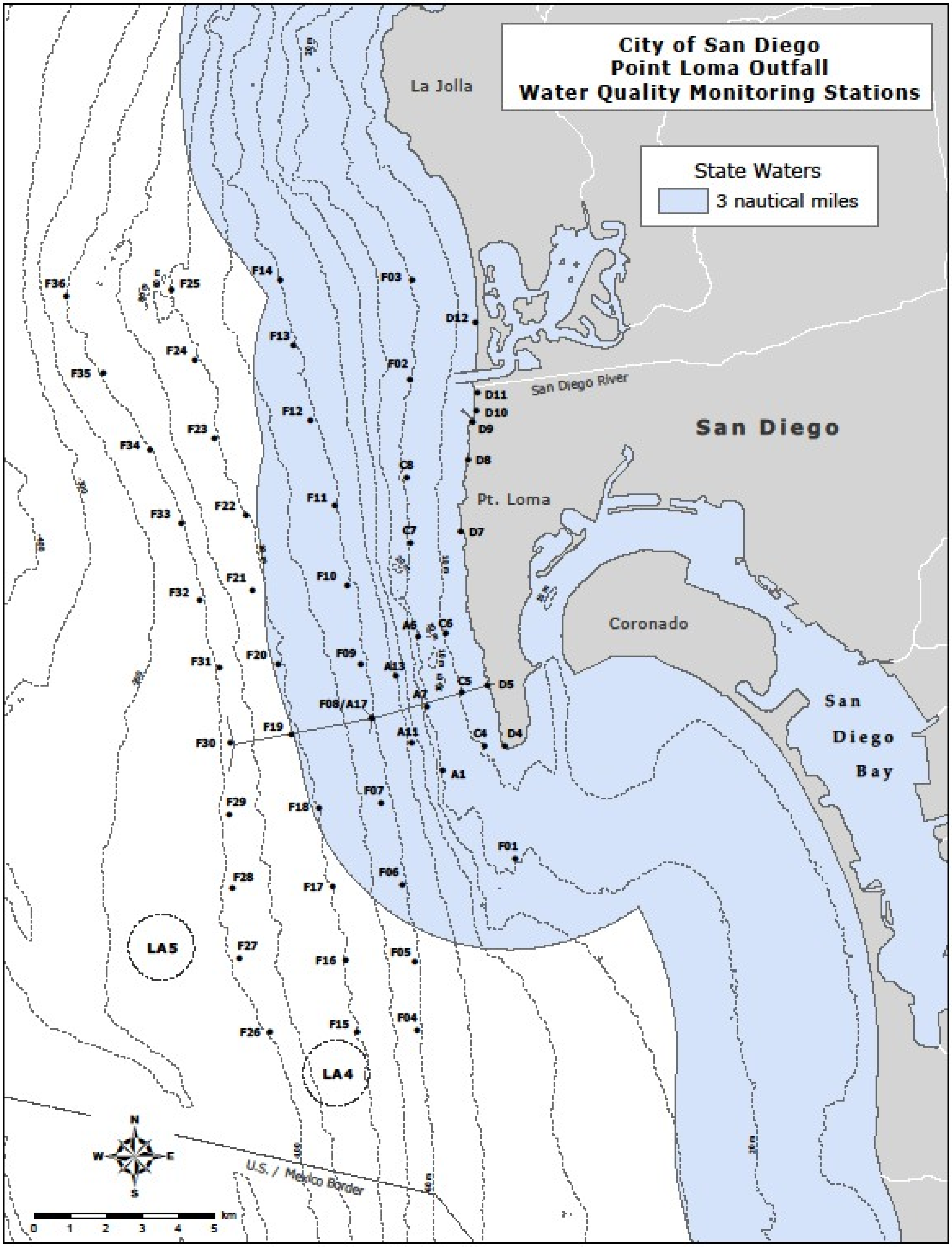


Figure A-4. Map of sediment chemistry and benthic macrofauna monitoring station locations in offshore area.

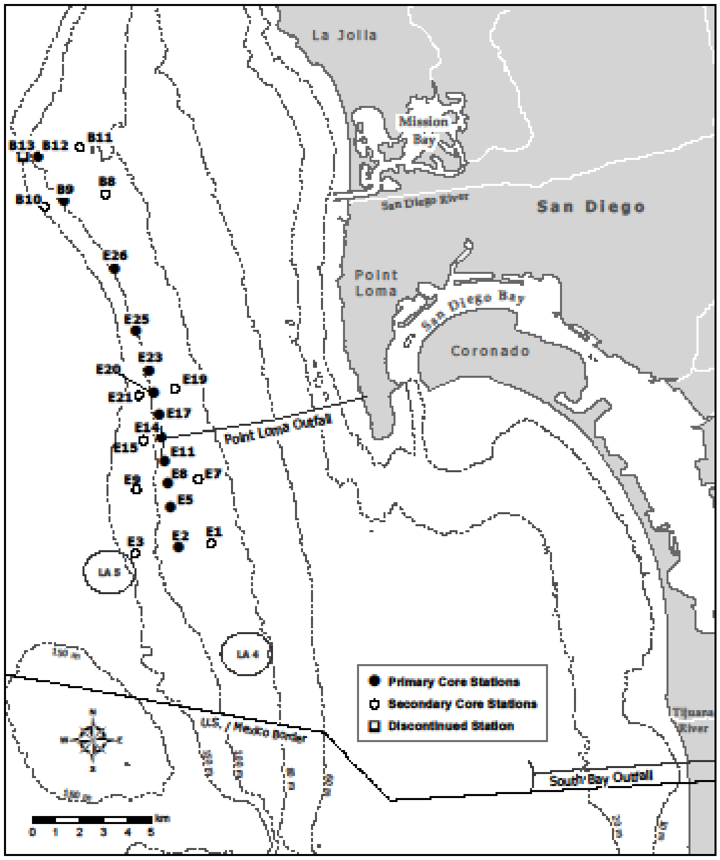


Figure A-5. Long-term average and standard deviation for percent transmissivity at 20, 60, 80, and 100 meter contours (January 2008 through December 2013).

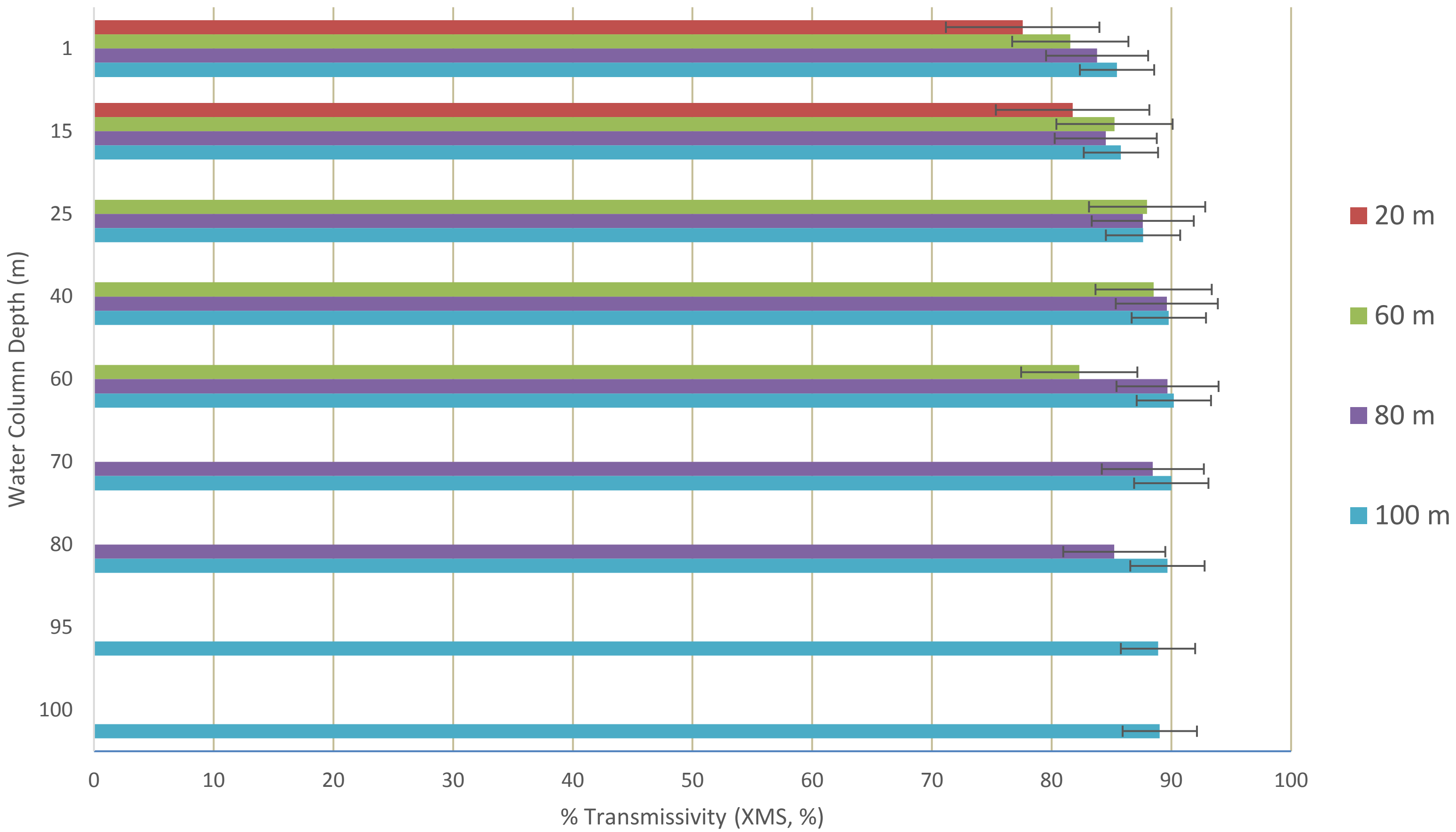


Figure A-6. Long-term average and standard deviation for Dissolved Oxygen at 20, 60, 80, and 100 meter contours (January 2008 through December 2013).

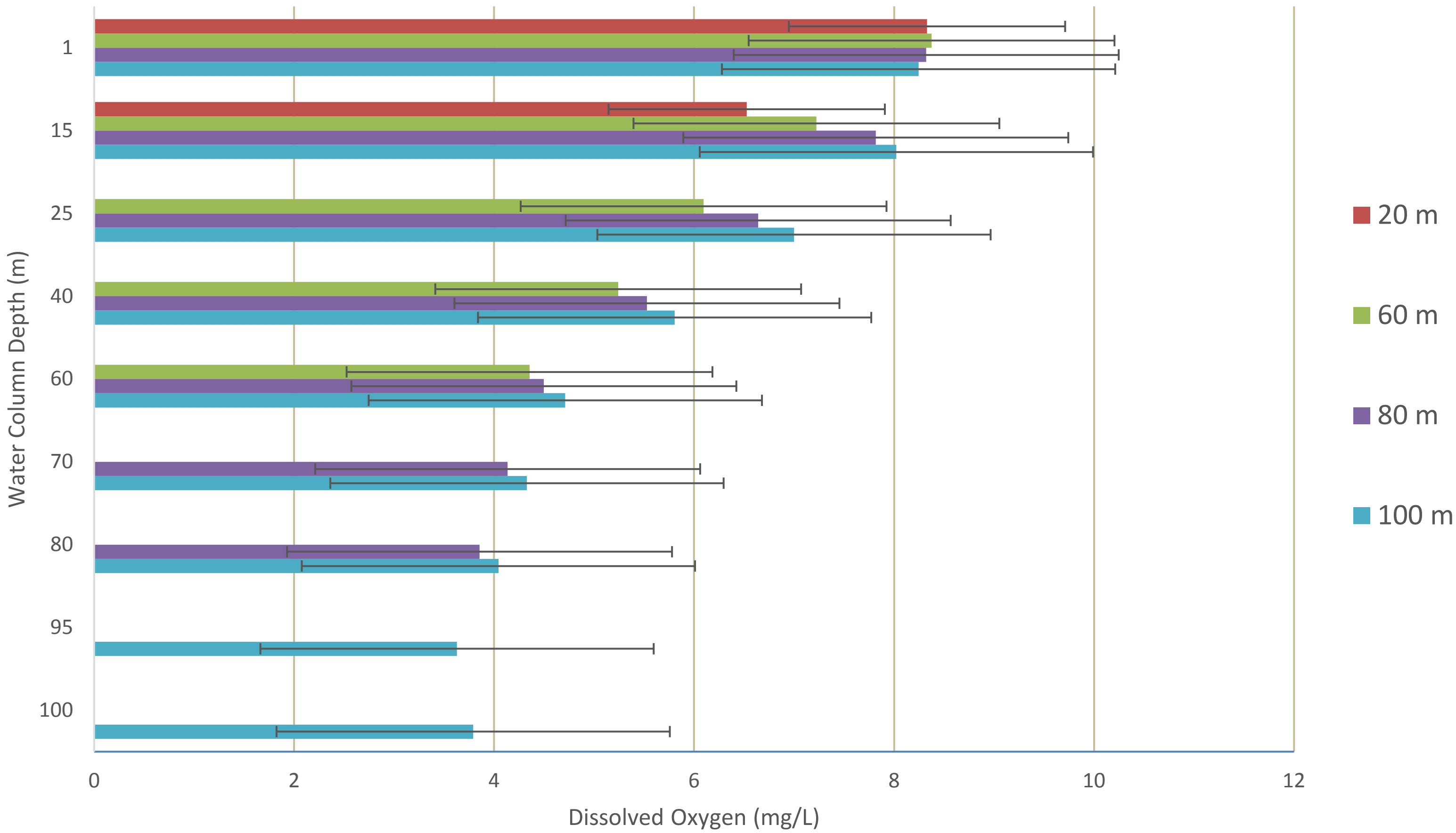


Figure A-7. Long-term average and standard deviation for pH at 20, 60, 80, and 100 meter contours (January 2008 through December 2013).

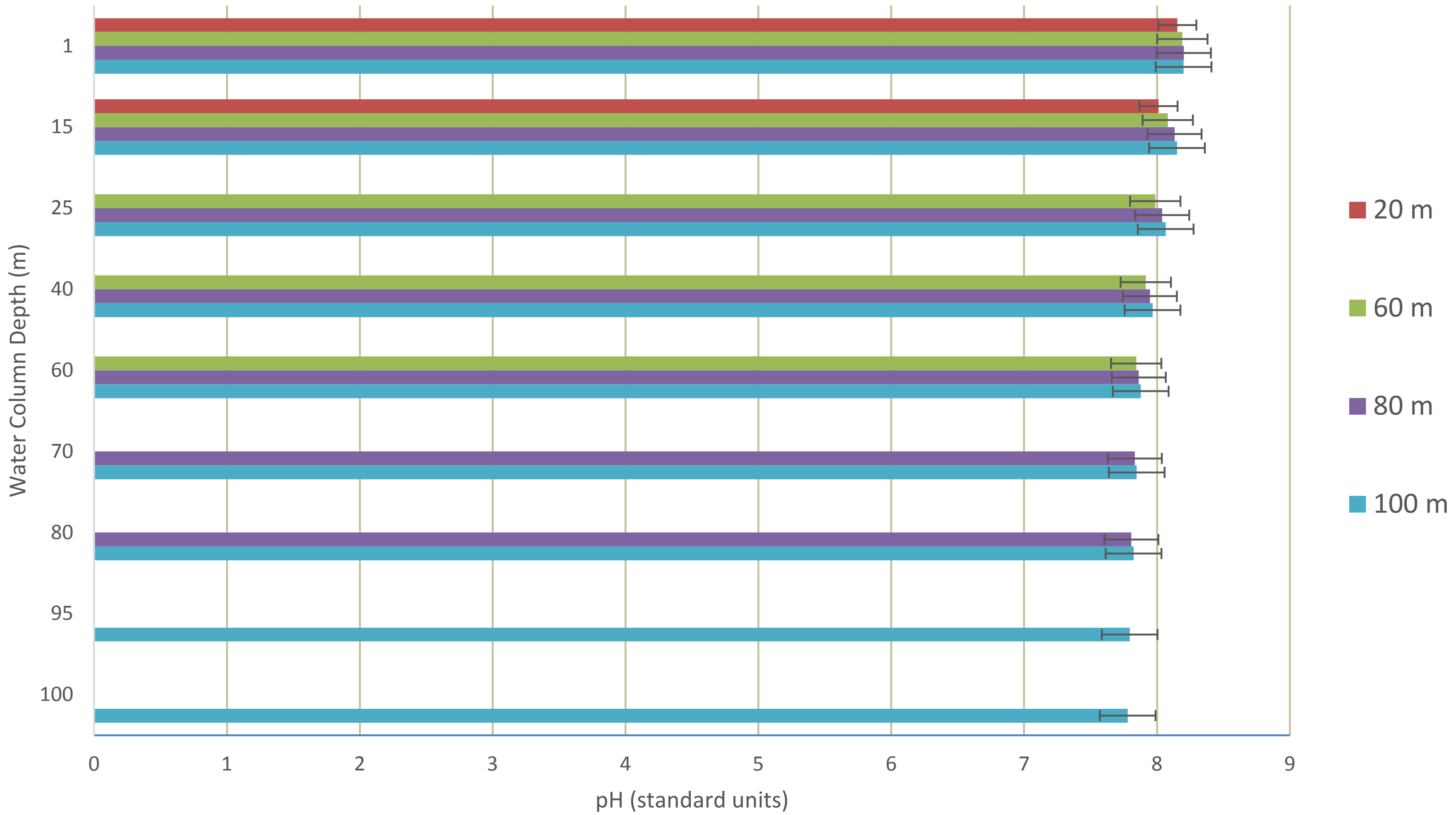
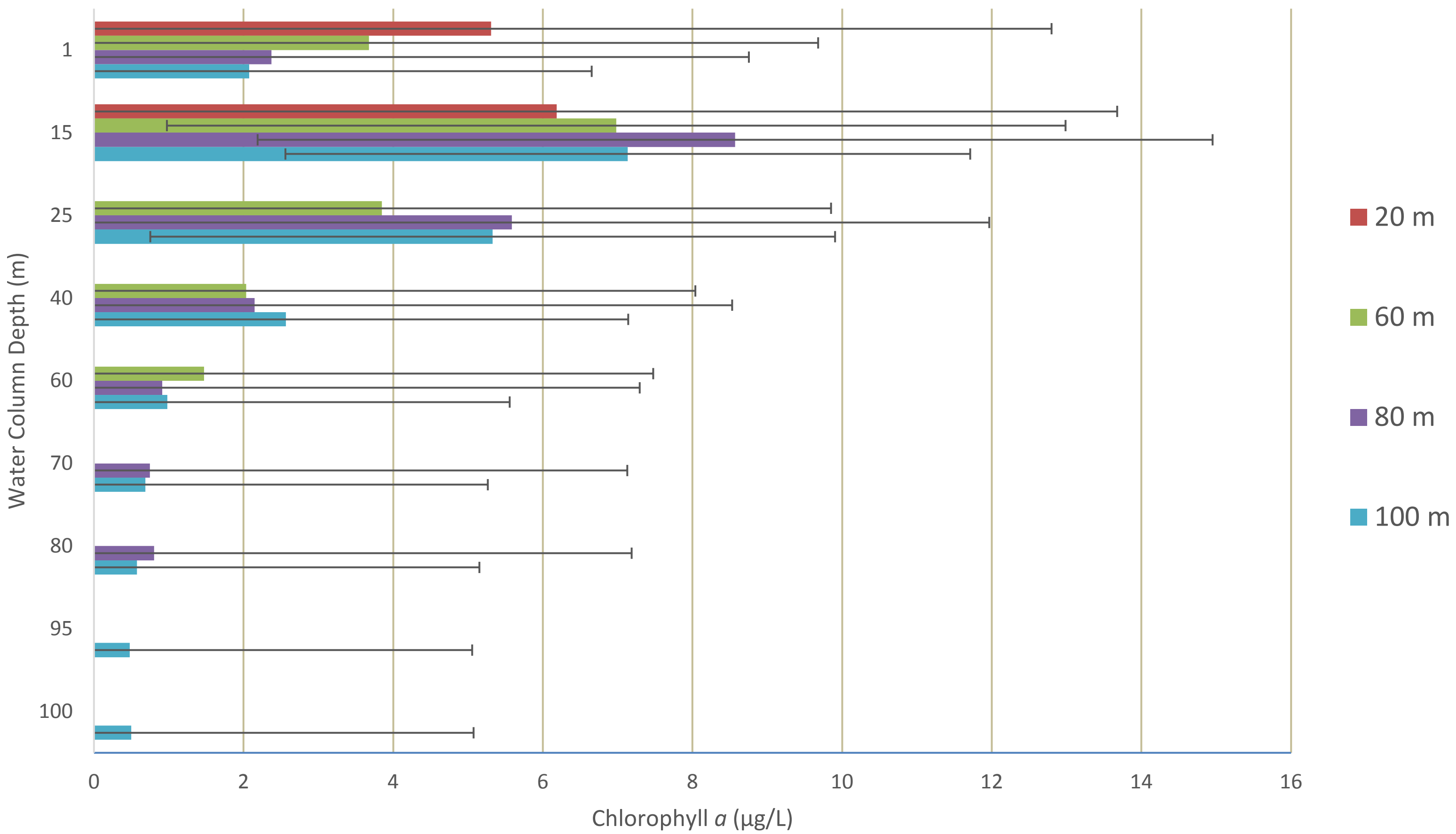


Figure A-8. Long-term average and standard deviation for Chlorophyll *a* at 20, 60, 80, and 100 meter contours (January 2008 through December 2013).



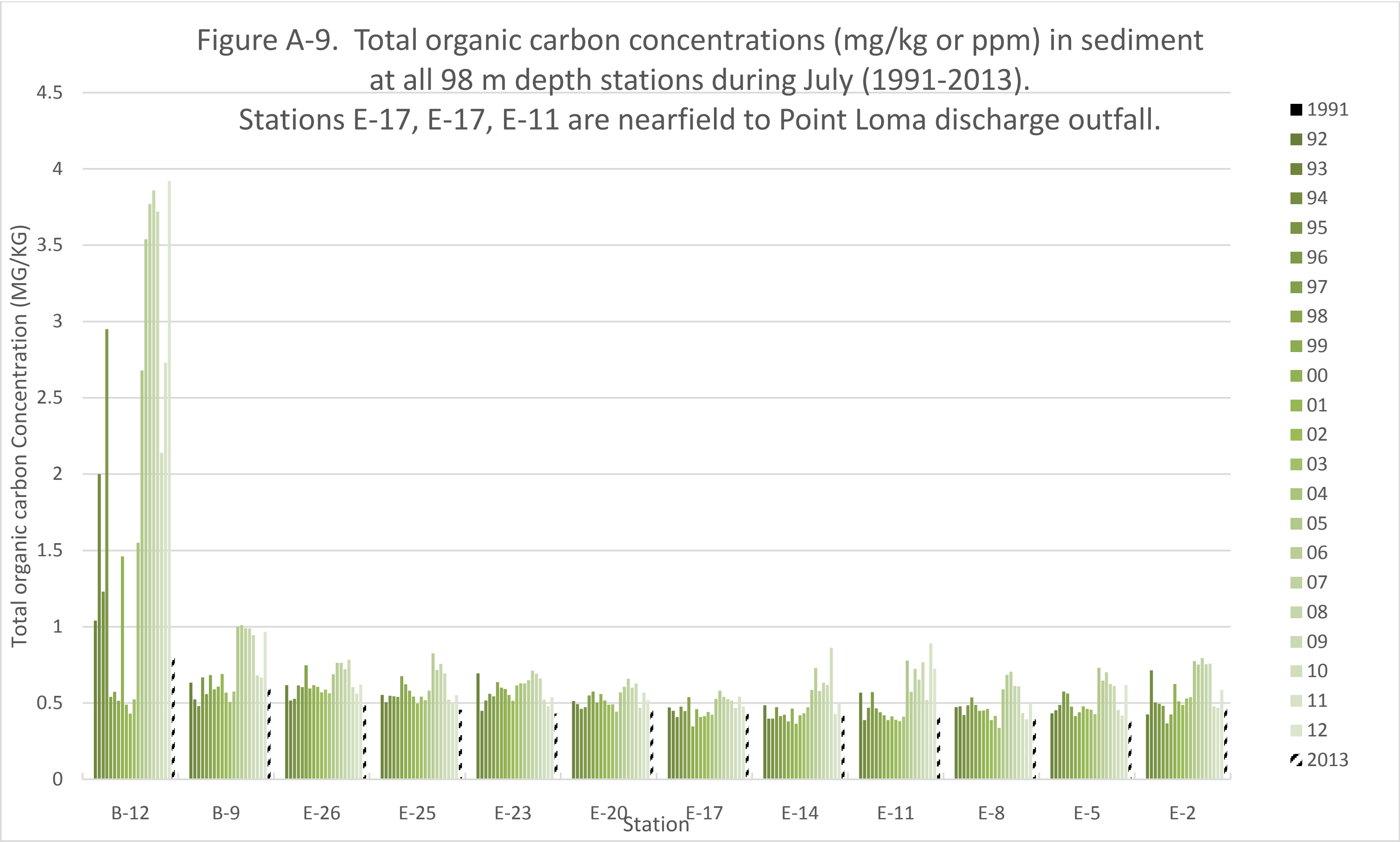


Figure A-9. Total organic carbon concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total organic carbon Concentration (MG/KG)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

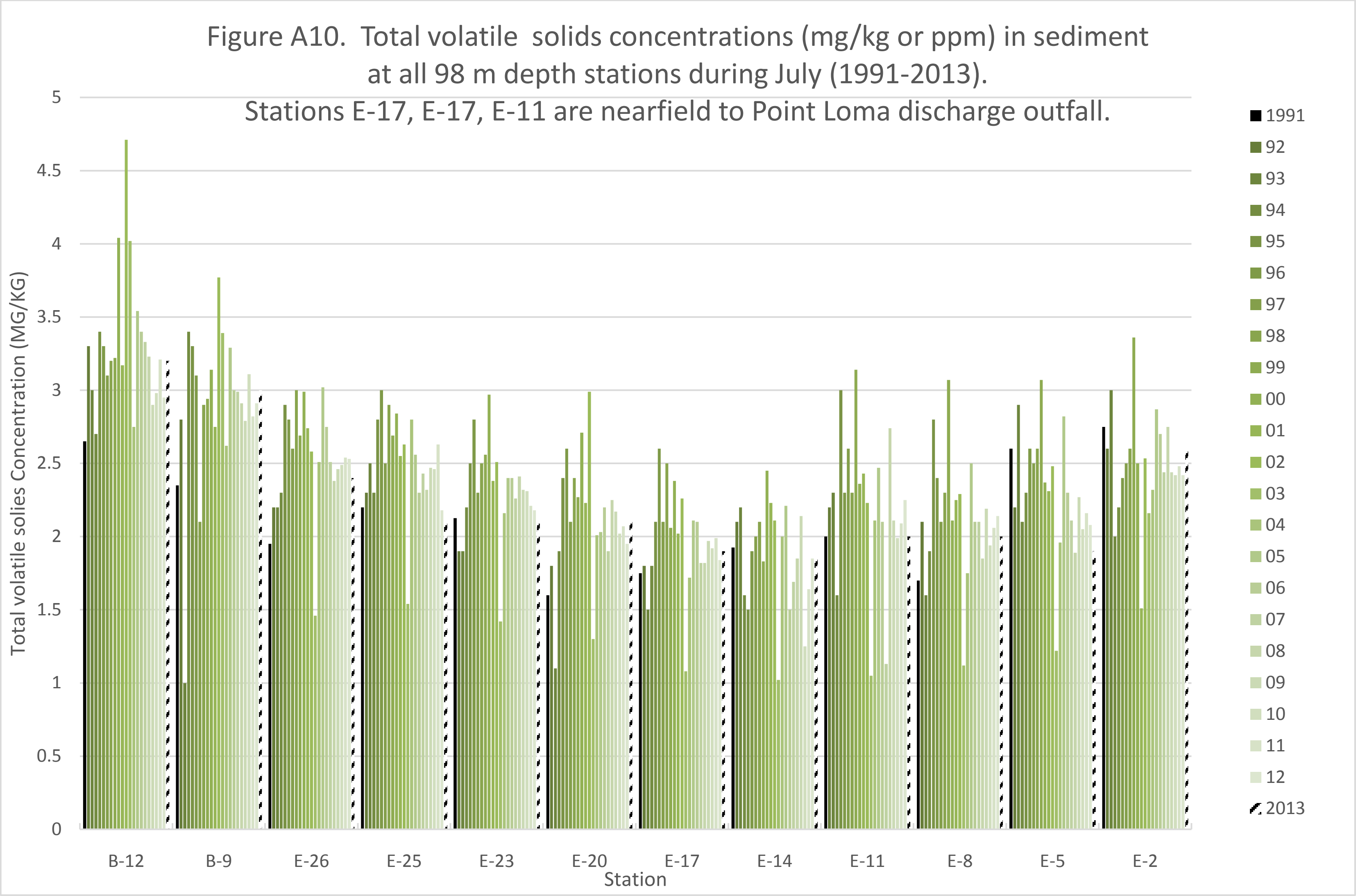


Figure A10. Total volatile solids concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total volatile solies Concentration (MG/KG)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

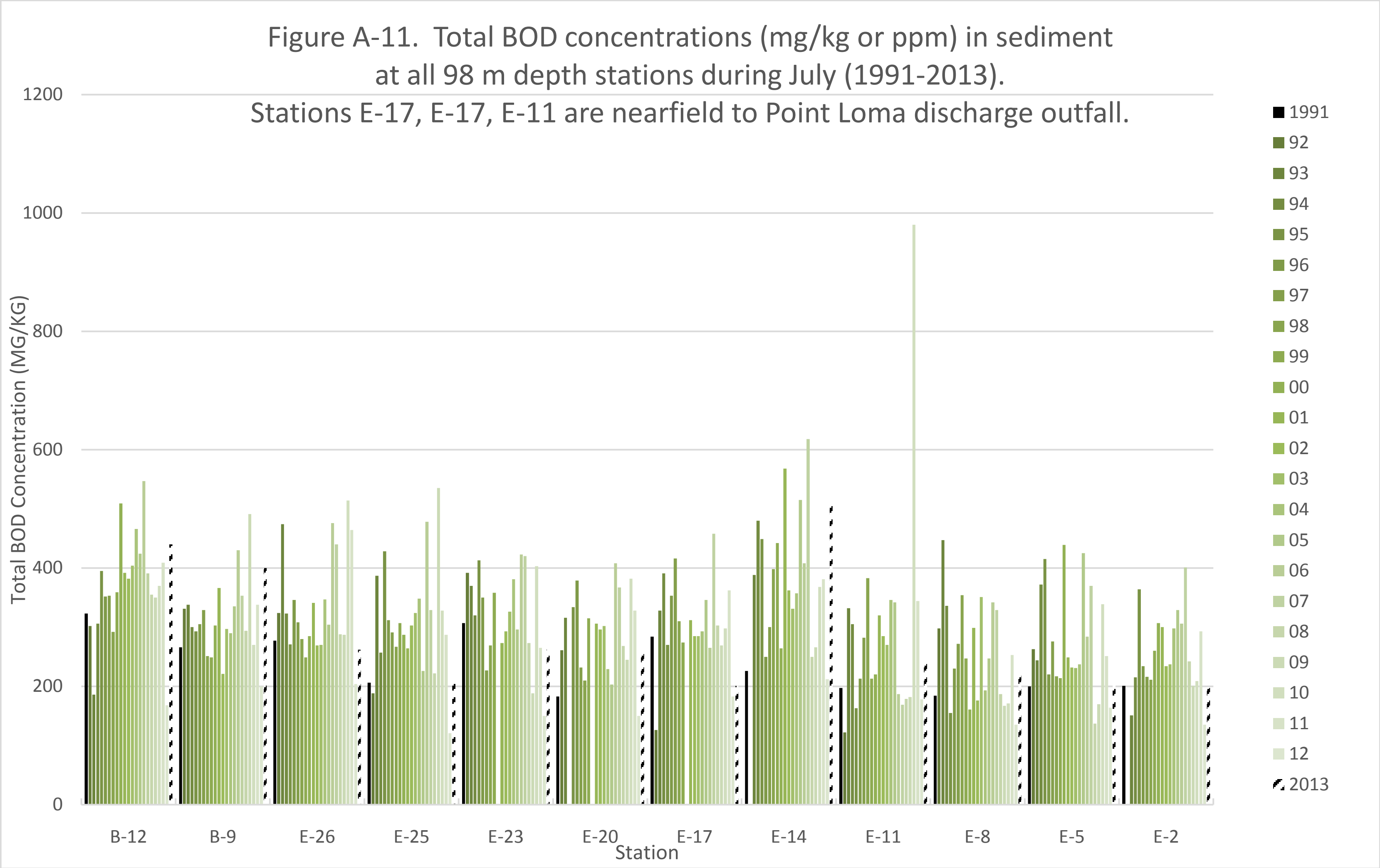


Figure A-11. Total BOD concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total BOD Concentration (MG/KG)
1200
1000
800
600
400
200
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

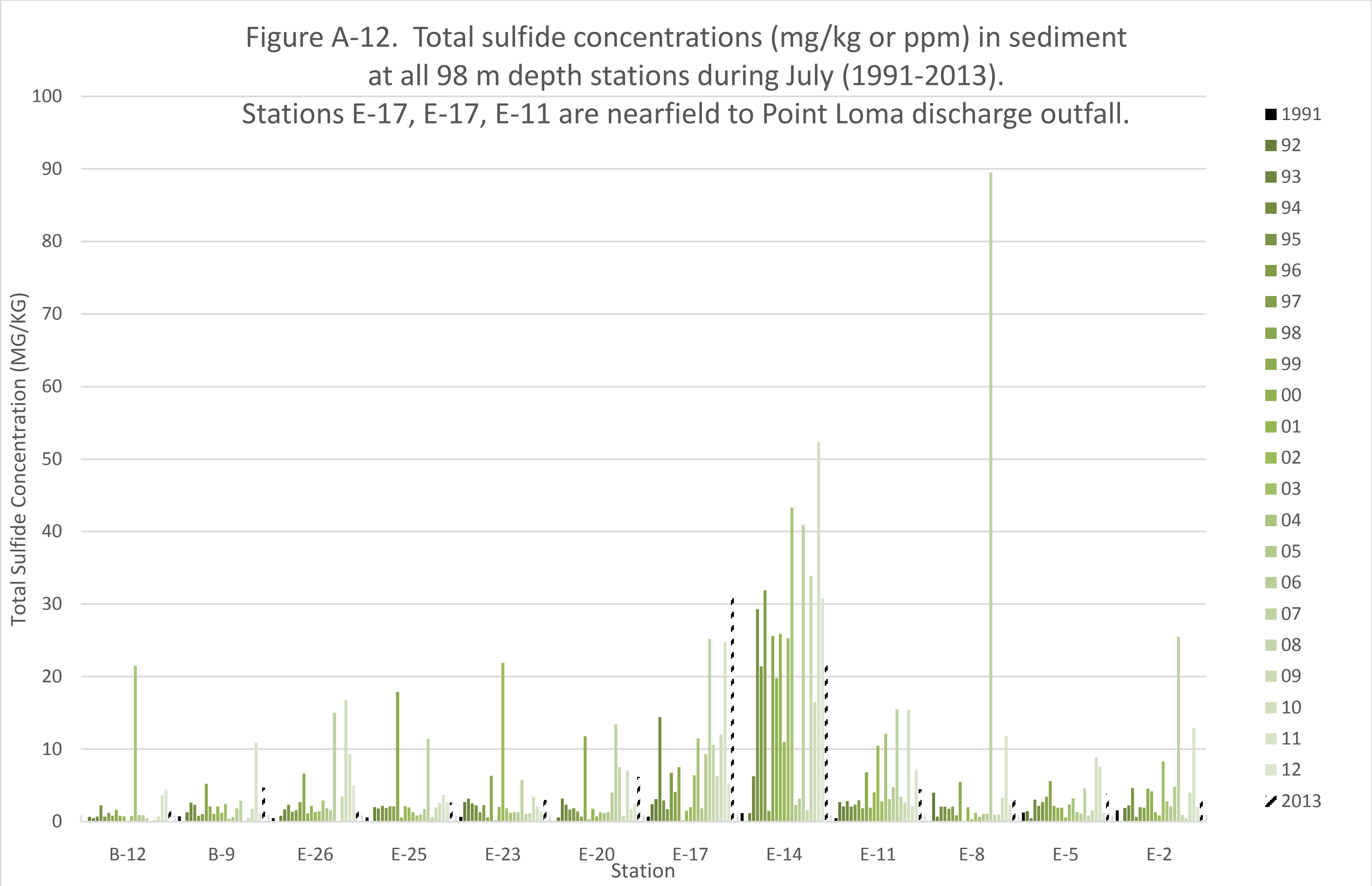


Figure A-12. Total sulfide concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total Sulfide Concentration (MG/KG)
100
90
80
70
60
50
40
30
20
10
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

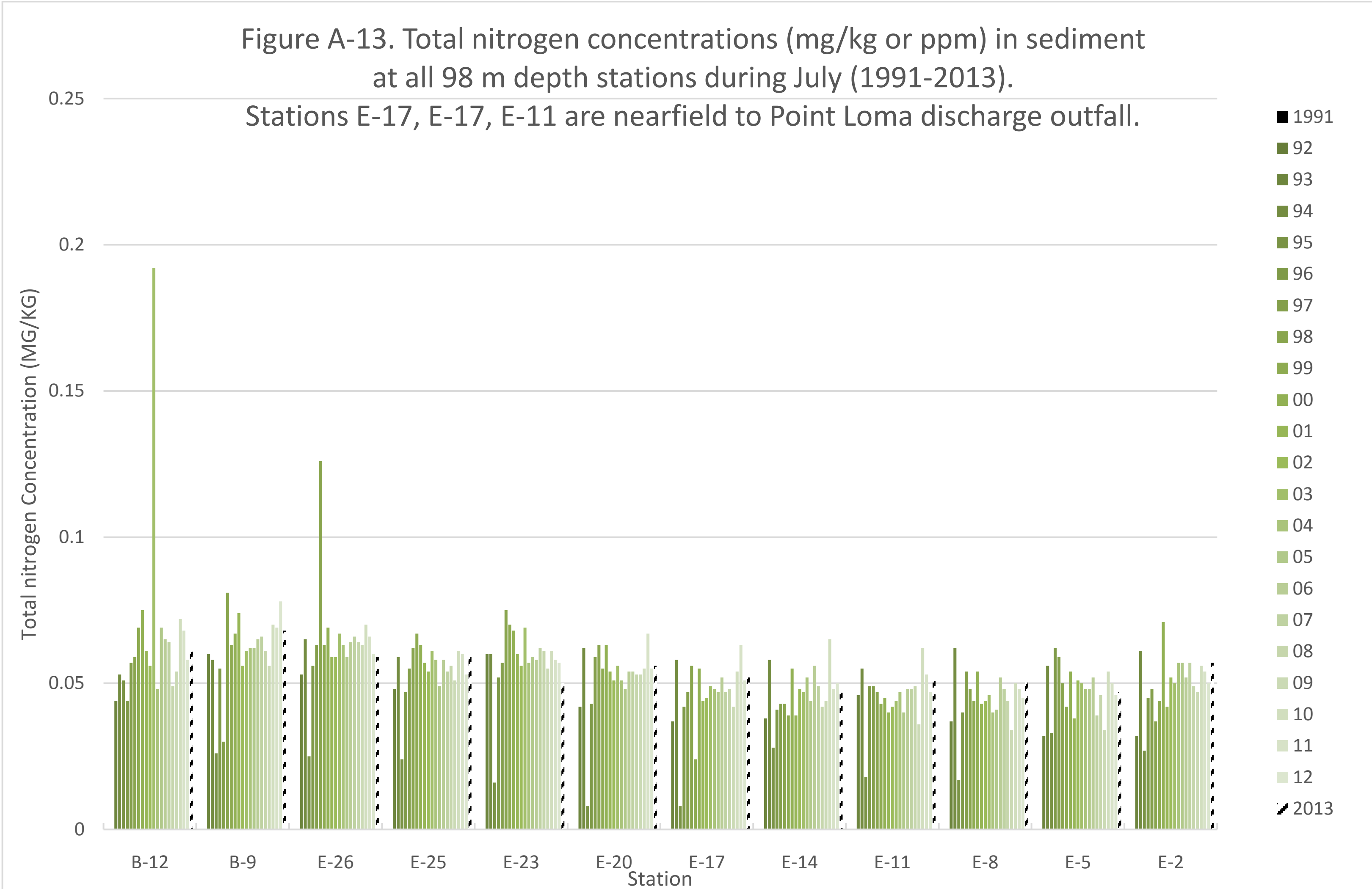


Figure A-13. Total nitrogen concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total nitrogen Concentration (MG/KG)
0.25
0.2
0.15
0.1
0.05
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

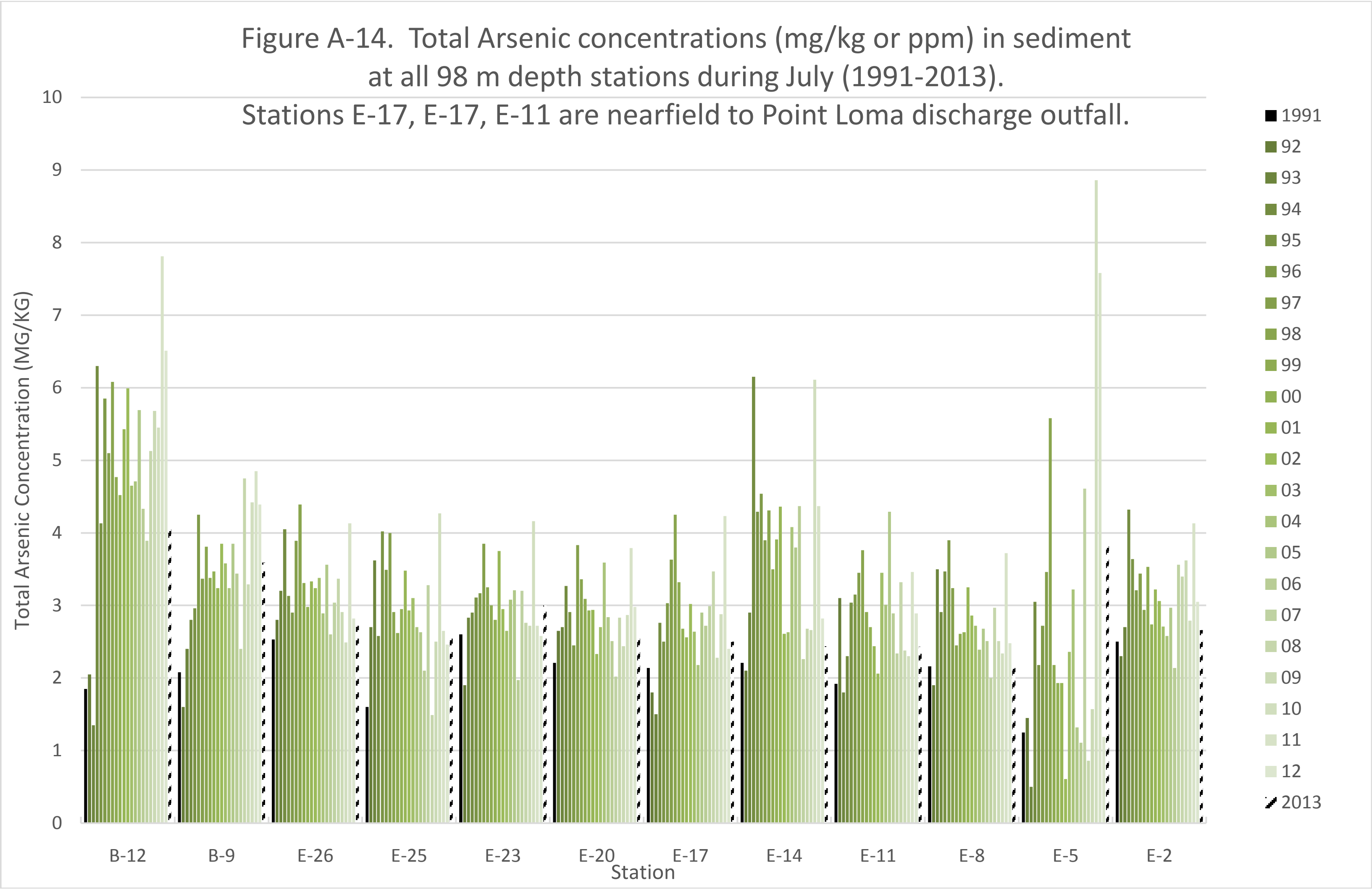


Figure A-14. Total Arsenic concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total Arsenic Concentration (MG/KG)
0
1
2
3
4
5
6
7
8
9
10
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

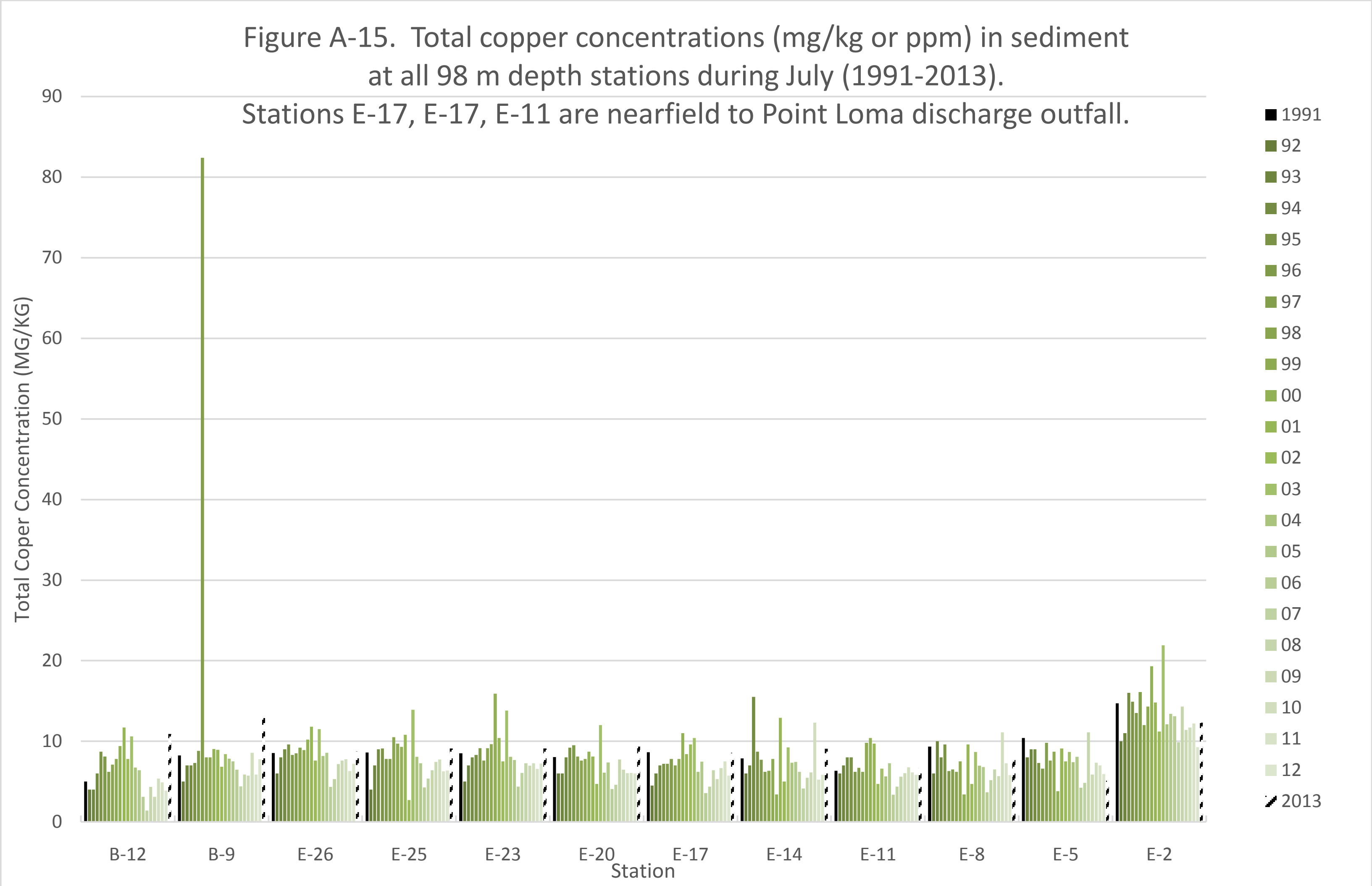


Figure A-15. Total copper concentrations (mg/kg or ppm) in sediment at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total Coper Concentration (MG/KG)
0
10
20
30
40
50
60
70
80
90
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

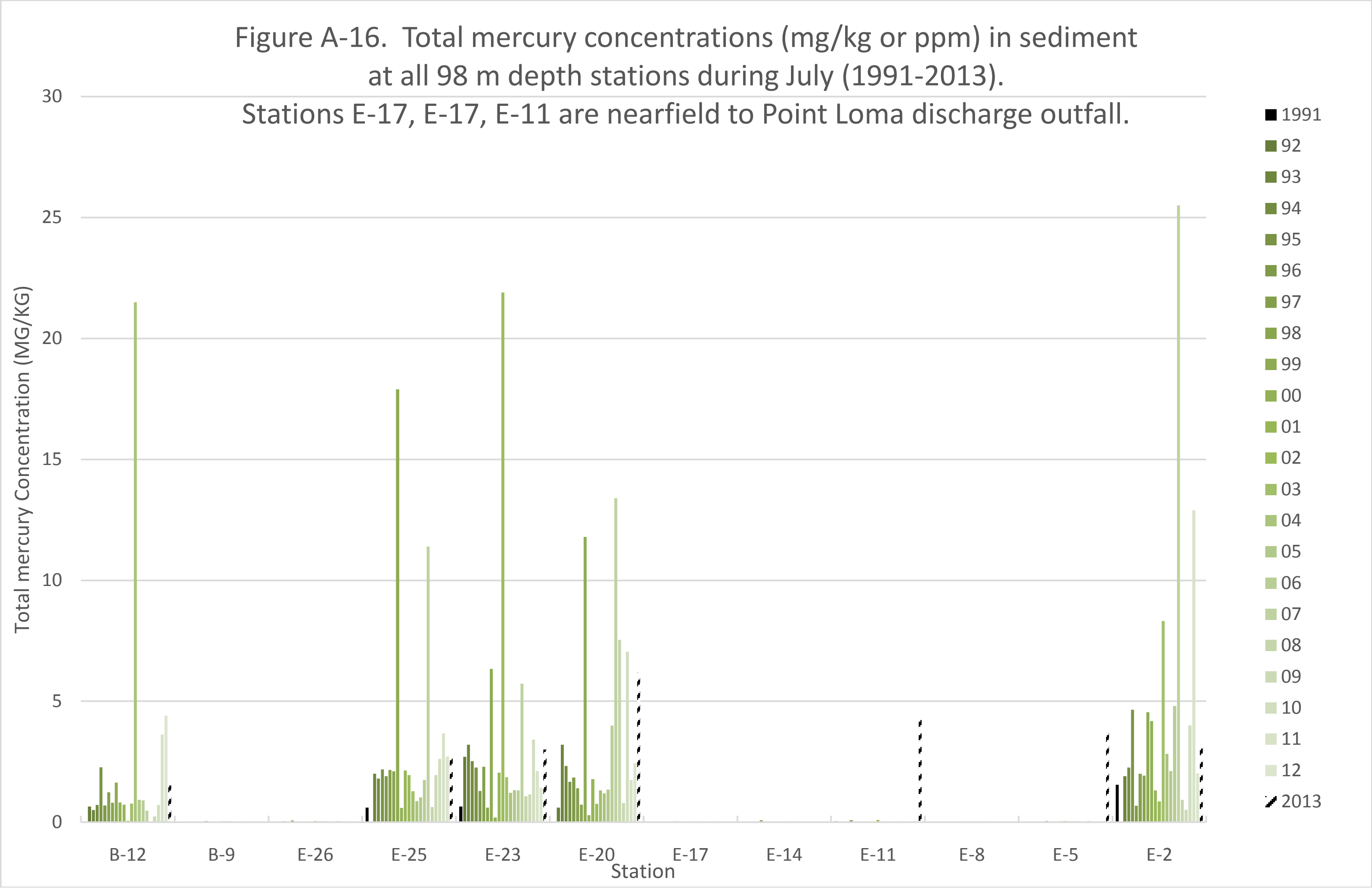


Figure A-16. Total mercury concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total mercury Concentration (MG/KG)
30
25
20
15
10
5
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

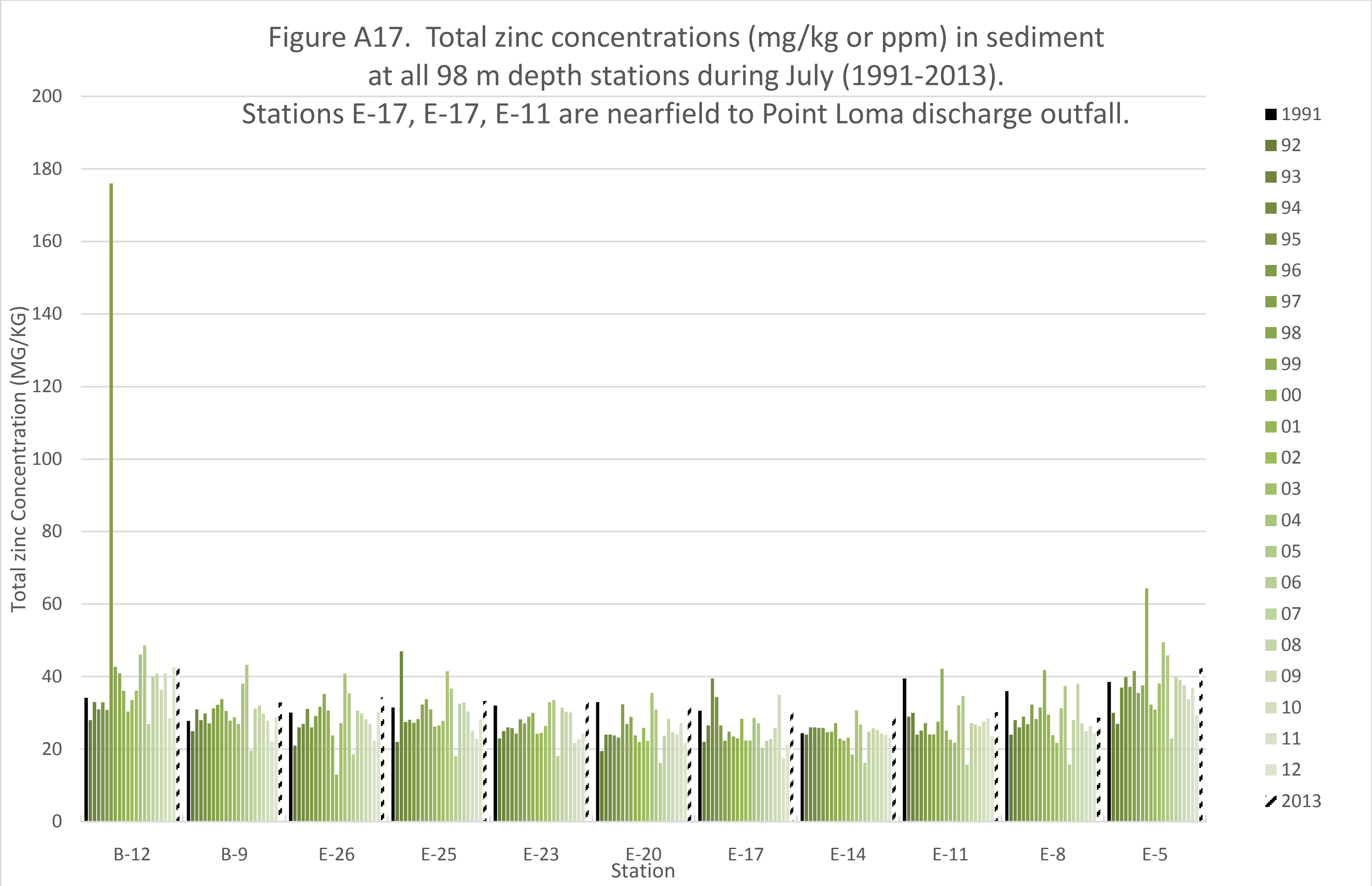


Figure A17. Total zinc concentrations (mg/kg or ppm) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total zinc Concentration (MG/KG)
0
20
40
60
80
100
120
140
160
180
200
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

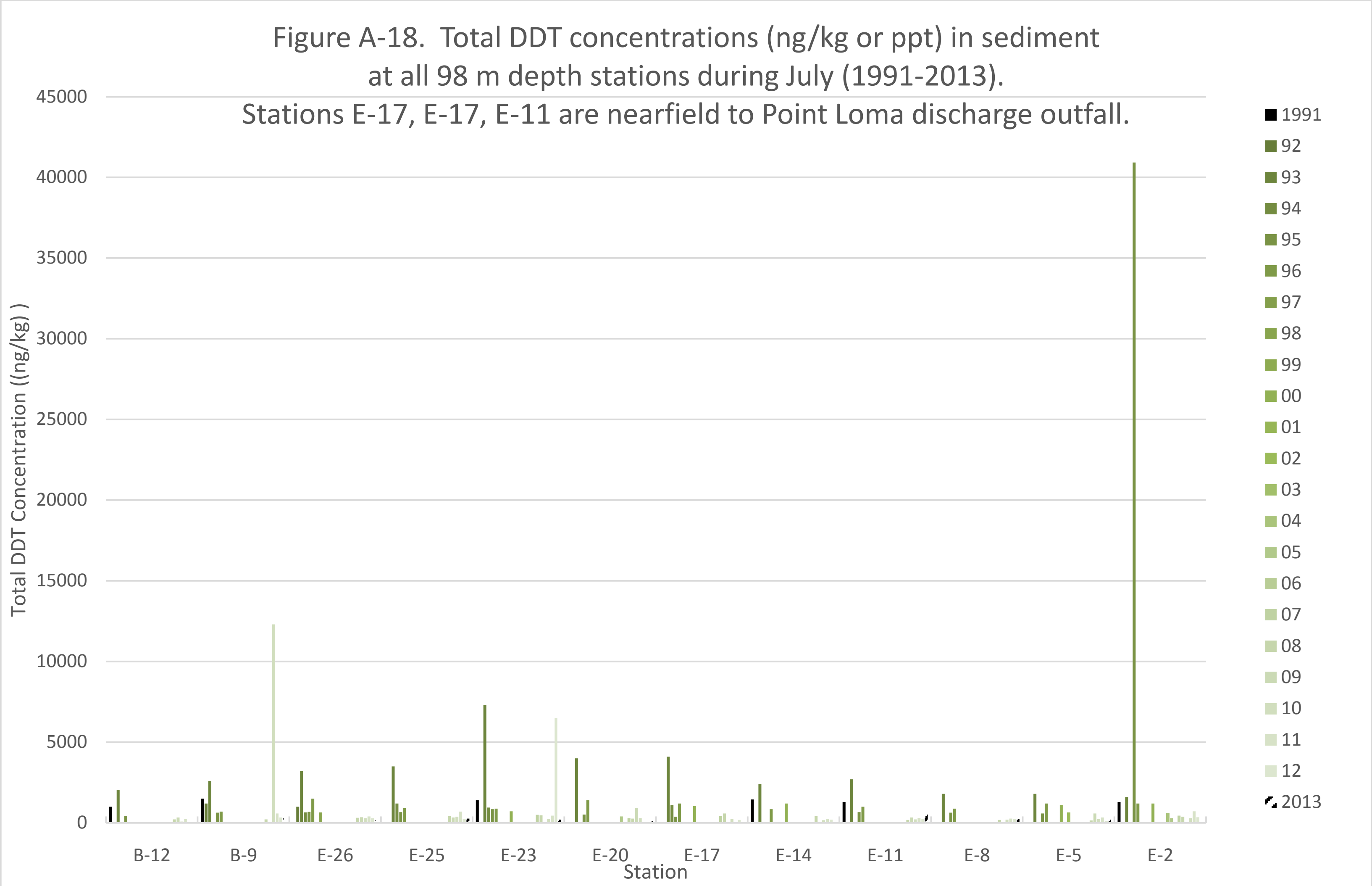


Figure A-18. Total DDT concentrations (ng/kg or ppt) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total DDT Concentration ((ng/kg))
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

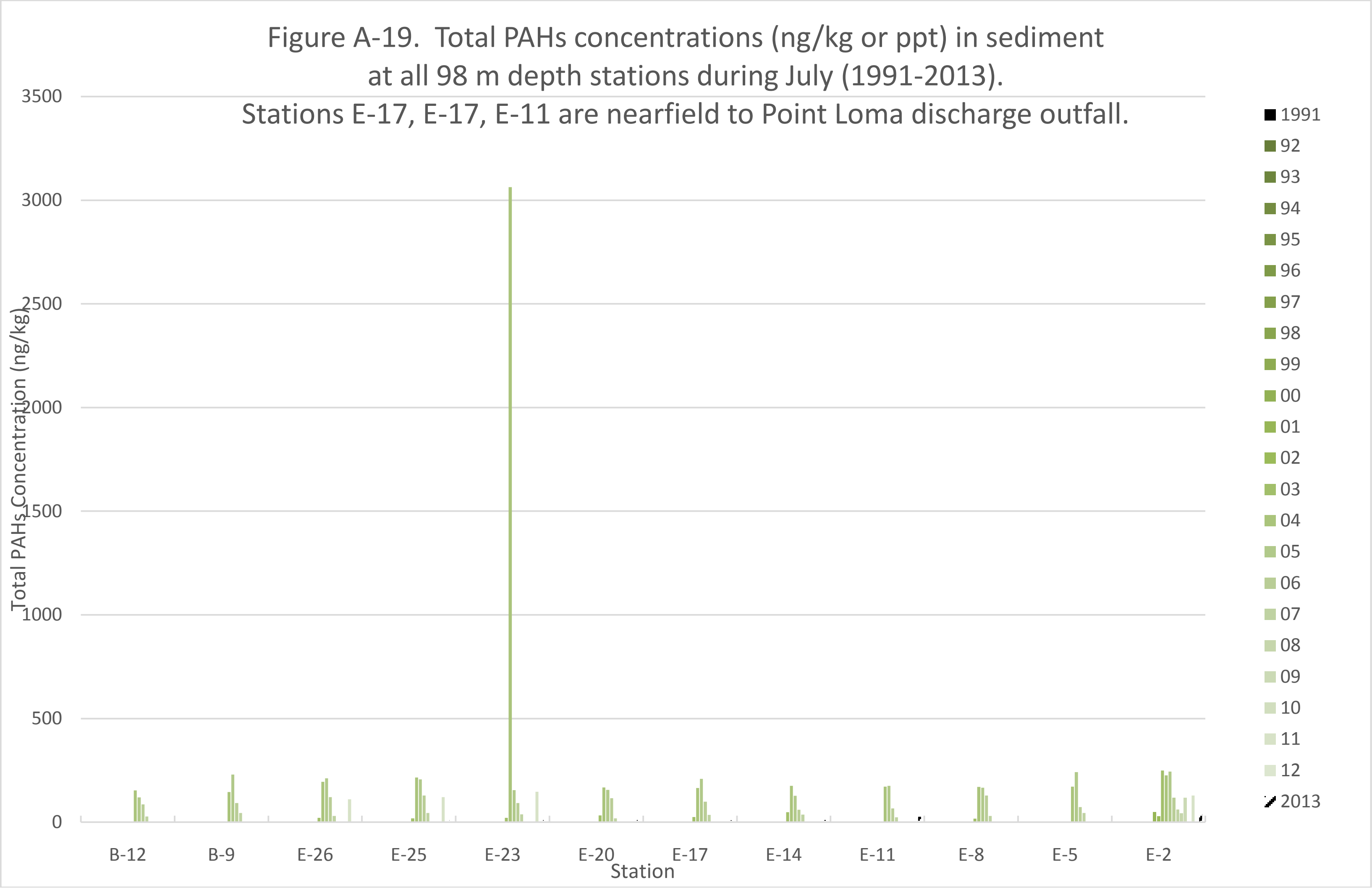


Figure A-19. Total PAHs concentrations (ng/kg or ppt) in sediment
at all 98 m depth stations during July (1991-2013).
Stations E-17, E-17, E-11 are nearfield to Point Loma discharge outfall.
Total PAHs Concentration (ng/kg)
3500
3000
2500
2000
1500
1000
500
0
B-12
B-9
E-26
E-25
E-23
E-20
E-17
E-14
E-11
E-8
E-5
E-2
Station
1991
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11
12
2013

Figure 20.(replicated from Application figure C.1-30) BRI values at near-ZID station, farfield station E26, and reference station B-9 along PLOO discharge outfall contour from 1991 – 2013. Data expressed as mean BRI values for each station in January and July surveys.

Figure A-21. (replicated from Application C.1-41) Abundance of the ostracods *Euphilomedes* spp at outfall discharge depths near the PLOO from 1991-2013. Values for each station during July survey only. Data expressed as mean abundance per $0.1m^2$.

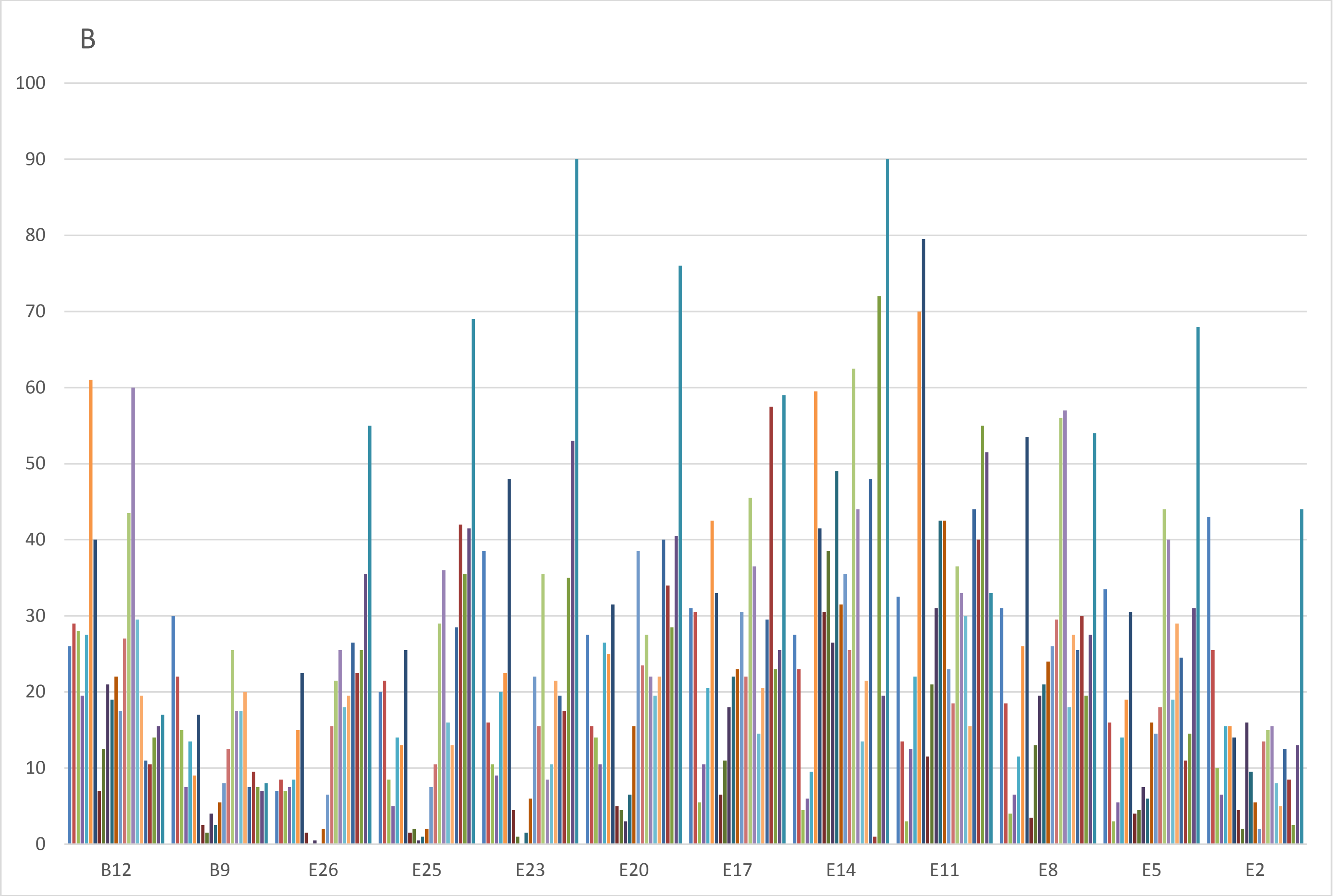


Figure A-22. (replicated from Application C.1-45) Abundance of bivalve *Pariluncina tenuisculpta* at outfall depths stations near PLOO from 199-2013. Values for each station during July survey only. Data expressed as mean abundance per $0.1m^2$.

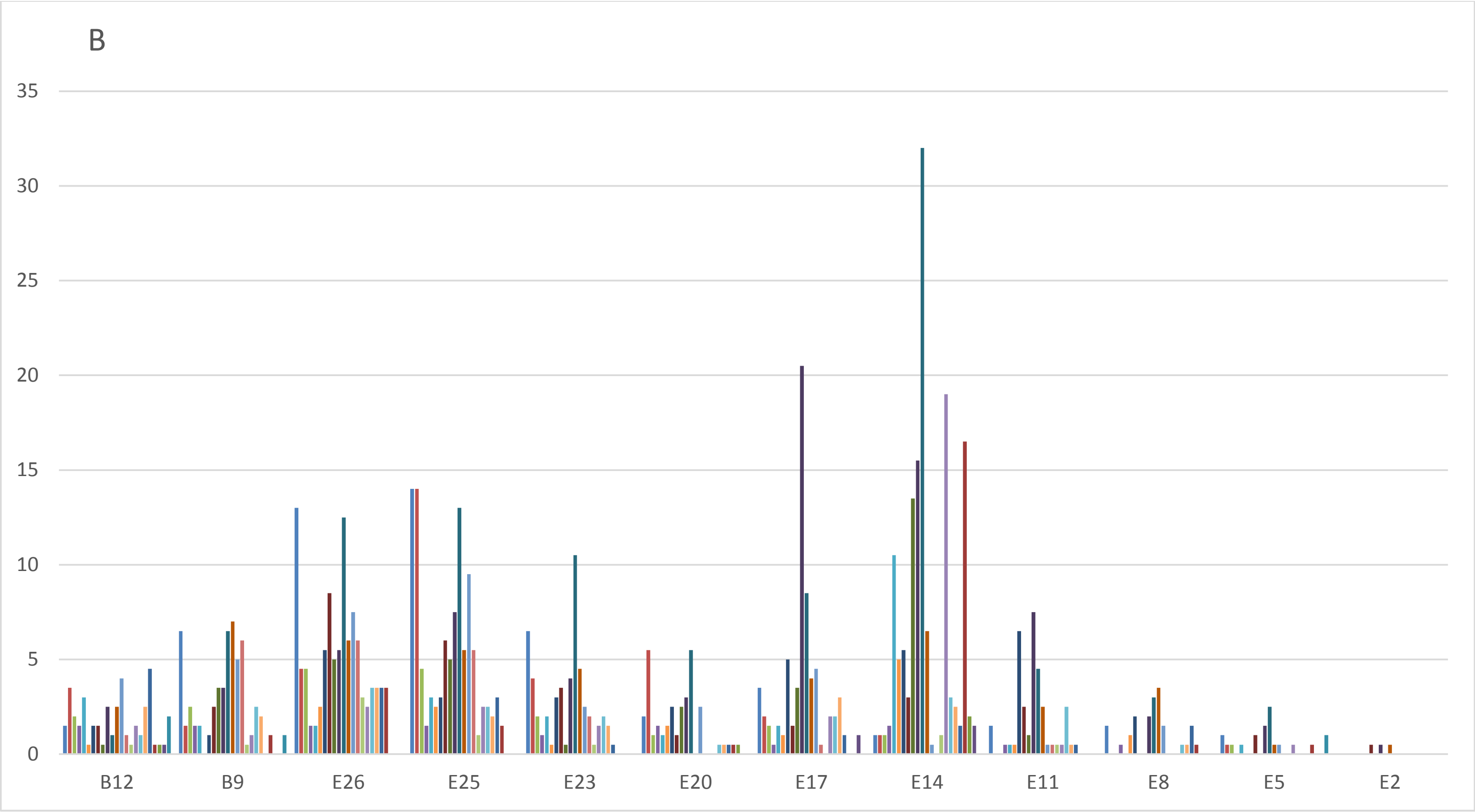


Figure A-23. (replicated from Application C.1-36) Abundance of *Capitella telata* at outfall depths stations near PLOO from 1991-2013. Values for each station during July survey only. Data expressed as mean abundance per $0.1m^2$.

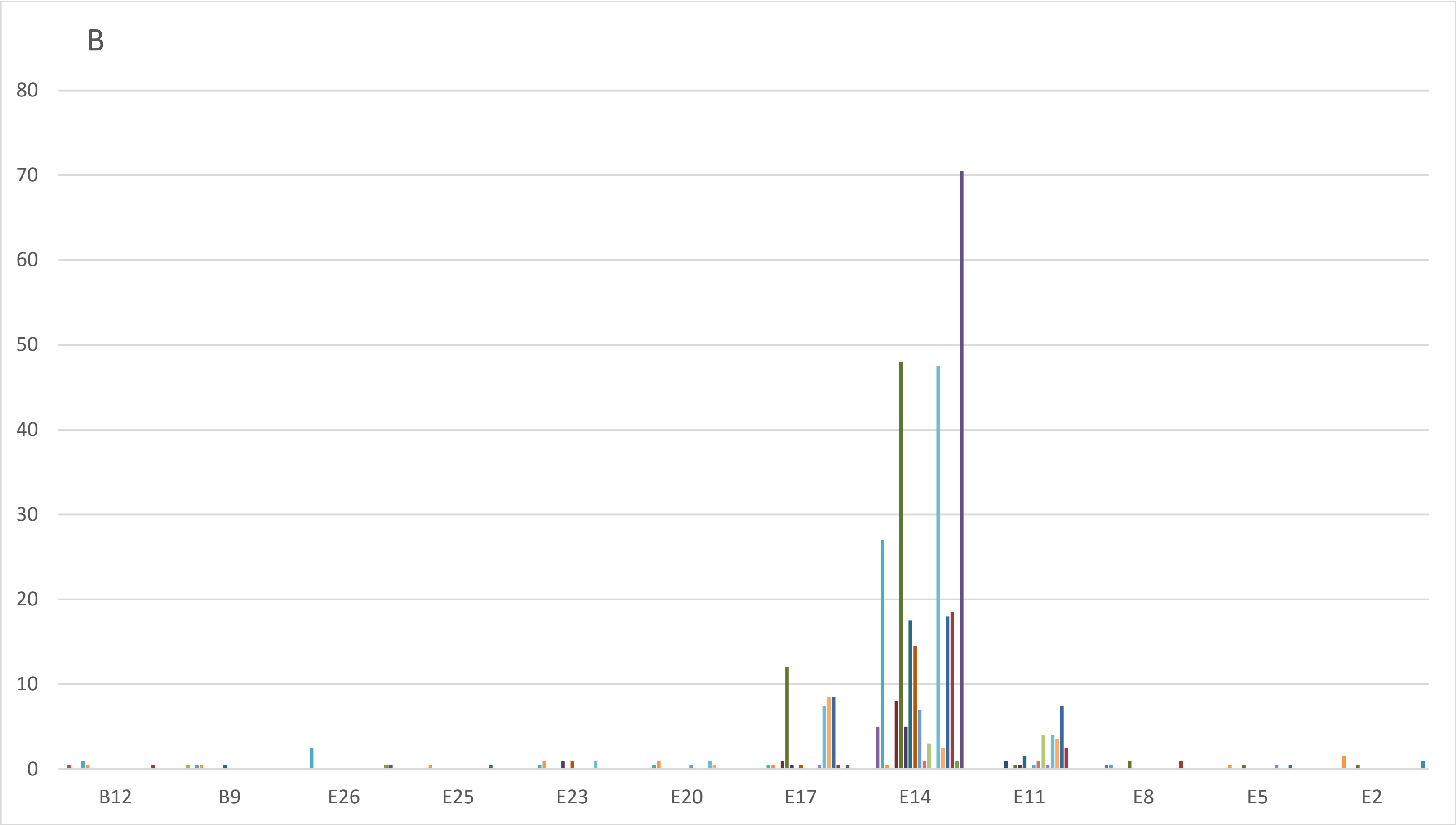


Figure A-24. Map of trawl fishing zones and rig fishing monitoring station locations in offshore area.

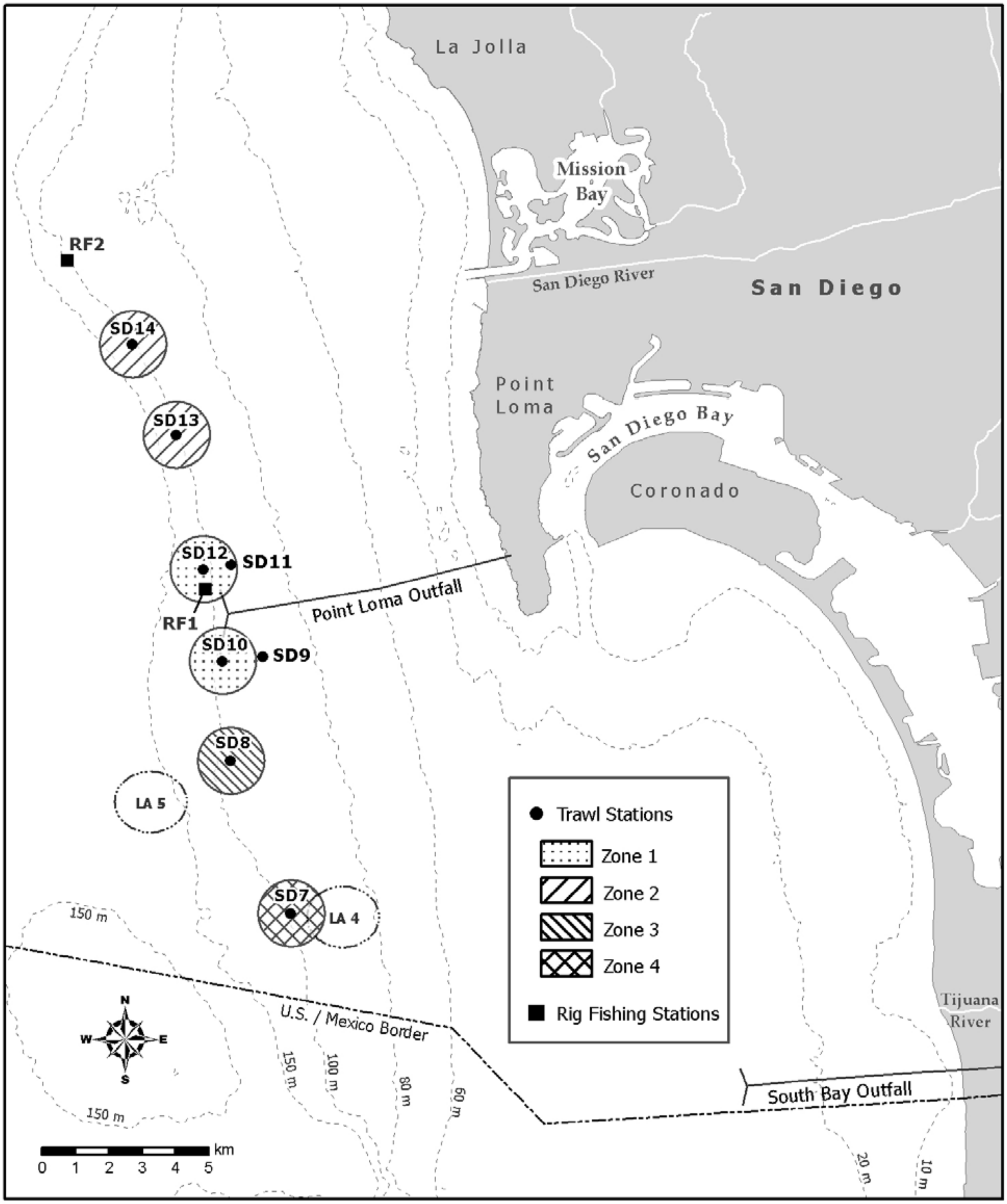


Figure A-25. Average total arsenic concentrations in flatfish liver at 98 meter trawl fishing zone (TFZ) stations during October (1995-2013).

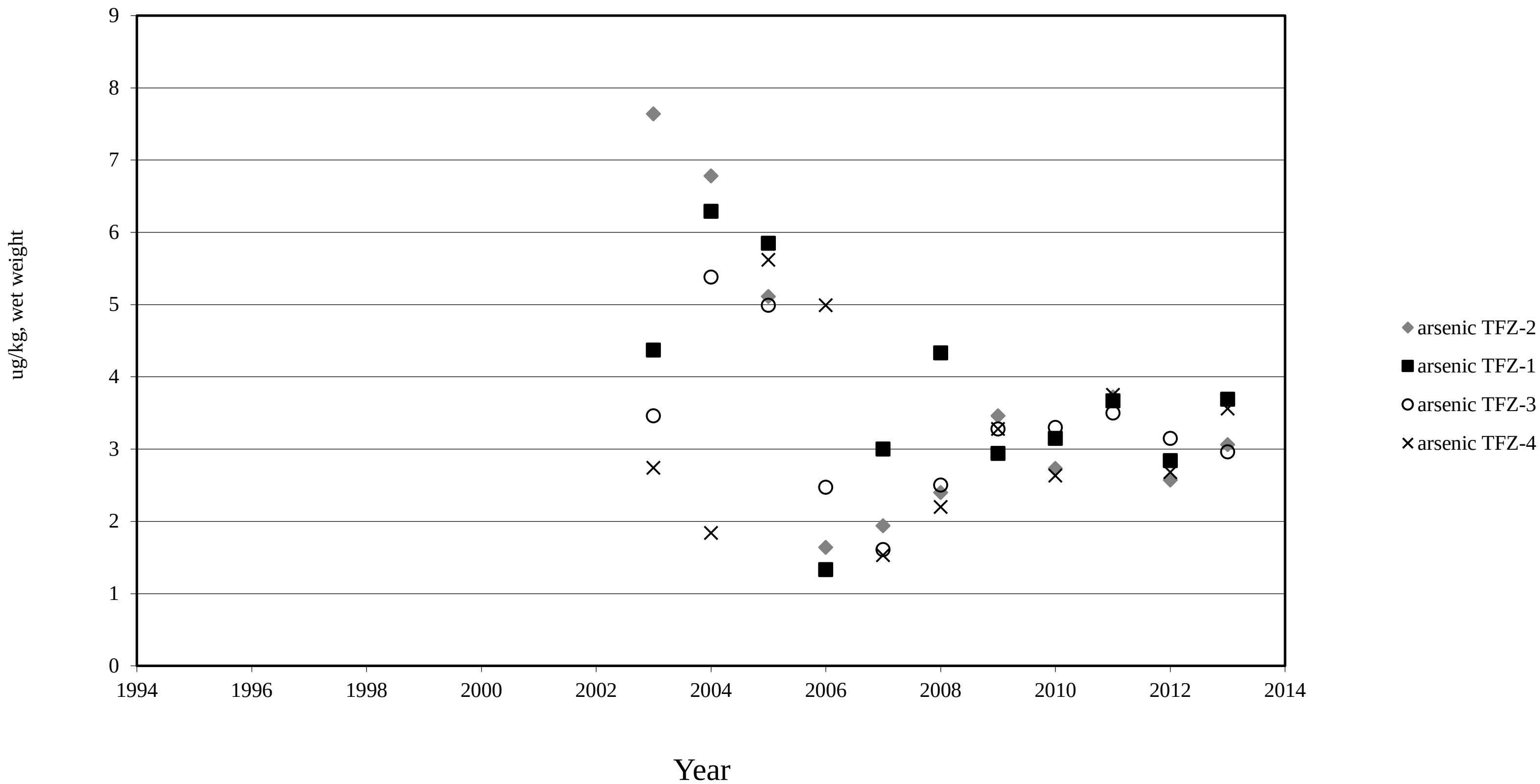


Figure A-26. Average mercury concentrations (ug/kg) in flatfish liver at trawl fishing zone stations during October (2003-2013).

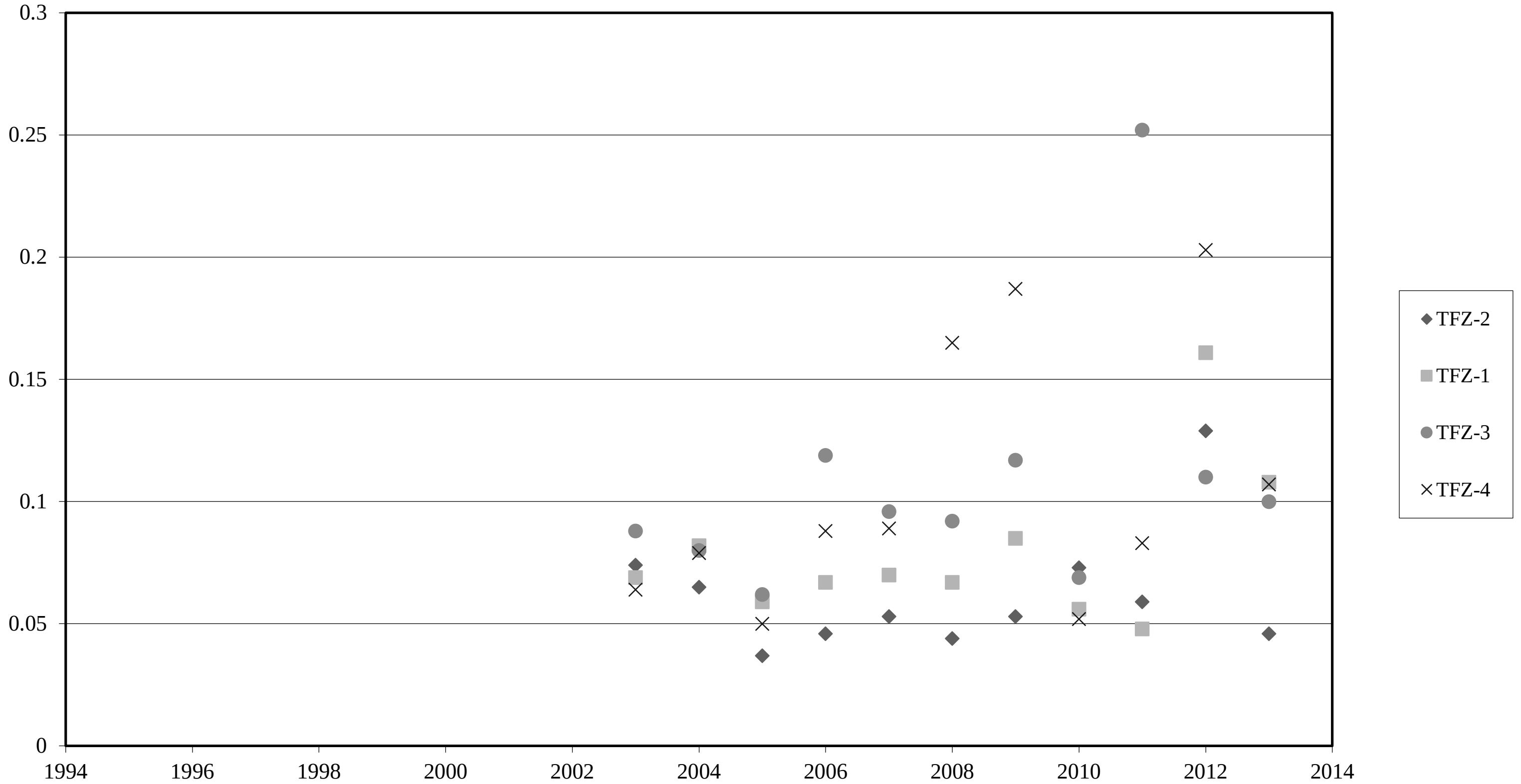


Figure A-27. Average selenium concentrations (ug/kg) in flatfish liver at trawl fishing zone stations during October (2003-2013).

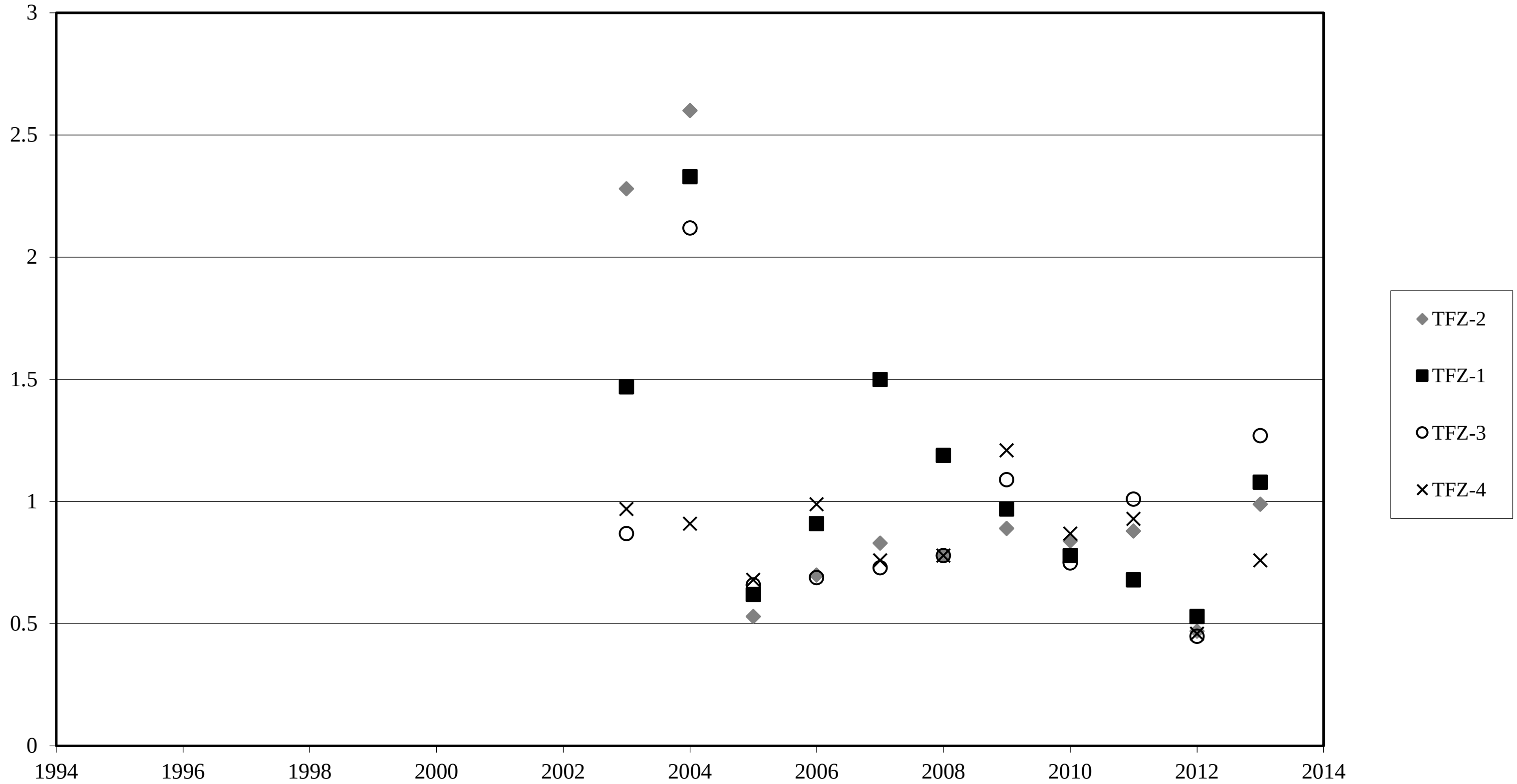


Figure A-28. Total BHC concentrations (ug/kg) in flatfish liver at trawl fishing zone stations during October (1995-2013).

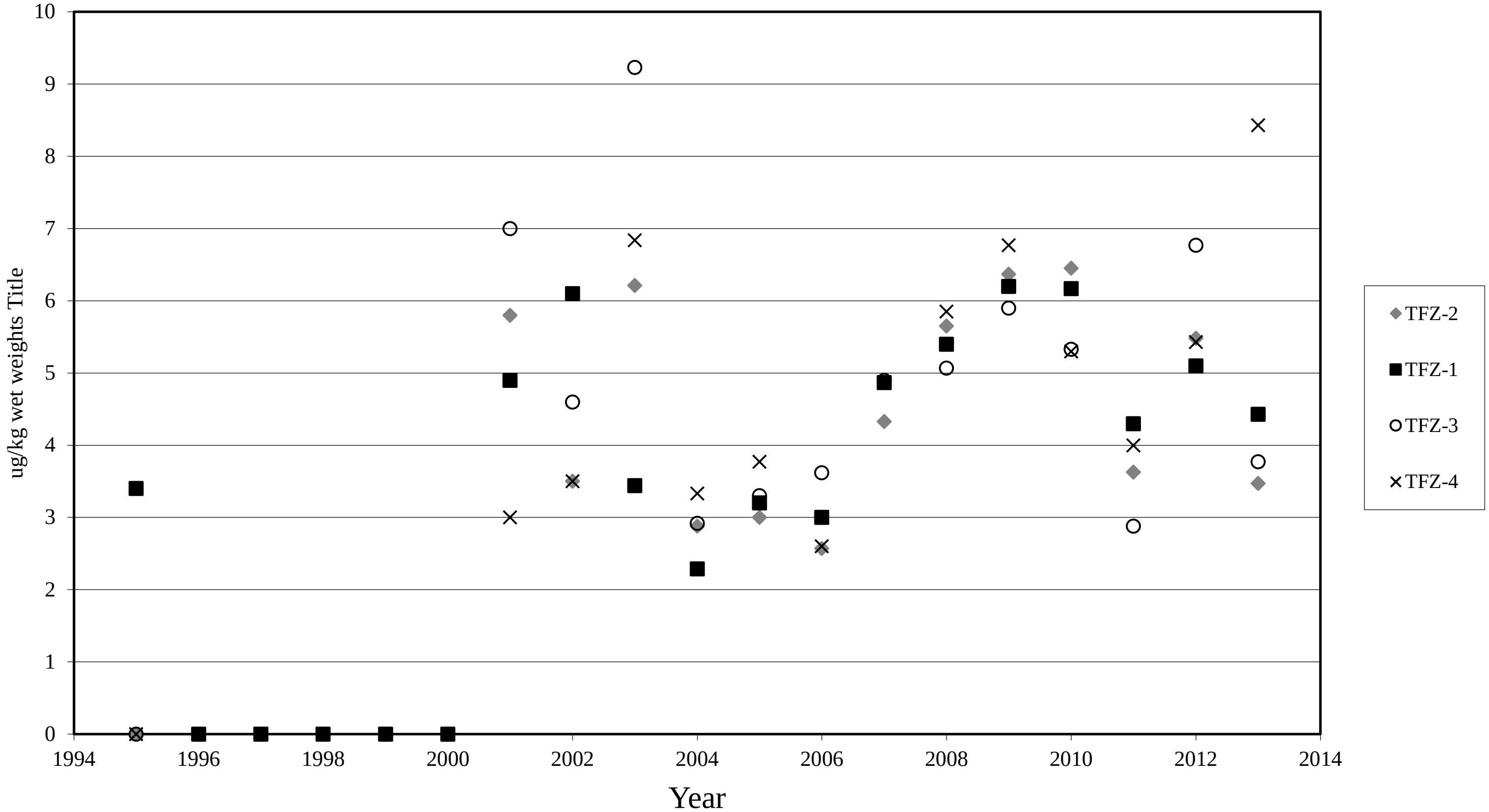


Figure A-29. Average total chlordane concentrations in flatfish liver at 98 meter trawl fishing zone (TFZ) stations during October (1995-2013).

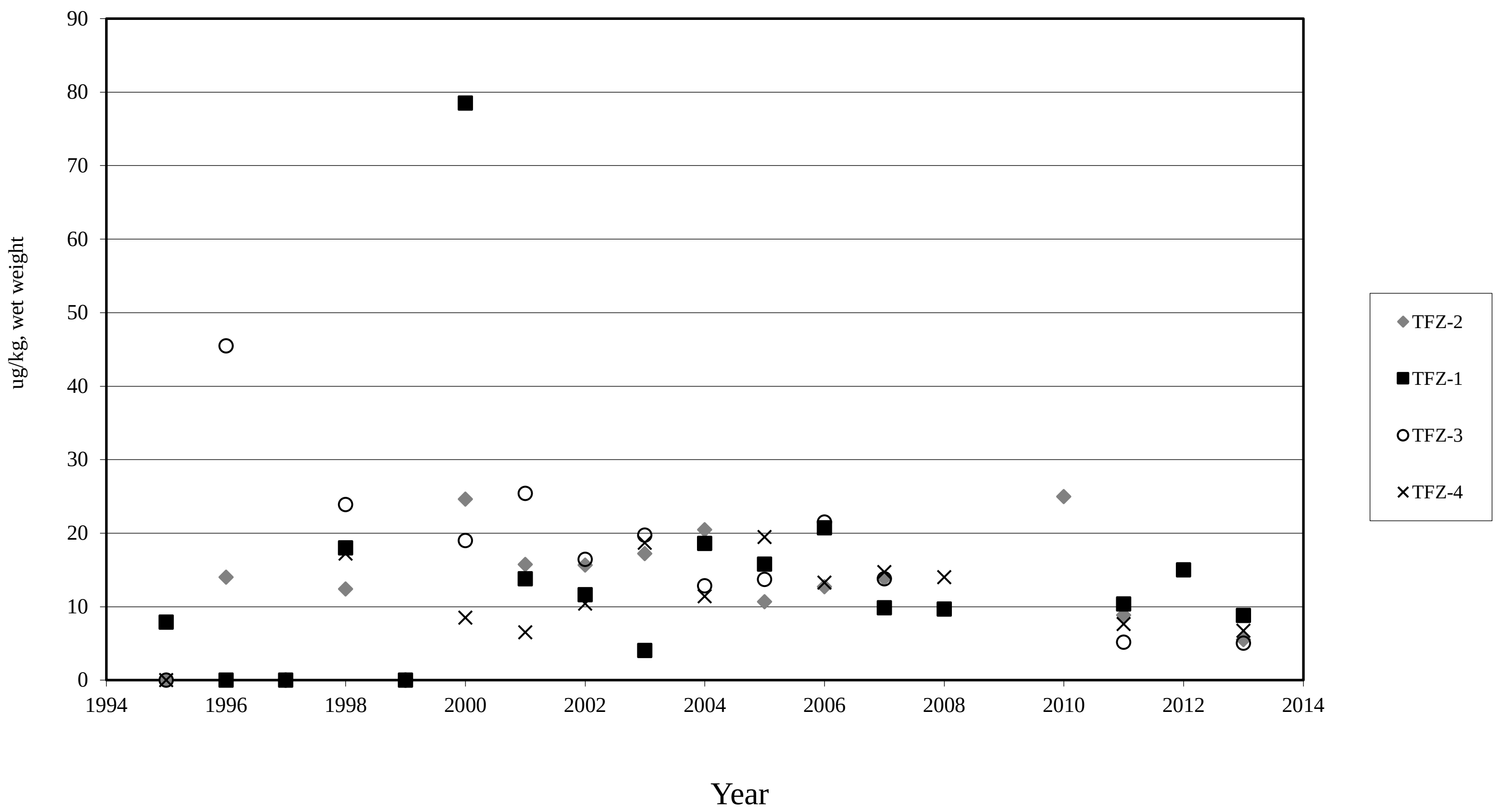


Figure A-30. Average total DDT concentrations in flatfish liver at 98 meter trawl fishing zone (TFZ) stations during October (1995-2013).

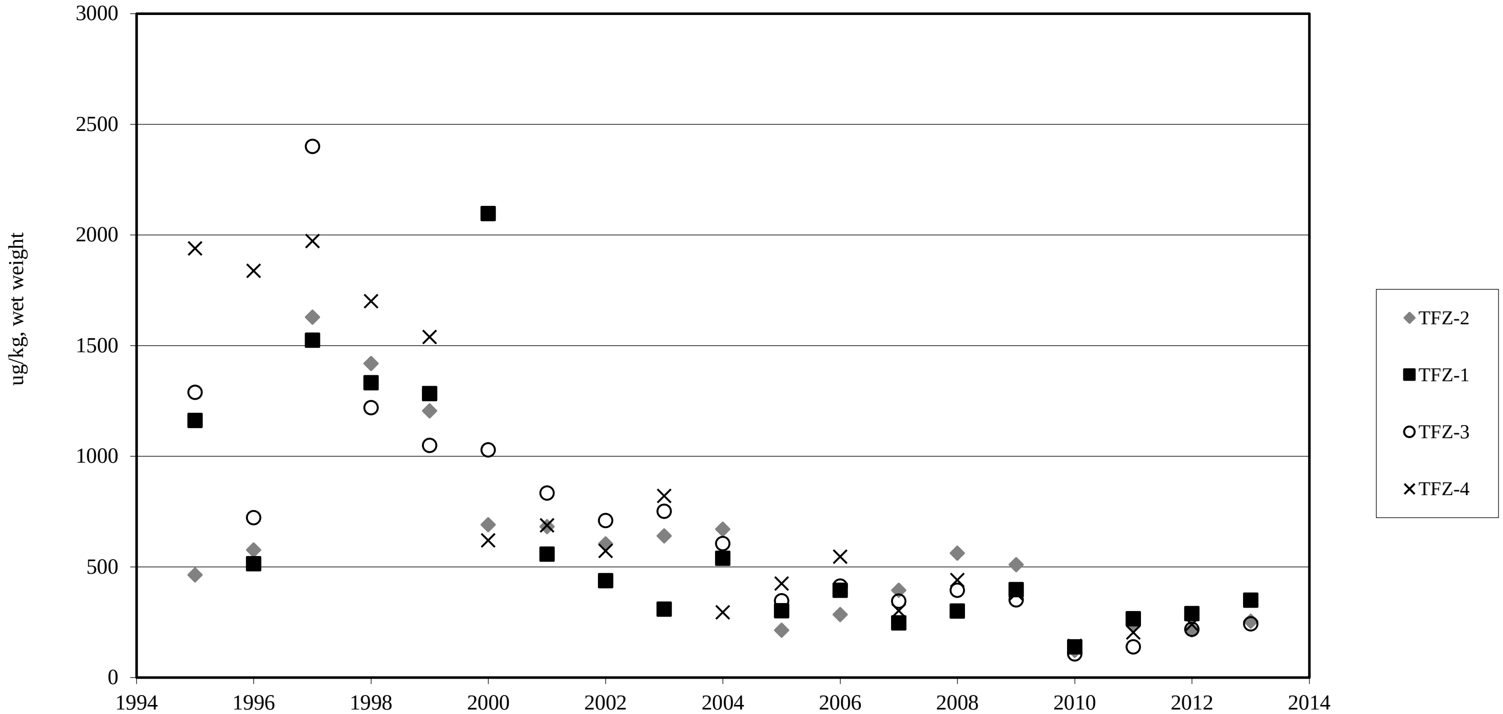


Figure A-31. Average total PCB concentrations in flatfish liver at 98 meter trawl fishing zone (TFZ) stations during October (1995-2013).

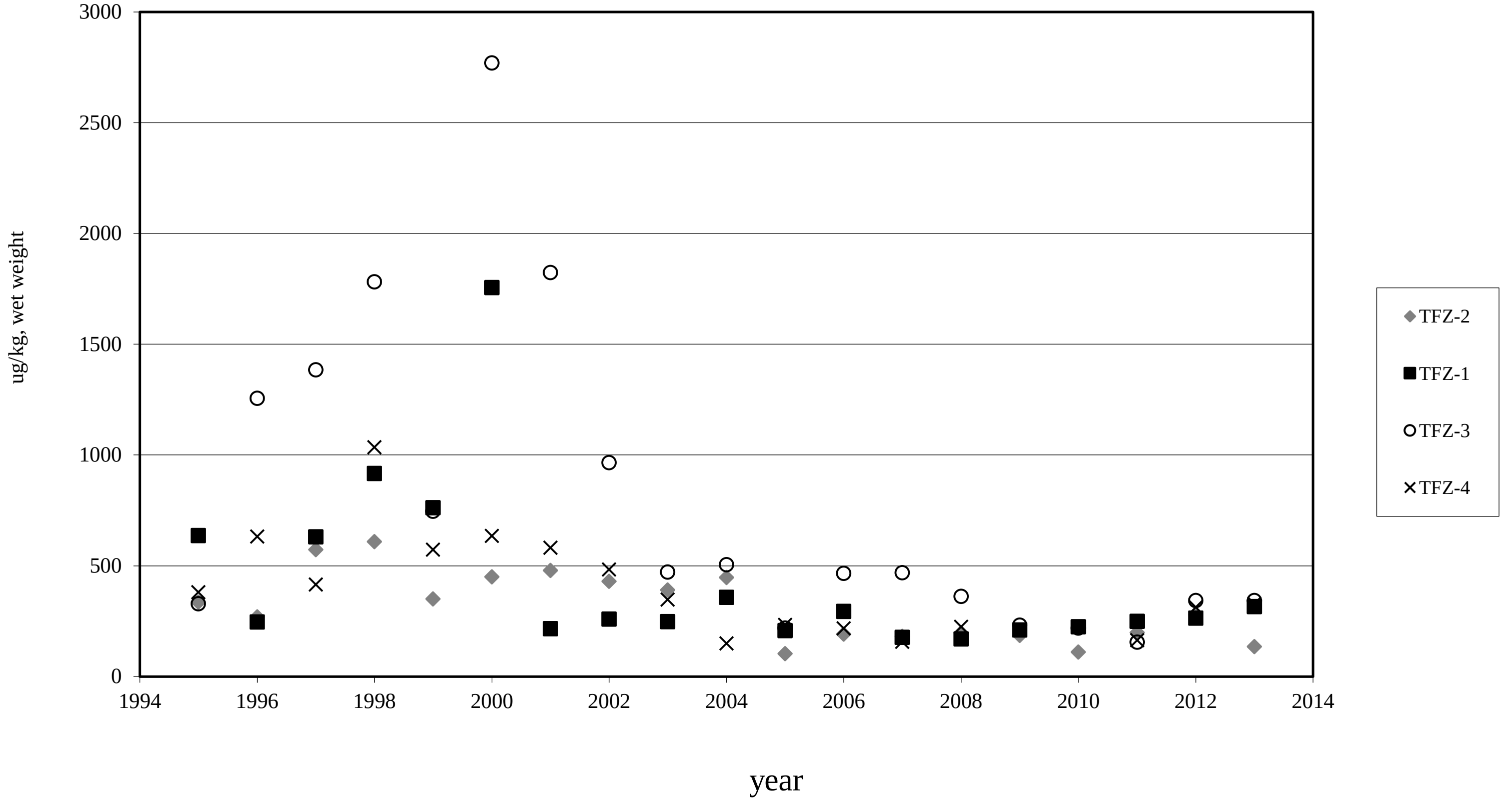


Figure A-32. Average total Arsenic concentrations in rockfish muscle at 98 meter rig fishing (RF) stations during October (1995-2013).

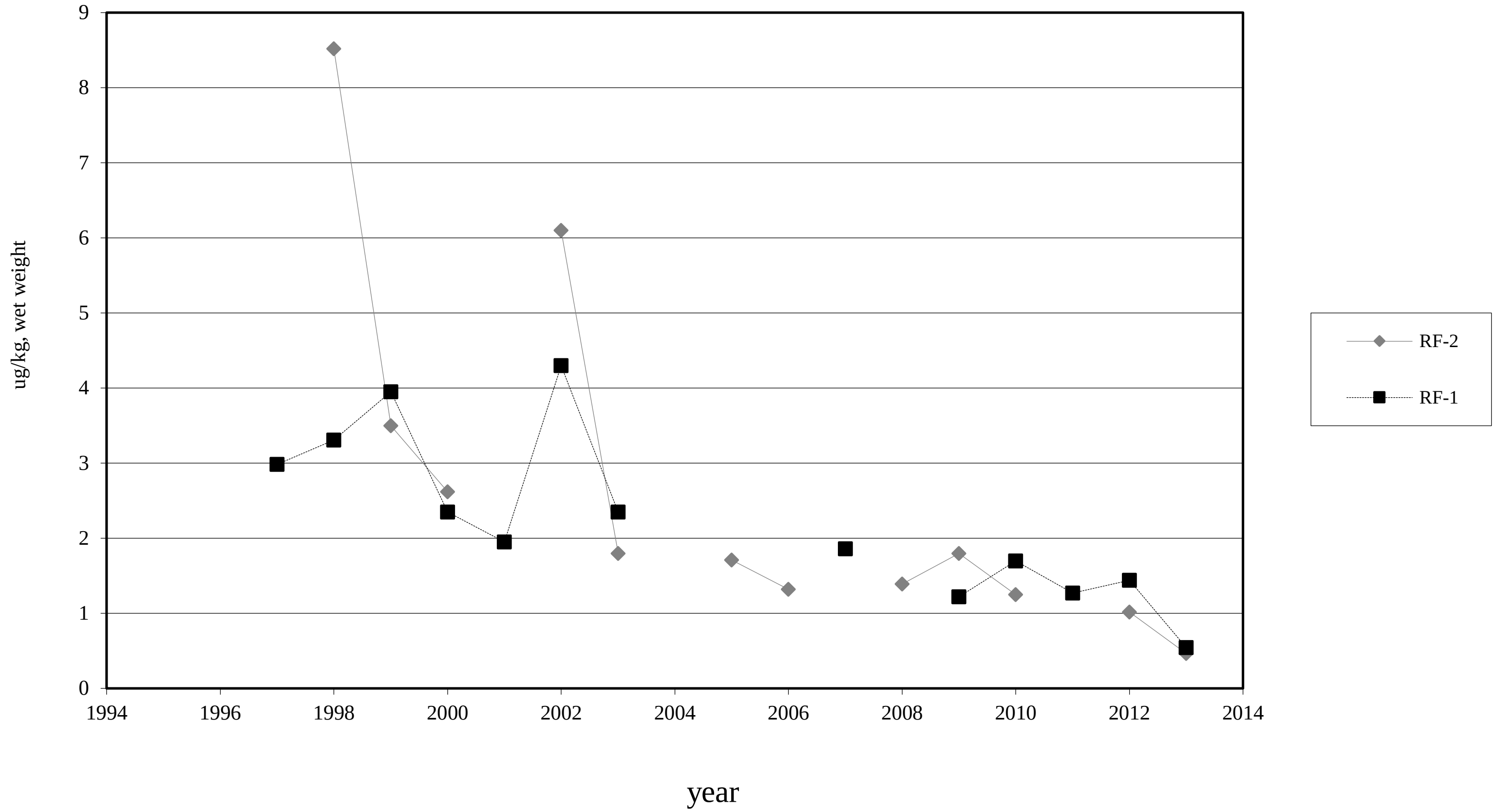


Figure A-33. Average total mercury concentrations in rockfish muscle at 98 meter rig fishing (RF) stations during October (1995-2013).

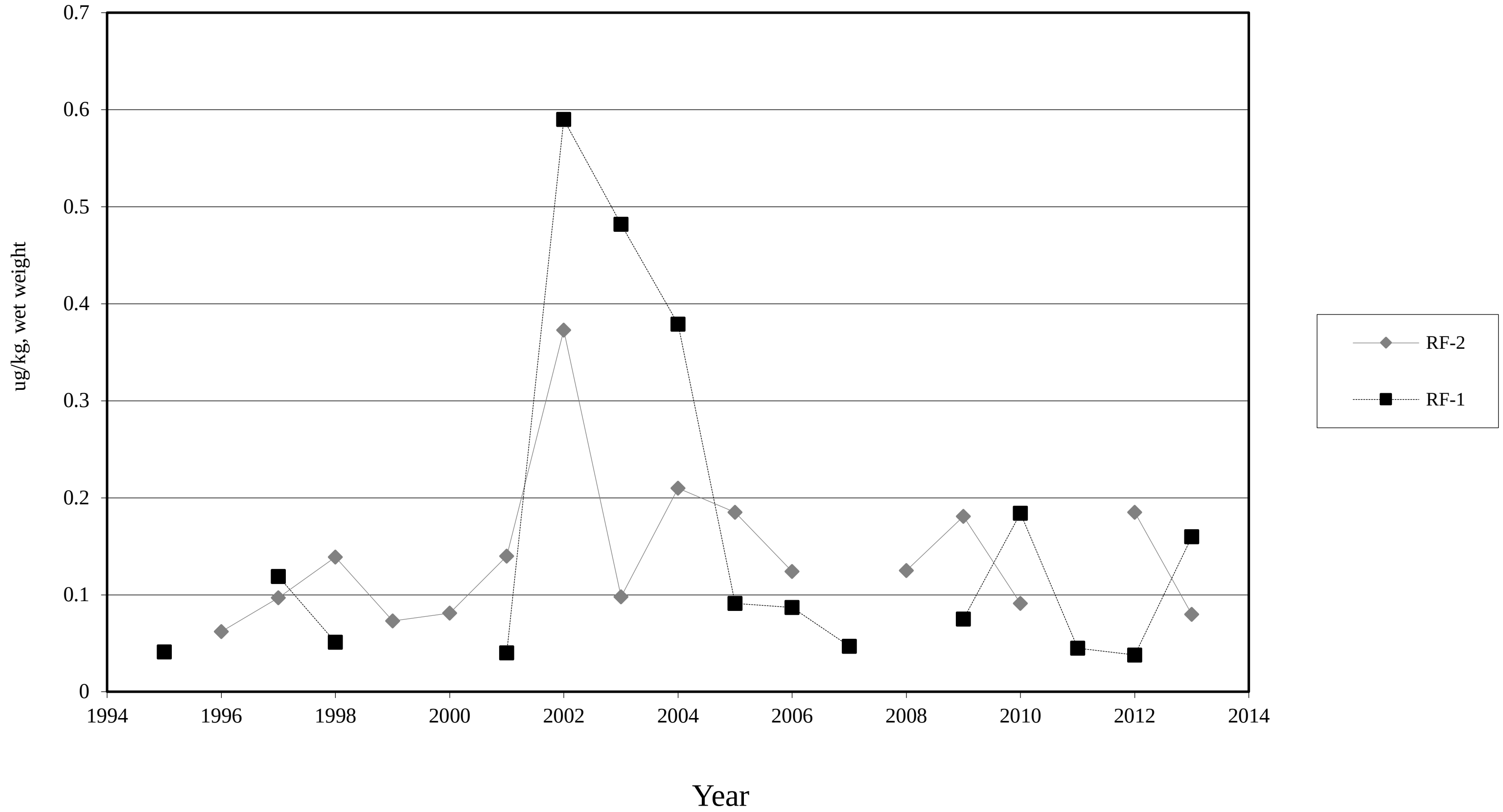


Figure A-34. Average total selenium concentrations in rockfish muscle at 98 meter rig fishing (RF) stations during October (1995-2013).

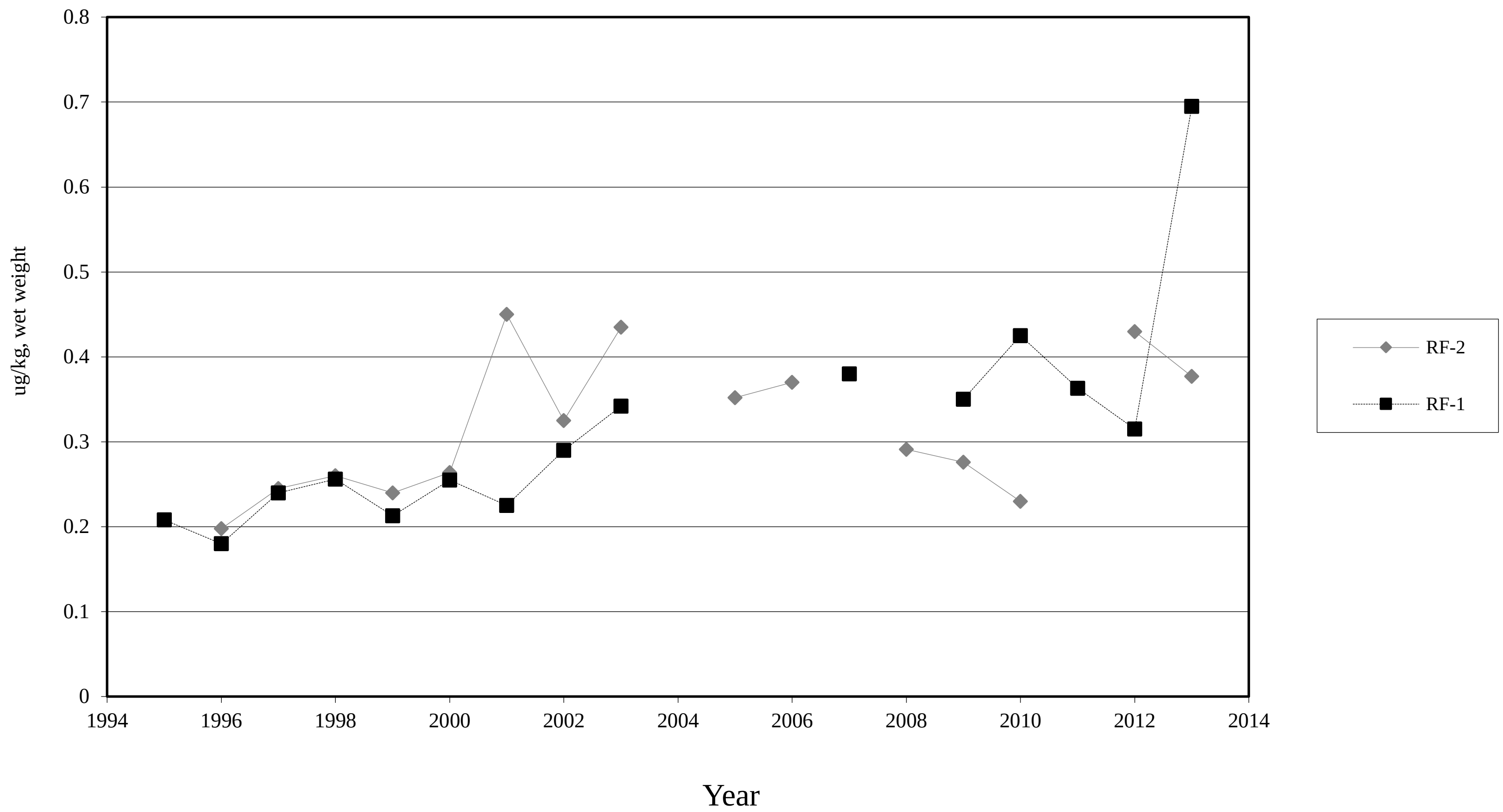


Figure A-35. Average total chlordane concentrations in rockfish muscle at 98 meter rig fishing (RF) stations during October (1995-2013).

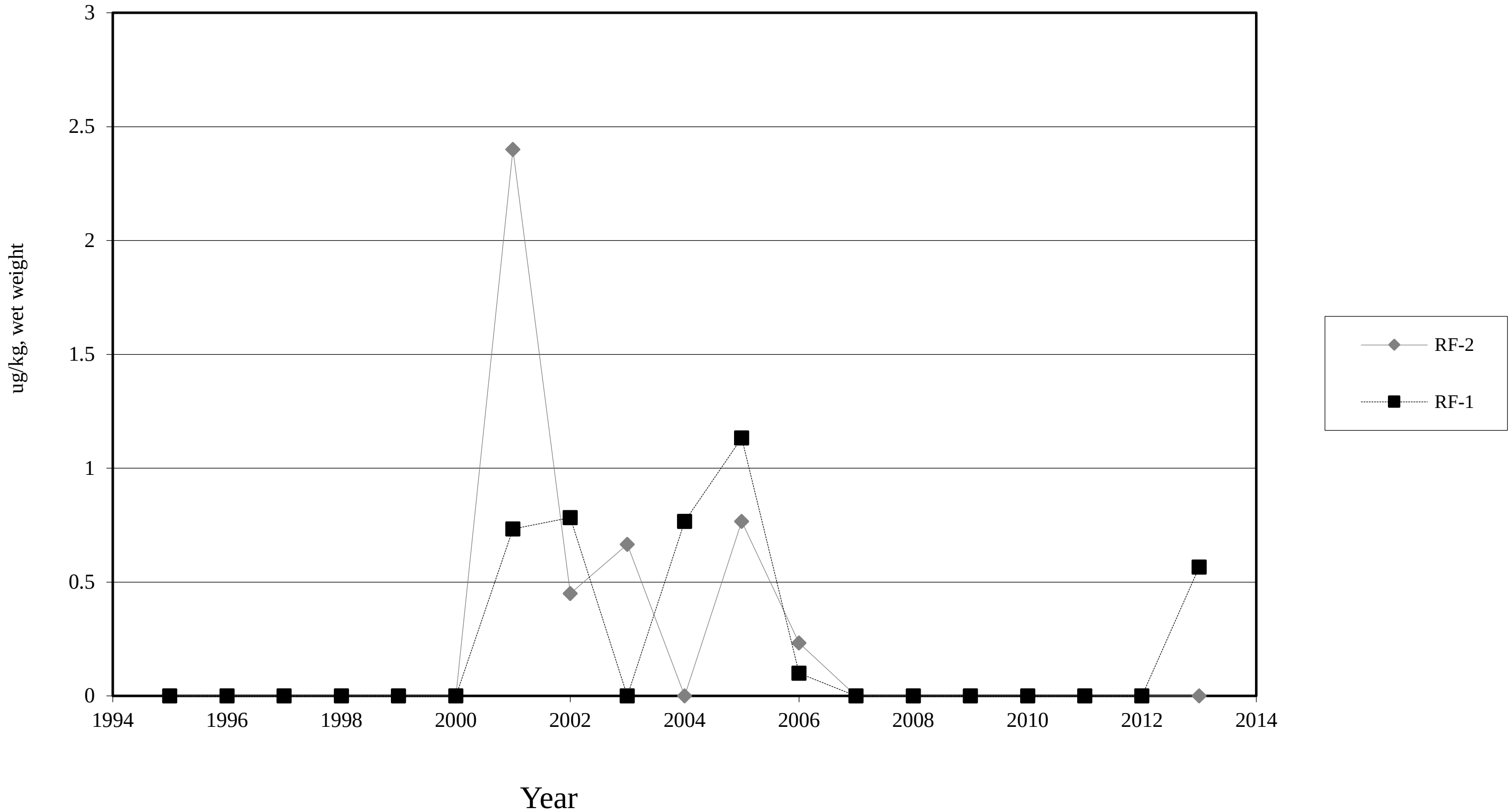


Figure A-36. Average total DDT concentrations in rockfish muscle at 98 meter rig fishing (RF) stations during October (1995-2013).

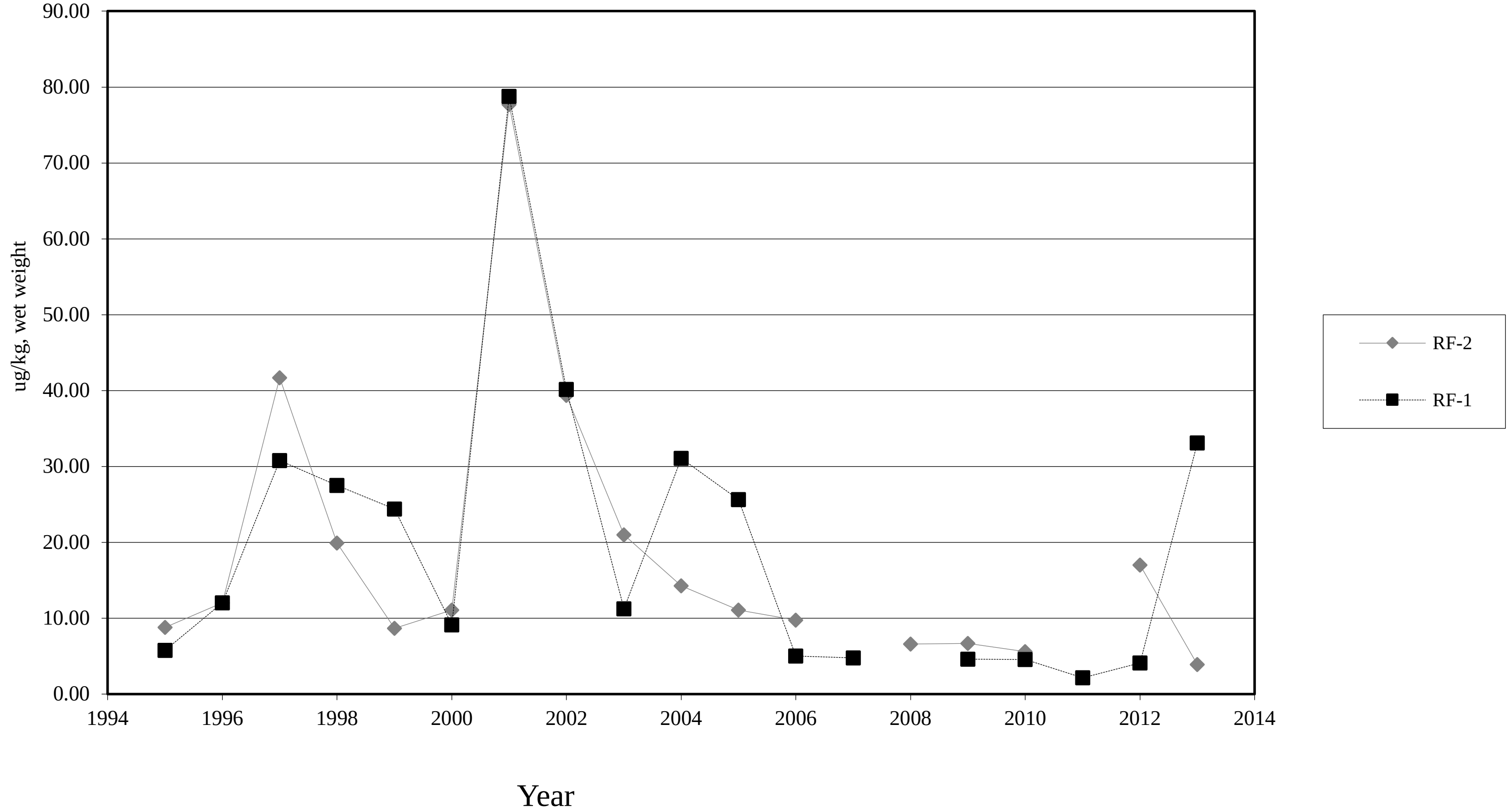
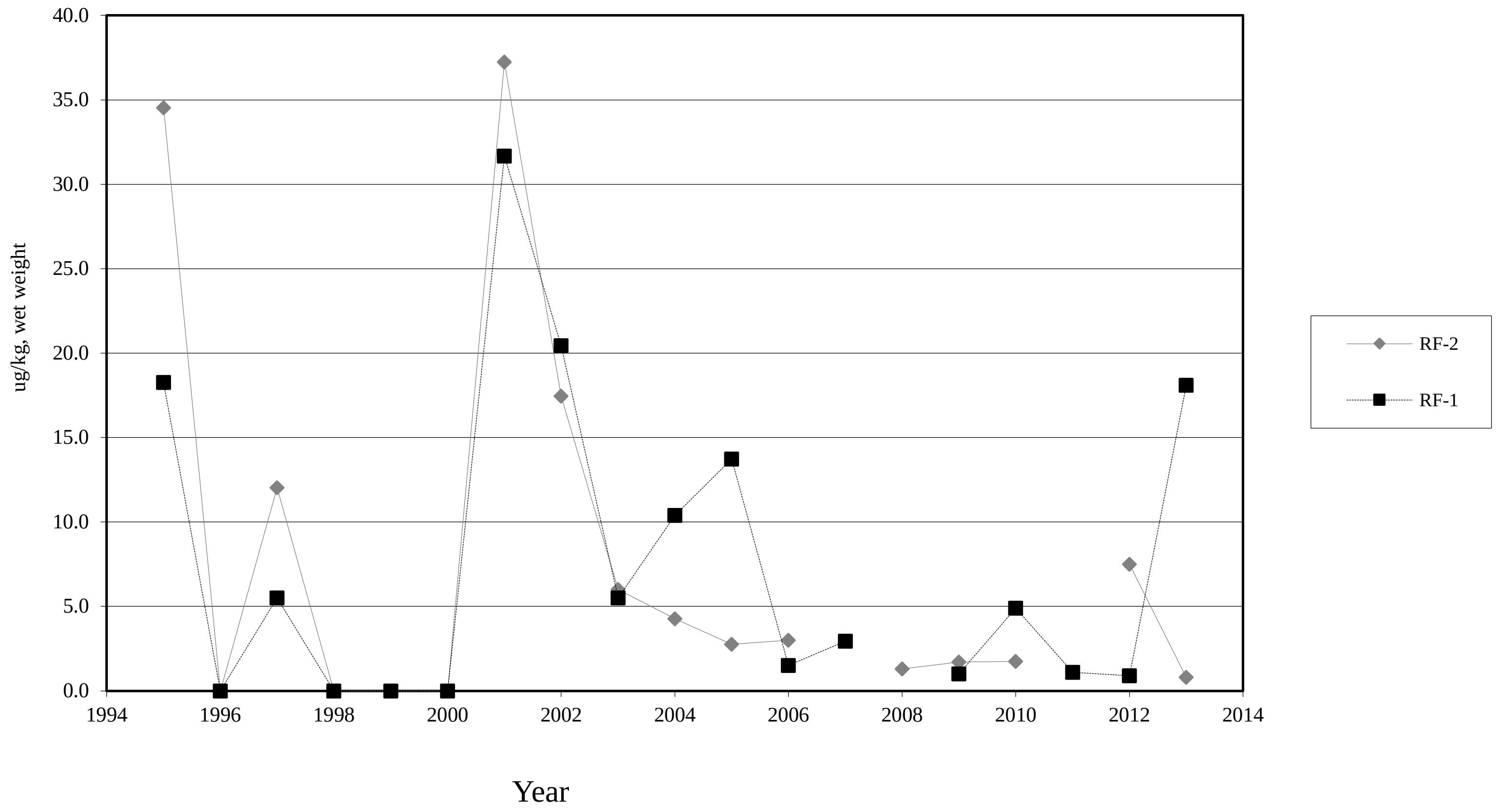


Figure A-37. Average total PCB concentrations in rockfish muscle at 98 meter rig fishing (RF) stations during October (1995-2013).



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APPENDIX B – TABLES

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Table B-1. Long-term average and ±1 standard deviation for percent transmissivity (XMS, %) at offshore station water depths, by contour, from 2008 through 2013.

Contour (m)	Stn	Water Depth (m)								
		1	15	25	40	60	70	80	95	100
20	F03	79 ± 4	82 ± 7	-	-	-	-	-	-	-
	F02	76 ± 7	82 ± 6							
	F01	78 ± 7	82 ± 4							
60	F14	83 ± 4	85 ± 3	87 ± 3	88 ± 3	80 ± 10	-	-	-	-
	F13	83 ± 4	85 ± 4	88 ± 3	88 ± 4	81 ± 11				
	F12	77 ± 8	86 ± 3	88 ± 2	88 ± 4	82 ± 7				
	F11	82 ± 5	86 ± 3	88 ± 2	88 ± 4	81 ± 5				
	F10	82 ± 6	85 ± 4	88 ± 3	88 ± 3	80 ± 6				
	F09	82 ± 6	85 ± 5	88 ± 3	88 ± 3	81 ± 5				
	F08	82 ± 6	85 ± 4	88 ± 2	88 ± 3	83 ± 4				
	F07	81 ± 7	85 ± 5	88 ± 3	88 ± 3	84 ± 4				
	F06	81 ± 7	85 ± 6	88 ± 3	89 ± 2	82 ± 7				
	F05	82 ± 7	86 ± 5	88 ± 4	90 ± 2	85 ± 4				
	F04	82 ± 7	85 ± 5	88 ± 3	89 ± 3	86 ± 4				
80	F25	86 ± 3	86 ± 4	88 ± 3	89 ± 1	89 ± 2	88 ± 2	86 ± 3	-	-
	F24	86 ± 3	85 ± 4	88 ± 3	89 ± 2	89 ± 2	88 ± 3	85 ± 5		
	F23	86 ± 3	85 ± 5	88 ± 3	90 ± 2	90 ± 2	88 ± 3	85 ± 4		
	F22	83 ± 5	85 ± 5	88 ± 2	90 ± 1	90 ± 2	89 ± 2	85 ± 4		
	F21	84 ± 5	84 ± 7	88 ± 2	90 ± 2	90 ± 2	89 ± 2	87 ± 3		
	F20	84 ± 4	84 ± 6	88 ± 3	90 ± 2	90 ± 1	89 ± 2	86 ± 3		
	F19	84 ± 4	85 ± 5	88 ± 4	90 ± 2	89 ± 1	89 ± 2	86 ± 4		
	F18	83 ± 6	84 ± 5	87 ± 4	89 ± 2	89 ± 2	87 ± 7	84 ± 6		
	F17	83 ± 6	84 ± 8	86 ± 6	89 ± 2	90 ± 2	88 ± 3	84 ± 6		
	F16	83 ± 6	84 ± 7	87 ± 4	89 ± 2	90 ± 2	88 ± 2	85 ± 5		
	F15	80 ± 6	84 ± 5	88 ± 2	90 ± 2	90 ± 1	89 ± 2	85 ± 4		
100	F36	87 ± 2	86 ± 5	88 ± 2	90 ± 2	91 ± 1	91 ± 1	90 ± 2	89 ± 4	89 ± 2
	F35	86 ± 3	86 ± 3	87 ± 5	90 ± 1	90 ± 1	90 ± 2	90 ± 2	89 ± 2	89 ± 2
	F34	85 ± 4	85 ± 6	88 ± 3	90 ± 1	90 ± 1	90 ± 1	89 ± 2	89 ± 2	88 ± 2
	F33	85 ± 3	86 ± 4	87 ± 5	90 ± 2	90 ± 2	90 ± 2	89 ± 2	89 ± 2	89 ± 2
	F32	85 ± 3	85 ± 5	88 ± 2	90 ± 1	90 ± 2	90 ± 2	90 ± 2	89 ± 2	88 ± 3
	F31	85 ± 4	85 ± 4	87 ± 5	90 ± 1	90 ± 1	90 ± 1	89 ± 2	89 ± 2	91 DIV/0
Near-ZID:	F30	85 ± 4	85 ± 5	88 ± 2	90 ± 1	90 ± 2	89 ± 2	88 ± 2	89 ± 2	90 ± 1
	F29	85 ± 4	86 ± 3	88 ± 2	90 ± 1	90 ± 1	90 ± 1	90 ± 1	89 ± 3	89 ± 1
	F28	85 ± 4	86 ± 3	88 ± 2	90 ± 1	90 ± 1	90 ± 1	90 ± 2	89 ± 3	89 ± 1
	F27	86 ± 4	86 ± 4	87 ± 2	90 ± 1	90 ± 1	90 ± 1	90 ± 2	89 ± 2	89 ± 2
	F26	85 ± 5	86 ± 4	87 ± 3	90 ± 1	90 ± 1	90 ± 1	90 ± 2	89 ± 2	89 ± 1

Table B-2. Long-term average and ±1 standard deviation for dissolved oxygen (mg/l) at offshore station water depths, by contour, from 2008 through 2013.

Contour (m)	Stn	Water Depth 1	15	25	40	60	70	80	95	100
20	F03	8.4 ± 0.6	6.6 ± 1.3	-	-	-	-	-	-	-
	F02	8.2 ± 0.4	6.5 ± 1.3							
	F01	8.3 ± 1.0	6.4 ± 1.3							
60	F14	8.3 ± 0.6	7.6 ± 1.4	6.2 ± 1.4	5.3 ± 1.3	4.4 ± 1.1	-	-	-	-
	F13	8.2 ± 0.6	7.4 ± 1.4	6.1 ± 1.4	5.3 ± 1.3	4.3 ± 1.1				
	F12	8.3 ± 0.6	7.2 ± 1.5	6.2 ± 1.4	5.3 ± 1.3	4.3 ± 1.1				
	F11	8.2 ± 0.7	7.0 ± 1.6	6.0 ± 1.3	5.3 ± 1.2	4.4 ± 1.1				
	F10	8.4 ± 0.6	7.1 ± 1.5	6.1 ± 1.4	5.2 ± 1.2	4.4 ± 1.2				
	F09	8.4 ± 0.6	7.4 ± 1.5	6.1 ± 1.3	5.2 ± 1.4	4.3 ± 1.2				
	F08	8.4 ± 0.6	7.1 ± 1.4	6.0 ± 1.4	5.1 ± 1.4	4.3 ± 1.2				
	F07	8.4 ± 0.7	7.0 ± 1.5	6.0 ± 1.6	5.3 ± 1.5	4.4 ± 1.3				
	F06	8.5 ± 0.9	7.3 ± 1.6	6.1 ± 1.5	5.3 ± 1.4	4.4 ± 1.2				
	F05	8.5 ± 1.1	7.1 ± 1.6	6.0 ± 1.4	5.3 ± 1.3	4.3 ± 1.2				
	F04	8.6 ± 1.0	7.3 ± 1.5	6.2 ± 1.4	5.3 ± 1.3	4.3 ± 1.1				
80	F25	8.2 ± 0.5	8.2 ± 0.8	7.0 ± 1.3	5.8 ± 1.3	4.6 ± 1.0	4.1 ± 0.9	3.9 ± 1.0	-	-
	F24	8.1 ± 0.6	8.1 ± 1.0	6.9 ± 1.4	5.7 ± 1.2	4.5 ± 1.1	4.1 ± 1.0	3.8 ± 1.0		
	F23	8.1 ± 0.6	7.9 ± 1.1	6.7 ± 1.5	5.6 ± 1.2	4.5 ± 1.1	4.1 ± 1.1	3.8 ± 1.0		
	F22	8.2 ± 0.5	7.8 ± 1.2	6.5 ± 1.4	5.4 ± 1.2	4.5 ± 1.2	4.1 ± 1.1	3.8 ± 1.0		
	F21	8.3 ± 0.6	7.7 ± 1.1	6.6 ± 1.3	5.6 ± 1.2	4.5 ± 1.1	4.1 ± 1.1	3.8 ± 1.0		
	F20	8.3 ± 0.8	7.5 ± 1.2	6.5 ± 1.4	5.5 ± 1.2	4.5 ± 1.1	4.1 ± 1.1	3.8 ± 1.0		
	F19	8.4 ± 1.0	7.6 ± 1.2	6.5 ± 1.5	5.5 ± 1.2	4.4 ± 1.1	4.1 ± 1.1	3.8 ± 1.0		
	F18	8.5 ± 1.2	7.7 ± 1.4	6.6 ± 1.4	5.4 ± 1.3	4.4 ± 1.1	4.2 ± 1.1	3.9 ± 1.1		
	F17	8.4 ± 1.1	7.9 ± 1.2	6.7 ± 1.4	5.5 ± 1.4	4.5 ± 1.2	4.2 ± 1.1	3.9 ± 1.0		
	F16	8.4 ± 1.0	7.8 ± 1.4	6.7 ± 1.6	5.5 ± 1.4	4.5 ± 1.2	4.2 ± 1.2	3.9 ± 1.1		
	F15	8.5 ± 1.1	7.7 ± 1.1	6.6 ± 1.4	5.4 ± 1.4	4.5 ± 1.2	4.2 ± 1.1	3.8 ± 1.0		
100	F36	8.0 ± 0.5	8.4 ± 0.7	7.1 ± 1.2	6.1 ± 1.3	5.1 ± 1.3	4.6 ± 1.2	4.2 ± 1.1	3.6 ± 0.9	3.5 ± 0.8
	F35	8.1 ± 0.5	8.2 ± 0.9	7.0 ± 1.2	5.9 ± 1.3	4.8 ± 1.2	4.4 ± 1.1	4.1 ± 1.0	3.6 ± 0.9	3.5 ± 1.0
	F34	8.4 ± 1.2	8.3 ± 1.0	6.9 ± 1.2	5.8 ± 1.3	4.7 ± 1.1	4.3 ± 1.0	4.0 ± 1.0	3.6 ± 1.0	3.6 ± 1.0
	F33	8.3 ± 1.0	8.2 ± 1.4	6.9 ± 1.4	5.7 ± 1.3	4.5 ± 1.2	4.2 ± 1.1	4.0 ± 1.0	3.7 ± 1.0	3.7 ± 0.9
	F32	8.3 ± 0.8	7.8 ± 0.9	7.0 ± 1.4	5.6 ± 1.3	4.6 ± 1.1	4.3 ± 1.1	4.0 ± 1.1	3.6 ± 0.9	3.8 ± 1.0
	F31	8.3 ± 0.9	8.2 ± 1.4	7.0 ± 1.4	5.8 ± 1.1	4.7 ± 1.1	4.3 ± 1.1	4.0 ± 1.0	3.6 ± 1.0	3.9 ± 0.0
NearZID	F30	8.3 ± 0.8	7.8 ± 1.1	7.0 ± 1.5	5.8 ± 1.2	4.6 ± 1.1	4.1 ± 1.1	3.9 ± 1.1	3.6 ± 0.9	3.2 ± 1.2
	F29	8.2 ± 0.7	7.8 ± 1.1	7.0 ± 1.5	5.8 ± 1.2	4.7 ± 1.2	4.3 ± 1.1	4.1 ± 1.1	3.6 ± 0.9	4.4 ± 1.2
	F28	8.2 ± 0.7	7.9 ± 1.0	7.1 ± 1.4	5.9 ± 1.2	4.8 ± 1.2	4.4 ± 1.1	4.1 ± 1.1	3.7 ± 1.0	3.7 ± 1.0
	F27	8.2 ± 0.7	7.8 ± 0.9	7.0 ± 1.3	5.8 ± 1.3	4.7 ± 1.1	4.4 ± 1.1	4.0 ± 1.0	3.6 ± 0.9	3.9 ± 1.5
	F26	8.3 ± 0.7	7.8 ± 0.9	7.0 ± 1.3	5.8 ± 1.4	4.8 ± 1.2	4.4 ± 1.1	4.0 ± 1.0	3.7 ± 1.0	4.4 ± 1.5

Table B-3. Long-term average and ±1 standard deviation for pH (units) at offshore station water depths, by contour, from 2008 through 2013.

Contour (m)	Stn	Water Depth (m) 1	15	25	40	60	70	80	95	100
20	F03	8.16 ± 0.1	8.02 ± 0.1	-	-	-	-	-	-	-
	F02	8.14 ± 0.1	8.01 ± 0.2							
	F01	8.16 ± 0.1	8.01 ± 0.1							
60	F14	8.17 ± 0.1	8.09 ± 0.1	7.97 ± 0.2	7.89 ± 0.2	7.82 ± 0.2	-	-	-	-
	F13	8.17 ± 0.1	8.08 ± 0.1	7.97 ± 0.2	7.90 ± 0.2	7.82 ± 0.2				
	F12	8.17 ± 0.1	8.06 ± 0.2	7.97 ± 0.2	7.90 ± 0.2	7.82 ± 0.2				
	F11	8.15 ± 0.1	8.03 ± 0.2	7.95 ± 0.2	7.89 ± 0.2	7.82 ± 0.2				
	F10	8.21 ± 0.1	8.10 ± 0.1	8.00 ± 0.2	7.93 ± 0.2	7.86 ± 0.2				
	F09	8.21 ± 0.1	8.11 ± 0.1	8.00 ± 0.1	7.92 ± 0.2	7.85 ± 0.2				
	F08	8.21 ± 0.1	8.09 ± 0.1	7.99 ± 0.1	7.92 ± 0.2	7.85 ± 0.2				
	F07	8.19 ± 0.1	8.06 ± 0.1	7.99 ± 0.2	7.93 ± 0.2	7.86 ± 0.2				
	F06	8.21 ± 0.1	8.10 ± 0.2	8.02 ± 0.2	7.94 ± 0.2	7.86 ± 0.2				
	F05	8.21 ± 0.1	8.07 ± 0.1	7.99 ± 0.1	7.92 ± 0.2	7.86 ± 0.2				
	F04	8.21 ± 0.1	8.10 ± 0.1	8.01 ± 0.2	7.93 ± 0.2	7.86 ± 0.2				
80	F25	8.16 ± 0.1	8.13 ± 0.1	8.04 ± 0.2	7.94 ± 0.2	7.84 ± 0.2	7.80 ± 0.2	7.76 ± 0.1	-	-
	F24	8.18 ± 0.1	8.14 ± 0.1	8.04 ± 0.2	7.93 ± 0.2	7.84 ± 0.2	7.80 ± 0.2	7.78 ± 0.2		
	F23	8.18 ± 0.1	8.12 ± 0.1	8.02 ± 0.2	7.93 ± 0.2	7.84 ± 0.2	7.81 ± 0.2	7.78 ± 0.2		
	F22	8.20 ± 0.1	8.14 ± 0.1	8.04 ± 0.2	7.94 ± 0.2	7.87 ± 0.2	7.84 ± 0.2	7.82 ± 0.2		
	F21	8.21 ± 0.1	8.13 ± 0.1	8.04 ± 0.2	7.95 ± 0.2	7.87 ± 0.2	7.84 ± 0.2	7.82 ± 0.2		
	F20	8.21 ± 0.1	8.12 ± 0.1	8.03 ± 0.2	7.95 ± 0.2	7.87 ± 0.2	7.84 ± 0.2	7.81 ± 0.2		
	F19	8.22 ± 0.1	8.13 ± 0.1	8.04 ± 0.2	7.95 ± 0.2	7.86 ± 0.2	7.84 ± 0.2	7.82 ± 0.2		
	F18	8.22 ± 0.1	8.13 ± 0.1	8.05 ± 0.2	7.95 ± 0.2	7.87 ± 0.2	7.85 ± 0.2	7.83 ± 0.2		
	F17	8.22 ± 0.1	8.15 ± 0.1	8.05 ± 0.2	7.96 ± 0.2	7.88 ± 0.2	7.85 ± 0.2	7.83 ± 0.2		
	F16	8.22 ± 0.1	8.14 ± 0.1	8.06 ± 0.2	7.96 ± 0.2	7.88 ± 0.2	7.85 ± 0.2	7.83 ± 0.2		
	F15	8.21 ± 0.1	8.13 ± 0.1	8.04 ± 0.2	7.94 ± 0.2	7.87 ± 0.2	7.84 ± 0.2	7.82 ± 0.2		
100	F36	8.15 ± 0.1	8.15 ± 0.1	8.05 ± 0.2	7.96 ± 0.2	7.87 ± 0.2	7.83 ± 0.2	7.80 ± 0.2	7.76 ± 0.2	7.70 ± 0.1
	F35	8.17 ± 0.1	8.14 ± 0.1	8.05 ± 0.2	7.95 ± 0.2	7.86 ± 0.2	7.83 ± 0.2	7.80 ± 0.2	7.76 ± 0.2	7.71 ± 0.2
	F34	8.18 ± 0.1	8.15 ± 0.1	8.05 ± 0.2	7.94 ± 0.2	7.86 ± 0.2	7.82 ± 0.2	7.79 ± 0.2	7.77 ± 0.2	7.73 ± 0.1
	F33	8.21 ± 0.1	8.17 ± 0.1	8.07 ± 0.1	7.96 ± 0.2	7.87 ± 0.2	7.85 ± 0.2	7.83 ± 0.2	7.80 ± 0.2	7.78 ± 0.1
	F32	8.21 ± 0.1	8.15 ± 0.1	8.07 ± 0.2	7.96 ± 0.2	7.88 ± 0.2	7.85 ± 0.2	7.83 ± 0.2	7.80 ± 0.2	7.78 ± 0.1
	F31	8.21 ± 0.1	8.17 ± 0.1	8.07 ± 0.2	7.97 ± 0.2	7.88 ± 0.2	7.85 ± 0.2	7.83 ± 0.2	7.80 ± 0.2	7.76 0.0
Near-ZID:	F30	8.21 ± 0.1	8.15 ± 0.1	8.07 ± 0.2	7.98 ± 0.2	7.88 ± 0.2	7.84 ± 0.2	7.82 ± 0.2	7.80 ± 0.2	7.71 ± 0.1
	F29	8.21 ± 0.1	8.14 ± 0.1	8.07 ± 0.2	7.98 ± 0.2	7.89 ± 0.2	7.86 ± 0.2	7.84 ± 0.2	7.80 ± 0.2	7.86 ± 0.1
	F28	8.21 ± 0.1	8.15 ± 0.1	8.08 ± 0.2	7.98 ± 0.2	7.89 ± 0.2	7.86 ± 0.2	7.84 ± 0.2	7.81 ± 0.2	7.81 ± 0.1
	F27	8.21 ± 0.1	8.14 ± 0.1	8.07 ± 0.2	7.98 ± 0.2	7.89 ± 0.2	7.86 ± 0.2	7.84 ± 0.2	7.80 ± 0.2	7.84 ± 0.1
	F26	8.22 ± 0.1	8.14 ± 0.1	8.07 ± 0.1	7.97 ± 0.2	7.89 ± 0.2	7.86 ± 0.2	7.84 ± 0.2	7.84 ± 0.2	7.88 ± 0.1

Table B-4. Long-term average and ±1 standard deviation for chlorophyll a (mg/L) at offshore station water depths, by contour, from 2008 – 2013.

Contour (m)	Stn	Water Depth (m) 1	15	25	40	60	70	80	95	100
20	F03	4.0 ± 3.5	6.4 ± 5.5	-	-	-	-	-	-	-
	F02	4.8 ± 3.8	6.1 ± 5.7							
	F01	7.1 ± 7.6	6.1 ± 4.9							
60	F14	2.3 ± 1.5	5.9 ± 4.5	4.4 ± 4.5	1.9 ± 1.6	1.4 ± 1.1	-	-	-	-
	F13	2.4 ± 1.7	6.7 ± 6.8	3.8 ± 3.6	2.0 ± 2.5	2.1 ± 5.0				
	F12	3.9 ± 3.7	7.0 ± 8.3	3.6 ± 2.7	1.9 ± 1.4	1.4 ± 2.1				
	F11	4.1 ± 3.6	5.4 ± 4.5	3.6 ± 2.7	1.9 ± 1.6	1.2 ± 0.7				
	F10	3.5 ± 4.4	7.0 ± 6.1	4.2 ± 3.7	2.3 ± 2.0	1.6 ± 1.7				
	F09	3.5 ± 3.9	8.1 ± 8.9	4.2 ± 3.6	2.1 ± 1.5	1.6 ± 1.8				
	F08	3.5 ± 4.5	7.1 ± 7.0	4.1 ± 3.5	2.0 ± 1.5	1.5 ± 1.1				
	F07	5.6 ± 6.5	7.2 ± 9.3	3.8 ± 3.2	2.3 ± 2.1	1.3 ± 0.9				
	F06	3.4 ± 3.6	6.9 ± 8.0	3.6 ± 2.8	2.1 ± 1.3	1.6 ± 1.4				
	F05	4.5 ± 6.7	7.6 ± 9.2	3.5 ± 2.3	1.9 ± 1.2	1.3 ± 0.8				
	F04	3.8 ± 4.8	7.8 ± 10.2	3.6 ± 1.8	1.9 ± 1.1	1.1 ± 0.7				
80	F25	1.8 ± 1.1	7.7 ± 9.1	5.3 ± 5.1	2.4 ± 1.4	0.9 ± 0.5	0.6 ± 0.4	0.9 ± 0.9	-	-
	F24	1.6 ± 1.0	7.3 ± 7.8	5.1 ± 5.2	2.4 ± 2.2	0.9 ± 0.6	0.7 ± 0.5	0.7 ± 0.4		
	F23	2.2 ± 1.6	8.4 ± 8.7	4.7 ± 4.1	1.8 ± 1.0	0.8 ± 0.5	0.6 ± 0.4	0.6 ± 0.4		
	F22	3.0 ± 3.4	7.7 ± 7.7	4.7 ± 3.0	2.0 ± 2.0	0.8 ± 0.5	0.8 ± 0.6	1.1 ± 1.9		
	F21	2.4 ± 2.3	8.7 ± 8.4	5.2 ± 5.3	1.9 ± 0.9	0.9 ± 0.5	0.7 ± 0.4	0.6 ± 0.5		
	F20	2.2 ± 1.8	9.7 ± 13.5	5.6 ± 7.1	2.1 ± 1.9	0.9 ± 0.5	0.8 ± 0.7	1.4 ± 4.2		
	F19	2.6 ± 1.6	8.3 ± 10.0	5.9 ± 9.2	2.3 ± 1.7	0.9 ± 0.5	0.7 ± 0.4	0.6 ± 0.4		
	F18	2.3 ± 2.3	8.6 ± 8.7	6.0 ± 9.2	2.0 ± 1.0	0.9 ± 0.5	0.8 ± 0.5	0.7 ± 0.5		
	F17	2.7 ± 3.7	9.9 ± 14.0	7.4 ± 11.8	2.3 ± 1.6	1.0 ± 0.5	0.8 ± 0.5	0.7 ± 0.4		
	F16	2.1 ± 2.0	8.7 ± 14.7	6.6 ± 11.0	2.3 ± 1.7	1.1 ± 1.1	0.9 ± 0.8	0.7 ± 0.4		
	F15	3.2 ± 5.1	9.4 ± 10.7	4.9 ± 4.1	2.1 ± 1.3	1.0 ± 0.6	0.8 ± 0.6	0.7 ± 0.5		
100	F36	1.5 ± 1.1	7.0 ± 7.9	5.1 ± 3.9	2.7 ± 1.8	1.0 ± 0.6	0.7 ± 0.4	0.5 ± 0.3	0.4 ± 0.3	0.6 ± 0.5
	F35	1.8 ± 1.3	6.4 ± 6.9	5.3 ± 6.1	2.5 ± 1.5	0.9 ± 0.5	0.6 ± 0.3	0.5 ± 0.3	0.4 ± 0.3	0.9 ± 1.1
	F34	2.3 ± 1.7	9.4 ± 14.7	5.6 ± 5.5	2.4 ± 1.6	0.9 ± 0.5	0.7 ± 0.3	0.6 ± 0.3	0.5 ± 0.3	0.5 ± 0.3
	F33	2.3 ± 2.1	7.5 ± 7.2	6.6 ± 8.8	2.5 ± 1.9	1.0 ± 1.0	0.7 ± 0.7	0.5 ± 0.3	0.5 ± 0.3	0.6 ± 0.5
	F32	2.5 ± 2.2	7.5 ± 10.1	5.3 ± 3.9	2.6 ± 1.7	0.9 ± 0.6	0.7 ± 0.4	0.6 ± 0.4	0.5 ± 0.3	0.6 ± 0.5
	F31	2.4 ± 2.0	6.7 ± 7.1	6.0 ± 6.6	2.5 ± 1.3	0.9 ± 0.5	0.7 ± 0.4	0.6 ± 0.4	0.5 ± 0.3	0.3 0.0
Near-ZID:	F30	2.4 ± 2.1	9.0 ± 14.0	5.0 ± 4.5	2.4 ± 1.3	0.8 ± 0.4	0.7 ± 0.3	0.6 ± 0.4	0.5 ± 0.3	0.3 ± 0.1
	F29	1.9 ± 1.7	6.0 ± 6.3	4.5 ± 3.0	2.7 ± 1.6	1.2 ± 0.9	0.7 ± 0.4	0.6 ± 0.3	0.5 ± 0.4	0.5 ± 0.2
	F28	1.8 ± 1.4	5.6 ± 5.6	4.8 ± 3.0	2.6 ± 1.4	1.0 ± 0.6	0.7 ± 0.4	0.6 ± 0.3	0.5 ± 0.3	0.6 ± 0.5
	F27	1.8 ± 1.4	6.7 ± 7.8	5.2 ± 3.3	2.7 ± 1.5	1.0 ± 0.5	0.7 ± 0.4	0.6 ± 0.4	0.5 ± 0.3	0.4 ± 0.1
	F26	2.3 ± 2.1	6.7 ± 6.8	5.3 ± 5.0	2.7 ± 1.7	1.0 ± 0.6	0.7 ± 0.4	0.6 ± 0.4	0.5 ± 0.4	0.5 ± 0.1

Table B-5. Monitored chemical parameters in Point Loma WTP effluent in 2009-2013.

CAS #	Chemical Parameter	CAS #	Chemical Parameter
71-55-6	1,1,1-trichloroethane	56534-02-2	Alpha chlordene
79-34-5	1,1,2,2-tetrachloroethane	959-98-8	Alpha endosulfan
79-00-5	1,1,2-trichloroethane	7429-90-5	Aluminum
75-34-3	1,1-dichloroethane	7664-41-7	Ammonia-N
75-35-4	1,1-dichloroethene	120-12-7	Anthracene
35822-46-9	1,2,3,4,6,7,8-hepta CDD	7440-36-0	Antimony
67562-39-4	1,2,3,4,6,7,8-hepta CDF	7440-38-2	Arsenic
55673-89-7	1,2,3,4,7,8,9-hepta CDF	7440-39-3	Barium
39227-28-6	1,2,3,4,7,8 hexa CDD	71-43-2	Benzene
70648-26-9	1,2,3,4,7,8-hexa CDF	92-87-5	Benzidine
57653-85-7	1,2,3,6,7,8-hexa CDD	56-55-3	Benzo[a]anthracene
	1,2,3,6,7,8-hexa CDF	50-32-8	Benzo[a]pyrene
19408-74-3	1,2,3,7,8,9-hexa CDD	192-97-2	Benzo[e]pyrene
72918-21-9	1,2,3,7,8,9-hexa CDF	191-24-2	Benzo[g,h,i]perylene
40321-76-4	1,2,3,7,8-penta CDD	207-08-9	Benzo[k]fluoranthene
57117-41-6	1,2,3,7,8-penta CDF	100-44-7	Benzyl chloride
120-82-1	1,2,4-trichlorobenzene	7440-41-7	Beryllium
106-93-4	1,2-dibromoethane	33213-65-9	Beta endosulfan
95-50-1	1,2-dichlorobenzene	319-84-6	BHC, alpha isomer
107-06-2	1,2-dichloroethane	319-85-7	BHC, beta isomer
78-87-5	1,2-dichloropropane	319-86-8	BHC, delta isomer
122-66-7	1,2-diphenylhydrazine	58-89-9	BHC, gamma isomer
541-73-1	1,3-dichlorobenzene	92-52-4	Biphenyl
106-46-7	1,4-dichlorobenzene	111-91-1	Bis(2-chloroethoxy) methane
90-12-0	1-methylnaphthalene	111-44-4	Bis(2-chloroethyl) ether
832-69-9	1-methylphenanthrene	108-60-1	Bis-(2-chloroisopropyl) ether
60851-35-5	2,3,4,6,7,8-hexa CDF	117-81-7	Bis(2-ethylhexyl) phthalate
57117-31-4	2,3,4,7,8-penta CDF		BOD (Biochemical oxygen demand)
2245-38-7	2,3,5-trimethylnaphthalene		BOD (Soluble)
1746-01-6	2,3,7,8-tetra CDD	35400-43-2	Bolstar
51207-31-9	2,3,7,8-tetra CDF	7440-42-8	Boron
95-95-4	2,4,5-trichlorophenol		Bromide
88-06-2	2,4,6-trichlorophenol	75-27-4	Bromodichloromethane
120-83-2	2,4-dichlorophenol	75-25-2	Bromoform
105-67-9	2,4-dimethylphenol	74-83-9	Bromomethane
51-28-5	2,4-dinitrophenol	85-68-7	Butyl benzyl phthalate
121-14-2	2,4-dinitrotoluene	7440-43-9	Cadmium
581-42-0	2,6-dimethylnaphthalene	7440-70-2	Calcium
606-20-2	2,6-dinitrotoluene		Calcium hardness
78-93-3	2-butanone	75-15-0	Carbon disulfide
110-75-8	2-chloroethylvinyl ether	56-23-5	Carbon tetrachloride
91-58-7	2-chloronaphthalene		Chemical oxygen demand
95-57-8	2-chlorophenol		Chloride
534-52-1	2-methyl-4,6-dinitrophenol	108-90-7	Chlorobenzene
91-57-6	2-methylnaphthalene	75-00-3	Chloroethane
95-48-7	2-methylphenol	67-66-3	Chloroform
88-75-5	2-nitrophenol	74-87-3	Chloromethane
79-46-9	2-nitropropane	126-99-8	Chloroprene
91-94-1	3,3-dichlorobenzidine	2921-88-2	Chlorpyrifos
205-99-2	3,4-benzo(b)fluoranthene	7440-47-3	Chromium
108-39-4	3-methylphenol (4-MP is unresolved)	218-01-9	Chrysene
101-55-3	4-bromophenyl phenyl ether	5103-73-1	Cis nonachlor
59-50-7	4-chloro-3-methylphenol	10061-01-5	Cis-1,3-dichloropropene
7005-72-3	4-chlorophenyl phenyl ether	7440-48-4	Cobalt
108-10-1	4-methyl-2-pentanone		COD (Soluble)
106-44-5	4-methylphenol (3-MP is unresolved)		Conductivity
100-02-7	4-nitrophenol	7440-50-8	Copper
83-32-9	Acenaphthene	56-72-4	Coumaphos
208-96-8	Acenaphthylene	57-12-5	Cyanides, total
67-64-1	Acetone	298-03-3	Demeton O
107-02-8	Acrolein	126-75-0	Demeton S
107-13-1	Acrylonitrile	333-41-5	Diazinon
309-00-2	Aldrin	53-70-3	Dibenzo(a,h)anthracene
107-05-1	Allyl chloride		Dibrom
5103-71-9	Alpha(cis) chlordane	128-48-1	Dibromochloromethane

Table B-5 (cont.). Monitored chemical parameters in Point Loma WTP effluent in 2009-2013.

CAS #	Chemical Parameter	CAS #	Chemical Parameter
	Dibutyl tin	86-30-6	N-nitrosodiphenylamine
	Dichlofenthion	53-19-0	o,p-DDD
62-73-7	Dichlorvos	3424-82-6	o,p-DDE
60-57-1	Dieldrin	789-02-6	o,p-DDT
84-66-2	Diethyl phthalate	3268-87-9	octa CDD
60-51-5	Dimethoate	39001-02-0	octa CDF
131-11-3	Dimethyl phthalate		Ortho phosphate
84-74-2	Di-n-butyl phthalate	95-47-6	Ortho-xylene
117-84-0	Di-n-octyl phthalate	27304-13-8	Oxychlordane
298-04-4	Disulfoton	72-54-8	p,p-DDD
1031-07-8	Endosulfan sulfate	72-55-9	p,p-DDE
72-20-8	Endrin	50-29-3	p,p-DDT
7421-93-4	Endrin aldehyde	56-38-2	Parathion
2104-64-5	EPN	12674-11-2	PCB 1016
13194-48-4	Ethoprop	11104-28-2	PCB 1221
100-41-4	Ethylbenzene	11141-16-5	PCB 1232
115-90-2	Fensulfothion	346689-21-9	PCB 1242
	Floatables	12672-29-6	PCB 1248
206-44-0	Fluoranthene	11097-69-1	PCB 1254
86-73-7	Fluorene	11096-82-5	PCB 1260
16984-48-8	Fluoride	37324-23-5	PCB 1262
5103-74-2	Gamma (trans) chlordane	87-86-5	Pentachlorophenol
56641-38-4	Gamma chlordene	198-55-0	Perylene
	Grease/oil		pH
	Gross alpha radiation	85-01-8	Phenanthrene
	Gross beta radiation	108-95-2	Phenol
86-50-0	Guthion	298-02-2	Phorate
76-44-8	Heptachlor	7440-09-7	Potassium
1024-57-3	Heptachlor epoxide	129-00-0	Pyrene
118-74-1	Hexachlorobenzene	110-86-1	Pyridine
87-68-3	Hexachlorobutadiene	299-84-3	Ronnel
77-47-4	Hexachlorocyclopentadiene	7782-49-2	Selenium
67-72-1	Hexachloroethane		Settleable solids
	Hexane extractable material	7440-22-4	Silver
193-39-5	Indeno(1,2,3-cd)pyrene	7440-23-5	Sodium
7439-89-6	Iron	22248-79-9	Stirophos
78-59-1	Isophorone	100-42-5	Styrene
98-82-8	Isopropylbenzene		Sulfate
7439-92-1	Lead	18496-25-8	Sulfides-total
7439-93-2	Lithium	3698-24-5	Sulfotepp
7439-95-4	Magnesium	127-18-4	Tetrachloroethene
	Magnesium hardness	107-49-3	Tetraethylpyrophosphate
121-75-5	Malathion	7440-28-0	Thallium
7439-96-5	Manganese	34643-46-4	Tokuthion
	MBAS (Surfactants)	108-88-3	Toluene
7439-97-6	Mercury		Total alkalinity (bicarbonate)
	Merphos		Total dissolved solids
108-38-3	meta,para xylenes		Total hardness
72-43-5	Methoxychlor		Total Kjeldahl nitrogen
74-88-4	Methyl iodide		Total solids
80-62-6	Methyl methacrylate		Total suspended solids
1634-04-4	Methyl tert-butyl ether		Total volatile solids
75-09-2	Methylene chloride	8001-35-2	Toxaphene
7786-34-7	Mevinphos, e isomer	39765-80-5	Trans nonachlor
7786-34-7	Mevinphos, z isomer	156-60-5	Trans-1,2-dichloroethene
2385-85-5	Mirex	10061-02-6	Trans-1,3-dichloropropene
7439-98-7	Molybdenum	56-36-0	Tributyl tin
	Monobutyl tin	79-01-6	Trichloroethene
919-44-8	Monocrotophos	75-69-4	Trichlorofluoromethane
91-20-3	Naphthalene	327-98-0	Trichloronate
7440-02-0	Nickel		Turbidity
	Nitrate	7440-62-2	Vanadium
98-95-3	Nitrobenzene	75-01-4	Vinyl chloride
62-75-9	N-nitrosodimethylamine		Volatile suspended solids
621-64-7	N-nitrosodi-n-propylamine	7440-66-6	Zinc

Table B-6. Monitored chemical parameters detected at least once in Point Loma WTP effluent from 2009 -2013.

Chemical Parameter	
1,1,2-trichloroethane	Gross alpha radiation
1,4-dichlorobenzene	Gross beta radiation
1-methylnaphthalene	Heptachlor
2,4,6-trichlorophenol	Hexane extractable material
2-butanone	Iron
2-methylnaphthalene	Lead
4-methylphenol (3-MP is unresolved)	Lithium
Acetone	Magnesium
Alpha (cis) chlordane	Magnesium hardness
Alpha endosulfan	Malathion
Aluminum	Manganese
Ammonia-N	MBAS (Surfactants)
Antimony	Mercury
Arsenic	meta,para xylenes
Barium	Methyl tert-butyl ether
Beryllium	Methylene chloride
BHC, delta isomer	Molybdenum
BHC, gamma isomer	Monocrotophos
Bis-(2-ethylhexyl) phthalate	Naphthalene
BOD (Biochemical oxygen demand)	Nickel
BOD (Soluble)	Nitrate
Boron	octa CDD
Bromide	Ortho phosphate
Bromodichloromethane	p,p-DDD
Bromomethane	pH
Cadmium	Phenol
Calcium	Potassium
Calcium hardness	Selenium
Carbon disulfide	Settleable solids
Chemical oxygen demand	Silver
Chloride	Sodium
Chloroform	Sulfate
Chloromethane	Sulfides-total
Chromium	Tetrachloroethene
Cobalt	Thallium
COD (Soluble)	Toluene
Conductivity	Total alkalinity (bicarbonate)
Copper	Total dissolved solids
Cyanides,total	Total hardness
Diazinon	Total Kjeldahl nitrogen
Dibromochloromethane	Total solids
Diethyl phthalate	Total suspended solids
Di-n-octyl phthalate	Total volatile solids
Disulfoton	Trans nonachlor
Endosulfan sulfate	Trichloroethene
Ethylbenzene	Turbidity
Floatables	Vanadium
Fluoride	Volatile suspended solids
Grease/oil	Zinc

Table B-7. Flatfish species sampled for liver tissue (*) at 98 meter trawl fishing zones in October (1995-2013).

Common Name	'95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	'13
Bigmouth Sole									*										
Dover Sole	*							*											
English Sole		*				*	*		*	*		*	*	*					
Hornyhead Turbot			*			*			*										
Longfin Sanddab	*	*	*	*	*	*	*	*	*	*									
Pacific Sanddab	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*

Table B-8. Rockfish species sampled for muscle tissue (*) at 98 meter rig fishing stations in October (1995-2013).

Common Name	'95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	'13
California Scorpionfish			*	*	*											*			
Canary Rockfish	*																		
Chilipepper																	*		
Copper Rockfish	*	*		*			*	*	*	*		*	*		*			*	
Flag Rockfish								*									*		
Greenspotted Rockfish										*			*	*				*	
Rockfish unid.	*	*	*	*		*	*	*	*	*	*		*	*	*	*		*	*
Rosethorn Rockfish											*								
Speckled Rockfish		*	*		*						*							*	*
Squarespot Rockfish			*								*								
Starry Rockfish			*	*			*					*						*	*
Vermilion Rockfish	*	*		*	*	*	*	*	*				*	*	*	*	*	*	
Yellowtail Rockfish												*							

Table B-9. Exceedance summary for single sample maximum enterococcus objective at shoreline stations from January 2008 through December 2015.				
Enterococcus Objective: 104 per 100 ml Single Sample Maximum				
Station	# of times exceeded	# of observations	% > 104	% < 104
D12	6	368	1.6%	100%
D11	11	368	3.0%	97%
D10	7	365	1.9%	98.1%
D9	6	366	1.6%	98.4%
D8	19	349	5.4%	94.6%
D7	7	365	1.9%	98.1%
D6	NR	NR	--	--
D5	2	366	0.5%	99.5%
D4	2	361	0.6%	99.4%
total	60	2908	2.1%	97.9%
Note:				

Table B-10. Exceedance summary for 30-day geometric mean exceedance of enterococcus objective at shoreline stations from January 2008 through December 2015.				
Enterococcus Objective: 35 per 100 ml Single Sample Maximum				
Station	# of times exceeded	# of observations	% > 35	% < 35
D12	0	368	0%	100%
D11	6	368	1.6%	98.4%
D10	2	365	0.6%	99.4%
D9	0	362	0.0%	100%
D8	16	343	4.7%	95.3%
D7	0	362	0%	100%
D6	NR	NR	--	--
D5	0	362	0%	100%
D4	0	361	0%	100%
total	24	2891	0.8%	99.2%
Note:				

Table B-11. Exceedance summary for single sample maximum enterococcus objective at kelp bed stations from January 2009 through December 2015.

Enterococcus Objective: 104 per 100 ml Single Sample Maximum

Station	Depth (m)	# of times exceeded	# of observations	% > 104	% < 104
C6	Surface (1)	0	417	0%	100%
	Mid (3)	0	418	0%	100%
	Bottom (9)	0	417	0%	100%
C5	Surface (1)	0	417	0%	100%
	Mid (3)	0	417	0%	100%
	Bottom (9)	0	417	0%	100%
C4	Surface (1)	0	417	0%	100%
	Mid (3)	3	417	0.72%	99.28%
	Bottom (9)	0	417	0%	100%
C8	Surface (1)	2	418	0.48%	99.52%
	Mid (12)	2	418	0.48%	99.52%
	Bottom (18)	0	418	0%	100%
C7	Surface (1)	1	418	0.24%	99.76%
	Mid (12)	0	418	0%	100%
	Bottom (18)	0	418	0%	100%
A6	Surface (1)	3	418	0.72%	99.28%
	Mid (12)	2	418	0.48%	99.52%
	Bottom (18)	2	419	0.48%	99.52%
A7	Surface (1)	3	418	0.72%	99.28%
	Mid (12)	3	418	0.72%	99.28%
	Bottom (18)	1	418	0.24%	99.76%
A1	Surface (1)	1	418	0.24%	99.76%
	Mid (12)	3	418	0.72%	99.28%
	Bottom (18)	2	418	0.48%	99.52%
Total		28	10,025	0.28%	99.72%

Note: Number of individual kelp bed station samples during January 2009 through December 2015 that exceeded the state single sample maximum enterococcus objective of 104 per 100 ml.

Table B-12. Exceedance summary for 30-day geometric mean enterococcus objective at kelp bed stations from January 2009 through December 2015.

Enterococcus Objective: 35 per 100 ml 30-Day Geometric Mean

Station	Depth (m)	# of calendar months geometric mean exceeds 200	# of observations	% of calendar months geometric mean > 35	% of calendar months geometric mean < 35
C6	Surface (1)	0	417	0%	100%
	Mid (3)	0	418	0%	100%
	Bottom (9)	0	417	0%	100%
C5	Surface (1)	0	417	0%	100%
	Mid (3)	0	417	0%	100%
	Bottom (9)	0	417	0%	100%
C4	Surface (1)	0	417	0%	100%
	Mid (3)	0	417	0%	100%
	Bottom (9)	0	417	0%	100%
C8	Surface (1)	0	418	0%	100%
	Mid (12)	0	418	0%	100%
	Bottom (18)	0	418	0%	100%
C7	Surface (1)	0	418	0%	100%
	Mid (12)	0	418	0%	100%
	Bottom (18)	0	418	0%	100%
A6	Surface (1)	0	418	0%	100%
	Mid (12)	0	418	0%	100%
	Bottom (18)	0	419	0%	100%
A7	Surface (1)	0	418	0%	100%
	Mid (12)	1	418	1.39%	98.61%
	Bottom (18)	0	418	0%	100%
A1	Surface (1)	0	418	0%	100%
	Mid (12)	0	418	0%	100%
	Bottom (18)	0	418	0%	100%
Total		1	10025	0.05%	99.95%

Note: Number of calendar months within January 2009 through December 2015 where the computed 30-day geometric mean at the listed station and depth exceeded the state 30-day geometric mean enterococcus objective of 35 per 100 ml. Listed number of observations is the number of samples at the given station and depth within this 84 month period.

Table B-13. Exceedance summary for single sample maximum enterococcus objective at offshore stations in State waters from January 2009 through December 2015.

Enterococcus Objective in State Waters: 104 per 100 ml Single Sample Maximum

Contour	Station	Depth (m)	# of times exceeded	# of observations	% > 104	% < 104
18	F3	1	0	28	0%	100%
		12	0	28	0%	100%
		18	0	28	0%	100%
	F2	1	0	28	0%	100%
		12	0	28	0%	100%
		18	0	28	0%	100%
	F1	1	0	28	0%	100%
		12	0	28	0%	100%
		18	0	28	0%	100%
60	F14	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F13	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F12	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F11	1	0	28	0%	100%
		25	0	28	0%	100%
		60	2	30	6.67%	93.33%
	F10	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F9	1	0	28	0%	100%
		25	0	28	0%	100%
		60	1	28	3.57%	96.43%
	F8	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F7	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F6	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
80	F20	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
		80	1	28	3.57%	96.43%
	F19	1	0	28	0%	100%
		25	0	28	0%	100%
		60	3	29	10.34%	89.66%
		80	5	31	16.13%	83.87%
	F18	1	0	28	0%	100%
		25	0	28	0%	100%
		60	1	29	3.45%	96.55%
		80	4	31	12.90%	87.10%
Total			17	1354	1.26%	98.74%

Table B-14. Comparison of enterococcus concentrations in individual samples from offshore state waters with the 30-day geometric mean enterococcus objective of 35 per 100 ml from Jan. 2009 – Dec. 2015.

Contour	Station	Depth (m)	# of days above 35 per 100ml	# of observations	% > 35	% < 35
18	F3	1	0	28	0%	100%
		12	0	28	0%	100%
		18	0	28	0%	100%
	F2	1	0	28	0%	100%
		12	0	28	0%	100%
		18	0	28	0%	100%
	F1	1	0	28	0%	100%
		12	0	28	0%	100%
		18	0	28	0%	100%
60	F14	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F13	1	0	28	0%	100%
		25	0	28	0%	100%
		60	2	28	7.14%	92.86%
	F12	1	0	28	0%	100%
		25	0	28	0%	100%
		60	2	28	7.14%	92.86%
	F11	1	0	28	0%	100%
		25	0	28	0%	100%
		60	4	30	13.33%	86.67%
	F10	1	0	28	0%	100%
		25	0	28	0%	100%
		60	0	28	0%	100%
	F9	1	0	28	0%	100%
		25	0	28	0%	100%
		60	1	28	3.57%	96.43%
	F8	1	0	28	0%	100%
		25	0	28	0%	100%
		60	2	28	7.14%	92.86%
	F7	1	0	28	0%	100%
		25	0	28	0%	100%
		60	2	28	7.14%	92.86%
	F6	1	0	28	0%	100%
		25	1	28	3.57%	96.43%
		60	1	28	3.57%	96.43%
80	F20	1	1	28	3.57%	96.43%
		25	0	28	0%	100%
		60	1	28	3.57%	96.43%
		80	7	28	25.00%	75.00%
	F19	1	0	28	0%	100%
		25	1	28	3.57%	96.43%
		60	5	29	17.24%	82.76%
		80	8	31	25.81%	74.19%
	F18	1	0	28	0%	100%
		25	0	28	0%	100%
		60	5	29	17.24%	82.76%
		80	8	31	25.81%	74.19%
Total			51	1354	3.77%	96.23%

Note: Since only one enterococcus sample is collected per quarter at the above stations, the above table compares individual sample results with the 30-day geometric mean state objective for enterococcus. Because a low percentage of individual enterococcus samples exceed 35 per 100 ml, the probability is extremely low that multiple samples collected in any given 30-day period would exceed the state 30-day geometric mean enterococcus objective of 35 per 100 ml.

Table B-15. Maximum enterococcus density in offshore waters from January 2009 through December 2015. State waters are shown in bold font.

Contour	Station	Maximum Enterococcus Concentration (CFU/100 ml)						
		1m depth	12m depth	18m depth	25m depth	60m depth	80m depth	98m depth
18	**F3**	**2**	**2**	**4**				
	F2	**4**	**6**	**4**				
	F1	**4**	**30**	**4**				
60	**F14**	**16**			**20**	**32**		
	F13	**6**			**10**	**70**		
	F21	**6**			**8**	**86**		
	F11	**12**			**4**	**140**		
	F10	**32**			**4**	**32**		
	F9	**2**			**8**	**120**		
	F8	**8**			**4**	**76**		
	F7	**2**			**4**	**72**		
	F6	**2**			**86**	**42**		
	F5	2			2	50		
	F4	2			4	44		
80	F25	4			6	76	30	
	F24	2			76	86	56	
	F23	22			200	160	60	
	F22	2			2	60	56	
	F21	16			8	260	120	
	F20	**40**			**2**	**54**	**160**	
	F19	**14**			**38**	**860**	**280**	
	F18	**2**			**4**	**190**	**340**	
	F17	2			2	4	400	
	F16	2			2	2	92	
	F15	2			2	4	50	
98	F36	2			10	14	24	24
	F35	2			4	22	32	58
	F34	68			2	44	92	70
	F33	2			2	920	120	72
	F32	2			2	130	220	64
	F31	28			2	180	240	200
	F30	4			4	300	660	620
	F29	8			20	340	620	160
	F28	2			2	64	240	130
	F27	2			2	74	44	58
	F26	4			2	400	110	32

Note: Quarterly enterococcus sampling is required for the above stations. The above data represent a total of 28 quarterly enterococcus samples collected between January 2009 and December 2015.

Table B-16. Long-term average enterococcus density in offshore waters from January 2009 through December 2015. Station results in State waters are shown in bold font.

Contour	Station	Enterococcus Arithmetic Average Concentration (CFU/100 ml)						
		1m depth	12m depth	18m depth	25m depth	60m depth	80m depth	98m depth
18	**F3**	**2**	**2**	**2**				
	F2	**2**	**2**	**2**				
	F1	**2**	**3**	**2**				
60	**F14**	**3**			**3**	**4**		
	F13	**2**			**2**	**9**		
	F21	**2**			**2**	**11**		
	F11	**2**			**2**	**19**		
	F10	**4**			**2**	**6**		
	F9	**2**			**2**	**10**		
	F8	**2**			**2**	**12**		
	F7	**2**			**2**	**9**		
	F6	**2**			**5**	**6**		
	F5	2			2	6		
	F4	2			2	6		
80	F25	2			2	8	6	
	F24	2			6	8	12	
	F23	3			10	14	12	
	F22	2			2	10	11	
	F21	3			2	23	21	
	F20	**4**			**2**	**7**	**25**	
	F19	**2**			**3**	**65**	**45**	
	F18	**2**			**2**	**17**	**43**	
	F17	2			2	2	27	
	F16	2			2	2	13	
	F15	2			2	2	10	
98	F36	2			2	2.5	4	4
	F35	2			2	3	4	7
	F34	5			2	6	12	7
	F33	2			2	52	17	8
	F32	2			2	12	24	9
	F31	3			2	16	30	15
	F30	2			2	30	217	108
	F29	2			3	18	42	10
	F28	2			2	8	13.5	13
	F27	2			2	8.5	5	7
	F26	2			2	18	15	5

Note: Quarterly enterococcus sampling is required for the above stations. The above data represent a total of 28 quarterly enterococcus samples collected between January 2009 and December 2015.

TABLE B-17 (adapted from Application Table C.1-5). Summary of various benthic macrofauna indices for PLOO stations. Data from January and July surveys only, from 1991 – 2013.

	Pre-Discharge Surveys (1991−1993)				2009−2013 Post-Discharge			All Post-Discharge Surveys			
	All Sites		Outfall Stn. E14	Ref. Stn. B9	All Sites	Outfall Stn. E14	Ref. Stn. B9	All Sites		Outfall Stn. E14	Ref. Stn. B9
	Mean	Range	Mean	Mean	Mean	Mean	Mean	Mean	Range	Mean	Mean
Abundance											
All Invertebrates	274	79 – 551	262	237	325	441	285	349	94 – 966	443	313
Annelids[a]	156	44 – 424	154	132	186	294	163	204	35 – 827	296	183
Arthropods[b]	46	10 – 102	45	51	75	77	61	64	11 – 178	74	56
Molluscs	19	3 – 102	12	13	28	52	32	29	2 – 139	48	24
Echinoderms	50	9 – 92	48	36	31	7	24	46	0 – 179	16	46
Misc. Other Taxa	4	0 – 14	3	5	5	12	5	6	0 – 31	8	4
Species Richness	67	36 – 100	66	66	90	103	89	90	47 – 145	100	86
Swartz Dominance	19	8 – 31	20	20	32	30	34	29	3 – 50	30	29
Diversity (H')	3.3	2.7 – 3.9	3.4	3.4	3.9	3.9	4.0	3.8	1.9 – 4.4	3.8	3.7
BRI	4.8	-4.2 – 14.1	5.6	6.7	14.2	22.6	10.0	9.2	-4.8 – 28.5	17.1	5.4

[a] Annelids = mostly polychaetes [b] Arthropods = mostly crustaceans

APPENDIX C – LIST OF TABLES AND FIGURES