STATE OF THE OCEAN SUMMARY REPORT 2020-2021

SD Public Utilities

Presented in this report is a summary of the 2020-2021 data collection efforts for the Point Loma Ocean Outfall (PLOO) and South Bay Ocean Outfall (SBOO) regions, from northern San Diego County southward across the international border into northern Baja, and extending offshore to depths of up to 500 m.

For more detailed information please refer to the City of San Diego 2020-2021 Receiving Waters Biennial Report:

City of San Diego. (2022). Biennial Receiving Waters Monitoring and Assessment Report for the Point Loma and South Bay Ocean Outfalls, 2020–2021. City of San Diego Ocean Monitoring Program, Public Utilities Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

All raw data for the 2020-2021 sampling period have been submitted to either the San Diego Regional Water Quality Control Board (SDRWQCB) or the California Environmental Data Exchange Network (CEDEN) and may also be accessed upon request to the City of San Diego.

SD Public Utilities

STATE OF THE OCEAN SUMMARY REPORT

2020-2021

Point Loma Wastewater Treatment Plant
(Order No. R9-2017-0007; NPDES No. CA0107409)

South Bay Water Reclamation Plant
(Order No. R9-2021-0011; NPDES No. CA0109045)

South Bay International Wastewater Treatment Plant
(Order No. R9-2021-0001; NPDES No. CA0108928)

Prepared by:
City of San Diego Ocean Monitoring Program
Environmental Monitoring and Technical Services Division
Public Utilities Department

Dr. Ryan Kempster, Managing Editor

December 2022

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OVERVIEW

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The City of San Diego (City) conducts an extensive Ocean Monitoring Program to evaluate potential environmental effects associated with the discharge of treated wastewater to the Pacific Ocean via the Point Loma and South Bay Ocean Outfalls (PLOO and SBOO, respectively). Data collected are used to determine compliance with receiving water quality requirements as specified in National Pollutant Discharge Elimination System (NPDES) permits, and associated orders, issued by the San Diego Regional Water Quality Control Board (SDRWQCB) and the U.S. Environmental Protection Agency (USEPA). These permits are issued to the City's Point Loma Wastewater Treatment Plant (PLWTP), South Bay Water Reclamation Plant (SBWRP), and the South Bay International Wastewater Treatment Plant (SBIWTP), which is operated by the U.S. Section of the International Boundary and Water Commission (USIBWC).

Veronica Rodriguez pouring a sediment sample to separate invertebrates for later identification in the laboratory.

Zoe Scott assessing preserved invertebrate samples to assist with identifications.

Lauren Valentino rinsing a plankton ('Bongo') net between tows.

The principal objectives of the combined ocean monitoring efforts for both the PLOO and SBOO are to:

(1) Measure and document compliance with NPDES permit requirements and California Ocean Plan (Ocean Plan) water quality objectives and standards;

(2) Track movement and dispersion of the wastewater plumes discharged via the outfalls;

(3) Assess any impact of wastewater discharge on the local marine ecosystem, including effects on coastal water quality, seafloor sediments, and marine life.

OCEAN CONDITIONS

OCEAN CONDITIONS

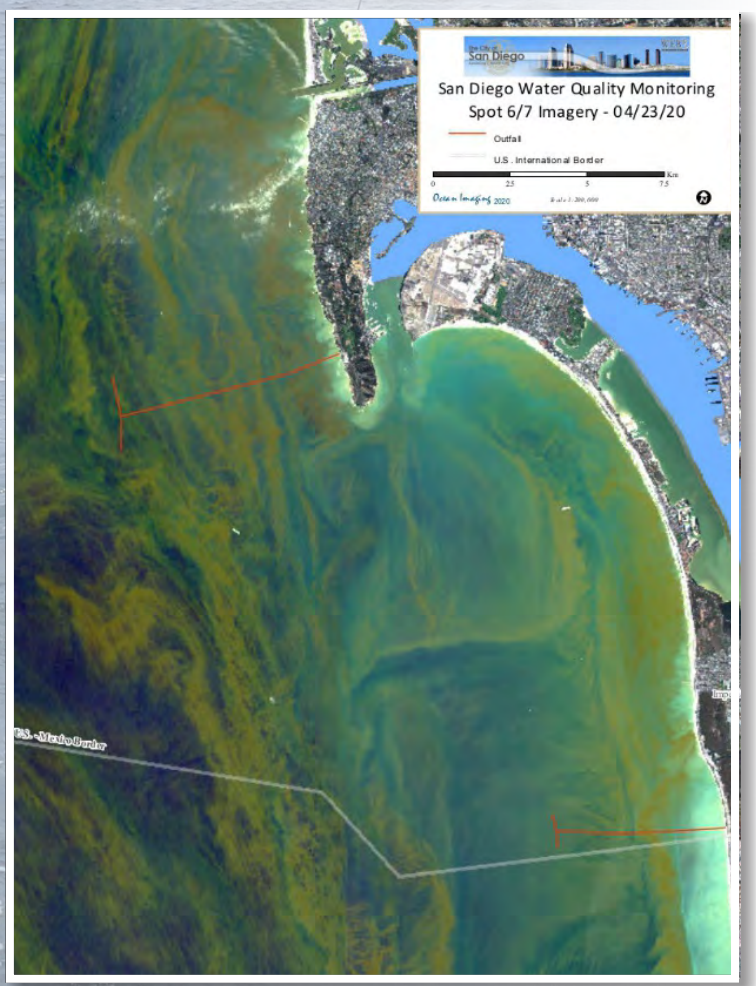
Oceanographic conditions, such as water temperature, salinity, dissolved oxygen (DO), pH, natural light level (transmissivity or water clarity), and concentration of chlorophyll *a* were generally within historical ranges and followed typical seasonal patterns reported for the PLOO and SBOO monitoring regions.

As is characteristic for these waters, conditions typically indicative of coastal upwelling were most evident during the spring, while maximum stratification or layering of the water column occurred during the spring and summer, after which the local waters became more mixed in the winter. Reductions in water clarity, or transmissivity, tended to be associated with terrestrial runoff or outflows from rivers and bays, resuspension of bottom sediments in nearshore waters due to waves or storm activity, or the presence of phytoplankton blooms.

Overall, ocean conditions during 2020 and 2021 were consistent with well documented patterns for southern California and northern Baja California. These findings suggest that natural factors, such as upwelling of deep ocean waters, and changes due to climatic events, such as El Niño/La Niña oscillations, continue to explain most of the temporal and spatial variability observed in the coastal waters off San Diego.

Phytoplankton blooms were evident during spring and summer 2020, and winter through summer 2021, in the PLOO and SBOO regions.

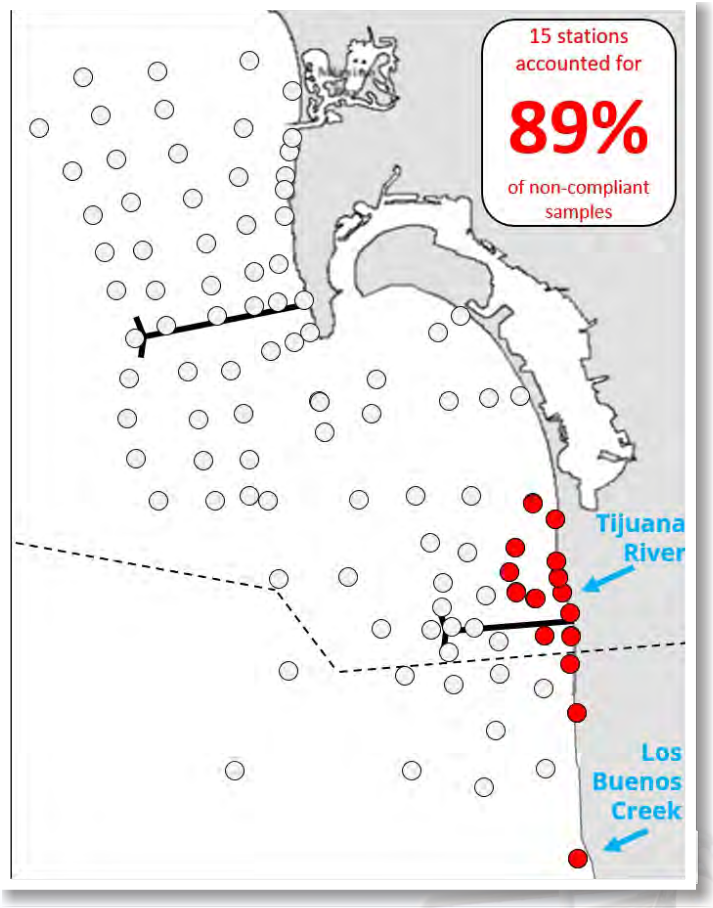
A notably large regional phytoplankton bloom in spring 2020 resulted in very high near-surface DO and pH levels, and low observations of near-surface dissolved carbon dioxide levels.



Satellite image of San Diego coastal region showing large phytoplankton bloom on April 23, 2020

WATER QUALITY

WATER QUALITY

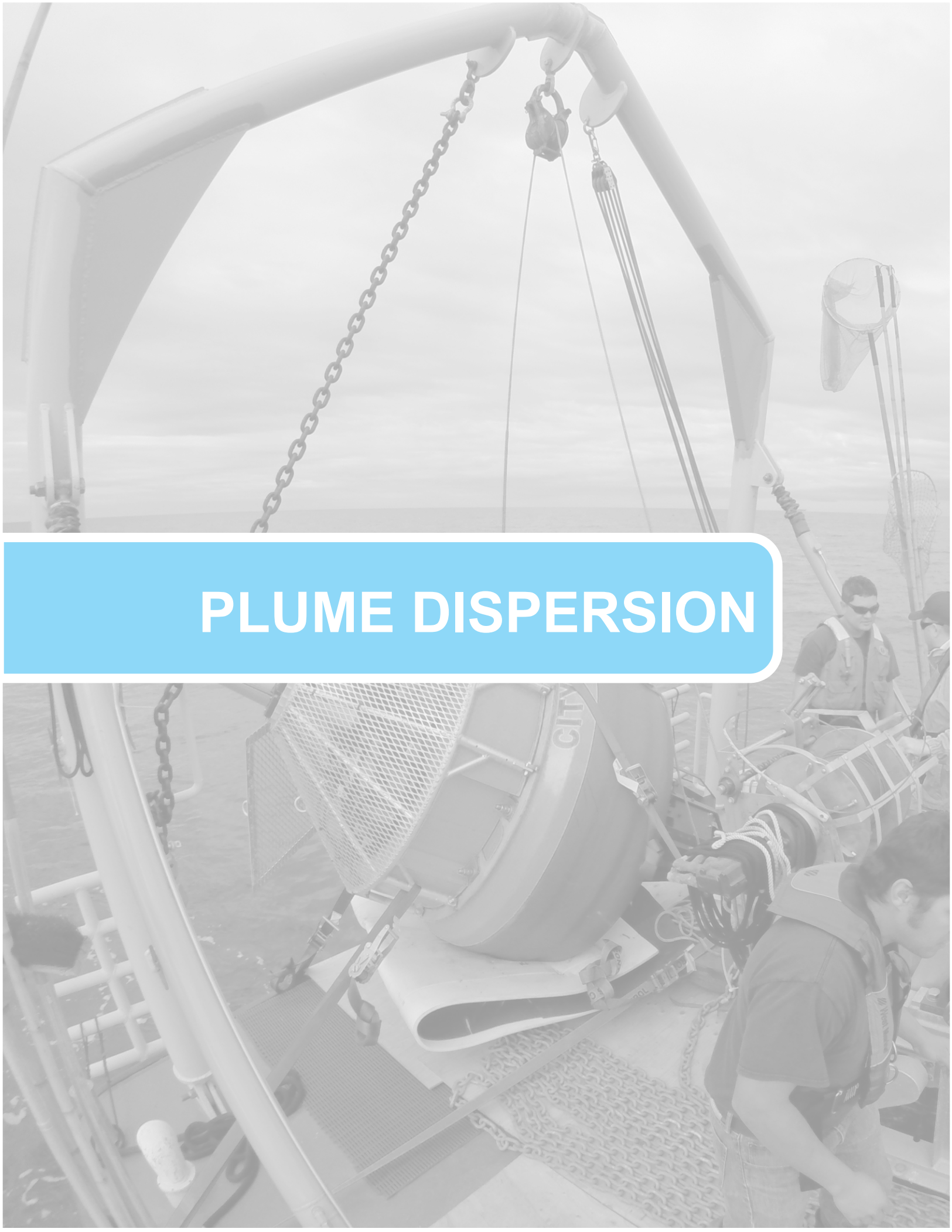


Map of water quality sampling stations in the PLOO and SBOO regions, highlighting 15 stations in the South Bay that accounted for most of the out-of-compliance Fecal Indicator Bacteria samples.

Throughout the PLOO region, overall compliance with the Ocean Plan water contact standards was above the minimum threshold for all metrics. In contrast, in the SBOO region, overall compliance was below the minimum threshold for all metrics except for offshore stations. Shore stations located near the mouth of the Tijuana River, and in Mexican waters near San Antonio de Los Buenos Creek, have historically had higher levels of elevated fecal indicator bacteria (FIB) samples than stations located farther to the north. It is also well established that sewage-laden discharges from the Tijuana River and San Antonio de Los Buenos Creek are likely sources of bacteria during or after storms or other periods of increased flows. The spatial and temporal distribution of elevated FIB observed during the current report period corroborate the findings of previous City reports and other studies, which suggest that the Tijuana River and other terrestrial inputs are the largest drivers of contamination in the South Bay region.

The significant impact of the Tijuana River on receiving water quality can be highlighted by removing the shore and kelp stations closest to the estuary mouth. Once removed, the remaining stations in the SBOO region were compliant with the overall metric throughout the report period. Thus, the source of contamination in SBOO receiving waters is of known origin and likely associated with outflows from the Tijuana River and not related to wastewater discharge.

Overall water quality compliance was typically higher in the PLOO region than the SBOO, and higher at offshore stations compared to shore stations. Reduced compliance at shore stations, in both regions, tended to occur more frequently during the wet season.



PLUME DISPERSION

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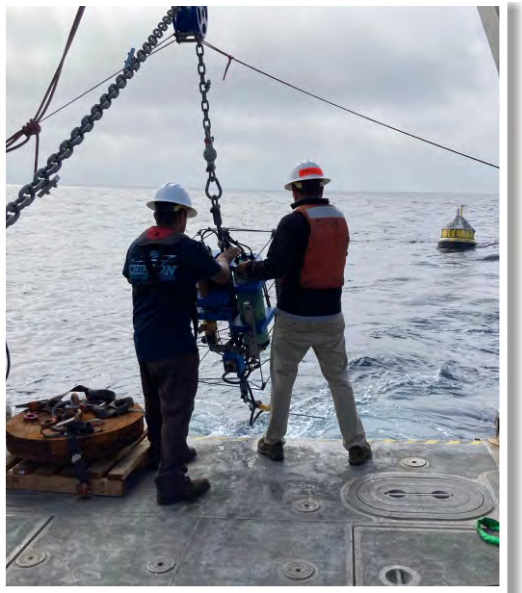
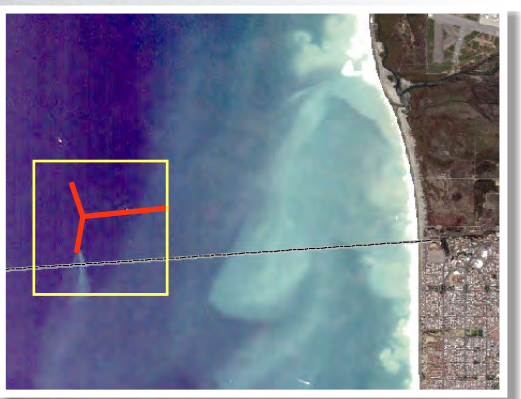
Treated wastewater effluent plumes from the SBOO and PLOO show a lack of shoreward transport and are generally transported along the coast with no evidence of nearshore movement. Although variable over space and time, the general axes of current velocities in the PLOO and SBOO regions followed a N:NW or S:SE trajectory. Thus, as effluent mixes with ambient seawater, it generally travels along the coast rather than being directed inshore toward the kelp beds, shoreline, or other recreational waters.

In the PLOO region, the plume generally remained below a depth of 44 m, while the SBOO plume was generally trapped below the pycnocline (≤ 11m) during seasonal periods of water column stratification. However, unlike the PLOO plume, the SBOO plume showed potential evidence of rising to the surface when waters became more mixed and stratification broke down, typically during the winter months.

Similarly, results of water quality monitoring over the past 20+ years are consistent with observations from remote sensing studies (i.e., satellite imagery), which show a lack of shoreward transport of wastewater plumes from either outfall. Monitoring results are also consistent with past studies, which indicate that other sources, such as terrestrial runoff or outflows from rivers and creeks were more likely to impact coastal water quality than wastewater discharge from the outfalls, especially during and immediately after significant rain events.



Staff members deploying a real time ocean mooring.



Satellite image showing an effluent plume emanating from the south leg of the South Bay Ocean Outfall.

Despite differences in observed plume vertical rise heights between the outfalls, there was no evidence that wastewater discharged to the ocean, via either outfall, reached recreational waters along the shore or nearshore kelp beds.

BENTHIC CONDITIONS

BENTHIC CONDITIONS

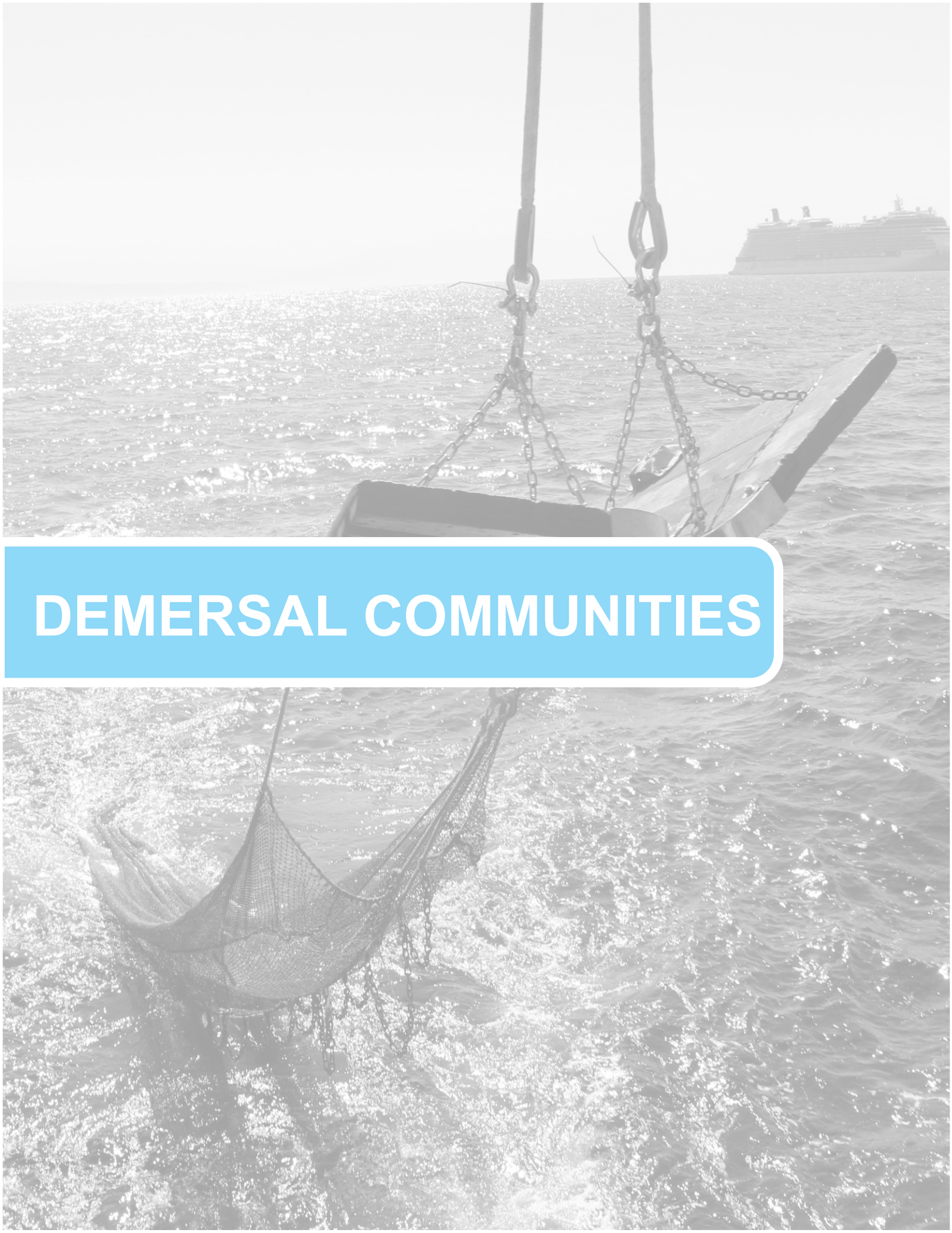
Benthic habitats, and associated biological communities, found on the continental shelf and upper slope off San Diego were found to be in good condition. The results of comprehensive assessments of benthic conditions show that the physical composition of the sediments, sediment quality, and the ecological status of the resident macrofaunal communities remain stable, with little evidence of environmental impact. Particle size composition varied throughout the region, but generally followed the typical pattern of sediments becoming finer with increasing depth.

Sediment quality was excellent throughout the entire San Diego region. There was no evidence of degraded benthic habitats, in terms of the concentration or spatial distribution of the different types of contaminants. This is further supported by results from sediment toxicity sampling, which revealed minimal toxicity at all of the near-outfall or regional stations tested. These results, when integrated with benthic infauna and sediment chemistry results, demonstrated that the shelf off San Diego remains unimpacted by the PLOO or SBOO.

Benthic macrofaunal communities off San Diego also appeared to be healthy, with most assemblages appearing to be similar to those observed over the past 30 years throughout southern California and northern Baja California. Although communities varied across depth and sediment gradients, there was no evidence of disturbance or significant environmental degradation that could be attributed to anthropogenic factors, such as wastewater discharge.

Ricardo Martinez sorting a sediment sample to separate invertebrates for later identification in the laboratory.

Major benthic community metrics, such as species richness, macrofaunal abundance, diversity, evenness, and dominance showed no evidence of wastewater impact or significant habitat degradation.



DEMERSAL COMMUNITIES

DEMERSAL COMMUNITIES

Demersal fish and megabenthic invertebrate communities trawled off San Diego remain unaffected by wastewater discharge. Although highly variable, patterns in the abundance and distribution of individual species were similar regardless of proximity to the outfalls and were representative of similar habitats throughout the Southern California Bight.

Pacific Sanddabs dominated assemblages surrounding the PLOO region, and Speckled Sanddabs dominated assemblages surrounding the SBOO region, as they have done since monitoring began. Halfbanded Rockfish were also prevalent in PLOO assemblages, while California Lizardfish were also prevalent within the SBOO region during this period, as they have been in eleven of the past thirteen years. Other commonly captured, but less abundant fishes, collected from the PLOO and SBOO regions included California Tonguefish, Dover Sole, English Sole, Longfin Sanddab, Northern Anchovy, Longspine Combfish, Shortspine Combfish, and White Croaker. External examinations of fish captured indicated that fish populations remained healthy off San Diego, with fewer than 0.4% of all fish having external parasites or showing any evidence of disease or other abnormalities.

Trawl-caught invertebrate assemblages in the PLOO region were dominated by the pelagic red crab *Pleuroncodes planipes*. Whereas, no single species of invertebrate dominated SBOO trawls. Other commonly captured, but less abundant, trawl-caught invertebrates collected from the PLOO and SBOO regions included the sea urchin *Lytechinus pictus*, the shrimps *Sicyonia ingentis, Sicyonia penicillata,* and *Crangon nigromaculata*, the crab *Platymera gaudichaudii,* and the sea star *Astropecten californicus*. However, increasing occurrences of historically more southerly located species, such as *Octopus veligero* and *S. penicillata,* are potential indicators of large-scale climate driven effects of species distribution and occurrence, which will likely only increase in the future.

Large amount of red crabs hauled up in trawl net.

Red crabs accounted for 92% of the 164,076 megabenthic invertebrates recorded in the PLOO region.

CONTAMINANTS IN FISHES

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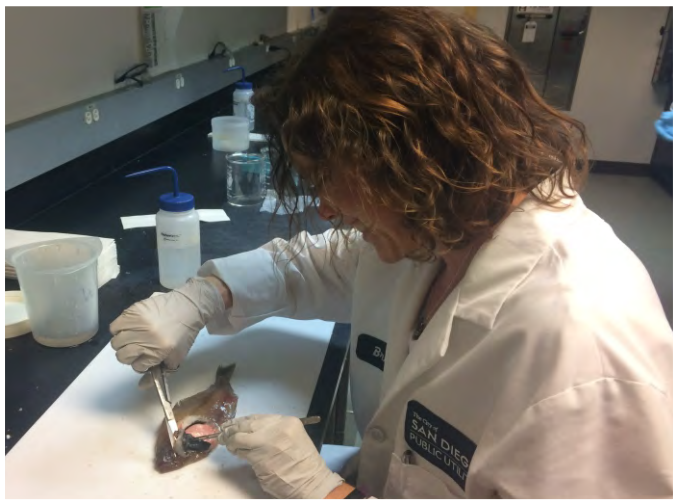
Although several different trace metals, pesticides, PCB congeners, and various PAHs were detected in both liver and muscle tissues, these contaminants occurred in fishes distributed throughout both the SBOO and PLOO regions, with no patterns that could be attributed to wastewater discharge via either outfall. Consequently, the occurrence of some metals and chlorinated hydrocarbons in some local fishes off San Diego is likely influenced by other factors, such as the widespread distribution of many contaminants in southern California sediments, differences in the physiology and life history traits of various species of fish, different exposure pathways, and differences in the migration pathways of various species. For example, an individual fish may be exposed to contaminants at a polluted site, but then migrate to an area that is less contaminated. This is of particular concern for fishes collected in the vicinity of the PLOO and SBOO, as there are many other nearby potential point and non-point sources of contamination.



Zoe Scott dissecting a fish to remove a liver sample for contaminant analysis.

There was no evidence of contaminant accumulation in fishes that could be associated with wastewater discharge from the PLOO or SBOO, which is consistent with historical findings.

Sanddabs commonly collected for contaminant analysis.

CONCLUSION

CONCLUSION

There were few changes to local receiving waters, benthic sediments, or marine invertebrate and fish communities that could be attributed to wastewater discharge. Coastal water quality conditions were generally excellent throughout the region, with the exception of the South Bay shore stations, which showed the highest frequency of elevated fecal indicator bacteria. However, the spatial and temporal distribution of these observations corroborate previous findings, which suggest that the Tijuana River and other terrestrial inputs are the largest drivers of contamination in the South Bay region. Thus, there was no evidence that wastewater was a driver of nearshore contamination, and no evidence that wastewater plumes from either of the two outfalls were transported shoreward into nearshore recreational waters. There were also no clear outfall related patterns in sediment contaminant distributions or differences between invertebrate and fish assemblages at the different monitoring sites. Additionally, benthic habitats surrounding both outfalls, and throughout the entire San Diego region, remained in good overall condition, similar to reference conditions for much of the SCB. Finally, the low level of contaminant accumulation, minimal sediment toxicity, and general lack of physical anomalies or other symptoms of disease or stress in local fishes was also indicative of a healthy marine environment off San Diego.

There was no evidence that the discharge of treated wastewater was a driver of nearshore contamination, or impacted patterns in sediment contaminant distributions or differences between invertebrate and fish assemblages throughout the SBOO and PLOO regions.


The City of
SAN DIEGO
Ocean Monitoring Program
Junior Marine Biologist

OUTREACH

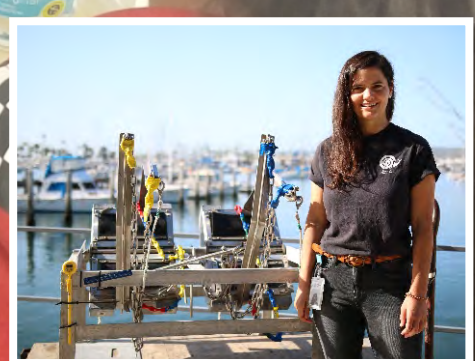
OUTREACH

In addition to the permit mandated sampling highlighted in this report, a goal of the Ocean Monitoring Program is to make data and resources easily accessible to the public. To this end, City staff continue to advance the program's outreach efforts by creating educational videos, attending outreach events, speaking with the media, and making all data and reports freely available via the City's website. Over the course of the current reporting period we have made significant advances in this area with all City data now available for direct download via the website and/or via the California Environmental Data Exchange Network (CEDEN). Furthermore, the Ocean Monitoring Program website has had a significant makeover to allow for easier access to a number of resources to help the public better understand the importance of this program. We also regularly interact with the public and the media to share relevant information about the status of San Diego's coastal waters. We will continue to create and share content to help the public better understand the work of the Ocean Monitoring Program and encourage the public to reach out to our team, via the website, if they have any questions. For more information and to access videos, data, reports etc. please see the link below.

SanDiego.gov/OceanMonitoring

Greg Welch, Megan Lilly, and Maiko Kasuya presenting the ocean monitoring program at a school science fair.

Dr. Ryan Kempster being interviewed about the ocean monitoring program for CBS news.



Lauren Valentino filming an educational outreach video.