EXECUTIVE SUMMARY

The Santa Monica Bay receiving water monitoring program is promulgated under the NPDES Permit No. CA0109991, Waste Discharge Requirements Order No. 94-021 for the Hyperion Treatment Plant (HTP), City of Los Angeles. The HTP NPDES Permit was adopted on May 11, 1994 by the Regional Water Quality Control Board (RWQCB), Los Angeles, and issued jointly with the Regional Administrator, United States Environmental Protection Agency (USEPA), Region IX, San Francisco. Under this permit, extensive monitoring of effluent quality, microbiology, ambient water quality, benthic sediments and macrofauna, demersal fish and invertebrates, and priority pollutant tissue concentrations of trawled organisms and sportfish through focused monitoring is required to determine impacts, if any, from the discharged treated effluent from HTP into Santa Monica Bay. This biennial assessment report contains Santa Monica Bay monitoring data collected during the period from January 2001 to December 2002. The annual summary of effluent and receiving water data is reported separately to the RWQCB and USEPA Region IX.

On November 23, 1998, a full secondary treatment process was implemented at HTP thereby significantly improving the quality of the treated wastewater being discharged into the marine environment. The full secondary process was augmented in calendar years 1999–2000 with additional pure oxygen activated sludge modules, secondary clarifiers, and egg-shaped digesters to achieve a very high quality effluent. During 2001-2002, an average of 317 mgd of 79% domestic and 21% industrial/commercial-treated wastewater was discharged through the Serial Discharge Port No. 002 (5-Mile Outfall).

This report provides the initial assessment of the impact of the full secondary treatment on the water quality, diversity of benthic invertebrates and fishes, and contaminant levels in the sediment, sport fish, and crabs. A modified benthic sampling program was submitted and accepted by the RWQCB in December 1998 and implemented in January 1999. The current benthic sampling program is a modification of the former sampling grid to a combination fixed station and random station array in order to more effectively assess any effects from HTP's full secondary treated discharge on the Santa Monica Bay.

Since water quality at SMB shoreline is impacted by non-point urban runoff sources, in 1995, the shoreline stations were re-positioned adjacent to storm drains to monitor the stormwater runoff, which is the predominant source of bacterial shoreline exceedances. In December 2001, shoreline monitoring program was placed in the Los Angeles County Municipal Stormwater Separate Sewer System (MS4) Permit. In addition, the current HTP permit is scheduled for renewal in 2003 based upon the recommendations of the "Model Monitoring Program" (MMP) guidance for the large publicly operated treatment works (POTWs). The MMP was developed jointly by the large South Coast POTWs, USEPA, LARWQCB, and Southern California Coastal Water Research Project (SCCWRP). The MMP Guidance document, meant to build the basic standardized design for POTW ocean monitoring programs, was published in March 2002. As a result of the MMP, the new Santa Monica Bay monitoring program for HTP is expected to be significantly revised.

Effluent Quality

Completion of Hyperion Treatment Plant's secondary treatment expansion and subsequent discharge of fully secondary-treated effluent beginning in November 1998 resulted in a marked and immediate effect on the quality of effluent discharged into Santa Monica Bay. The efficient removal of solids from wastewater has resulted in continually fewer solids and associated pollutants being discharged each reporting period. During 2001–2002, removal efficiencies were still improved from the previous reporting period (1999-2000). For example, solids removal increased from 94% to 95.8%. The removal of most constituents was the same or improved overall, and for the two-year reporting period, there were no permit exceedances in any of the monitoring constituents. All treatment objectives were met and in many cases surpassed during this reporting period from January 2001 to December 2002.

Microbiology Water Quality – Shoreline and Inshore

The Hyperion Treatment Plant effluent has had no impact on the water quality of the shoreline and only minimal impact on the inshore stations of Santa Monica Bay, as indicated by the low bacterial densities at stations closest to the 5-mile outfall during the dry-weather season. The highest bacterial geometric means were often found at stations adjacent to flowing storm drains and during periods of rainfall. Although bacteriological water quality standards were occasionally exceeded at both shoreline and inshore stations, data presented herein suggest that these were due to influences from stormwater and storm drain urban runoff at shoreline stations, and to Ballona Creek and King Harbor influences at inshore stations. Storm drain urban runoff contributes largely to the degradation of the water quality of beaches along Santa Monica Bay. Efforts to reduce bacterial contamination at some of Santa Monica Bay's most impaired beaches have come in the form of storm drain diversion structures. One such diversion structure was completed in December 2000 and by the start of the dry weather season of 2001, two of Santa Monica's largest flows (Santa Monica Pier and Pico-Kenter) were diverted to the Santa Monica Urban Runoff Recycling Facility (SMURRF) where it is treated via UV radiation. The completion of more diversion structures and facilities by the City's Watershed Protection Division are expected to result in lower bacterial counts along the shoreline, thereby, improve water quality. Following conversion to full secondary treatment in November 1998, the HTP effluent has shown a substantial improvement and reduction in its bacterial composition. Additionally, the number of floatable materials such as plastic and rubber goods, which often originate from Hyperion, has declined from previous years as a result of the revamp in the treatment process.

Water Quality – Offshore

All Santa Monica Bay water quality objectives were met during 2001-2002 as set forth in Hyperion's 1994 NPDES permit. Materials of sewage origin were not observed during any of the water quality surveys. The wastewater field was identified during most surveys for this reporting period, January 2001 through December 2002. When stratified oceanic conditions were present, the wastewater field remained submerged, moved in variable directions, and generally was detected

within 2 km of the outfall although it could be detected at distances up to 7.1 km. Although the bacterial content in the effluent was reduced 100-fold following implementation of full secondary treatment, the volume of effluent has remained relatively unchanged resulting in similar dispersion patterns as seen previously.

Sediment Chemistry

The sediment chemistry provides assessment of accumulation of metals and organic pollutants in the vicinity of HTP effluent outfall (5-Mile Outfall) in Santa Monica Bay. The sediment samples were collected from 44 stations in Santa Monica Bay in summer of 2001 and 2002. Dissolved sulfide and cyanide were detected in only one station during the 2001 and 2002 surveys.

All 9 metal pollutants were detected. Six metals were detected at all 44 stations in 2001 and four metals were detected in all stations in 2002. Most of the detected metals had their highest concentrations at the vicinity of the 7-Mile Outfall (station E6). Significant decreasing trends of chromium, copper, cadmium and zinc were observed at the 5-Mile Outfall in contrast to the increasing trend at the reference site (station C1) from 1992 to 2002.

Of 89 organic pollutants, p,p'-DDE was the most predominant in 2001 and 2002 survey. The highest total DDT was detected at station E10 (near the Palos Verdes area) in both years. Among PCB compounds monitored in 2001 and 2002, PCB congener Aroclor 1260 was detected with elevated concentrations near the 7-Mile outfall (station E6).

To assess the biological impact of the bulk sediment contamination in Santa Monica Bay, the concentrations of metal and organic pollutants were compared with the Effective Range-Low (ER-L) and Effective Range-Median (ER-M) values. The average concentrations of all metal pollutants in Santa Monica Bay and 5-Mile Outfall were below their ER-M values. However, the average concentrations in the Bay and the concentrations at the 5-Mile Outfall both exceeded ER-L values on several instances. Thus given the natural processes and continued high quality of HTP effluent, levels of contaminants in surface sediments continue to diminish around the outfall over time.

Macrofaunal Assemblages

The infauna community during the 2001-2002 sampling period at the 5-Mile outfall and near-outfall stations were shown to have slightly enhanced numbers of species and species diversity values relative to the other monitoring stations that are spatially removed from these areas, but in close proximity to the 60-m isobath. By the Summer 2002 sampling period, one of the Z2 (outfall-station) replicates possessed the highest number of species, with the second highest diversity value in our sampling regime. Both parsimony analyses and multivariate non-metric multidimensional scaling (NMDS) grouped the outfall and near-outfall stations generally together and away from their other 60-m cohorts. The historical study of Z2 using the same aforementioned methods, show extremely high temporal grouping fidelity. Distinct sets of station samples group by year, with the subset of Z2 samples collected after commencement to full secondary treatment all grouping

together. Non-metric multidimensional scaling (NMDS) of species richness shows a striking picture of increasing numbers of species over time, congruent with improving effluent quality.

The greatest rate of change occurred after the Hyperion Treatment Plant had shifted to full secondary. Although the locally enhanced numbers suggest infaunal community recovery, there are still pollution-sensitive species such as *Amphiodia urtica*, which are still not colonizing the outfall areas and remain in small numbers. Pollution-tolerant species, such as *Capitella capitata, Euphilomedes carcharodonta,* and *Parvilucina tenuisculpta* are showing large reductions in their numbers suggesting recovery at the community level. Indeed, the increase in species with the increased topological complexity of the parsimony analysis of co-occurring species (PACOS) exemplar cladograms illustrate the increased species diversity, phylogenetic diversity, and trophic diversity of the community concordant with the increase in effluent quality over time. This in combination with species numbers, diversity values, and infauna trophic index values equal to or exceeding those from other presumably non-impacted stations, strongly suggest the 5-Mile outfall area is on its way to recovery.

Trawled Organisms

The trawl-caught fish and macroinvertebrate community during the 2001-2002 sampling period at the 5-Mile outfall and near-outfall stations were shown to have comparable numbers of species and species diversity values relative to the other monitoring stations spatially removed from these areas on the 60-m isobath. Both parsimony analyses and multivariate NMDS grouped this subset of stations generally together and away from their other 60-m cohorts. The historical study of Z2 over time using the same aforementioned methods show high temporal grouping fidelity, with a distinct set of station samples, collected after the commencement of full secondary treatment grouping together. Although, there is a slight trend in the numbers of species increasing over time at outfall-station Z2, undoubtedly in response to improved effluent quality and increased food resources from the locally enhanced infauna community, there is a dual signal. The dual signal is the observation of slightly increased species with a unique community since full secondary treatment commenced in concert with the observation that pollution-sensitive species, such as the white urchin *Lytechinus pictus*, are still avoiding the outfall areas, while pollution-tolerant species, such as the spiny sandstar *Astropecten verrilli* are still showing large enhancements in their numbers, maintaining the uniqueness of this interesting outfall area.

Tissue Chemistry

Measurement of chemical contaminants in the tissues of selected trawled fish and invertebrates, and rig-fish (sportfish) is required under HTP's NPDES permit. The trawled organisms are closely associated with the sea bottom throughout much of their lives. Thus, they are more likely to bioaccumulate pollutants from contaminated sediments and potential bottom-dwelling preys compared to organisms living in the water column. The analysis of pollutants in rig-caught fish, and crabs are of considerable interest to the public, as fishermen also seek these species.

A total of 44 trawled fish (hornyhead turbot), 155 rig-fish (sportfish), and 3 cancer crabs were collected in 2001 and 2002 surveys. During this two-year period, zinc and p,p'-DDE were detected in all muscle and liver tissues of hornyhead turbot, as well as in all rig-fish samples. Arsenic was found in all the muscle and liver tissue of hornyhead turbot and in most of rig-fish tissue. Mercury was detected in all tissue samples collected in 2001 and in most of samples in 2002. All nine priority metal pollutants analyzed were detected in liver tissues of hornyhead turbot. Levels of arsenic, nickel, mercury and lead in liver and muscle tissues were very similar, but the concentration of other metals were much higher in liver tissue. Poor correlations in hornyhead turbot tissue were observed between %lipid and the concentrations of DDT and PCB pollutants at all trawl stations over time.

Except for sporadic elevated concentrations of certain metals in horneyhead muscle at some stations, no clear spatial distribution pattern of metals and organic pollutants was observed with the data collected from 1998 to 2002. For rig-fish (sportfish) samples, mercury, zinc, p,p-DDE, and PCB Aroclor 1254 and 1260 were the most frequently detected pollutants. Since white croaker and scorpionfish were the two most frequently collected species during 1998 to 2002 sampling period, the trend of tissue concentration of five metals (arsenic, copper, mercury, lead, and zinc) in these two species collected at 5-Mile outfall (station Z2) was assessed. No significant correlation was observed between the sediment level and tissue bioaccumulation for these metals.

For rig-fish (sportfish) samples, mercury, zinc, p,p-DDE, and PCB Aroclor 1254 and 1260 were the most frequently detected pollutants. The highest levels of DDT derivatives and PCB Aroclors were found in starry rockfish during 2001 and 2002 surveys. While the concentrations detected for DDT derivatives and PCB Aroclors in rig-fish were well below the DDT (5 ppm) and PCB (2 ppm) concentration levels set by the Food and Drug Administration (FDA), some have exceeded the standard limits of 0.100 ppm used by the California Office of Environmental Health Hazard Assessment (OEHHA 1991). Although mercury was detected in almost all fish tissue (except blue rockfish) sampled in 2001 and 2002, its concentrations in all samples were well below the FDA action level of 1.0 mg/kg.