UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

January 31, 2023

Refer to NMFS No:
WCRO-2022-03044

Elizabeth Sablad
Manager, NPDES Permit Section
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Re-issuance of a Permit under the National Pollutant Discharge Elimination System to the City of Los Angeles for Wastewater Discharges by the Hyperion Water Reclamation Plant

Dear Ms. Sablad:

This letter responds to your November 8, 2022, request for initiation of consultation with the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and analysis because it met our screening criteria and contained all required information on, and analysis of, your proposed action and its potential effects to listed species and designated critical habitat.

We reviewed the U.S. Environmental Protection Agency's (EPA) consultation request and related initiation package. Where relevant, we have adopted the information and analyses you have provided and/or referenced, but only after our independent, science-based evaluation confirmed they meet our regulatory and scientific standards. The EPA's Biological Evaluation and Essential Fish Habitat Assessment (BE/EFHA) is attached to this letter. We adopt by reference here the following sections of the BE/EFHA submitted to NMFS along with the consultation request on November 8, 2022, for the proposed action, status of the species, action area, environmental baseline, and effects analysis:

- Executive Summary
- Section 1.0 Background
- Section 2.0 Environmental Baseline in the Action Area
- Section 3.0 Threatened and Endangered Species and Critical Habitat
- Section 4.0 Potential Adverse Effects of the Action on ESA-listed Species
- Section 5.0 Essential Fish Habitat Assessment
- Section 6.0 Potential Adverse Effects on Essential Fish Habitat

CONSULTATION HISTORY

In July 2022, the NMFS West Coast Region (WCR) received a request from the EPA for an updated ESA-species list, which we provided on July 25, 2022. NMFS WCR and the EPA staff exchanged information in August through October 2022, including conference calls on August 11, September 26, and October 11 to discuss technical information about the proposed action and timelines. We received a draft BE/EFHA from the EPA on October 24, 2022 and provided comments and clarifications on the BE/EFHA to the EPA on November 2, 2022.

On November 8, 2022, we received a letter from the EPA requesting formal consultation under Section 7 of the ESA. The EPA included a revised BE/EFHA for the EPA's reissuance of a permit under the National Pollutant Discharge Elimination System (NPDES) to the City of Los Angeles for wastewater discharge by the Hyperion Water Reclamation Plant. After reviewing all of the information provided, we determined that the EPA satisfied the requirements for initiating formal consultation under 50 CFR part 402.14(c), and initiated formal consultation on November 8, 2022. We also determined that the EPA's request qualified for our expedited review and analysis.

In their letter dated November 8, 2022, the EPA requested to receive a draft biological opinion for review and to discuss any Reasonable and Prudent Measures (RPMs). On January 23, 2023, we transmitted a draft incidental take statement to the EPA. On January 24, 2023, the EPA submitted comments to NMFS regarding the language in the Terms and Conditions and Conservation Recommendations. We considered the EPA's comments in preparing this final biological opinion.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 FR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. As a result, the 2019 regulations are once again in effect, and we are applying the 2019 regulations here. For purposes of this consultation, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

PROPOSED ACTION

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). For the purposes of EFH consultation, a Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910). The EPA's proposed action is to re-issue an NPDES permit to the City of Los Angeles for continued discharge by the Hyperion Water Reclamation Plant (Hyperion) of secondary-treated wastewater through two outfalls into the Pacific Ocean. The EPA's re-issuance of the NPDES permit would authorize wastewater discharge by Hyperion for another five years (2023-2028). Over the five-year period, the EPA anticipates that Hyperion would discharge effluent at approximately 230-236 million gallons per day (MGD) (annual average), and that the effluent quality would be similar to the current effluent quality as there would be no significant changes to Hyperion's treatment system. The proposed NPDES permit would set effluent limits for various constituents in the effluent, such as metals and nutrients (ammonia, nitrogen). The proposed NPDES permit would also establish monitoring requirements for these and additional constituents of concerns, such as flame retardants and per- and polyfluoroalkyl substances (PFAS). The EPA's BE/EFHA provides a detailed discussion of the proposed action in the Executive Summary and Sections 1.2 (Plant History and Outfall Description), 1.3 (Facility Operation and Average Flows), 1.4 (Planned Changes and Upgrades at Hyperion 2023-2028 and up to 2035), and 1.5 (Effluent Plume and Zone of Initial Dilution for 5-mile Outfall). We adopt these sections of the EPA's BE/EFHA here (50 CFR 402.14(h)(3)).

RANGEWIDE STATUS OF THE SPECIES

We examined the status of each species that would be adversely affected by the proposed action to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. These species are:

- Marine mammals: blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), gray whale (*Eschrichtius robustus*; Western North Pacific (WNP) Distinct Population Segment or DPS), humpback whale (*Megaptera novaeangliae*; Central America DPS and Mexico DPS), and Guadalupe fur seals (*Arctocephalus townsendi*).
- Sea turtles: green (*Chelonia mydas*; East Pacific DPS), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*; North Pacific DPS), and olive ridley (*Lepidochelys olivacea*) sea turtles.
- Marine invertebrates: black abalone (*Haliotis cracherodii*) and white abalone (*H. sorenseni*).

The EPA's BE/EFHA provides a detailed discussion of the status of the species likely to be affected and those not likely to be adversely affected by the proposed action in Section 3.0 (Threatened and Endangered Species and Critical Habitat) and Section 4.3 (Consequence Analysis). We adopt these sections of the EPA's BE/EFHA here (50 CFR 402.14(h)(3)).

The only designated critical habitat that may be affected by the proposed action is black abalone critical habitat. Ultimately we determined the proposed action is not likely to adversely affect that critical habitat. We also determined it would not adversely affect the following species: North Pacific right whales, sei whales, sperm whales, giant manta rays, green sturgeon (Southern DPS), oceanic whitetip shark, scalloped hammerhead sharks (Eastern Pacific DPS), and steelhead (Southern California DPS) (see the *"Not likely to adversely affect" Determinations* section of this letter).

ACTION AREA

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the proposed action is the entire Santa Monica Bay. The EPA's BE/EFHA identifies and describes the action area in Section 1.6 (Action Area – Santa Monica Bay) and Section 2.1 (Physical Description of Santa Monica Bay). We adopt these sections of the EPA's BE/EFHA here (50 CFR 402.14(h)(3)).

ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The EPA's BE/EFHA provides a detailed discussion and comprehensive assessment of the environmental baseline in Section 2.0 (Environmental Baseline in the Action Area) and Sections 3.2 (Description of Marine Mammal Species), 3.3 (Description of Sea Turtle Species), and 3.4 (Description of Marine Invertebrates). We adopt these sections of the EPA's BE/EFHA here (50 CFR 402.14(h)(3)). In the following paragraphs, we provide additional information on the environmental baseline for ESA-listed species within the action area.

For ESA-listed marine mammals and sea turtles, the action area (Santa Monica Bay; i.e., the Bay) represents a relatively small and confined area compared to the relatively large range of these highly migratory species. However, when individuals do occur in the Bay, they experience threats such as vessel strikes, disturbance, and habitat degradation. Stranding records originating from the Bay since 2012 include fin, humpback, and gray whales; Guadalupe fur seals; and green, loggerhead, and olive ridley sea turtles. The known causes of these strandings include a ship strike (for a fin whale) and illness and malnutrition (for Guadalupe fur seals). For sea turtles, known causes for strandings include recreational fishing gear interactions, entrainment in local utility systems, entanglement in marine debris, and hypothermia. In many instances, the causes of marine mammal and sea turtle strandings are unknown.

Information on persistent organic pollutant (POPs) levels in ESA-listed marine mammals and sea turtles throughout their range can be used as a measure of general baseline pollutant levels in these species. For sea turtles, relatively higher levels of POPs were found in green sea turtles off southern California compared to other turtle species in other regions (Komoroske et al. 2011). High DDE (dichlorodiphenyldichloroethylene) levels exceeded the "no effect" thresholds established for loggerheads and suggest potential immunological effects on green turtles (Keller et al. 2006). For baleen whales, more data are available for humpback whales than other species. Elfes et al. (2010) found higher POP levels in humpback whales from the North Atlantic than from the North Pacific; however, DDT (dichlorodiphenyltrichloroethane) levels in humpback whales off southern California were higher than those in the North Atlantic. All POP classes were higher in the blubber of humpback whales off southern California than in other feeding regions in the North Pacific, potentially because of the species' strong site fidelity to feeding areas and the highly urbanized coast of southern California (Elfes et al. 2010). Some individuals had PCB (polychlorinated biphenyl) levels at or near the health effects threshold identified for marine mammals (Ross et al. 1996; Kannan et al. 2000; Elfes et al. 2010). Analyses of dead beached gray whales from Alaska, Washington, and California did not show any region-specific differences in POP concentrations (Varanasi et al. 1993). Very little data are available for fin and blue whales. For Guadalupe fur seals, POP levels are not known; however, California sea lions may be used as a proxy given similar migration habits and patterns. California sea lions exhibit a wide range in pollutant values, including PCB and DDT levels higher than those found in humpback and gray whales (Kannan et al. 2004).

For abalone, studies in the 1970s found elevated levels of heavy metals as well as DDT and PCBs in black abalone and red abalone off Palos Verdes (Jan et al. 1977; Young et al. 1980). Exposure to discharges of primary and secondary treated wastewater from Hyperion and other facilities in the area may have contributed to these observed levels. However, other factors, including overfishing for white abalone and disease for black abalone, have been identified as the primary causes of decline for these species within the action area.

EFFECTS OF THE ACTION

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

The EPA's BE/EFHA provides a detailed discussion and comprehensive assessment of the effects of the proposed action in Section 4.0 (Potential Adverse Effects of the Action on ESA-listed Species); specifically Sections 4.1 (2018 Biological Opinion), 4.2 (Activity Analysis), and 4.3 (Consequence Analysis). We adopt these sections of the EPA's BE/EFHA here (50 CFR 402.14(h)(3)). NMFS has evaluated these sections and, after our independent, science-based evaluation, we have determined that the analysis of effects in these sections meets our regulatory and scientific standards.

The EPA proposes to re-issue the NPDES permit for Hyperion that authorizes the discharge of treated wastewater through two ocean outfalls; the 5-mile outfall (the main outfall for discharges) and the one-mile outfall (for emergencies and preventative maintenance). The potential effects associated with the discharge of treated wastewater by Hyperion are:

- Toxicity associated with exposure to the discharge plume constituents such as metals and ammonia;
- Accumulation of other contaminants that may persist, be potentially harmful in low amounts, or otherwise emerging as concerns for marine life; and
- Exposure to environmental conditions created by the discharge of nutrients, including increased instances of harmful algal blooms (HABs).

Exposure and Response to the Toxicity of Hyperion's Effluent

For ESA-listed marine mammals and sea turtles, we do not have information to suggest any individuals from these species take up extended residence within the action area, but we do expect that individuals could make numerous or possibly frequent and extended visits to the action area over the course of relatively long lifetimes of extensive migrations or residence in the Southern California Bight (SCB). During these visits, these individuals would be exposed to the effects of the proposed action. We expect the duration of exposure to the proposed action to vary from as little as an hour up to several days at a time and could include multiple times for individuals. For white abalone and black abalone, their sedentary life history means that the risks for exposure to the discharged effluent are persistent across entire years. Considering the overlap between the discharge plume and abalone habitat, white abalone are more likely to be exposed to the effluent and its effects than black abalone because the latter inhabit the shore in rocky intertidal habitats and thus receive less exposure to the effluent.

Regarding toxicity effects, exposure to potentially toxic pollutants from the discharge effluent would primarily occur through the uptake of pollutants from food sources for ESA-listed marine mammals and sea turtles. The available data indicate that ESA-listed marine mammals and sea turtles are generally not at risk of health effects from most of the compounds or elements measured in Hyperion's effluent—this includes ammonia and heavy metals such as cadmium, chromium, copper, lead, nickel, silver, and zinc. Ammonia does not accumulate up the food chain and is not expected to accumulate in marine mammals or sea turtles. Most metals do not appear to biomagnify and are regulated and excreted by a host of marine life (Gray 2002); therefore, we expect exposure to Hyperion's effluent to result in limited increases in pollutant uptake in marine mammals and sea turtles. Levels of metals measured in marine mammal tissues and sea turtles are generally low and not expected to pose a health risk (O'Shea 1999; Saeki et al. 2000; Pugh and Becker 2001; Das et al. 2003; O'Hara and Becker 2003; Komoroske et al. 2012). Overall, we expect ESA-listed marine mammals and sea turtles to be exposed to toxic pollutants in Hyperion's effluent when foraging in the action area, but do not expect this occasional exposure to result in toxic health effects.

For ESA-listed abalone, exposure to potentially toxic pollutants from the discharge effluent would occur through direct uptake of pollutants from the water as well as from food. Exposure to heavy metals can increase shell abnormalities and reduce shell growth, settlement, metamorphosis, and survival in larval abalone (Conroy et al. 1996; Gorski 2006; Gorski and Nugegoda 2006). Juvenile and adult abalone can accumulate heavy metals in their tissues, resulting in reduced feeding rates, growth, and survival (Martin et al. 1977; Liao et al. 2002; Chen and Liao 2004; Tsai et al. 2004; Gorski 2006; Huang et al. 2008, 2010; Chen et al. 2011). The levels of heavy metals measured in Hyperion's effluent were generally below the values found to cause harmful effects on larval, juvenile, and adult abalone, especially when dilution is accounted for. Larval abalone may be exposed to higher effluent concentrations when passing through the zone of initial dilution (ZID), but we do not expect harmful effects because their exposure is likely to be of short duration.

Exposure and Response to Accumulation of Potentially Harmful Contaminants

POPs, including legacy organochlorine compounds and flame retardants, are likely being accumulated by ESA-listed marine mammals, sea turtles, and abalone (in part) as a result of wastewater discharge, and that accumulation poses a threat to such long-lived species. For white abalone and black abalone, studies involving other abalone species show that exposure to POPs such tributyltin, triclosan, and bisphenol A, can result in accumulation, and thus, harmful effects on growth and reproductive development (Horiguchi et al. 1998, 2001, 2002, 2005; Zhou et al. 2010; Gaume et al. 2012). These POPs have all been detected in Hyperion's effluent, but generally at lower levels than those found to cause harmful effects on abalone species. However, long-term exposure to low concentrations could result in accumulation and harmful effects. Little is known about the effects on abalone from other POPs found in Hyperion's effluent.

With regard to marine mammals and sea turtles, numerous studies on humans and other mammals have linked POPs like PCBs, DDTs, and PBDEs (polybrominated diphenyl ethers; used as flame retardants) to elevated risks for reproductive impairment (Reijnders 1986; Subramanian et al. 1987; Reddy et al. 2001; Schwacke et al. 2002), immunotoxicity (De Swart et al. 1996; Fonnum et al. 2006), endocrine disruption (Legler and Brouwer 2003; Darnerud 2008; Legler 2008), neurotoxicity (Darnerud 2003, 2008; Viberg et al. 2003, 2006), and cancer (Bonefeld-Jørgensen et al. 2001; Ylitalo et al. 2005). For example, relatively low PBDE concentrations have been associated with altered thyroid hormone levels in post-weaned and juvenile grey seals (Hall et al. 2003), which can then affect growth and development (Boas et al. 2006). Hyperion's discharge is a source of PCBs and flame retardants such as PBDEs and organophosphate esters (LASAN 2020b). ESA-listed marine mammals would be indirectly affected by the proposed action by consuming prey that has accumulated POPs from Hyperion's effluent. This, in turn, would expedite the potential for adverse health effects in individuals feeding in the action area, including effects on reproductive, endocrine, and immune systems. The same would hold true for sea turtles in the action area.

For legacy pollutants like PCBs and DDTs, the majority of the exposure likely results from historical contamination and the persistence of these pollutants in the action area. More recent POPs of concern include flame retardants such as PBDEs, which are being phased out and replaced by chlorinated organophosphates. The EPA (2015) identified three chlorinated organophosphates of concern for risks to aquatic organisms and human health: TCEP, TCPP, and TDCPP. The City of Los Angeles conducted a special study in 2019 to determine the mass loadings of constituents of emerging concern (CECs), including PBDEs and TCEP, TCPP, and TDCPP, released from Hyperion (LASAN 2020b). Several PBDEs were not detected; for the two that were detected, average mass loadings ranged from 0.011 – 0.022 lbs/day (LASAN 2020b). All three organophosphate flame retardants were detected, although TDCPP was not quantified. Effluent concentrations ranged from 0.10 to 0.15 µg/L for TCEP and 2.08 to 3.12 µg/L for TCPP; average mass loadings ranged from 0.19 – 0.28 lbs/day for TCEP and from 3.97 – 5.86 lbs/day for TCPP (LASAN 2020b). The average mass loadings were calculated for a period when the average discharge at Hyperion was approximately 230 MGD (LASAN 2020b). The EPA's BE/EFHA uses the sum of the TCPP and TCEP values as a proxy for total concentration of flame retardants in Hyperion's effluent. Based on the LASAN (2020b) results, the EPA estimates that during the five-year period of the proposed action, mass loadings for flame retardants would range from 4.33 to 6.26 lbs/day (1.96 – 2.84 kg/day), with a potential (rare) high value of 6.33 lbs/day (2.87 kg/day). The EPA's estimate is based on an annual average discharge rate of 233 MGD. Using these values, and the estimated annual average discharge rates of 230 to 236 MGD, we estimate that Hyperion's discharge would results in mass loading of flame retardants ranging from 1,561 to 2,313 pounds (708 to 1,049 kg) per year, or 7,807 to 11,566 pounds (3,541 to 5,246 kg) over the five-year permit period. This estimate of flame retardant loading from the proposed action would add to the long-term accumulation of POPs in the action area.

<u>Exposure and Response to Harmful Algal Blooms (HABs)</u>

Hyperion continuously discharges nutrients, which may contribute to the increased extent and severity of HABs in the action area. As a result, the proposed action could increase the risk of exposure to biotoxins for ESA-listed abalone that reside in the action area, and for ESA-listed marine mammals and sea turtles foraging in the action area. HAB species found within the action area include *Pseudo-nitzschia* spp that can produce domoic acid, and the dinoflagellates *Procentrum* and *Akashiwo sanguinea* that can produce saxitoxin (Corcoran and Shipe 2011). Both domoic acid and saxitoxin are biotoxins known to be toxic to marine mammals, causing mortality and morbidity events (Van Dolah et al. 2003). Domoic acid may also be toxic for sea turtles (Harris et al. 2011). For abalone, blooms of *Cochlodinium* and *Gonyaulax spinifera* have resulted in mortality events along the California coast (Rogers-Bennett et al. 2012; Howard et al. 2012a; Wilkins 2013; De Wit et al. 2014). *Cochlodinium* has been associated with Hyperion's effluent (Howard et al. 2012a; Reifel et al. 2013), and could affect white abalone and black abalone in the action area.

To understand the contribution of Hyperion's wastewater discharge to the risk of HABs in the action area, the City of Los Angeles conducted a Toxicity Reduction Special Study in 2019 (LASAN 2020a) that projected the total nitrogen concentration (ammonia+nitrate+nitrite+org-nitrogen) in Hyperion's effluent under the proposed action would range from an annual average of 48.96 mg/L to a maximum monthly average of 55.71 mg/L. Using the projected annual average discharge rates under the proposed action (230 – 236 MGD), the estimated mass loading of total nitrogen from Hyperion would range from 93,976 to 109,722 lbs/day (42,627 to 49,769 kg/day). This equates to an estimated 34.3 to 40 million pounds (15.6 to 18.2 million kg per year) per year, or 171.5 to 200.2 million pounds (77.8 to 90.8 million kg) of total nitrogen discharged into the action area by Hyperion over the five-year period of the proposed action. This amount of nitrogen is roughly equivalent to the nitrogen brought into the Bay from coastal upwelling (Howard et al. 2014). The discharge of large amounts of nitrogen in the effluent can tilt the phytoplankton community toward developing HABs (Howard et al. 2012b; Reifel et al. 2013; Booth 2015; Seegers et al. 2015).

Risks to Populations

In summary, the proposed continuation of wastewater discharge from Hyperion for another five years under the re-issued NPDES permit poses a risk to ESA-listed marine mammals, sea turtles, and abalone by exposing individuals to pollutants in the effluent and plume, and/or to the increased frequency or extent of HABs the effluent could promote. The concentrations of metals and most other potentially toxic constituents in Hyperion's effluent are expected to be lower than those typically expected to cause harmful effects and do not pose much of a threat for direct uptake from the water column or bioaccumulation through the food chain. However, studies confirm that ESA-listed marine mammals, sea turtles, and abalone are susceptible to endocrine disruption and harmful effects from POPs and other potentially harmful constituents that are known or expected to be found in Hyperion's effluent (e.g., PBDEs and organophosphate flame retardants). The proposed action is likely to increase the body burdens of these contaminants and potentially expedite diminished health and fitness. Finally, HABs have been documented to cause mortality and other health issues in marine mammals and abalone along the California coast. The potential increase in frequency and/or extent of HABs due to Hyperion's discharge poses an increased risk of killing marine mammals, abalone, and possibly sea turtles as well. Further studies are needed to evaluate the levels of potentially harmful contaminants found in the effluent and their effects on ESA-listed species in the action area, as well as the composition, frequency, and extent of HABs in the action area and their association with Hyperion's discharge.

It is difficult to assess how these potential effects from the proposed action may affect ESA-listed marine mammals, sea turtles, and abalone at the population and species levels given the available information. For marine mammals and sea turtles, their transitory nature and broad distribution in the Pacific Ocean likely limits their exposure to the proposed action to relatively small segments of populations that may occasionally visit or favor the action area (as opposed to large proportions or entire populations). One exception may be the Central America DPS of humpback whales because it has a small population and many or all of its members may visit the Southern California Bight annually and could enter the action area. We do not have information to further describe how many individuals or what percentage of their populations would be exposed or potentially affected by the proposed action. In addition, the extent of effects at the individual level are highly uncertain, given varying exposure levels and frequencies.

For white abalone, the action area contains one of the few known, remaining wild populations along the southern California coast, as well as one of two restoration sites where captive-bred white abalone have been outplanted in support of recovery. For black abalone, the populations within the action area represent a small portion of the populations along the Southern California mainland coast. The effects of the proposed action on individual health and fitness could affect the recovery of local populations within the action area; however, effects at the individual level are highly uncertain, making it difficult to anticipate what the population level effects may be. Based on their location within the action area (several miles from the discharge point), we expect abalone populations to be exposed to highly diluted, low concentrations of contaminants in the plume, which would likely require a long period of time to accumulate to levels that result in adverse effects on individual health. We do not expect that all abalone in the action area would be exposed to contaminants in the plume at the same concentrations, resulting in varying levels of exposure, uptake, and accumulation across individuals. We also do not expect that all abalone in the action area would be exposed to all HABs that occur within the area. Given the distribution of abalone in the action area and the best available information on past effects, we expect HAB-related impacts, including mortality, to generally be limited to a few abalone in a confined area at any given time, which would limit the effects on the population and species as a whole.

CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The EPA's BE/EFHA provides a detailed discussion of the cumulative effects in Section 4.4 (Cumulative Effects), and this section is adopted here (50 CFR 402.14(h)(3)). The EPA's BE/EFHA discusses several permitted discharges in the action area that are expected to continue over the course of the proposed action. Several of these discharges require non-Federally issued permits and are considered part of the cumulative effects. Some of these discharges require Federally-issued permits that would be subject to a separate consultation under section 7 of the ESA; and as such would not be considered part of the cumulative effects.

INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action to the environmental baseline and the cumulative effects, taking into account the status of the species and critical habitat, to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

We aggregate the *Integration and Synthesis* across species groups (e.g., marine mammals, sea turtles, and abalone) for two reasons: (1) overall similarities in how some ESA-listed species are exposed to the proposed action at an individual and population level; and (2) uncertainty regarding the occurrence and magnitude of adverse effects that may result from the proposed action, limiting our ability to describe expected effects for each species individually. We provide a general synthesis of our understanding of how the proposed action may affect ESA-listed species and, where appropriate and necessary, we consider and describe any species-specific risks relevant to concluding this biological opinion.

Marine Mammals and Sea Turtles

As described in Section 4.3 (Consequence Analysis) of the EPA's BE/EFHA, we do not anticipate that ESA-listed marine mammals and sea turtles will experience any adverse health effects associated with most of the potentially toxic compounds and elements found in Hyperion's effluent discharge plume as a result of occasional exposure when foraging in the action area. We base this conclusion on the limited exposure to concentrated amounts of these constituents and/or minimal risks the exposure may pose to their health.

However, ESA-listed marine mammals and sea turtles that may occasionally occur in the action area are susceptible to diminished health and reduced fitness as a result of exposure to potentially harmful contaminants, including POPs such as organophosphate flame retardants. Individuals of these species may already carry loads of potentially harmful contaminants prior to exposure (or as a result of previous exposure) to the proposed action and these existing loads could already be compromising overall health and fitness. We recognize that Hyperion's discharge may contain numerous other contaminants that could potentially harm ESA-listed marine mammal and sea turtle species, but the lack of information on these contaminants, their effects, and their concentrations limits our ability to analyze those effects further.

As described in the Executive Summary and Section 2.0 (Environmental Baseline, specifically Section 2.3.5 Special Study for Hyperion Toxicity Reduction, 2.3.6 Persistent Organic Pollutants, and 2.3.7 Contaminants of Emerging Concern) of the EPA's BE/EFHA, we expect the proposed action would increase the amount of POPs and other potentially harmful contaminants that are released into the environment. This would increase or expedite the accumulation of these potentially harmful constituents in the bodies of ESA-listed marine mammals and sea turtles feeding in the action area, increasing the potential for and rate of adverse health effects for these species. The expected occurrence and magnitude of exposure and adverse effects resulting from the discharge of potentially harmful contaminants is uncertain, partly because levels of some POPs and other potentially harmful contaminants in the effluent have not been extensively monitored and partly because the potential exposure and response of individuals is highly variable.

To address this uncertainty, the proposed action includes requirements to monitor and describe the discharge of some of these potentially harmful contaminants, including flame retardants. As this information is collected, we expect to be better able to assess the relative effect and contribution of Hyperion's discharge to increasing contaminant levels of ESA-listed species. Given what is already known about the harmful nature of these constituents, we expect that the monitoring data will inform efforts by the EPA and the City of Los Angeles to investigate measures to minimize the discharge of potentially harmful contaminants during future permit actions.

As described in Section 4.3 (Consequence Analysis) of the EPA's BE/EFHA, ESA-listed marine mammals and sea turtles that may occasionally occur in the action area are susceptible to diminished health, reduced fitness, and even mortality, from exposure to HABs, including HABs that may occur in the action area. As described in Section 2.8 (Harmful Algal Blooms) and 4.3 (Consequence Analysis) of the EPA's BE/EFHA, the proposed action may contribute to an increased probability of HABs occurring within the action area, as well as to the increased extent and severity of these HABs. We do not have a precise understanding of how much Hyperion's discharge may increase the probability or severity of HABs in the action area, or a way to assess if particular blooms are associated with nutrient input from Hyperion's discharge. The proposed action includes monitoring requirements for the influent, effluent, and receiving waters. The intent of this monitoring is to increase our understanding of the nitrogen dynamics and point loading that result from Hyperion's discharge and relate that knowledge to HAB occurrence in the action area.

Due to uncertainty associated with these two potential avenues for adverse effects at an individual level, we are also uncertain as to the relative occurrence and magnitude of these adverse effects at the population level for the ESA-listed marine mammals and sea turtles that may be exposed to the proposed action. As described in Section 4.3 (Consequence Analysis) of the EPA's BE/EFHA and the *Effects of the Action* section of this biological opinion, we generally expect that exposure will be limited to relatively few individuals (adults or juveniles) or small portions of these populations over the duration of the proposed permit. Exposure is more likely for individuals that may have some preference for or site fidelity to the action area. Although there is uncertainty in the specific extent of population level exposure, at this time we generally do not anticipate widespread effects across populations that could potentially produce reduced productivity or fitness at a population level for any of these species.

As described in Section 2.0 (Environmental Baseline) and Section 4.4 (Cumulative Effects) of the EPA's BE/EFHA, we anticipate that most of the factors that have been affecting the quality and health of the environment within the action area are likely to continue into the future over the duration of the proposed permit. The effects from these factors pose potential continuing threats to the health of ESA-listed marine mammals and sea turtles that may visit the action area, as well as to the action area as a whole. Climate change could influence the migration and distribution of prey species, the relative exposure of various individuals and ESA-listed populations within the action area, and increase the probability and/or magnitude of HAB occurrence in the action area over time. However, these climate change effects are unlikely to factor into the 5-year proposed action time frame considered in this opinion.

Currently, there is substantial uncertainty regarding the expected effects' occurrence and magnitude. Additional information is needed to support a better understanding of these potential effects and inform future analyses. For example, additional information is needed regarding (a) the levels of POPs and other potentially harmful constituents in the discharge effluent and their effects on ESA-listed marine mammals and sea turtles, and (b) the effects that the discharge effluent may have on the frequency and extent of HABs within the action area.

Blue Whales

Over the course of the proposed action, we anticipate that some individual blue whales may occasionally enter the action area and possibly be harmed by the proposed action, especially during the summer months. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. Although the ENP stock of blue whales is relatively small (670 to 1,898 individuals) (Becker et al. 2020; Carretta et al. 2021a), exposure to the proposed action would likely be limited to a small number of individuals and the population that may be affected constitutes only a small portion of the globally-listed blue whale species.

At this time, additional information is needed to more fully evaluate the exposure of blue whales to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any blue whales that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of blue whales, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Fin Whales

Over the course of the proposed action, we anticipate that some individual fin whales may occasionally enter the action area and possibly be harmed by the proposed action at any time during the year. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. The CA/OR/WA stock of fin whales is estimated to consist of 11,065 individuals (Becker et al. 2020), although exposure to the proposed action would likely be limited to a small number of individuals, and the population that may be affected constitutes only a portion of the globally-listed fin whale species.

At this time, additional information is needed to more fully evaluate the exposure of fin whales to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any fin whales that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of fin whales, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Humpback Whales, Mexico DPS

Over the course of the proposed action, we anticipate that some individual humpback whales may occasionally enter the action area and possibly be harmed by the proposed action, especially during the spring, summer, and fall months. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. Based on contaminant signatures, there are likely individual humpback whales that favor or frequent foraging sites in Southern California that could include the action area. These individuals would be at increased risk of diminished health and fitness, and even death. The Mexico DPS has recently been estimated to consist of 6,981 individuals (NMFS 2021), but humpback whales in the action area would more likely consist of animals from the Central America DPS. However, this Mexico DPS could occur in the action area given their general migratory movements along the U.S. west coast.

At this time, additional information is needed to more fully evaluate the exposure of the Mexico DPS humpback whales to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any humpback whales that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits. In the future, NMFS will be developing further scientific information regarding the distribution of ESA-listed humpback whales. This information will support an improved understanding of the potential exposure of the Mexico DPS humpback whales to actions throughout their range, including specifically their presence and abundance in the SCB.

We do not expect the proposed action to reduce the likelihood of survival and recovery of the Mexico DPS of humpback whales, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Humpback Whales, Central America DPS

Similar to the Mexico DPS of humpback whales, we anticipate that some individual Central America DPS humpback whales may occasionally enter the action area and possibly be harmed by the proposed action, especially during the spring, summer, and fall months. Based on contaminant signatures, there are likely individual humpback whales that favor or frequent foraging sites in Southern California that could include the action area. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. The Central America DPS has been recently estimated to consist of 1,809 individuals (NMFS 2021). They could occur in the action area given their general migratory movements along the U.S. west coast.

As described above for the Mexico DPS, additional information is needed to more fully evaluate the exposure of the Central America DPS of humpback whales to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any humpback whales that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits. In the future, NMFS will be developing further scientific information regarding the distribution of ESA-listed humpback whales. This information will support an improved understanding of the potential exposure of Central America DPS humpback whales to actions throughout their range, including specifically their presence and abundance in the SCB.

We do not expect the proposed action to reduce the likelihood of survival and recovery of the Central America DPS of humpback whales, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Gray Whales, WNP DPS

Over the course of the proposed action, we anticipate that some individual WNP gray whales may occasionally enter the action area and possibly be harmed by the proposed action during the winter and spring migrations each year. There is a small likelihood (less than 1% chance) that any individual gray whale that may enter the action area could belong to the WNP population of gray whales. It is likely that at least one WNP gray whale would enter the action area during the five-year course of the proposed action and thus experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. The WNP population of gray whales is very small (271 individuals) (Carretta et al. 2021b), but exposure to the proposed action would likely be extremely limited given their migratory behavior through such a small action area, the limited number of WNP gray whales that may occur in the action area, and the limited potential for foraging to occur.

At this time, additional information is needed to more fully evaluate the exposure of WNP gray whales to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any WNP gray whales that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of WNP gray whales, based on: (a) our current understanding of the actions' potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Guadalupe Fur Seals

Over the course of the proposed action, we anticipate that some individual Guadalupe fur seals may occasionally enter the action area and possibly be harmed by the proposed action, especially during the summer months. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. The Guadalupe fur seal population is estimated to be at least 31,091 individuals (Carretta et al. 2021b), although exposure to the proposed action would likely be limited to a small number of individuals and thus a small portion of the population.

At this time, additional information is needed to more fully evaluate the exposure of Guadalupe fur seals to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any Guadalupe fur seals that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of Guadalupe fur seals, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Green Sea Turtles, East Pacific DPS

Over the course of the proposed action, we anticipate that some individual East Pacific green sea turtles may be present in the action area and possibly be harmed by the proposed action. It is possible that some individual green turtles may reside in or make frequent or extended visits to the action area. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. Although there are no estimates for the total abundance of East Pacific DPS green sea turtles, the number of nesting females in one of the primary nesting areas exceeds 11,000 individuals (Seminoff et al. 2015). Green sea turtles are likely at an increased risk of exposure to the proposed action compared to other ESA-listed sea turtles, given their known occurrence in and around the action area. However, we expect that exposure would be limited to a small subset of individuals from the East Pacific DPS.

At this time, additional information is needed to more fully evaluate the exposure of green sea turtles to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any green sea turtles that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of East Pacific DPS green sea turtles, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Leatherback Sea Turtles

Over the course of the proposed action, we anticipate that some individual leatherback sea turtles may occasionally visit the action area and possibly be harmed by the proposed action. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. While there are no estimates for the total abundance of leatherback sea turtles within the population that may occur in the action area, the number of annual nesting females in western Pacific has been estimated at 1,054 (Martin et al. 2020). There is concern that the western Pacific population is in a state of decline, at high risk of extinction, and has shown no signs of recovery to date. However, we expect that exposure would be limited to a small number of individuals, constituting only a portion of the population that may be affected and a portion of the globally-listed leatherback sea turtle species. The overall risks of exposure to the proposed action are relatively low, given that the SCB is not a primary foraging location for this species and the species is not known to show site fidelity to the SCB.

At this time, additional information is needed to more fully evaluate the exposure of leatherback sea turtles to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any leatherback sea turtles that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of leatherback sea turtles, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Loggerhead Sea Turtles, North Pacific Ocean DPS

Over the course of the proposed action, we anticipate that some individual juvenile North Pacific Ocean DPS loggerhead sea turtles may occasionally visit the action area and possibly be harmed by the proposed action. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. There are no estimates for the total abundance of North Pacific Ocean DPS loggerhead sea turtles that may occur in the action area. The total number of adult females in the population was recently estimated at around 7,000 (NMFS 2019). It is estimated that there are approximately 340,000 loggerhead sea turtles of all ages in the North Pacific (Jones

2019 as cited in NMFS 2019). We expect that exposure would be limited to a small number of individuals (juveniles) and thus a small portion of the DPS.

At this time, additional information is needed to more fully evaluate the exposure of loggerhead sea turtles to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any loggerhead sea turtles that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of North Pacific Ocean DPS loggerhead sea turtles, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Olive Ridley Sea Turtles

Over the course of the proposed action, we anticipate that some individual olive ridley sea turtles, most likely from Mexican nesting beach origins, may occasionally visit the action area and possibly be harmed by the proposed action. These individuals would experience increased risks of diminished health, diminished fitness, and even death. However, these fitness effects are expected to be minimal and restricted to a few animals only, and death is an unlikely outcome in all cases. Moreover, the concentration of contaminants from Hyperion is a gradient and listed species occurrence in the action area is transitory in nature. While there is no specific estimate of abundance for the Mexican nesting beach population, the total abundance of olive ridleys in the eastern tropical Pacific exceeds one million individuals, which includes hundreds of thousands of individuals from the Mexican nesting beach population (NMFS and USFWS 2014). We expect that exposure to the proposed action would be limited to a small number of individuals and a small portion of the population.

At this time, additional information is needed to more fully evaluate the exposure of olive ridley sea turtles to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and any olive ridley sea turtles that may occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of olive ridley sea turtles, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and

(c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

White Abalone and Black Abalone

As described in Section 4.3 (Consequence Analysis) of the EPA's BE/EFHA and the *Effects of the Action* section of this biological opinion, we do not expect ESA-listed abalone to experience adverse health effects from exposure to most of the potentially toxic constituents found in Hyperion's effluent. In general, the levels of heavy metals and other constituents that have been reported in Hyperion's effluent are lower than the levels found to significantly reduce survival, growth, and/or reproductive development in abalone.

Exposure to potentially harmful contaminants in the effluent such as POPs may result in accumulation and harmful effects such as reduced growth, reproductive development, and survival among individual abalone. Based on the distribution of abalone within the action area, exposure would likely be limited to low concentrations of contaminants in the plume and would likely vary by individual. In addition, accumulation may require a long period of time to reach levels that could adversely affect individual health.

The proposed action likely contributes to the increased probability, extent, and severity of HABs in the action area; however, we do not have information to assess if particular blooms are associated with the proposed action. We do not expect that all abalone in the action area would be exposed to all HABs that occur within the action area. If oceanographic conditions expose abalone to a HAB, then there is a reasonable potential for some abalone to die. Based on the best available information on past effects and the distribution of abalone in the action area, we would expect any HAB-related mortality of abalone to consist of no more than a few individuals in a confined area, limiting the effects on the population and species as a whole.

In summary, the proposed action may adversely affect survival, growth, and reproductive development of abalone in the action area, further exacerbating the risks of low density and reduced reproductive capacity for white abalone and black abalone. As described in Section 2.0 (Environmental Baseline) and Section 4.4 (Cumulative Effects) of the EPA's BE/EFHA, abalone in the action area have already experienced years of exposure to discharges from wastewater treatment plants (including Hyperion), stormwater runoff, and adjacent rivers. The effects of the proposed action would be in addition to the ongoing effects of other discharges into the action area, warming water temperatures, and ocean acidification, along with other threats such as disease and poaching. However, based on the distribution of abalone in the action area, we expect exposure to harmful contaminants in the plume to be limited to low concentrations. Accumulation may vary for individual abalone and, given the low concentrations, may require a long period of time to reach levels that could adversely affect individual health. We also expect HAB-related mortality of abalone to be limited to a few individuals in a confined area. We acknowledge the high degree of uncertainty regarding the specific occurrence and magnitude of expected effects based on the available information.

White Abalone

White abalone have declined significantly throughout their range and face a high risk of extinction, primarily due to overfishing and the resulting low local densities. The action area is an important area for white abalone because it contains several wild white abalone, as well as one of two experimental restoration sites where captive-bred white abalone have been outplanted to re-establish populations. We expect the proposed action to continue exposing these white abalone to Hyperion's effluent plume. These individuals would experience increased risks of diminished health, diminished fitness, and even death due to the proposed action. However, we expect these effects on fitness to be limited and restricted to a few individuals.

Additional information is needed to more fully evaluate the exposure of white abalone to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and white abalone that occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of white abalone, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Black Abalone

Black abalone have declined significantly throughout a large portion of their range (south of Cayucos), in areas that once supported the majority of adult abundance in California. Although fishery harvest contributed to these declines, the primary cause was the disease called withering syndrome. Most disease-impacted populations remain at low abundance and density and may be more vulnerable to other threats. Black abalone historically occupied rocky reefs along the coasts of Palos Verdes and Point Dume within the action area. Little information is available regarding their current presence, abundance, and distribution in the action area, but a recent survey did find black abalone at Palos Verdes, at sites near the action area, as well as high quality habitat (Eckdahl 2015). These data indicate black abalone are present at these sites, though likely at low densities similar to populations elsewhere along the southern California coast.

We expect the proposed action to continue exposing these black abalone to Hyperion's effluent plume. These individuals would experience increased risks of diminished health, diminished fitness, and even death due to the proposed action. However, black abalone are likely exposed to low concentrations of contaminants in the plume due to their location in nearshore waters. Thus, we expect the effects on fitness to be limited and restricted to a few individuals. Additional information is needed to more fully evaluate the exposure of black abalone to Hyperion's discharge and the anticipated effects at an individual and population level. The EPA's proposed permit requires monitoring that would address key questions regarding the effects of Hyperion's discharge on the action area and black abalone that occur there. The data generated will support improved effects analyses in future consultations on the proposed action, which is expected to continue into the foreseeable future beyond the current permit cycle. When that information becomes available, we anticipate that the EPA and NMFS will be in a better position to assess potential measures to minimize effects under future NPDES permits.

We do not expect the proposed action to reduce the likelihood of survival and recovery of black abalone, based on: (a) our current understanding of the action's potential effects even given the acknowledged uncertainties regarding the magnitude and intensity of those effects on the species' status; (b) the measures that have been proposed to address these uncertainties; and (c) the prospect of developing actions to minimize the effects in future consultations, using information gathered under these measures.

Effects Determinations

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of blue whales, fin whales, Mexico DPS and Central America DPS humpback whales, the WNP DPS of gray whales, Guadalupe fur seals, East Pacific DPS green sea turtles, leatherback sea turtles, North Pacific Ocean DPS loggerhead sea turtles, olive ridley sea turtles, white abalone, or black abalone.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

We anticipate that all individual ESA-listed marine mammals, sea turtles, and abalone residing or feeding in the action area would uptake and/or accumulate potentially harmful contaminants including POPs such as organophosphate flame retardants. This uptake and/or accumulation would increase their body burden of these contaminants and the risk of incurring adverse effects on their growth, reproduction, and overall health and survival over a shorter period of time than would otherwise occur absent the proposed action. We expect all ESA-listed individuals that may enter or reside in the action area would be at increased risk of experiencing this effect, but we expect that adverse effects would generally be limited to relatively few individuals (adults or juveniles) from these populations.

We cannot further enumerate the anticipated take of ESA-listed species from the proposed action, due to uncertainty in the number of individuals that may be subject to exposure and uncertainty in the response and level of harm that would occur for individuals exposed from each ESA-listed species. Instead, we can describe the extent of take associated with the potential accumulation of potentially harmful contaminants by relating the extent of take to the amount of these potentially harmful contaminants being discharged into the action area by Hyperion. While there are many potentially harmful contaminants, our analysis focused on the apparently increasing threat associated with accumulation of organophosphate flame retardants, given the recent literature describing the potential harm organophosphate flame retardants can have on numerous ESA-listed species, and its known association with wastewater discharge in general. Consequently, we elect to use the extent of organophosphate flame retardant discharge as a surrogate to describe the extent of take associated with risks of increased contaminant levels for ESA-listed species as a result of the proposed action.

We have therefore quantified the potential incidental take of the proposed action in terms of the total loading of organophosphate flame retardants that we expect to be discharged by Hyperion. The City of Los Angeles completed a special study in 2019 to determine the mass loadings of CECs in Hyperion's effluent, including three organophosphate flame retardants (TCEP, TCPP, and TDCPP) (LASAN 2020b). Using the values from this special study, we estimated that Hyperion could discharge up to approximately 2,313 pounds (1,049 kg) of organophosphate flame retardants per year. These organophosphate flame retardants are released into the ecosystem and are potentially bioavailable for uptake into the food web and ESA-listed species. For the total five years of this proposed action, the incidental take, therefore, equates to the discharge of up to approximately 11,566 pounds (5,246 kg) of these organophosphate flame retardants for the permit cycle.

The proposed action includes monitoring requirements to evaluate the levels of CECs, including specifically these organophosphate flame retardants, in the effluent and mass loadings to the receiving water. Through these monitoring requirements placed upon Hyperion by the EPA, we expect Hyperion to be able to monitor the discharge of organophosphate flame retardants relative to the amount of their discharge that has been assumed and described above and to report the annual monitoring data to the EPA.

We also anticipate that all individual ESA-listed marine mammals, sea turtles, and abalone residing or feeding in the action area would face increased risks of exposure to HABs because the frequency and/or extent of HABs is likely to increase. However, we expect that adverse effects would generally be limited to relatively few individuals (adults or juveniles) of these populations.

At this time, we cannot predict the precise extent that Hyperion's effluent discharge contributes to increased probabilities of HABs, or distinguish which HABs may be more or less associated or influenced by the additional nutrient input from Hyperion's discharge. Consequently, we cannot further enumerate the anticipated take of ESA-listed species from the proposed action. Instead, we can describe the extent of take associated with increased probabilities of harmful effects from exposure to HABs by relating the extent of the increased probability of HABs to the amount of nutrients, specifically nitrogen, that are being released into the action area. We elect to use the extent of total nitrogen discharged as a surrogate to describe the extent of take associated with risks of increased probability of HAB exposure for ESA-listed species as a result of the proposed action.

We have therefore quantified the potential incidental take of the proposed action in terms of total nitrogen that we expect to be discharged by Hyperion. As described in the Executive Summary and Section 2.2.3 (Ammonia and Nutrients) of the EPA's BE/EFHA, as well as in the Effects Analysis above, the City of Los Angeles conducted a Toxicity Reduction Special Study in 2019 to evaluate total nitrogen concentrations in Hyperion's effluent (City of Los Angeles 2020). Using the values from this special study, we estimated that Hyperion could discharge up to approximately 40 million pounds (18.2 million kg) of total nitrogen per year. For the total five years of this proposed action, the incidental take, therefore, equates to the discharge of up to approximately 200.2 million pounds (90.8 million kg) of total nitrogen for the permit cycle.

As part of the proposed action, the EPA requires Hyperion to monitor the influent, effluent, and receiving waters for parameters that include the several forms of nitrogen (e.g., ammonia, nitrate nitrogen, nitrite nitrogen). Through these monitoring requirements placed upon Hyperion by the EPA, we expect Hyperion to be able to monitor nitrogen levels in the discharge and estimate the total loading of nitrogen to the action area relative to the amount that has been assumed and described above and to report the annual total nitrogen monitoring data to the EPA.

Effect of the Take

In this biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species.

Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. The EPA shall monitor, document, and report the extent of incidental take of ESA-listed species resulting from Hyperion's discharge using the surrogates described in the *Amount or Extent of Take* section of this biological opinion, through the requirements placed upon the permittee (City of Los Angeles).

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The EPA or any applicant has a continuing duty to monitor the effects of incidental take and must report the progress of the action and its effect on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

The following terms and conditions implement reasonable and prudent measure 1:

1a. The EPA shall require the City of Los Angeles to collect the necessary data to determine levels of organophosphate flame retardants in the effluent and the estimation of total organophosphate flame retardant discharge on an annual basis to the waters of Santa Monica Bay, using sampling and analysis protocols that are consistent with or equivalent to those used in studies by other wastewater dischargers.

1b. The EPA shall require the City of Los Angeles to collect the necessary data to support the ongoing monitoring of all nitrogen forms from Hyperion's discharge, and the estimation of total nitrogen discharge on an annual basis to the waters of Santa Monica Bay. In order to support this, the EPA shall require Hyperion to maintain at least monthly effluent sampling of ammonia, nitrate nitrogen, nitrite nitrogen, and organic nitrogen (Table E-7 in the proposed NPDES permit). The results from this monitoring will produce a more consistent and robust dataset that can be used in regional efforts, such as the Bight studies conducted by the permittee and other organizations.

1c. The EPA shall report the following to NMFS WCR within 180 days after the permit expiration date or at the time of permit renewal and consultation with NMFS: the estimated discharge of organophosphate flame retardants (pounds or kg) by Hyperion into the action area per year and the estimated levels of total nitrogen (pounds or kg) discharged by Hyperion into the action area per year.

The EPA may require the City of Los Angeles to directly submit their report(s) to NMFS, provided that the EPA also receives the report(s). The report(s) shall be submitted electronically to the NMFS WCR Protected Resources Division's Long Beach Office Branch Chief (Dan Lawson) at the following email address: Dan.Lawson@noaa.gov.

Upon request from NMFS, the EPA shall provide NMFS any monitoring reports that have been submitted by the City of Los Angeles to the EPA during the permit term.

1d. The EPA shall notify NMFS WCR if Hyperion's estimated annual discharge of organophosphate flame retardants and/or total nitrogen exceeds the amounts/levels that have been assumed and described above, within a reasonable amount of time after monitoring results indicate that the amounts have been exceeded.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

Contaminants of Emerging Concern (CECs)

Effluent discharged from wastewater treatment plants can be a major source of CECs to the receiving waters. The following conservation recommendation related to CECs would provide information for future consultations and address questions related to the effects of the proposed action's discharge on the frequency and extent of CECs in the action area and the SCB.

a. Collect the necessary data to determine levels of CECs in Hyperion's effluent and to estimate the total discharge of CECs on an annual basis to the waters of Santa Monica Bay, using sampling and analysis protocols consistent with or equivalent to those used in studies by other wastewater dischargers. CECs include pharmaceutical and personal care products, veterinary medicines, endocrine-disrupting chemicals, and nanomaterials.

Harmful Algal Blooms

The following conservation recommendations related to HABs in the action area would provide information for future consultations and address questions related to the effects of Hyperion's discharge on the frequency and extent of HABs in the action area and SCB.

a. Evaluate the generation of nitrogen form, timing, and mass balance data from upwelling and stormwater runoff events in Santa Monica Bay and the SCB to couple with the required generation of nitrogen data from Hyperion's discharge and feed into regional modeling efforts (e.g., SCB Regional Monitoring Program).

b. Assess what HAB species are in Santa Monica Bay, whether these species are being maintained within the subsurface plume, and whether they are manifesting concurrently with *P. spp.* and high domoic acid levels, or if *P. spp.* tend to bloom first and therefore reduce the prevalence of other HAB species. This work may be conducted by Hyperion or through the five-year Regional Bight Monitoring Program that examines multiple wastewater treatment plants within the area.

c. Incident-specific monitoring of phytoplankton communities in Santa Monica Bay before, during, and after planned discharges from the 1-mile outfall, to evaluate the presence, composition, and extent of blooms related to the discharge in the nearshore area.

Results of additional data collection, monitoring, and/or evaluation can be provided to NMFS in a report or reports, submitted on a schedule to be determined.

REINITIATION OF CONSULTATION

This concludes formal consultation for the EPA's re-issuance of a NPDES permit to the City of Los Angeles for wastewater discharge by the Hyperion Water Reclamation Plant.

Under 50 CFR 402.16(a), reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action.

In this biological opinion, we describe the extent of take of the proposed action in terms of the amount of potentially harmful contaminants discharged into the action area by Hyperion, specifically the total loading of organophosphate flame retardants. We estimated that Hyperion discharges approximately 2,313 pounds (1,049 kg) of organophosphate flame retardants (TCEP, TCPP, and TDCPP combined) into the action area each year. If Hyperion's discharge of these organophosphate flame retardants per year is determined to be greater than this estimate (through the monitoring required by the EPA or other means), then we may determine that the extent of take of the proposed action that has been anticipated in this biological opinion has been exceeded.

We also describe the extent of take of the proposed action in terms of the amount of nutrients discharged into the action area by Hyperion, specifically nitrogen. We estimate that Hyperion discharges up to 40 million pounds (18.2 million kg) of total nitrogen into the action area per year. If Hyperion's discharge of total nitrogen per year is determined to be greater than this estimate (through the monitoring required by the EPA or other means), then we may determine that the extent of take of the proposed action that has been anticipated in this biological opinion has been exceeded.

In addition to the extent of take, we identify numerous uncertainties regarding the exposure of ESA-listed species to the proposed action and the effects of this exposure. If an event or events transpire such that HABs in the action area are identified as causing significant harm and/or mortality to ESA-listed species, we may determine that the extent of take associated with Hyperion's potential contribution to HABs and resulting effects to ESA-listed species has been exceeded, pending available information about the HAB event or events. In addition, we recognize that the state of science continues to develop regarding contaminants, HABs, wastewater discharge, and ESA-listed species. We also expect additional information to become available through studies undertaken in association with the proposed action and conservation recommendations provided in this biological opinion. We will consider new information as it becomes available and, based on that information, may determine that the extent of take of the proposed action that has been anticipated in this biological opinion has been exceeded.

"NOT LIKELY TO ADVERSELY AFFECT" DETERMINATIONS

We reviewed the EPA's consultation request document and related materials. Based on our knowledge, expertise, and your action agency's materials, we concur with your conclusions that the proposed action is not likely to adversely affect the following listed species: North Pacific right whale (*Eubalaena japonica*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), giant manta ray (*Mobula birostris*), green sturgeon (*Acipenser medirostris*; Southern DPS), oceanic whitetip shark (*Carcharhinus longimanus*), scalloped hammerhead shark (*Sphyrna lewini*; Eastern Pacific DPS), steelhead (*Oncorhynchus mykiss*; Southern California DPS). The action is also not likely to adversely affect designated critical habitat for black abalone. The EPA's BE/EFHA provides a detailed discussion and analysis of the effects on these species and on black abalone critical habitat in Sections 3.1 (Description of Fish Species), 3.2 (Description of Marine Mammal Species), 3.4 (Description of Marine Invertebrates), and 4.3 (Consequence Analysis). We adopt these sections of the EPA's BE/EFHA here (50 CFR 402.14(h)(3)).

ESSENTIAL FISH HABITAT

NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination made by the EPA regarding the potential effects of the action. This review was conducted pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation.

Section 305 (b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces the quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species, and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.0-5(b)).

NMFS determined the proposed action would adversely affect EFH for various federally managed fish species within the Pacific Coast Groundfish, Coastal Pelagic Species (CPS), and Highly Migratory Species (HMS) Fishery Management Plans (FMPs). In addition, the proposed action occurs within, or in the vicinity of, rocky reef and canopy kelp habitats, which are designated as habitat areas of particular concern (HAPC) for various federally managed fish species within the Pacific Coast Groundfish FMP.

NMFS determined the proposed action would adversely affect EFH as follows:

- Reducing habitat functions necessary for growth to maturity;
- Modifying community structure;
- Bioaccumulation; and
- Modifying habitat.

At certain concentrations, wastewater discharge can alter ecosystem properties, including diversity, nutrient and energy transfer, productivity, connectivity, and species richness. These discharges can impair functions of finfish, shellfish, and related organisms, such as growth and egg development, visual acuity, swimming speed, equilibrium, feeding rate, response time to stimuli, predation rate, photosynthetic rate, spawning seasons, migration routes, and resistance to disease and parasites. Point-source discharges may affect the growth, survival, and condition of EFH-managed species and prey species if high levels of contaminants (e.g., chlorinated hydrocarbons, trace metals, PAHs, pesticides, and herbicides) are discharged. If contaminants are present, they may be absorbed across the gills or concentrated through bioaccumulation as contaminated prey is consumed (Raco-Rands 1996).

The EPA's BE/EFHA evaluated several pollutants in Hyperion's effluent, including metals (cadmium, copper, nickel, lead, silver, zinc), nutrients (nitrogen, phosphorus) and ammonia, total suspended solids, biological oxygen demand, oil and grease, and several CECs. In general, concentrations of metals in the influent, except for copper and zinc, have declined significantly since the 1980s largely due to source control programs, and all detected metals in the effluent, after applying the initial dilution factor, are below water quality standards. Heavy metals and persistent organic compounds, such as pesticides and PCBs, tend to adhere to solid particles discharged from outfalls and accumulate in benthic sediments. Areas of sediment contamination are present within the action area, much of which is a result of historical deposition (e.g., of DDT and PCBs) and not associated with recent discharges from Hyperion. The concentrations of DDT and PCBs in the sediments have decreased substantially from those observed prior to the 1980s, primarily due to burial. Concentrations of DDT and PCBs in fish tissue have also decreased during that time but still remain above levels of concern. A TMDL for DDT and PCBs in the Bay was developed to address this legacy contaminant issue, as well as two additional TMDLs for marine debris and bacteria, due primarily to sediment contamination/toxicity resulting from historical discharge of primary treated wastewater and sludge. Despite these legacy contaminant issues, benthic communities on the Palos Verdes shelf have improved substantially.

For biological oxygen demand and total suspended solids, effluent limits have been met since full secondary treatment was implemented in 1998. The proposed permit also includes effluent limits for oil, grease, and trash. Methods to address these pollutants have been implemented within the Santa Monica Bay watershed, including installation of catch basin screening and filtration devices, bird-proofing trashcan lids in parks, better placement of trash receptacles in high traffic areas, and public outreach.

CECs include endocrine disruptors and neurotoxins that can cause deleterious effects in aquatic life. For example, many personal care products contain compounds known to be endocrine disruptors that can cause estrogenic effects on fish at relatively low concentrations (Brausch and Rand 2011). In Santa Monica Bay, male hornyhead turbots were found to have levels of an active estrogen comparable to those in reproductively active females; however, these elevated levels were found in hornyhead turbots sampled throughout the Bay, with no clear correlation to Hyperion's discharge (City of Los Angeles 2011; Reyes et al. 2012). PBDEs have been documented in sediment and fish tissue samples near Hyperion's outfall, as well as reduced thyroid production in hornyhead turbots at sites near Hyperion's outfall and changes in gene expression when exposed to 5% of Hyperion's effluent in a lab setting (Maruya et al. 2011; Vidal-Dorsch et al. 2011; Bay et al. 2012). However, Bay et al. (2012) concluded that while chemical exposure at low level doses occurs, the biological responses did not appear to be associated with reduced reproduction or survival. The City of Los Angeles' receiving water monitoring program for fish abundance and community health shows minimal impact on fish species, as numbers and diversity of species are greater than those in previous decades for Hyperion's outfall sampling sites. These results are consistent with the Regional Bight monitoring data indicating the condition of offshore fish communities throughout the Bight is equivalent to that of reference sites (Bay et al. 2012).

Adverse effects on EFH for species managed under the Pacific Coast Groundfish, CPS, and HMS FMPs associated with the proposed action would be primarily limited to the ZID (the zone of initial dilution, which is the region surrounding the discharge point where organisms would be exposed to higher concentrations of the effluent prior to dilution) and to the influence of the discharge on HAB formation and prevalence. Various pollutants, including ammonia, pesticides, petroleum-based contaminants, and metals, can adversely affect EFH through acute (i.e., lethal) or chronic (i.e., sublethal) toxicity (Hanson et al. 2003). Organisms temporarily entrained in or passing through the ZID would be exposed to higher concentrations of Hyperion's effluent, but are likely not present long enough to be exposed to chronic or lethal toxicity levels. However, whole effluent toxicity tests conducted in a laboratory have found limited and transient acute toxicity, most likely due to higher than normal ammonia concentrations.

In addition, as described in Section 2.8 (Harmful Algal Blooms) and 4.3 (Consequence Analysis) of the EPA's BE/EFHA, the discharge of nutrients in Hyperion's effluent likely contributes to the increased frequency, duration, size, and severity of HABs in the action area. HABs can have various effects on EFH, including effects on prey species, reduced dissolved oxygen levels, and direct toxicity. For example, HAB-related toxins such as saxitoxins have sublethal to lethal effects on crustaceans (Vasconcelos et al. 2010) and yessotoxins were linked to a large invertebrate mass mortality event off Sonoma County in 2001, involving abalone, sea urchins, and crab species (De Wit et al. 2014). Dense HABs can cause low dissolved oxygen levels, resulting in fish kills (Trainer et al. 2010; Anderson et al. 2012; Backer and Miller 2016). Fish kills have also been linked to HAB-related toxins, such as saxitoxins (Gosselin et al. 1989; Lefebvre et al. 2004; Kudela et al. 2010; Trainer et al. 2010; Backer and Miller 2016).

Due to the high site fidelity of many species managed under the Pacific Coast Groundfish FMP (e.g., rockfish), they may be at risk of greater localized effects from wastewater discharges compared to other fish species with a more dispersed, pelagic distribution, such as those managed under the CPS and HMS FMPs. However, localized effects from discharge via the 5-mile outfall have decreased, both in spatial extent and severity, over the past few decades as a result of implementing full secondary treatment and a decrease in effluent volume. Increases in invertebrate and fish species abundance and diversity suggest the conditions around the 5-mile outfall are progressing toward background conditions. Moreover, the proposed action includes measures to avoid, minimize, or otherwise offset many of these adverse effects, including source control programs for toxic constituents, compliance with discharge permit requirements and water quality standards, outfall design to prevent nearshore transport of the effluent, and effluent discharge via a multi-port diffuser to reduce discharge velocities and pollutant concentrations at the point of discharge. In addition, where data gaps exist (e.g., toxicity effects anticipated from increased water recycling, flame retardant and hormone concentrations in the effluent and loadings to the action area), the proposed permit includes monitoring requirements to increase the understanding of potential effects associated with these constituents.

In terms of effects on HAPCs (rocky reef and canopy kelp beds), the 5-mile outfall discharges at a depth of 187 ft and was designed to prevent nearshore transport of the effluent, to reduce effects on nearshore rocky reefs. Kelp beds in the action area are primarily limited to two areas; neither of which are in close proximity to the discharge point.

Regarding cumulative effects, multiple permitted discharges release contaminants into the action area, resulting in cumulative impacts to EFH. Low flow diversions and treatment facilities have been effective at reducing bacteria and influent levels. When combined with other stormwater management practices, low flow diversions will improve water quality within the action area. In addition, increased recycling by the City of Los Angeles' four wastewater treatment plants has reduced wastewater discharges into the action area. Reduced flow, discharge prohibitions, and other NPDES permit requirements will continue to improve water quality in the action area. Cumulative impacts may also occur due to brine discharges from the West Basin Edward C. Little Water Recycling Plan (West Basin). The brine discharge is mixed with effluent from Hyperion and discharged via the 5-mile outfall. The main effect from the brine effluent is buoyancy, which drives initial dilution. Brine effluents are denser than freshwater effluents and may sink in the receiving water. However, because the brine effluent is such as small portion of the discharge (i.e., less than 2 percent), there is little to no effect on the discharge density. Therefore, brine discharges are not expected to affect the available mixing in the receiving water. Ammonia is also commonly found in brine; however, all detected values are below water quality requirements within the California Ocean Plan.

NMFS determined that as long as the measures identified and described in the *Reasonable and Prudent Measures* and *Terms and Conditions* sections of this biological opinion are implemented, then no additional measures are needed to avoid or minimize the adverse effects of the proposed action on EFH.

The EPA must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH (50 CFR 600. 920(l)). This concludes the MSA consultation.

DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The biological opinion and the EPA's BE/EFHA will be available within two weeks at the NOAA Institutional Repository (https://repository.library.noaa.gov/). A complete record of this consultation is on file at the NMFS WCR Long Beach Office.

Please direct questions regarding this letter to Susan Wang, NMFS WCR PRD Long Beach, at Susan.Wang@noaa.gov.

Sincerely,

Chris E. Yates

FOR Scott M. Rumsey, Ph.D.
Acting Regional Administrator

Enclosure

cc: Peter Kozelka, EPA
Administrative File: 151422WCR2022PR00223

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BIOLOGICAL EVALUATION and ESSENTIAL FISH HABITAT ASSESSMENT
for Discharges to the Pacific Ocean from Outfalls associated with the City of Los Angeles Hyperion Water Reclamation Plant and Wastewater Collection systems

Re-issuance of
NPDES Permit No. CA0109991
(State Order No. R4-2023-00XX)

FINAL

January 2023

Prepared by U.S. Environmental Protection Agency Region 9

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EXECUTIVE SUMMARY

Overview

EPA prepared this revised Biological Evaluation and Essential Fish Habitat Assessment for the reissuance of the National Pollutant Discharge Elimination System (NPDES) Permit (CA0109991) for the Hyperion Water Reclamation Plant, EPA is partnering with the Los Angeles Regional Water Quality Control Board to jointly-issue this NPDES permit. The draft permit was public noticed on August 30, 2022; and it anticipated to be issued as final in 2023. The Hyperion WRP discharges secondary treated wastewater thru ocean outfalls into Santa Monica Bay.

EPA's Effect Determinations:

Summary of effect determinations for federally-listed species, critical habitat, and essential fish habitat.

Table 1. Summary of Effect Determinations for ESA listed species, critical habitat, and essential fish habitat.

Type	Common Name	Summary of Effect Determinations	Critical Habitat Action Area
National Marine Fisheries Service			
Fish	Steelhead, southern California DPS	May Affect, Not likely to Adversely Effect	No
	Green sturgeon (Southern DPS)	May Affect, Not likely to Adversely Effect	No
	Scalloped hammerhead shark, Eastern Pacific DPS	May Affect, Not likely to Adversely Effect	No
	Oceanic Whitetip shark	May Affect, Not likely to Adversely Effect	No
	Giant Manta Ray	May Affect, Not likely to Adversely Effect	No
Marine Mammals	North Pacific Right whale	May Affect, Not likely to Adversely Effect	No
	Sei Whale	May Affect, Not likely to Adversely Effect	No
	Sperm Whale	May Affect, Not likely to Adversely Effect	No
	Blue Whale	Likely to Adversely Effect	No

Type	Common Name	Summary of Effect Determinations	Critical Habitat Action Area
	Fin whale	Likely to Adversely Effect	No
	Gray whale, western North Pacific DPS	Likely to Adversely Effect	No
	Humpback whale, Central American DPS	Likely to Adversely Effect	No
	Humpback whale, Mexico DPS	Likely to Adversely Effect	No
	Guadalupe fur seal	Likely to Adversely Effect	
Sea Turtles	Leatherback turtle	Likely to Adversely Effect	No
	Loggerhead turtle, North Pacific DPS	Likely to Adversely Effect	No
	Olive ridley sea turtle	Likely to Adversely Effect	No
	Green sea turtle, East Pacific DPS	Likely to Adversely Effect	No
Invertebrates	White abalone	Likely to Adversely Effect	No
	Black abalone	Likely to Adversely Effect	Yes*
U.S. Fish and Wildlife Service Species Associated with Ocean Habitats			
Crustaceans	Riverside fairy shrimp	No Effect	No
Birds	CA least tern	No Effect	No
	Coastal CA gnatcatcher	No Effect	No
	Least bell's vireo	No Effect	No
	Western snowy plover	No Effect	No
NMFS Essential Fish Habitat (EFH)			
Coastal Pelagic Species		Adverse effect	NA
Pacific Coast Groundfish		Adverse effect	NA
Highly Migratory Species		Adverse effect	NA

*EPA has determined the action is not likely to adversely affect critical habitat for black abalone.

Highlights of this updated BE and EFHA

This BE and EFHA for the Hyperion WRP was updated using information within the NMFS 2018 Biological Opinion for Hyperion permit (NMFS 2018), the 2021 Biological Opinion for the Orange County permit (NMFS 2021) and the 2022 Biological Opinion for the Point Loma WWTP (NMFS 2022). This BE and EFHA assumes the environmental baseline is the continuation of treated wastewater and stormwater discharges from Hyperion WRP since the existing NPDES permit issued in 2017. This document includes recent monitoring results from the Hyperion WRP, data record is 2017 – 2020.

Table 2. Updated Topics and Reference Section

Topic	Description/Discussion	Reference
Species list	Updated from 2022 BiOp/Point Loma	Exec. Summary, Table 1
Ammonia and Nitrogen effluent results	Discussion and figures	2.2.3
Special Toxicity Study	Discussion and figures	2.2.5
PCBs/DDT/Dioxin effluent results	Discussion and figures	2.3.6
Flame Retardant/CEC effluent results	Discussion and figures	2.3.7
PCB congener effluent results	(not available yet)	Appendix X.
PCB congeners in sediment	Discussion and raw data	2.4 and Appendix 9.6
PCB congeners in Fish	Discussion and raw data	2.7 and Appendix 9.7

Anticipated Effluent Quality during next NPDES permit term (2023 – 2028)

The Hyperion WRP will be discharging effluent at approximately 230 to 236 MGD annual average. During the next permit term there will be no significant changes to the treatment system and thus the effluent quality will be very similar between the current conditions and the next five years. As described below, in Section 1.4, the facility will be diverting a small amount (1.1 MGD) to be treated by advanced water purification system (for non-potable water re-use) and a pilot membrane bioreactor (MBR) system that will add filtration and biological treatment. The effluent from these two side-stream treatment systems will stay on-site in a looped mode. So, during the 2023-2028 permit term, there will be minimal changes to concentrations of nitrogen species and total nitrogen in effluent. This small amount of flow (1.1 MGD out of 232 MGD) is about 0.4% of the total daily discharge flow rate.

For this BE, EPA provides estimated ranges of mass emission total nitrogen loads and total flame retardant loads from the Hyperion WRP to Santa Monica Bay during the 2023-2028 permit.

EPA defines the sum of nitrogen species (ammonia+nitrate+nitrite+org-nitrogen) as the total nitrogen concentration in effluent, from the City of LA Toxicity Reduction Special Study (2020). Using the City's projected annual average (48.96 mg/L) total nitrogen concentration the maximum monthly average total nitrogen value (55.71 mg/L) and projected annual average flow rate between 2023 and 2028 (233 MGD, from City of LA, 2020), EPA estimates a range of values for mass loadings of total nitrogen in effluent, 94,615 pounds/day (15,679 mt/yr) to 108,257 pounds/day (17,939 mt/yr) during the 2023-2028 permit. If future unusual or extreme discharge conditions should occur, EPA estimates a potential (rare) high value of total nitrogen of 109,651 pounds/day (18,170 mt/yr).

For this BE, EPA utilizes the sum of the TCPP and TCEP values as proxy for total concentration of flame retardants in effluent, from the City of LA CEC Special Study (2020), the lowest total value is 2.23 ug/mL and the highest total value is 3.22 ug/mL. Using projected annual average flow rate between 2023 and 2028 (233 MGD, from City of LA Toxicity Study, 2020), EPA estimates a range of values for mass loadings of total flame retardants in effluent, 4.33 pounds/day (0.718 mt/yr) to 6.26 pounds/day (1.04 mt/yr) during the 2023-2028 permit. If future unusual or extreme discharge conditions should occur, EPA estimates a potential (rare) high value of total flame retardants, using 3.22 ug/mL and 236 MGD, of 6.33 pounds/day (1.05 mt/yr).

During the 2017 permit term, Hyperion was required to monitor all forms of nitrogen and provide an estimation of total nitrogen discharged on an annual basis. The City submitted a special study on March 2020 that estimated, during 2015-2019, the total nitrogen load discharged to be 91,000 lbs/day (15,066 mt/yr). Within the total nitrogen load, the ammonia loads discharged were estimated at 82,000 lbs/day. (City of LA, 2020, page 20). In the 2018 BiOp, NMFS provided an estimate of 9,900 kg total nitrogen per km2 per year, based on Howard et. al, 2014.

During the 2017 permit term, EPA selected the sum of the TCPP and TCEP to equal total flame retardants and used the highest measured total flame retardant value (3.22 ug/mL) and average flow rate (228 MGD) estimates the annual mass loadings of total flame retardants in effluent to be 6.12 pounds/day (1.050 mt/yr). In the 2018 BiOp, NMFS estimated a range approximately 40 – 62 pounds (18 – 28 kg) per year of total PBDEs may be loaded into Santa Monica Bay as a result of Hyperion's wastewater discharge.

Significant Changes to the 2022 draft NPDES Permit (from the Previous 2017 Permit)

The 2022 Hyperion draft permit clarifies the applicability of effluent limits and prohibitions for discharges from the 1-mile outfall. The 2022 draft permit requires the City of LA to conduct three special studies: 1) pesticides/PCB method development for wastewater, receiving water, sediments, and biosolids; 2) levels of dioxin in ambient waters of LA Harbor (for the Terminal Island facility), and 3) assessment of ichthyoplankton meta-barcoding for routine monitoring. These special studies will enhance knowledge of Bay health and knowledge of emerging issues associated with discharges from Hyperion (and Terminal Island) Wastewater treatment plant(s). Other changes in the 2022 permit are listed below.

Table 3. Proposed Changes to NPDES permit

Type of Change	2017 Permit	2022 permit	Basis for Change/Reference
New or Revised Effluent Limits[1]	No effluent limits for copper	New copper effluent limit for 5-mile outfall.	**Permit Table 5; Factsheet 5.3; Permit Appendix H**

[1] The 2022 draft permit also contains a new discharge prohibition on trash consistent with the State Board Order (and the 2010 Offshore Debris TMDL that is implemented in the MS4 NPDES permit).

Type of Change	2017 Permit	2022 permit	Basis for Change/Reference
	at the 5-mile outfall. No effluent limits for TCDD equivalents at the 1- or 5-mile outfall. Polyaromatic hydrocarbons (PAHs) effluent limit for 1-mile outfall.	New TCDD equivalents effluent limit for both 1- and 5-mile outfalls. Removes 1-mile PAH effluent limit.	Sampling data indicated that there was a statistical likelihood of effluent concentrations exceeding the water quality standards (i.e., reasonable potential) for copper and TCDD equivalents. Sampling data did not show a statistical likelihood of effluent concentration to exceed PAH water quality standard (i.e. no reasonable potential).
Revised Performance Goals (PGs) and Mass Emission Benchmarks	Performance goals (PGs) based on MLs from Ocean Plan.	Revised PGs and mass emission benchmarks to be based on effluent data where sufficient data exists.	**Factsheet Section 6** PGs where the data showed at least 20 percent detectable data are based on the one-sided, upper 95% confidence bound for the 95^{th} % of performance. This approach is consistent with the purpose of PGs, which are based on the actual treatment performance of the facility. Mass emission benchmarks are based on the revised PGs and generally are more stringent due to improved performance than the benchmarks in the previous permit.
Receiving Water Limits	Bacteria objectives based on 2015 Ocean Plan.	Revised bacteria objectives consistent with the 2019 Ocean Plan.	**Permit Section 6** In 2019, the State Board adopted new bacteria water quality objectives and implementation provisions to protect recreational users from the effects of pathogens in ocean waters of California.
Effluent/Influent Related Monitoring	Toxicity species screening required every 24 months.	Revised toxicity species screening requirements to once a quarter during the last 18 months of the permit. Toxicity screening tests must all be valid to be considered in the screening.	**Permit 8.10; Monitoring and Reporting program 5.4 (E-37); Factsheet Section 5.3.6** Screening includes toxicity tests for 3 categories of organisms – vertebrate, invertebrate and plant. The selected species is used for chronic toxicity Max Daily effluent limit. NOTE: The 2021 State Board toxicity provisions do not yet apply to discharges to ocean waters, only to freshwater. State

Type of Change	2017 Permit	2022 permit	Basis for Change/Reference
			Board is working on a forthcoming amendment to Calif. Ocean Plan
	NA	Revises effluent monitoring frequency for copper, TCDD equivalents, and PAHs.	**Influent Monitoring is Table E-5; Effluent Monitoring is Table E-6** Monitoring is monthly for pollutants with effluent limits; quarterly for pollutants that are detected in effluent; semi-annually for pollutants not detected in effluent. Influent monitoring frequency is related to effluent monitoring. Therefore, PAH influent monitoring was reduced since there is no longer a permit limit.
None	Monitoring nitrogen species	Monitoring nitrogen species	**FS Section 10.2** **Table E-6 = Influent**: ammonia is monthly; total organic nitrogen and total nitrogen is quarterly. **Table E-7 = Effluent**: All nitrogen species are monthly, more frequent than quarterly in 2017 permit. Per 2018 BiOp, permittee must report annual mass-based total nitrogen in effluent.
None	Monitoring flame retardants	Monitoring flame retardants	**Table E-8; Pg. E-33 & E-73; pg. FS-69** Effluent monitoring has been retained in the draft permit. Per 2018 BiOp, permittee must report annual mass-based flame retardant values in effluent.
Special Studies	Special study monitoring flame retardants and hormone concentrations.[2]	Establishes annual monitoring for per- and polyfluoroalkyl substances. Removes a standalone special study requirement.	**Pg. FS-69; Table E-8; pg. E-33** EPA requirement for effluent characterization monitoring of PFAS and PFOS in federally issued permits. See **pg. FS-67** regarding the required PFAS monitoring**.**

[2] *NPDES Special Study Proposal for Constituents of Emerging Concern (CECs) Work Plan* (written in 2017, submitted on February 15, 2018, work began on May 15, 2018 and continued through March 31, 2020, final report submitted on April 30, 2020) and the *Hyperion Toxicity Reduction Work Plan* (the final plan was submitted on July 26, 2018; the study began in July 2018 and continued through March 2020, final report submitted on March 31, 2020).

Type of Change	2017 Permit	2022 permit	Basis for Change/Reference
	Special study evaluating the effects of water conservation and planned recycling on effluent acute toxicity and ammonia.	Removes special study requirement.	**Pg. F-61 & 62.** Final report submitted on March 31, 2020. During 2017-2021, all effluent toxicity tests were PASS, thus no need for special study to continue. Once the planned treatment plant upgrades are completed in 2034-35, then there will be decreased nitrogen loads.
	None.	Requires two new special studies: 1) Climate Change Effects Vulnerability Assessment and Mitigation Plan and 2) Annual Volumetric Reporting of Wastewater and Recycled Water.	Consistent with State Board Resolution Number 2017-0012 and RB4 Resolution Number R18-004 that steps be taken to address climate change as well as State Board Order WQ 2019-0037 EXEC to amend all permits requiring annual reports related to monthly volumes of influent, wastewater produced, and effluent, including treatment level and discharge type.
Receiving Water Monitoring	NA	Revises sample locations for benthic infauna, sediment chemistry, and trawl monitoring as well as two inshore water quality sample coordinates.	**FS pg. F-71** Revision to benthic infauna, sediment chemistry, and trawl monitoring sites needed due to telecommunication cables and difficulty sampling. Revision to coordinates needed to accurately reflect sample location as the previous permit had a typo in the longitudes for two inshore water quality monitoring stations.

1.0 Background

The U.S. Environmental Protection Agency (EPA) revised its biological evaluation (BE) and essential fish habitat (EFH) assessment for the reissuance of the National Pollutant Discharge Elimination System (NPDES) permit for effluent discharges from the City of Los Angeles, Hyperion Water Reclamation Plant (i.e., facility or Hyperion). The reissued permit will authorize the discharge of secondary-treated effluent to the Pacific Ocean. The facility is subject to permitting actions from EPA and the Los Angeles Regional Water Quality Control Board.[3]

EPA developed this BE and EFH assessment to assist with consultations for the permit action as required under Section 7 of the Endangered Species Act (ESA) and Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). EPA must submit a BE to assist the U.S Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) in evaluating whether a proposed action, such as EPA's reissuance of an NPDES permit, "is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. EPA must also submit an EFH Assessment to assist NMFS in evaluating whether a proposed action "may adversely affect" designated EFH for relevant commercial, federally managed fisheries species.

EPA is coordinating with FWS and NMFS (herein the "Services") to ensure the reissued permit addresses impact concerns. This BE and EFH assessment evaluates the impacts of facility discharges to species listed under the ESA and those formally proposed for listing, as well as compliance with EFH under the MSA.

This BE and EFHA reflects the best scientific and commercial data available to date.

1.1 Consultation History

Formal consultation on the 2017 permit was concluded in April 2018, when NMFS sent the Biological Opinion containing terms and conditions to EPA.

In July 2022, EPA contacted NMFS for an updated ESA-species list. On July 25, 2022, NMFS provided an updated species list which is part of the 2022 Biological Opinion for the Point Loma permit. (NMFS 2022) On August 11, 2022, EPA and NMFS met to discuss the approximate schedule of Hyperion permit development and EPA's anticipated timing to submit the request for formal consultation.

In September 2022, EPA and NMFS exchanged technical information about the proposed action, the action area, and past consultations in Southern California. EPA shared a draft BE and EFHA on September 26, 2022 and held a kickoff/technical assistance call on October 11, 2022 to

[3] Because the facility discharges to waters of the United States both within and beyond state territorial waters, U.S. EPA and the Regional Water Board jointly issue the NPDES permit. Brine is also discharged from the 5-mile outfall but is regulated under NPDES permit CA0063401, West Basin Municipal Water District, Edward C. Little Water Recycling Plant. The brine discharge is discussed in section 5.5, Cumulative Effects.

discuss the draft BE and EFHA and next steps by EPA. On October 24, 2022, EPA provided a draft Biological Assessment and EFH Assessment to NMFS. NMFS replied on November 2, 2022 with comments and clarifications. On November 8, 2022, EPA sent this revised BE/EFHA to NMFS with request for formal consultation pursuant to ESA Section 7(a)(2) and 50 CFR § 402.14(c) and EFH consultation pursuant to MSA Section 305(b)(2) and 50 CFR § 600.920 on the NPDES permit reissuance for the Hyperion Water Reclamation Plant and Ocean Outfall.

1.2 Plant History and Outfall Description

Hyperion has been in operation since 1894. Over the century of operations, treatment practices and flows have changed. Hyperion's primary facilities and outfalls were constructed in 1950 and by 1961, the City was discharging from the three ocean outfalls, discharge serial numbers 001, 002, and 003, commonly referred to as the 1-mile, 5-mile, and 7-mile outfalls. However, in 1987, the 7-mile outfall, used to discharge sludge, was decommissioned and is no longer operational. Today, the 5-mile outfall is continuously active, while the 1-mile outfall is used for emergencies and for preventative maintenance.

The design of the 5-mile outfall maximizes dilution to lessen the potential impacts of the discharge on the marine environment. It terminates about 26,500 feet (5.02 miles) west-southwest of the facility at a depth of 187 feet.[4] The 5-mile outfall ends in a "Y" shaped diffuser consisting of two 3,840-foot (0.7 miles) legs. On each diffuser leg, a series of 83 ports are alternately placed every six feet. See Appendix 9.2 for a diagram of the 5-mile outfall (and 1-mile outfall).

The 5-mile outfall is in an intermediate to low energy zone, which generally fully dissipates the effluent plume after a week. (Uchiyama et. al 2014). At times, the plume moves away from the outfall over tens of miles, but other times, the plume folds back on itself due to eddy current reversals.[5] The 5-mile outfall was designed so effluent discharged from the diffuser would be trapped below the thermocline to prevent nearshore transport.[6] As stated earlier, the 5-mile outfall discharges at a depth of 187 ft below the surface. At that depth, the effluent is usually discharged into cold ocean water below the seasonal thermocline – where temperature and density differences are the greatest, acting as a barrier to most vertical water movements in most calendar months (i.e. spring, summer, and autumn). (City of LA 2015).

The 5-mile outfall is kept in place by a large rock ballast in shallow water (to about 50 feet) and gravel ballast in deeper water. See Appendix 9.2. The City completed structural work on the 5-mile outfall in 2012 to protect the outfall from kinetic energy events, such as intense

[4] The 1-mile terminates at a depth of 50 feet. It is a 12-foot diameter outfall with a series of side ports and an end port.
[5] The City of LA reported that the plume data supports that the plume travels in various directions but generally not beyond 11 miles from the 5-mile outfall, restricted to offshore waters, and is below the surface. (City of LA 2021).
[6] The thermocline is a boundary that separates bottom waters from surface waters and is a barrier to circulation. Generally, if the plume is trapped below the thermocline, the plume will not mix upward where it could be transported into the nearshore environment. During late autumn when the surface waters cool to a temperature approaching that of waters beneath the thermocline, stratification is less, and vertical water movement occurs.

storms, tidal action, and limited seismic events. The structural work consisted of adding rock on top of scoured sections of the main barrel ballast. Rock ballast was restored and improved along most of the offshore section (i.e. main barrel to the outfall diffuser "Y" structure). In 2015, critical repairs of the effluent pumping plant header occurred, and flows from the 5-mile outfall were diverted to the 1-mile outfall.

1.3 Facility Operation and Average Flows

Figure 1. Aerial photograph of Hyperion.

The service area for Hyperion WRP covers about 90% of the city, collecting wastewater from around 4 million people and covering over 600 square miles.[7] Domestic wastewater comprises approximately 79% of the wastewater flow with the remaining 21% from industrial and commercial sources. Wastewater processing consists of preliminary treatment, advanced primary treatment, secondary treatment, and if applicable, disinfection. See Figure 1. Effluent is only chlorinated when discharged from the 1-mile outfall and for in-plant recycled uses, as described below.

The Hyperion WRP is located at 12000 Vista del Mar Boulevard, Playa del Rey, California. The plant was designed to accommodate both dry and wet weather days with a maximum daily flow of 450 million gallons per day (MGD) and peak wet weather flow of 850 MGD. The mass-based effluent limits continue to be based on a 420 MGD influent design flow rate. The facility has provided full secondary treatment since 1998. For the 2017 permit, Hyperion provided secondary treatment for wastewater and at annual average discharge flow rate of 223 MGD in 2017, 225 MGD in 2018, 232 MGD in 2019 and 215 MGD in 2020. Hyperion estimates this may increase to 236 MGD in 2022. During the 2023 to 2028 permit timeframe, Hyperion projects treated discharge flow rates ranging from 230 to 236 MGD.

[7] The City of LA and the County of LA set up separate wastewater collection systems at the beginning of the 20th century to be almost entirely gravity flowed and resulted in a number of negotiated contracts. As a result, the City of LA handles wastewater from eight other cities in LA County and wastewater from 21 other agencies, such as the Federal Office Building and West LA Community College. The City's harbor area, geographically separate from the rest of the city, is served by the Terminal Island Treatment Plant, which is also owned by the City of LA.

The Hyperion WRP has an industrial wastewater Pretreatment Program, which is approved by USEPA and the Los Angeles Water Board. The permittee continues to implement the Pretreatment Program throughout the Hyperion WRP's service area. However, since Contract Cities and Agencies operate their respective collection systems that are tributary to the City's main trunk lines, some contract cities and agencies also perform certain nondomestic source control activities, e.g., Fats, Oils, and Grease (FOG) program.

The Hyperion WRP collects and treats in-plant storm water runoff except that, during intense storms, undisinfected stormwater overflows may be discharged through the 1-Mile Outfall. This stormwater discharge is regulated by the State Water Board's NPDES Number CAS000001- General Permit for Storm Water Discharges Associated with Industrial Activities contained in Order 2014-0057, amended by Order 2015-0122-DWQ and 2018-0028-DWQ.

Currently, Hyperion recycles a portion of the effluent either in-house or at the West Basin Water Recycling facility. Approximately 11 MGD is processed at the Hyperion's Service Water Facility for internal plant use (i.e., line flushing, equipment seal water, cooling water, etc.). Approximately 36 MGD of effluent is sent to the West Basin facility for advanced treatment to produce 1.1 MGD of recycled water (i.e., tertiary treatment, microfiltration, and/or reverse osmosis). West Basin Municipal Water District anticipates this volume to increase to 54 MGD in the next five years.[8] (SMBRC 2015). The West Basin Water Recycling facility is permitted to discharge 5.2 MGD via the 5-mile outfall. Effluent used for in-house use is also eventually discharged via the 5-mile outfall. These flows reflect only a small portion of the discharge, less than 3% (i.e. 2% brine and 1% recycled in-house flow), from the 5-mile outfall.

Table 4. Summary of Treatment and Discharge Locations for Hyperion WRP

Type of Discharge	Flow (Q)	Treatment	Outfall
Dry Weather	Q $\leq$ 450 MGD	Secondary effluent	5-mile outfall
Wet Weather	450 < Q $\leq$ 720 MGD	Secondary effluent	5-mile outfall
Wet Weather	720 < Q $\leq$ 850 MGD	Secondary disinfected effluent	1-mile outfall
Preventive maintenance	Q $\leq$ 5 MGD	Secondary disinfected effluent	1-mile outfall
Stormwater[9]	Q $\leq$1,000 gpm	Untreated stormwater	1-mile outfall
Brine[10]	Q $\leq$ 5.2 MGD	Untreated reverse osmosis brine (from West Basin)	5-mile outfall

[8] West Basin is contractually entitled to receive up to 70 MGD of effluent from Hyperion. West Basin's discharge of brine is permitted under a separate NPDES permit, CA0063401. However, since the brine discharge is mixed with Hyperion's discharge, this BE considers the brine discharges in Section 4.2, Cumulative Impacts.

[9] Stormwater discharges from Hyperion are regulated under a state general permit CAS000001. Any stormwater exceeding the pumping capacity of pump station 2 or 3 (i.e.; 1,000 gallons per minute) will overflow to the 1-mile outfall. Pump station 1 has a larger capacity with a 313,000 gallon wet well and 18,000 gallon per minute pump capacity. See City of LA, Hyperion Stormwater Pollution Prevention Plan, 2015.

[10] Brine is discharged from the West Basin Municipal Water District's Edward C. Little Water Recycling Plant and is regulated by NPDES permit number CA0063401. Brine is less than two percent of the total discharge from the 5-mile outfall.

The 5-mile outfall has a dry weather capacity of 450 MGD, with a peak hydraulic capacity of 720 MGD.[11] The 1-mile outfall is an emergency outfall operational during intense wet weather events and increases the hydraulic capacity of the facility to 850 MGD. Actual wastewater flows into Hyperion continue to decrease due to a variety of conservation measures and drought conditions.

During the 2020 CEC Special Study, Hyperion collected effluent sample during six separate events, four dry and two wet weather, and the average flow rates of those six events was 228 MGD. Within the 2020 Toxicity Reduction Special study which measured effluent nitrogen species concentrations, there are three relevant annual discharge flow rates presented 232 MGD (2017-2019), ~236 MGD (estimated for 2022) and ~232 MGD (projected for 2025). In 2019, Hyperion WRP reported an annual average discharge flow rate of 232 MGD; while for 2020 it was 215 MGD. (City of LA, 2021)

During intense wet weather, stormwater may overwhelm the storage capacity of the facility's stormwater wet wells and discharge from the 1-mile outfall. Preventative maintenance activities are performed up to four times a year to test the emergency valve for the 1-mile outfall and usually results in a discharge of less than 5 MGD from the 1-mile outfall. See Table 4 for a description of flows from Hyperion.

On July 11-12, 2021, the Discharger released untreated wastewater through 1-mile outfall (Discharge Point 001) during an emergency. On July 11, 2021, the headworks of the Hyperion WRP experienced a backup that blocked bar screens at Hyperion's Headworks Screening Facility (Headworks Facility), resulting in the plant flooding and untreated wastewater overflowing to the 1-Mile Outfall. Untreated wastewater from the Headworks Facility flowed via the in-plant storm drain system due to the high-water levels in the sump wells. The wastewater overflow was directed through the 1-Mile Outfall rather than the 5-Mile Outfall because Hyperion's internal storm drains for overflows are connected to the 1-Mile Outfall to ensure stormwater flows do not overwhelm wastewater treatment processes. This resulted in approximately 17 million gallons (MG) of untreated wastewater being discharged as a controlled emergency measure through its 1-Mile Outfall relief system to prevent Hyperion WRP from going completely offline and to minimize the volume of untreated wastewater discharged. After the incident, the Discharger made notifications and submitted reports as required in 2017 permit. To date, this discharge event is under investigation by Los Angeles Water Board and EPA.

[11] The 2022 mass-based permit limits are based on the design flow rate of the treatment plant under the 1994 permit of 420 MGD. Although the design flow rate of the treatment plant has increased to 450 MGD, this increase has been accompanied by a significant improvement in the level of treatment necessary to achieve full secondary treatment. As a result, both the quantity of discharged pollutants and quality of the discharge are expected to remain relatively constant or improve. The 2022 permit contains a reopener provision if the City of LA wants to assess water quality impacts associated with mass-based limits calculated with the design capacity, 450 MGD. Pursuant to 40 CFR § 122.45(b), mass-based effluent limitations for POTWs are calculated based on design flow. If the permit used either 450 MGD or 720 MGD, mass loads would increase. Mass-based effluent limits are calculated using: daily max/average monthly effluent limit * flow MGD * 8.345 (conversion factor). For example, the 2022 permit includes a mass loading average monthly effluent limit for BOD of 105,000 lbs/day. If 450 or 720 MGD was used, mass loading would increase to 112,658 and 180,252 lbs/day, respectively. In order to increase mass loadings from 420, the 1996 design capacity, to 450 MDG, the permittee would need to conduct an anti-degradation analysis. The NPDES permit includes a reopener provision to address increasing mass-based loadings based on the current design capacity of 450 MDG.

1.4 Planned Changes and Upgrades at Hyperion 2023 – 2028 and up to 2035

Hyperion is in the process of upgrading and augmenting the existing treatment systems to produce and supply highly purified recycled water for various non-potable and potable uses. During the next permit cycle, two main projects are planned to be completed as part of the overall 2035 goal of upgrading the facility; however, between 2023 and 2028, the City expects the treated discharge to be similar effluent quality (same pollutants at similar concentrations) as has been discharged between 2017 and 2022. The first is called the Hyperion Advanced Water Purification Facility, which will produce 1.5 MGD of advanced treated non-potable recycled water to customers (i.e., currently LAX, irrigation, dual plumbing, cooling process, etc.). The second project is a membrane bioreactor (MBR, which uses physical and biological processes to produce higher quality effluent) pilot facility that will be used to determine the viability and design basis for converting Hyperion to an entirely MBR system by 2035. Hyperion plans to provide an average daily flow of 272 MGD for non-potable and potable reuse by 2035.

The Hyperion Advanced Water Purification Facility (HAWPF) will process primary treated effluent through fine screening, membrane bioreactor, reverse osmosis, and UV disinfection/advanced oxidation processes. This process will recover for water recycling 85% of the source/feed water and up to 15% will be brine that is recycled through the plant and discharged via the 5-mile outfall. This brine volume equates to approximately 1.1 MGD, which will be redirected back to Hyperion's headworks for further treatment prior to being discharged. (LACSD 2021).

Influent to the MBR pilot project will be comprised of Hyperion WRP primary effluent and will be treated by an MBR, reverse osmosis (RO), and advanced oxidation process (AOP). The pilot project will discharge streams of waste activated sludge, MBR filtrate overflow, RO permeate, RO concentrate, neutralized RO cleaning waste, and AOP effluent to the headworks of Hyperion WRP primary sedimentation through plant drains. The net effect of the discharge from the pilot project will be minimal because the volume of combined streams (i.e., backwash, sludge, recycled water used on-site at Hyperion WRP, RO concentrate, etc.) from HAWPF will be approximately 1.1 MGD and will be conveyed back to the headworks for treatment. Although the HAWPF waste stream will contain elevated concentrations of pollutants, the discharge accounts for less than 0.4% of the total effluent flow rate from the Hyperion WRP and is expected to have minimal impact on the Hyperion WRP effluent quality.

Figure 2. Location of the Advanced Water Purification Facility inside Hyperion. (LA Sanitation and Environment 2021).

1.5 Effluent Plume and Zone of Initial Dilution for 5-mile Outfall

The effluent plume has been detected moving in variable directions, reflecting the erratic nature of local currents and eddies. Normally, the plume is submerged between 65 to 100 feet from the surface due to density stratification. During winter conditions, stratification decreases, and the effluent plume may reach the surface. However, even under these winter conditions, the plume from the 5-mile outfall does not reach the shore. See Figure 3. For 2019-2020, the plume did not appear to reach shallower than 33 feet (10 m) from the surface and not detected less than 8200 feet (2.5 km) off shore. In 2019 and 2020, the plume generally was detected approximately 6.5 miles up- and downcoast of the outfall but did extend up to 16.5 miles north of the outfall in Fall 2020 (City of LA 2021). See figure 3a.

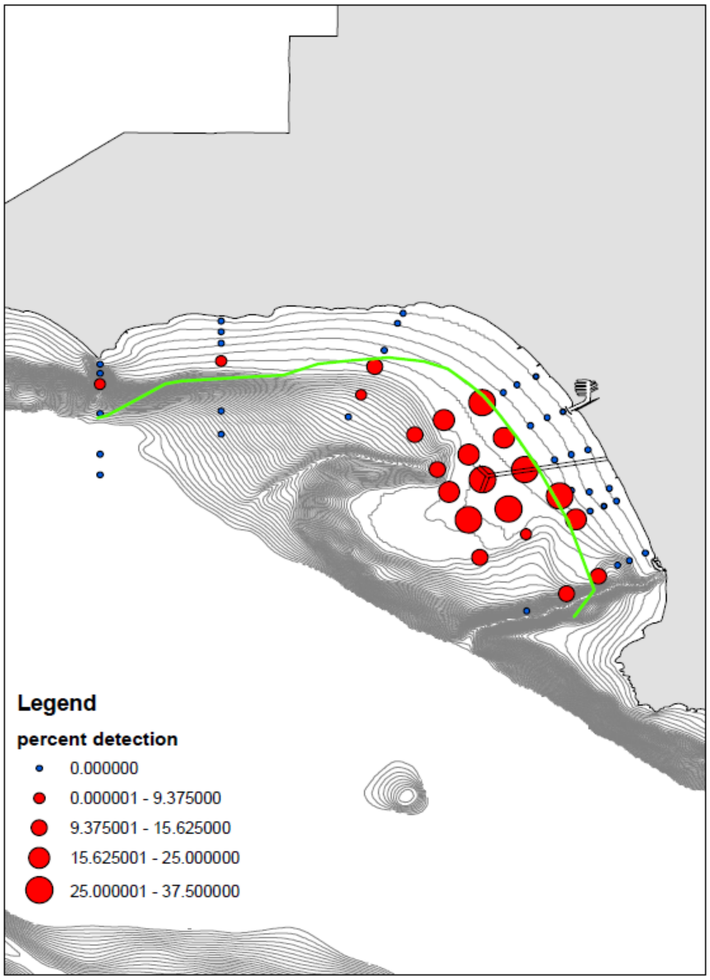

Figure 3. Plume probability figure for 2013 and 2014. Figure shows percent detection of the wastewater field. The green line denotes the 3 nautical mile mark. (City of LA 2016).

When effluent is discharged from the diffuser ports at the 5-mile outfall, there is an initial and rapid mixing of the effluent with ambient seawater (i.e. near field dilution). This plume of mixed effluent and ambient seawater moves away from the discharge point and becomes more diluted as distance increases from outfall (i.e. far field dilution). Once the discharge reaches a point of neutral buoyancy, either trapping below the surface, or reaching a boundary (i.e. surface or bottom of the receiving water), far field mixing occurs, as mixing is then controlled by currents and local turbulence.

The effluent rapidly mixes until a point of neutral buoyancy is reached, either trapping below the surface or reaching a boundary, such as the surface or ocean bottom. This process is referred to as initial dilution. The Ocean Plan specifically defines initial dilution as "the process which results in the rapid and irreversible turbulent mixing of wastewater with ocean water around the point of discharge." For submerged buoyant discharges, such as discharges from the 5-mile outfall, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing. Initial dilution in this case is completed when the diluting wastewater ceases to rise in the water column and first begins to spread horizontally.

Following initial dilution, passive diffusion becomes the dominant physical process that results in further dilution of the effluent with seawater. These two processes, initial dilution and passive diffusion, are physically different. The region surrounding the diffuser where initial dilution occurs is generally referred to as the zone of initial dilution. The process of initial dilution is rapid and energetic, with timescales of seconds to minutes, so that organisms temporarily entrained in or passing through the initial plume are not present long enough to be exposed to chronic or lethal toxicity effects.

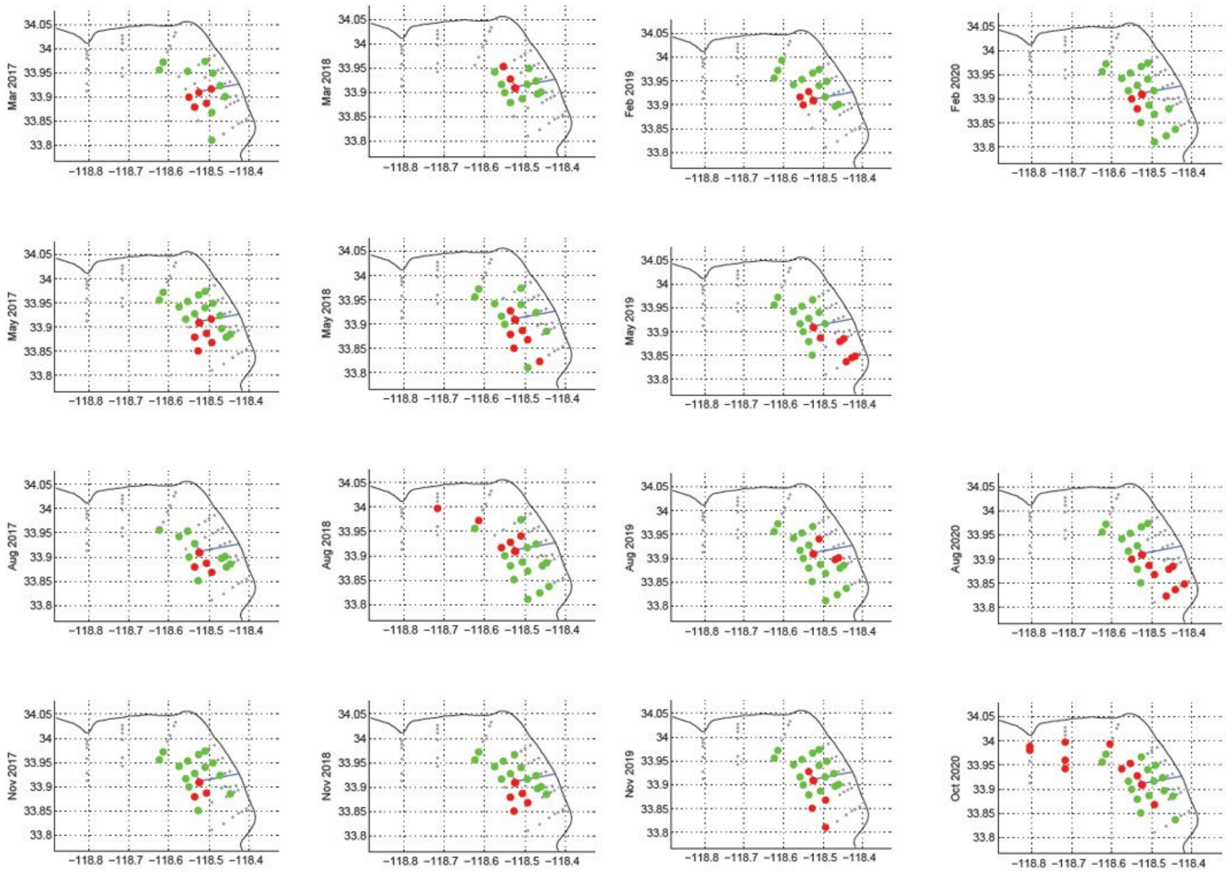

Figure 3a. Detection of effluent plume during 2017 - 2020. Stations are color coded: red indicates stations within the plume, green reference stations (i.e. no plume detected), and black/gray all other stations. No data was collected for Spring 2020 due to the COVID-19 pandemic. (modified from City of LA 2021).

The initial dilution is defined by critical conditions. Critical conditions are those under which the initial dilution will be the lowest (and the physical mixing zone the largest). To define critical conditions, the plume characteristic and initial dilution must be evaluated for a range of effluent and ambient receiving water conditions. Critical conditions generally are the highest effluent flow, the minimum and maximum ambient currents, and the density structure of the effluent and receiving water that result in the lowest initial dilution.

Based on Hyperion's dilution study (2015), a design capacity effluent flow of 450 MGD, zero ambient currents, and stratification in fall and winter are the critical conditions, which result in a reasonable worst case initial dilution of 96.[12] See figure 4. The dilution study also evaluated tidal conditions and zero current. Specifically, the dilution study determined available dilution at the mean lower low water level. However, the lowest tide modelled was 2.84 feet

[12] For effluent limit derivation in the California Ocean Plan (2019), initial dilution (Dm) is set to the lowest average initial dilution within any single month of the year. Dilution estimates shall be based on the observed waste flow characteristics, observed receiving water density structures (stratification), and the assumption that no currents, of sufficient strength to influence the initial dilution process, flow across the discharge structure.

(0.86 m) and the highest tide modelled was 8.49 feet (2.59 m) above the MLLW. The study concluded that while the water depth influenced dilution slightly, the MLLW was the appropriate depth to use for reasonable worst case scenarios.

EPA (and states) may use this initial dilution to establish a mixing zone, or zone of initial dilution. The mixing zone is an allocated portion of a receiving water where water quality criteria may be exceeded while effluent undergoes initial mixing with the receiving water. A mixing zone may be established by computing a dilution factor, or it can be delineated as a spatial area. The dilution factor is expressed as parts receiving water to part effluent, so an undiluted effluent (e.g. within the discharge pipe) would have a dilution factor of 1, or 1:1.

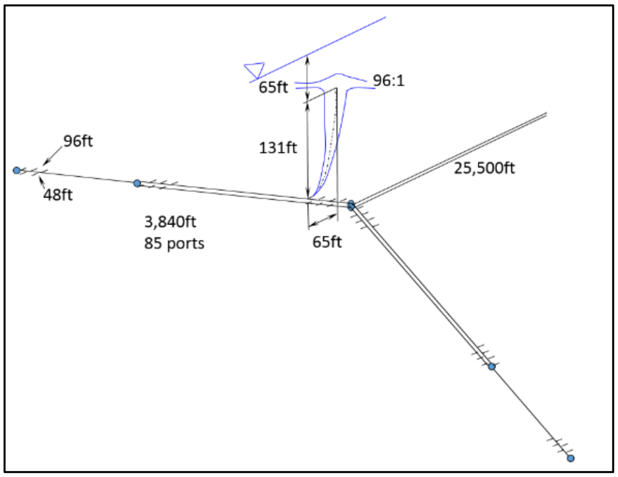

Figure 4. Plume Geometry for Hyperion's 5-mile outfall under critical conditions, as defined in the California Ocean Plan. The 96:1 corresponds to 65.6 feet on either side of the diffuser legs and 131 feet vertical from the diffuser.

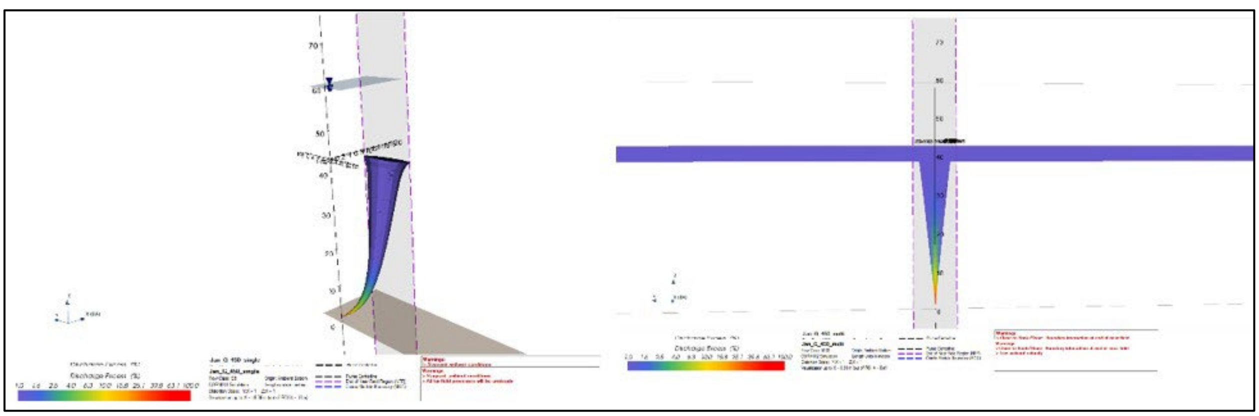

Figure 4a. The left plume is modelled from a single port of the 5-mile outfall and the right plume is from all ports along both legs of the 5-mile outfall. Due to setting the ambient current to zero, the CORMIX model can only calculate the point at which the buoyancy and momentum are dissipated and the plume begins to spread horizontally. For the critical conditions, the plume is trapped approximately 20 meters below the bay surface and spreads horizontally. As the plume spreads, each individual cone merge to form the horizontal plume.

The dilution factor is then used to calculate end-of-pipe effluent limits. A dilution factor of 96 was used to calculate effluent limits for ammonia and chronic toxicity and a dilution factor of 84 was used to calculate all other effluent limits.

Specifically, effluent limits, to be met at end-of-pipe, were calculated using the following equation from the 2015 California Ocean Plan:

$$Ce = Co + Dm\,(Co - Cs)$$

Where:
Ce = effluent concentration (ug/L)
Co = water quality objective concentration to be met at the completion of initial dilution (ug/L)
Cs = background seawater concentrations (applicable only for arsenic, copper, mercury, silver, and zinc in ug/L)
Dm = minimum probably initial dilution expressed as parts seawater per part wastewater

For example, the 6-month median ammonia effluent limit for the 5-mile outfall was calculated using the 6-month median water quality criteria (i.e. chronic criteria is 600 ug/L):

$$Ce_{chronic} = 600\text{ ug/L} + 96\,(600\text{ ug/L} - 0\text{ ug})$$
$$= 58{,}200\text{ ug/L or } 58.2\text{ mg/L}$$

1.6 Action Area: Santa Monica Bay

The ESA requires evaluation of potential effects to listed species as well as proposed endangered and threatened species in areas influenced by the proposed action. (50 CFR Part 402.02). The proposed action is reissuance of an NPDES permit. The evaluated area, or action area, must encompass the extent where the proposed action's direct and indirect effects are foreseeable and are reasonably certain to occur.

EPA selected the entire Santa Monica Bay, or 209 square miles, as the action area. The action area consists of areas where the discharge plume has been detected in Santa Monica Bay, from Point Dume to north and Point Vincente Marine Conservation Area (off the Palos Verde Peninsula) to the south. This action area includes all areas where the plume has been detected and where direct and indirect effects are foreseeable and are reasonably certain to occur (i.e. plume detection in 2020 ranged from localized near the 5-mile outfall to up to 16.5 miles north and 7.2 miles south of the outfall). See Figure 2 – Plume Probability (above).

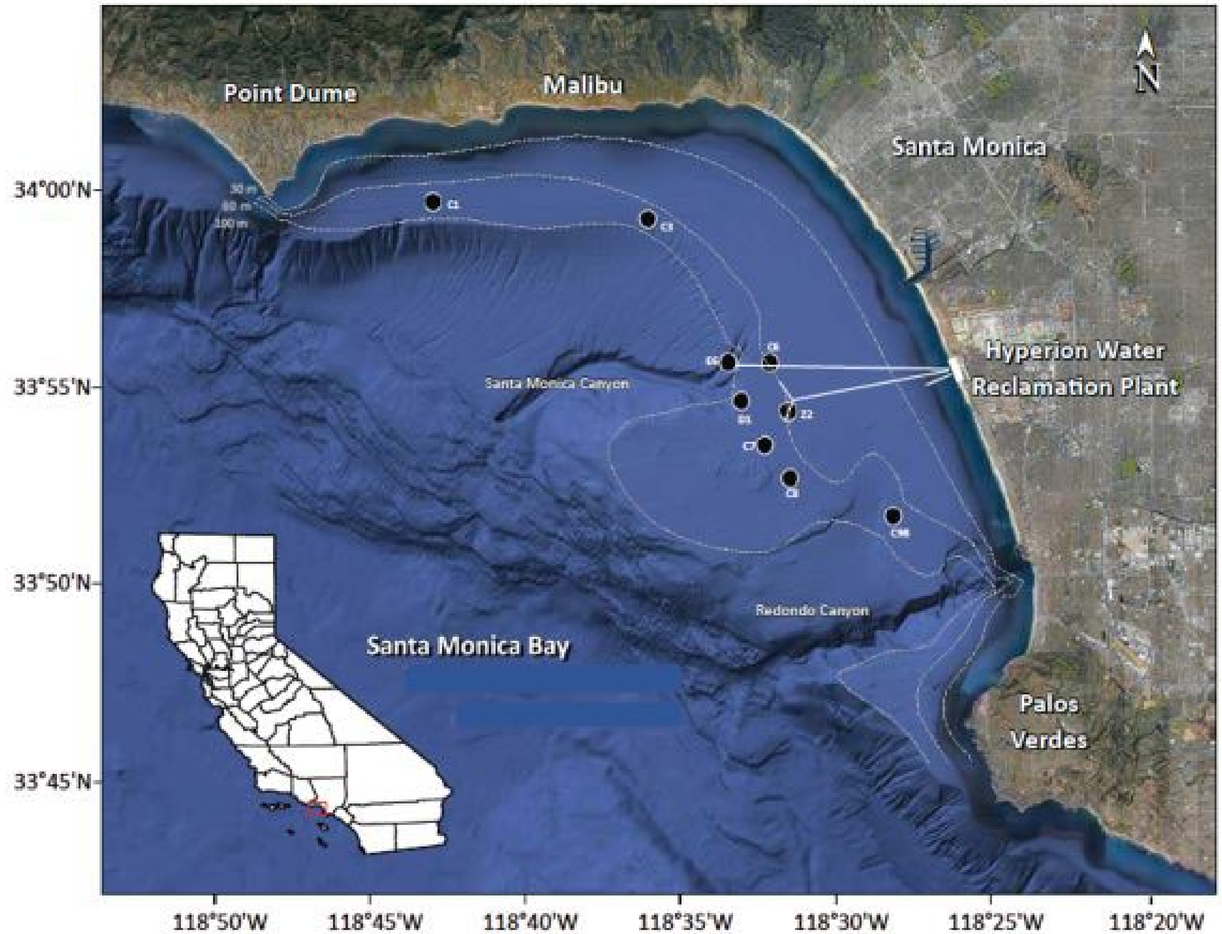

Figure 5. Action Area is Santa Monica Bay, from Point Dume to north and Point Vincente Marine Conservation Ares (off the Palos Verdes Peninsula) to the south. The action area includes the 1-mile outfall (short white segment close to Hyperion WRP) and 5-mile outfall (medium length white line with y at end). (longer white line is the 7-mile outfall which has been capped and discharge is prohibited from it.) Figure modified from City of LA, 2021.

In evaluating impacts to Santa Monica Bay, EPA examined data from all of the City's monitoring locations because indirect effects may occur at some of the regional monitoring locations, despite the plume not being detected at those locations. The data collected from the City's monitoring program corresponds to 152 square miles for the water column and 69 square miles for sediment and benthic monitoring. More than 5,000 samples of receiving water, sediments, fish, and invertebrates are collected and analyzed each year from this area and provide useful data to assess potential impacts to Santa Monica Bay.[13]

[13] Hyperion's monitoring program is modelled off of the principles, framework, and recommended design for effluent and receiving water monitoring elements in SCCWRP's Technical Report #357. This framework was also adopted in the California Ocean Plan, Appendices. (See Schiff, K.C., J.S. Brown and S.B. Weisberg. 2001. Model Monitoring Program for Large Ocean Dischargers in Southern California. SCCWRP Tech. Rep. #357. Southern California Coastal Water Research Project, Westminster, CA. 101 pp.).

2.0 ENVIRONMENTAL BASELINE IN THE ACTION AREA

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early ESA Section 7 consultation; and the impact of State or private actions contemporaneous with the consultation in process. The facility has been discharging into Santa Monica Bay since 1894. The facility's first operational ocean outfall was constructed in 1925 (i.e. 1-mile outfall) and offshore outfall was constructed in 1959 (i.e. 5-mile outfall). Full secondary treatment was achieved in 1998, which dramatically improved receiving water conditions.

EPA's 2017 Biological Evaluation included historical information, including the State of the Bay report (2015) and monitoring results from 2011-2014. Since the 2017 Hyperion permit was issued, EPA is adding the most recent monitoring results provided by City of LA annual reports from 2017 to 2020. Where possible, EPA is also presenting trend analyses, generally from 1987 to 2020.

2.1 Physical Description of Santa Monica Bay

The Santa Monica Bay is an integral part of the larger geographic region known as the Southern California Bight. The Southern California Bight is a large marine open embayment 94,000 km^2 in size that received the urban and agricultural non-point source runoff from coastal rivers and ocean discharges from primary or secondary treated wastewater from a coastal population of 22.7 million.[14]

[14] The Southern California Bight is an open embayment of the Pacific Ocean approximately 300 miles long and 125 miles wide, extending from Point Conception on the north to Cape Colnett, Baja California on the south.

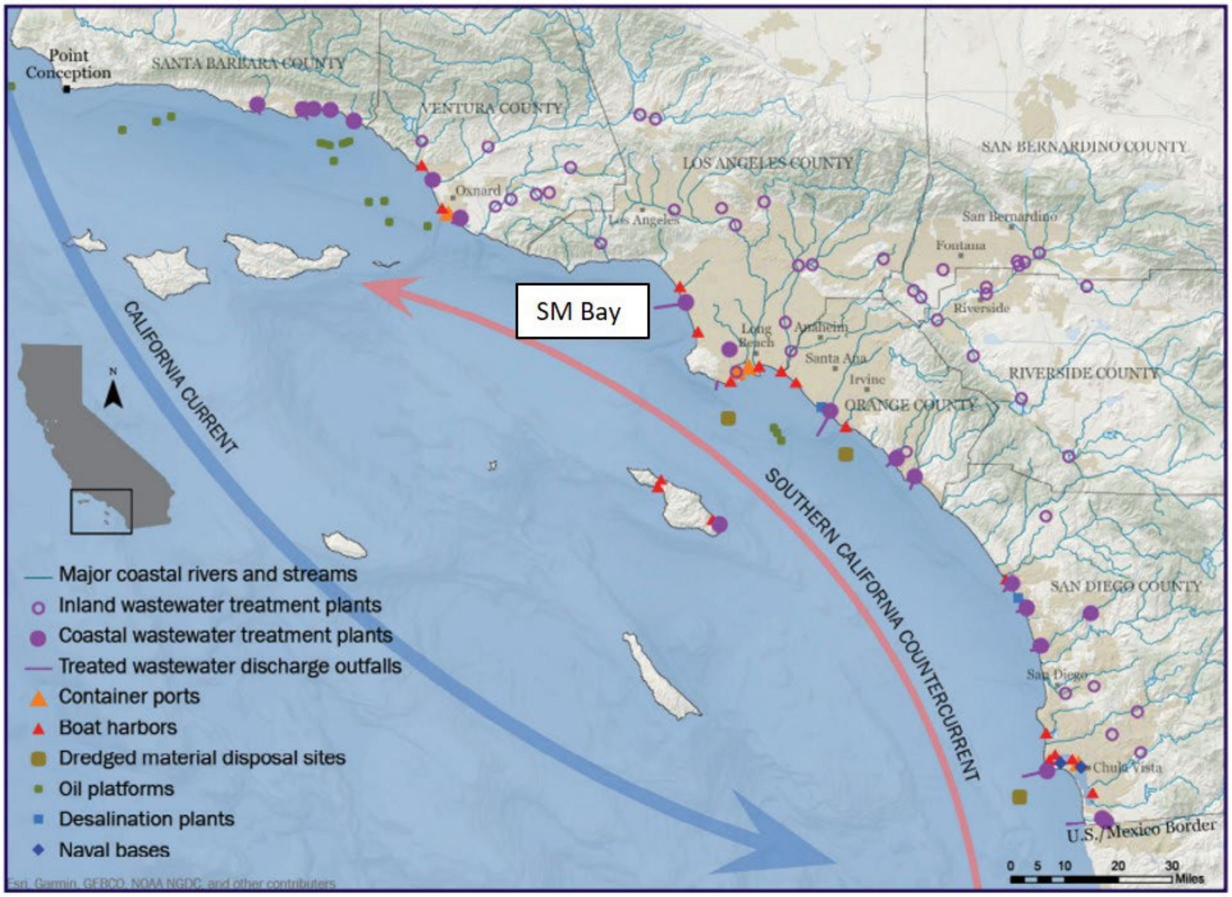

Figure X. The action area, Santa Monica Bay, within the Southern California Bight showing major sources of contaminants to coastal waters, and regional ocean currents. There are 19 coastal wastewater treatment plants that discharge over one billion gallons per day of treated municipal and industrial effluent into the Bight (SCCWRP 2022).

One shelf feature that contributes to the complex current system within the Bay is a plateau between two submarine canyons - Redondo Canyon (off King Harbor, Redondo Beach) and Santa Monica Canyon (central portion of Santa Monica Bay, upcoast of Hyperion). The 5-mile outfall is located on this plateau, known as the Short Bank, and extends to the edge of Santa Monica Canyon. The plateau contains coarser material (sand, shell debris, and rocks), as well as exposed bedrock and rocky outcrops. (City of LA 1990). See figure 6 for the location of the outfall to these canyons.

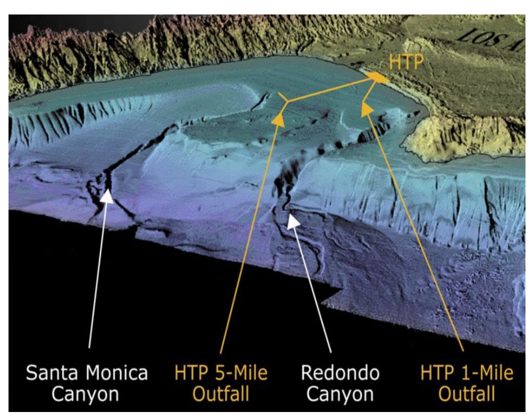

Figure 6. Map showing the location of the Hyperion outfalls and the two submarine canyons. (Source: Ballard Marine Construction. http://www.ballardmc.com/project/hyperion/).

Santa Monica Canyon heads at a depth of about 180 feet at a location about 3.5 miles offshore. Redondo Canyon is off Redondo Beach and is a source of upwelling in the Bay. The canyons are primarily soft-bottom, but there are some rocks and rocky ledges as some areas of the canyons have exposed bedrock. (City of LA 2009).

The main oceanographic feature of the Bight that distinguishes it from other adjacent coastal areas is the northward flowing return eddy, the counterclockwise Southern California Gyre. This means that the surface water generally flows southward and the remaining water, the California undercurrent, flows north. Within the Bight, seasonal density structures, and water mass characteristics, exist. In the spring, an atmospheric pressure gradient develops when land temperatures increase, causing upwelling-favorable winds. During this time, water column stratification occurs as sunlight intensity increases and brings cooler, less saline water into the Bay. In summer, winds relax, and the current moves away from the shore. The undercurrent peaks during fall and winter, bringing warm water in from the South with higher salinity and lower dissolved oxygen.

However, the currents within Santa Monica Bay are more complex than those found elsewhere in the Bight. The unpredictable currents in the Bay are primarily driven by complex basin topography and basin flows as well as by local wind forcing. In the action area, the prevailing current direction in the shallow, nearshore areas of the Bay is downcoast (equatorward) suggesting an eddy-type circulation pattern resulting from the upcoast (poleward) currents outside of the Bay. (SMBRC 2015).

2.2 Effluent Quality

2.2.1 Metals

Metals are essential elements for all living organisms and are found naturally in the environment. However, elevated concentrations may be harmful because metals bioaccumulate in marine organisms, causing a variety of chronic health problems and physical anomalies. Heavy metals of primary concern in the environment based on their toxicity include arsenic, cadmium, chromium, copper, mercury, magnesium, nickel, lead, and zinc.

EPA is evaluating some of these metals due to detected not quantified data or only low levels being detected in the effluent (i.e. cadmium, magnesium, mercury, and lead are not being evaluated). With the exception of copper, the metals are not at concentrations that could exceed the 2019 California Ocean Plan water quality objectives.

The concentrations of most metals in the plant influent, except zinc and copper, have declined significantly over time, largely because of the City's source control and pretreatment program. Removal efficiencies of metals through the treatment process have also improved over time. In general, higher removal efficiencies are found in metals that are less soluble in wastewater and have greater tendencies to associate with particles in the wastewater (i.e., cadmium, copper, chromium, mercury, lead, zinc, etc.). (City of LA 2021).

The draft 2022 permit contains an effluent limit for copper, restricting the amount of copper that can be discharged. The other metals are being controlled through performance goals that ensure treatment (i.e. removal efficiency) is maintained. If a performance goal is exceeded, the City must investigate the cause of the exceedance. The City also must submit a written report with corrective actions if concentrations are exceeded in three successive monitoring periods. The draft 2022 permit also contains 12-month average mass emission benchmarks for these metals as well.

Table 5. Annual Monthly Average Concentrations (ug/L) of Hyperion Effluent Metals. Compared to 2019 Calif. Ocean Plan

Pollutant[5]	2017	2018	2019	2020	Daily Max WQO[1]	6-month median WQO	6-month median WQO w/Dilution[2]
Arsenic	2.87	1.79	1.72	1.60	32	8	428
Chromium[3]			0.66	0.88	8[3]	2[3]	190,000[4]
Copper	10.01	10.68	15	11	12	3	87
Nickel	8.14	11.90	7.49	7.09	20	5	425
Zinc	22.12	21.79	23	18	80	20	1028

1 Averages only reflect detected, quantifiable results (detected but not quantified results were not used in determining averages). The 2017 NPDES permit required monthly monitoring, but only one sample event occurred during each month so presented values can be compared to daily maximum WQOs.
2 Dilution based on 84:1. The value in this column would be the effluent concentration to be met at end-of-pipe in order to ensure that after mixing, the chronic WQO would be met, per equation 1 in the California Ocean Plan.
3 The 2019 California Ocean Plan only contains a WQO for Chromium VI and dischargers may meet this objective as a total chromium objective.
4 The 190,000 ug/L is a 30-day average for Chromium III based on human health protection.
5 Lead concentrations were all non-detect

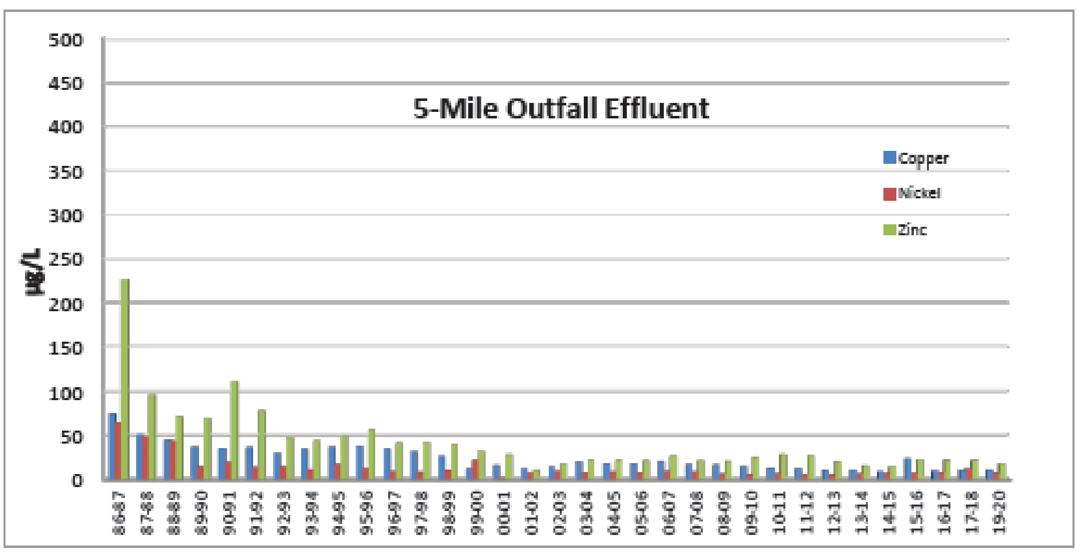

Figure 10. Average annual concentration of copper, nickel, and zinc in discharges from the 5-mile outfall from 1986 – 2020. The Ocean Plan copper standard is 3 µg/L for a 6-month medium and 12 µg/L for a daily maximum value; nickel standard is 5 ug/L for a 6-month medium and 20 ug/L for a daily maximum value; zinc standard is 20 ug/L for a 6-month medium and 80 ug/L for a daily maximum value.

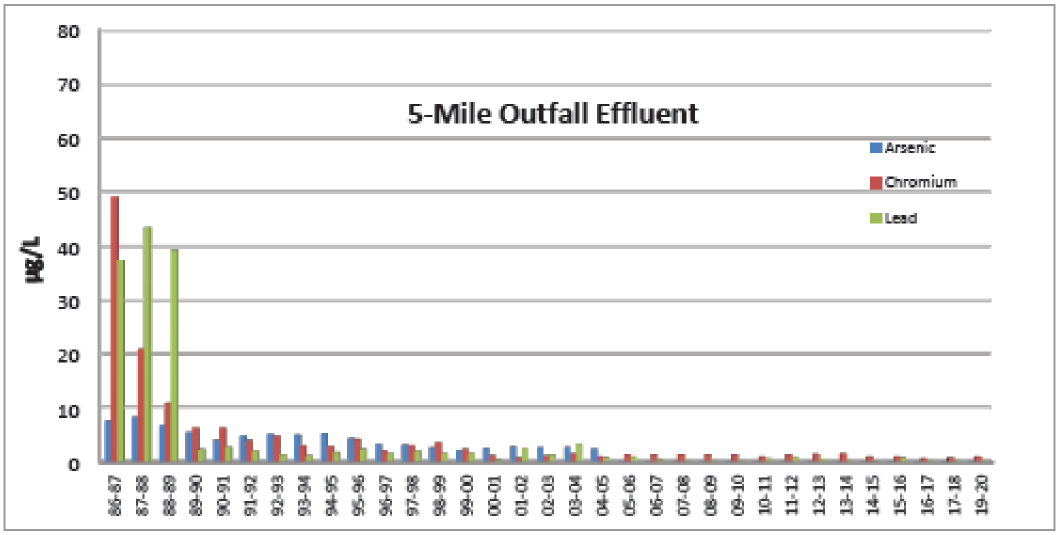

Figure 11. Annual average concentration of arsenic, chromium, and lead in discharges from the 5-mile outfall from 1986 – 2020. The Ocean Plan arsenic standard is 8 µg/L for a 6-month medium and 32 µg/L for a daily maximum value; chromium (hexavalent) and lead standard are both 2 ug/L for a 6-month medium and 8 ug/L for a daily maximum value.

2.2.2 Biological Oxygen Demand, Total Suspended Solids, and Dissolved Oxygen

A receiving water with little or no oxygen cannot support healthy levels of animals or plants and inhibits decomposition. Biological oxygen demand (BOD) and total suspended solids (TSS) both affect the level of oxygen in a receiving water, either directly or indirectly. Oxygen is depleted more rapidly with higher BOD. TSS has more indirect impacts.

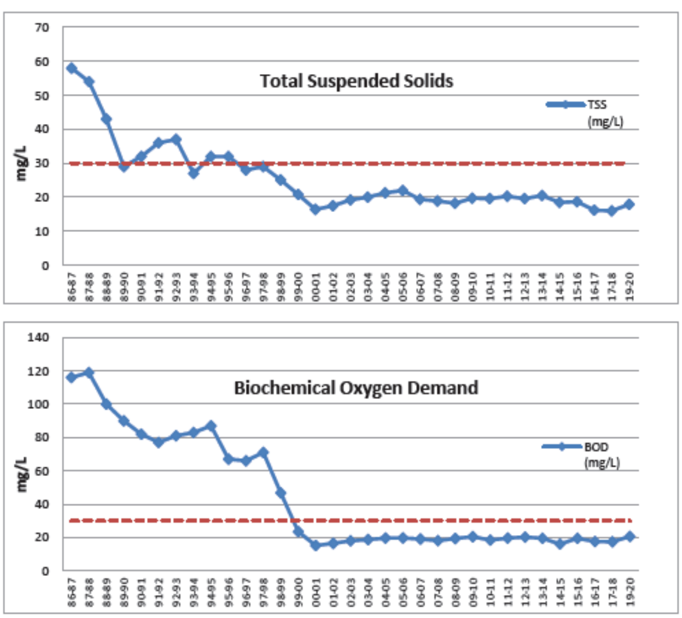

Figure 13. Annual average concentration of TSS and BOD from the 5-mile outfall. 1986-2020

TSS is related to turbidity, and excess turbidity can reduce light. Reduced rates of photosynthesis cause less dissolved oxygen to be released into the water by plants. High TSS can increase surface water temperatures because suspended particles absorb heat from sunlight. Warmer water holds less oxygen than cold water. High TSS can also increase the concentration of bacteria, nutrients, pesticides, and metals in the water because pollutants may attach to sediment particles.

The draft 2022 permit retains BOD, TSS, turbidity, and settleable solids effluent limits. The draft 2022 permit also retains narrative requirements, such as natural light shall not be significantly reduced at any point outside the initial dilution zone, to protect physical, biological, and chemical characteristics of the receiving water.

Since full secondary treatment, the effluent quality meets the TSS and BOD limits with the exception of the July 11-12 spill. See figures 13 and 14. Dissolved oxygen in plume water was 0.49 mg/L lower than the reference location.[15] Entrainment of the plume contributed to most of this depletion (i.e. 78% of the 0.49 mg/L difference). (City of LA 2014).

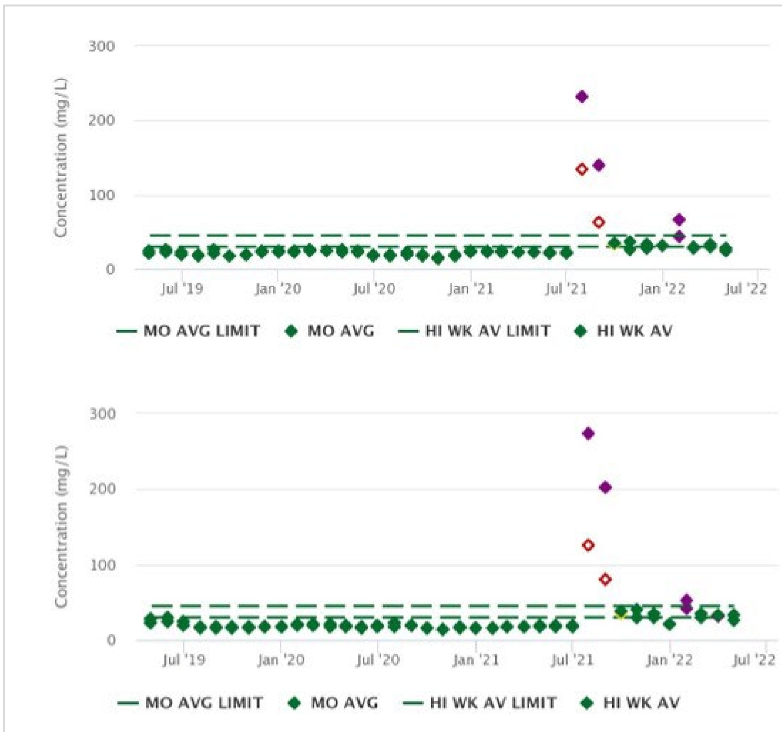

Figure 14. Biological oxygen demand (top) and total suspended solids (bottom), during July 2019 to May 2022 discharged from the 5-mile outfall. (EPA ECHO 2022).

[15] References locations/sites as described throughout the BE were standardized in 1998, with implementation of the Central Bight Cooperative Water Quality program and the Santa Monica Bay Restoration Commission monitoring program established in 2007. The permit describes this history in Attachment E, Section I.R and I.S.

2.2.3 Ammonia and Nutrients

Wastewater contains nutrients from human waste, food and certain soaps and detergents, specifically nitrogen and phosphorus. Nutrients in wastewater can exist in different forms of nitrogen and phosphorus. Phosphorus exists in the form of phosphate. Nitrogen compounds include ammonia, organic nitrogen, nitrite, and nitrate. Nutrient removal is a required process implemented at Hyperion during secondary treatment. However, traditional secondary treatment is sometimes insufficient to remove enough nutrients to prevent algal blooms or other harmful impacts in the receiving water.[16] Hyperion estimates that for every pound of nitrogen entering the facility, approximately 0.75 lbs is discharged in the secondary effluent. (City of LA 2020).

Most of the nutrient discussion in this section is with respect to ammonia. Ammonia is toxic to aquatic life at certain concentrations and can lead to a buildup in internal tissues and blood. The buildup can cause death. Environmental factors, such as pH and temperature, affect ammonia toxicity to aquatic animals. (EPA 2013). Similarly, excess nutrients can increase plant and algal growth leading to eutrophication. Further, ammonia is estimated as making up 92% of the nitrogen in the effluents discharged into the Bight by wastewater treatment plants (Howard et al 2014). Hyperion estimated that over 90 percent of nitrogen in the effluent is in the form of ammonia-N (City of LA 2020). Therefore, ammonia accounts for the vast majority of nitrogen discharged by Hyperion.

Table 6. Effluent Nutrient concentrations (mg/L) - Annual Average and Daily Maximum

Pollutant	2017		2018		2019		2020	
	Annual Avg	Daily Max	Annual Avg	Daily Max	Annual Avg	Daily Max	Annual Avg	Daily Max
Ammonia-N[1]	43.2	48.3	44.7	50.7	44.7	49.6	44.4	49
Organic N	4.1	7.4	2.6	4.3	3.87	4.7	3.5	4.5
Nitrate-N	ND	ND	ND	0.61	0.29	0.79	0.19	0.69
Nitrite-N	na	na	na	na	na	na	na	na
Total Phosphorus	2.97	3.82	2.64	3.21	2.81	3.38	2.89	3.62

1 The 2017 NPDES permit contained ammonia-N effluent limits: average monthly (58 mg/L) maximum daily (233 mg/L). The draft 2022 NPDES permit retains both of these effluent limits at same values.

Ammonia concentrations have been increasing over the last 9 years, largely due to increased urbanization of the service area and the use of a thermophilic digester process. Specifically, the ammonia effluent concentration increased by 9% since the City began producing Class A biosolids. The most recent increases in ammonia effluent concentrations are due to water conservation and drought conditions.

[16] See section 2.8 for a discussion of the role of nitrogen loads to harmful algal blooms.

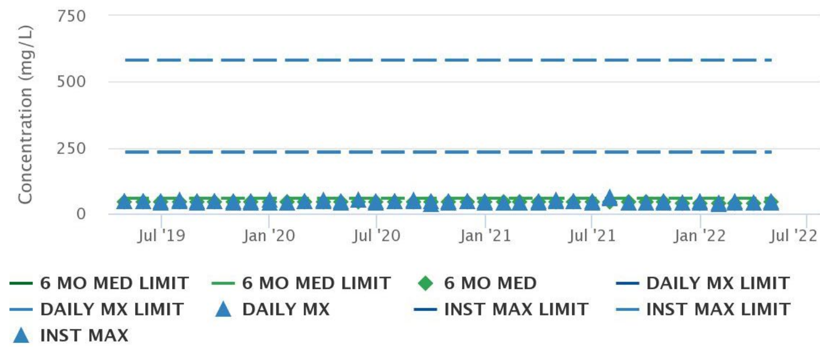

Figure 15. Effluent Ammonia concentrations, as an average monthly concentration, in the discharge during July 2017 to April 2022 at the 5-mile outfall. The Ocean Plan ammonia standard is 0.6 mg/L for a 6-month medium and 2.4 mg/L for a daily maximum value.

Under the 2017 permit, City of LA completed a special study evaluating effluent ammonia concentrations (and acute toxicity) and effluent total nitrogen based on monthly monitoring. Over the period of 2015-2019, the average total nitrogen load was 91,000 lbs/day to the Bay. Converting the 91,000 lbs/day, over the course of a year, this amounts to Hyperion 15.1 million kg/year, which is under the incidental take estimate in the 2018 Biological Opinion of 15.6 million kg/year.

Given the future upgrades to the Hyperion plant, the City also projects the effluent ammonia concentrations to slightly increase over the 2020 to 2034. Between 2023 and 2028, the projected effluent ammonia concentrations range from 33 to 34.5 mg/L. The maximum projected ammonia concentration is projected to be about 44 mg/L with the tertiary treatment (MBR) in 2034. This value is below the peak concentrations of 45.7 and 47.7 mg/L recorded in 2016 and 2018, and well below the 6-month median final effluent limitation of 58 mg/L in the 2017 permit and the draft 2022 permit.

In 2035, when the upgrades are completed to a 100% recycling facility, then effluent ammonia levels are expected to drop dramatically to less than 3 mg/L. After implementation of 100% water recycling at Hyperion in 2035, the brine produced at West Basin and sent to the 5-Mile Outfall is anticipated to contain ammonia levels similar to the projected ammonia-N concentration in future Hyperion brine (i.e., less than 3 mg/L). The mass-based projected total nitrogen loads are projected to be approximately 4700 lbs/day (780,000 kg/yr. (City of LA, 2020)

The following figures shows the current and project nitrogen loadings in the Bay. Ammonia-N loading in the Hyperion effluent sent to the 5-Mile Outfall decreased by approximately 9,000 lbs-N/day from 2008 through 2014 and has been relatively stable since 2015. When the ammonia-N load in the Hyperion secondary effluent flow sent to the West Basin is considered, the Hyperion secondary effluent ammonia-N load decreased by approximately 7,000 lbs/day or 6.7 percent. The future ammonia-N loads in the Hyperion secondary effluent and flow sent to the 5-Mile Outfall are expected to moderately increase though 2034 due to service population growth. When the Hyperion will be converted to 100 percent water recycling in 2035, ammonia loading to the 5-Mile Outfall is expected to drop sharply.

The draft 2022 permit includes three effluent limits for ammonia: average monthly (58 mg/L), maximum daily (233 mg/L), and instantaneous maximum (582 mg/L) for the 5-mile outfall. The monthly monitoring requirement is consistent with the monitoring frequency for pollutants with effluent limits. Monitoring frequencies should be sufficient to characterize effluent quality, to detect noncompliance and to consider the need for data (used in reasonable potential analysis to establish effluent limits). The permit also requires monthly influent monitoring for ammonia, total nitrogen and total phosphorus. In the draft 2022 permit, effluent monitoring frequencies for other forms of nitrogen are also monthly.

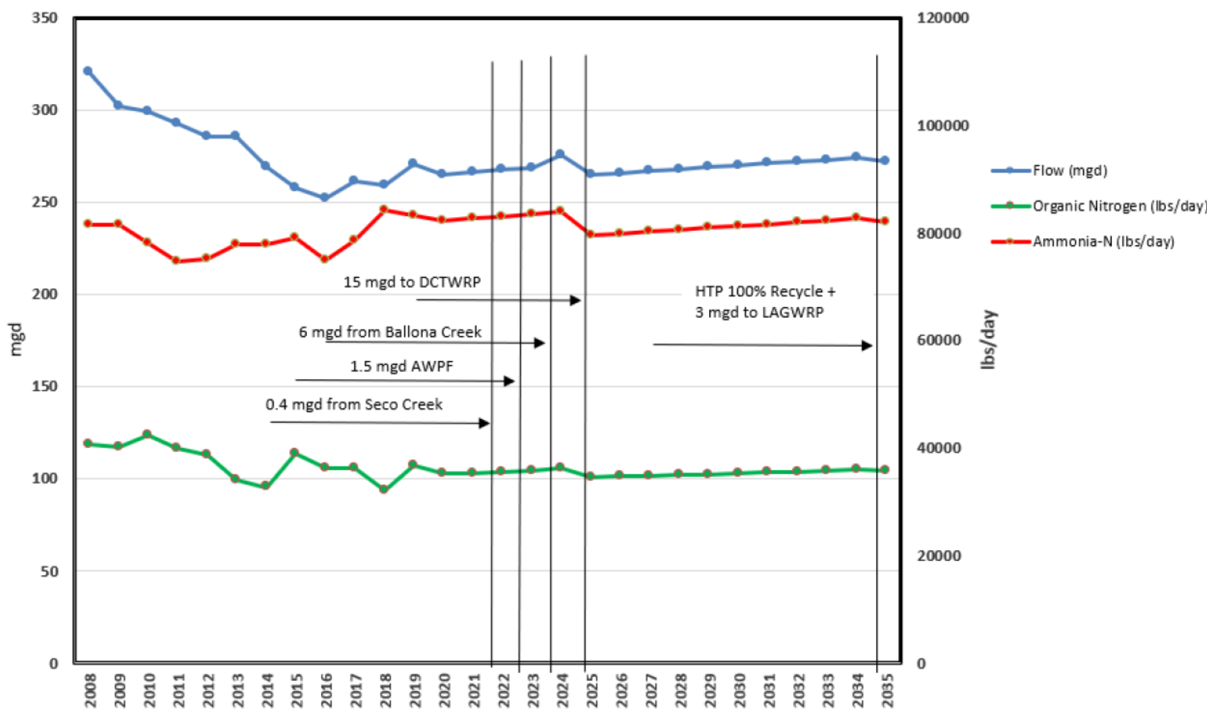

Figure N. Historical and projected **average influent flows** (mgd) and ammonia-N and organic nitrogen loads (lbs/day). (City of LA 2020). The black arrows represent planned projects that will affect influent flow to Hyperion. Specifically, two projects will reduce influent flows: 15 mgd of sewage from Hyperion's collection system and 3 mgd is planned to be sent other treatment plants. Influent flow will increase from stormwater flow from Ballona and Arroyo Seco Creek (6.4 mgd), and the 1.5 flow provides inhouse recycled water.

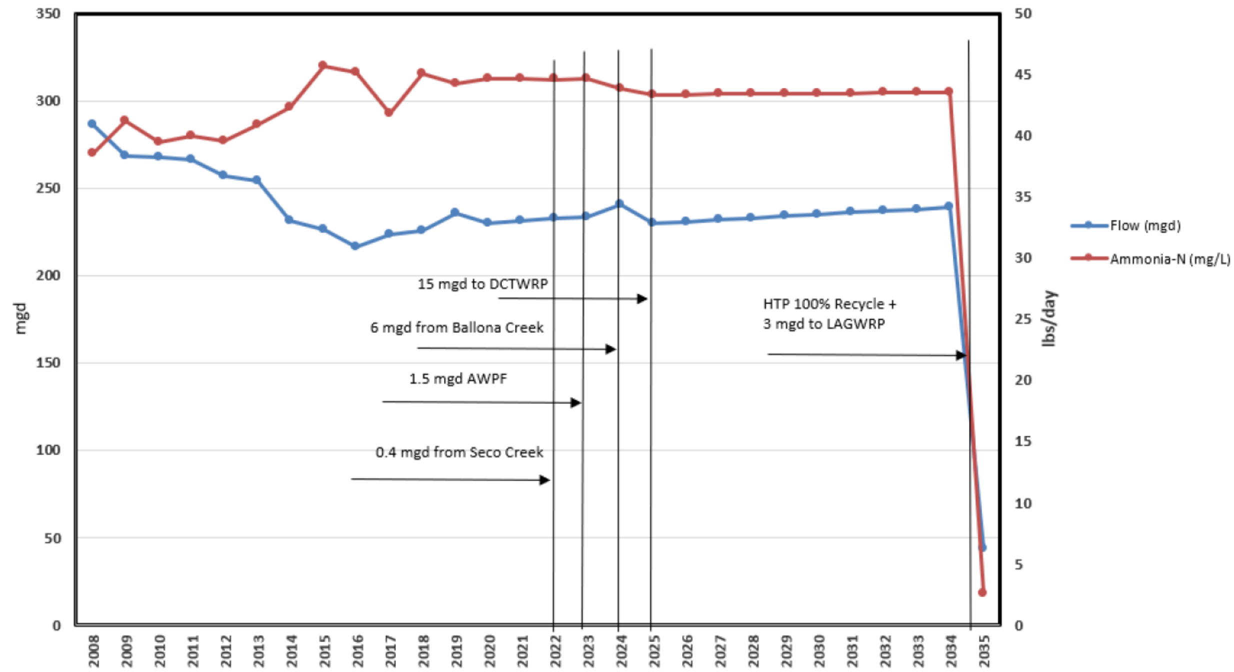

Figure NN. Historical and projected **average daily effluent flow** (mgd) and ammonia concentrations (mg/L) via the 5-mile outfall. The black arrows represent planned projects that will affect influent flow to Hyperion, as described in Figure above.

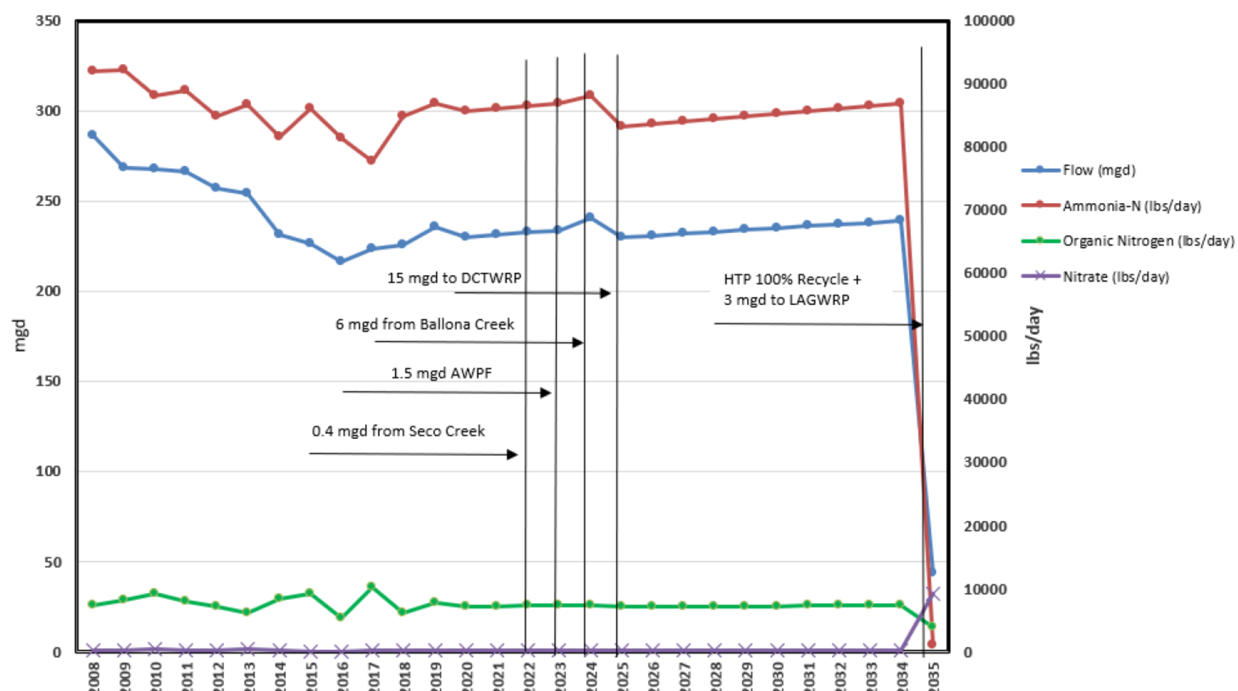

Figure NNN. Historical and projected **effluent nitrogen mass loads** (lbs/day) to Santa Monica Bay via the 5-mile outfall. The black arrows represent planned projects that will affect influent flow to Hyperion, as described in Figure above.

Total phosphorus in the effluent has undergone a gradual decline since conversion to full secondary treatment. Improved phosphorus removal was achieved through precipitation by addition of iron salts in the advanced primary treatment process and in the anaerobic digesters.

2.2.4 Whole Effluent Toxicity

Whole effluent toxicity (WET) is a useful parameter for assessing and protecting against impacts upon water quality and designated uses caused by the aggregate toxic effect of the discharge of pollutants and the toxic effect of individual chemicals without water quality criteria. Toxicity is not an absolute quantity but rather an effect that is determined relative to a control or reference sample using a given WET test method. Toxicity can be experimentally determined in a laboratory by exposing sensitive organisms, usually surrogate organisms representative of those found in the environment, to effluent concentration(s). Responses to this exposure are assessed. Different test species can exhibit different sensitivities to toxicants. Young organisms are often more sensitive to toxicants than are adults. For this reason, the use of early life stages, such as juvenile mysids or larval fish, are used in toxicity tests. Since it is not feasible to detect and/or measure all these (and other possible) effects of toxic substances on a routine basis, observations in toxicity tests generally have been limited to only a few effects, mainly mortality, growth, and reproduction. EPA has published extensive written protocols listing numerous marine and freshwater species for toxicity testing (EPA 1991 and 40 CFR 136).

The 2017 NPDES permit required comprehensive toxicity monitoring as part of the efforts to assess the effect of discharging effluent into the receiving waters and marine communities of Santa Monica Bay (SMB). The chronic toxicity tests conducted on the Hyperion effluent discharged through the 5-mile outfall as well as acute toxicity tests on SMB sediment samples to ensure compliance with the permit toxicity requirements and water quality standards in the Ocean Plan.

For effluent chronic toxicity testing, three species of west coast marine organisms, the Topsmelt, *Atherinops affinis*, the red abalone, *Haliotis rufescens*, and the giant kelp, *Macrocystis pyrifera*, are screened using EPA approved methods. The 2017 permit required sensitivity screening to occur every two years in order to determine the most-sensitive-species and to determine the species of test organism to be used in chronic toxicity testing. Results from the 2017 species screening determined Topsmelt to be the most sensitive species. Per the 2017 permit requirements, species screening tests were reconducted in 2020. Since the giant kelp test produced the highest percent effect, the giant kelp is the current testing species until the next re-screening in 2022.

Table 7 summarize effluent chronic toxicity results, primarily for Topsmelt, from 2017 to 2020 using the TST statistical approach.[17] Based on the biannual screening test results, monthly

[17] Prior to the issuance of Hyperion 2017 NPDES permit, chronic toxicity test results were reported in chronic toxicity units (TUc), which is an expression of the highest effluent concentration to which the organisms were exposed without observable adverse effects. The 2017 permit requires that the final effluent be tested once a month for chronic toxicity and the chronic toxicity test results be reported as either "Pass" or "Fail" following the Test of

chronic testing has been conducted with the Topsmelt till December 2020 and the giant kelp since January 2021. As shown in Table 7, nearly all tests resulted in a "Pass" and were thus declared non-toxic. (To receive a "pass" result, the species survival in the control sample cannot be greater than 20% as compared to the effluent sample.) Thus, no toxicity was observed in the Hyperion effluent, and no observable impact of this effluent was exhibited in SMB receiving waters or sediment for the years 2017-2020.

Significant Toxicity statistical approach described in the *National Pollutant Discharge Elimination System Test of Significant Toxicity (TST) Implementation Document* (EPA 2010). The TST is a statistical approach for analyzing WET data that uses a hypothesis testing approach and is based on type of hypothesis testing referred to as bioequivalence testing. In the context of the NPDES permit program, the TST statistical approach assess whether the response of test organisms at the instream waste concentration (or the percent of effluent in the test) is less than a predetermined proportion of the control response that is considered unacceptable toxic. The null hypothesis using the TST approach is that the IWC is significantly more toxic (i.e., results in a worse organism response) compared to the control (see Table 5). The alternative hypothesis using the TST approach is that the IWC is non-toxic. Thus, the null and alternative hypotheses using the TST approach are opposite of what they are under the traditional hypothesis testing approach of NOEC and LOEC. By using this statistical approach, EPA can improve consistency in assessing effluent toxicity and the impact of the discharge at the discharge-specific-in-stream waste concentration (IWC).

Table 7. Effluent monthly chronic toxicity results (2017-2020) for 5-mile outfall.

Results are calculated as "Pass" or "Fail" using the EPA's Test of Significant Toxicity (TST).

Year	Sample Date	Result	Percent Effect at IWC[1,2]	Year	Sample Date	Result	Percent Effect at IWC[1,2]
2017	January	Pass	--	2018	January	n/a	-23%
	February	Pass	--		February	Pass	-3.2%
	March	Pass	--		March	Pass	7%
	April	Pass	-5%		April	Pass	13.8%
	May	Pass	-0.3%		May	n/a	--
	June	Pass	7%		June	n/a	--
	July	Pass	0.6%		July	n/a	--
	August	Pass	3%		August	Pass	-1.8%
	September	Pass	7%		September	n/a	--
	October	Pass	0.5%		October	Pass	-13%
	November	n/a	--		November	Pass	13%
	December	Pass	2%		December	Pass	14%
2019	January	Pass	-3.6%	2020	January	Pass	17%
	February	Pass	-24%		February	Pass	18%
	March	Pass	-3.4%		March	Pass	12%
	April	Pass	-6%		April	Pass	2.3%
	May	Pass	-10%		May	Pass	1.4%
	June	Pass	-14%		June	Pass	3%
	July	Pass	-0.3%		July	Pass	3.4%
	August	n/a	--		August	Pass	2%
	September	n/a	--		September	Pass	-6.3%
	October	Pass	14%		October	Pass	-13%
	November	Pass	-26%		November	Pass	-6%
	December	Pass	-10%		December	Pass	-6%

[1] IWC = Instream Waste Concentration

[2] Percent effect = [(Control mean response – IWC mean response) ÷ Control mean response] x 100

The draft 2022 permit retains the same effluent chronic toxicity testing methods, approach and determination of PASS/FAIL and percent effect.

2.2.5 Special Study for Hyperion Toxicity Reduction

In addition to the permit monitoring requirements for whole effluent toxicity, Hyperion was also required to conduct, in coordination with the West Basin Municipal Water District, a special study to evaluate the effect of water conservation and planned recycling on effluent acute toxicity and ammonia. This study included a mass balance of nitrogen species through the treatment plant and an assessment of operational alternatives (e.g. treatment optimization, additional treatment, additional dilution credits) to ensure compliance with acute toxicity and ammonia water quality objectives.

Effluent acute toxicity measured in six quarterly tests performed between July 2018 and October 2019 were below the acute toxicity requirement (< 3.2 TUa). The six test samples included brine samples blended with Hyperion effluent and samples supplemented with an ammonium salt, which indicate that ammonia at the permit concentration limit is not a concern for acute toxicity. The nitrogen mass balance demonstrated that the ammonia concentration changes from the plant influent to the secondary effluent due to the biological conversion of organically-bound nitrogen to ammonia as it typical of biological treatment systems in water reclamation plants. Based on a plant-wide process model for projected flows and nitrogen loadings throughout Hyperion in 2035 after conversion of Hyperion to 100% water recycling, the ammonia concentration in the secondary effluent is projected to slightly increase up to 44 mg/L over the 2020 to 2034 time period, and drop dramatically to less than 3 mg/L once the fully nitrifying and denitrifying Membrane Bioreactors (MBR) system becomes operational in 2035. The maximum projected ammonia concentration and load through 2034 are still well below the 6-month median final effluent limitation of 58 mg/L listed in the 2017 permit. Over the period of 2015-2019, the average daily ammonia-N and the total nitrogen loads to the outfall were approximately 82,000 and 91,000 lbs/day. In 2035, once more advanced treatment is added, these values are projected to decrease to 900 and 4,700 lbs/day, respectively. See Figures N, NN, NNN above. As shown in Table 8, the TU_a value is also expected to remain below the acute toxicity requirement (< 3.2 TUa) through year 2035, which suggests that there is no need to modify the treatment processes at Hyperion for future compliance with ammonia toxicity.

Table 8. Effluent Acute toxicity results for Hyperion Toxicity Reduction Special Study

Test Date	Sample Type	TUa
July 9, 2018	HTP effluent	1.994
November 27, 2018	HTP effluent - Baseline	2.369
November 27, 2018	HTP effluent - Ammonia spike	2.574
November 27, 2018	HTP effluent/West Basin Brine Mixture	2.549
January 29, 2019	HTP effluent	1.945
April 9, 2019	HTP effluent	2.1
July 23, 2019	HTP effluent - Baseline	2.427
July 23, 2019	HTP effluent/West Basin Brine Mixture	2.418
October 9, 2019	HTP effluent	2.556

Based on brine flow and ammonia-N concentration data from the West Basin MWD, approximately 40 percent of the ammonia-N load sent to the West Basin WRF is returned in the brine discharged to the 5-Mile Outfall. After implementation of 100 percent water recycling at Hyperion in 2035, it is expected that the brine produced at the West Basin WRF and sent to the 5-Mile Outfall is anticipated to contain an ammonia-N concentration similar to the projected ammonia-N concentration in future Hyperion RO brine, ~ 3mg/L.

2.2.6 Persistent Organic Pollutants (Dioxins, PCBs and DDTs)

Table 9. Annual Average Effluent concentrations of Dioxin, PCBs, DDT. Compared to the Calif. Ocean Plan.

Pollutant	2017	2018	2019	2020	Avg Mon. Eff. Limit [1]	6-month median WQO	6-month median WQO w/Dilution[2]
2,3,7,8-Dioxin (pg/L)	ND	ND	0.04	0.085	0.33	0.0039	0.33
PCBstot (ng/L)	ND	ND	ND	ND	10.1	0.019	1.6
DDTtot (ng/L)	ND	ND	ND	ND	0.271	0.17	14.3

1- Averages only reflect detected, quantifiable results (detected but not quantified results were not used in determining averages). The 2017 NPDES permit required monthly monitoring, but only one sample event occurred during each month so presented values are compared to average monthly effluent limit.
2- Dilution based on 84:1. The value in this column would be the concentration to be meet at end-of-pipe (or in the effluent) in order to ensure that after mixing, the chronic WQO would be met, per equation 1 in the California Ocean Plan.
PCBs total results as sum of Arochlors, DDT total is sum of DDT and its derivatives

Effluent PCB congener results

In 2017, 0.180 ng/L of total PCB congeners was detected in the effluent, which is below the average monthly effluent limit of 0.271 ng/L, and therefore in compliance. In July 2018, the average monthly concentration (4.028 ng/L) and annual average (1236 g/yr) loading of PCB congeners in Hyperion effluent were both above the average monthly effluent limit of 0.271 ng/L and the annual mass-based limit of 157 g/yr. This caused accelerated monitoring in the following months, and additional effluent samples were collected on September 11 and 18, October 2, November 2, and December 1 to further assess the annual average mass load. However, the Hyperion effluent still exceeded the annual average loading of 157 g/yr for 2018, with a final result of 267 g/yr. (data not shown in this chapter). There were no exceedances of PCB congeners during 2019 and 2020.

2.2.7 Contaminants of Emerging Concern (CECs)

Recently, considerable attention has been generated by a widely ranging group of chemicals EPA calls contaminants (or constituents) of emerging concern (CECs). CECs have no Clean Water

Act regulatory standard (e.g. no established water quality standards and/or notification levels), have been recently "discovered" in natural streams (often because of improved analytical chemistry detection levels), and potentially cause deleterious effects in aquatic life at environmentally relevant concentrations. These chemicals are of concern because the risk to human health and the environment associated with their presence, frequency of occurrence, or source may not be known. (EPA 2010). CECs are not necessarily new chemicals and include several types of chemicals:

- Persistent organic pollutants (POPs) such as organophosphate flame retardants and other global organic contaminants such as perfluorinated organic acids (PFAS and PFOS);
- Pharmaceuticals and personal care products (PPCPs), including prescribed drugs (e.g., antidepressants, blood pressure), over-the-counter medications (e.g., ibuprofen), bactericides (e.g., triclosan), sunscreens, synthetic musks;
- Veterinary medicines such as antimicrobials, antibiotics, anti-fungals, growth promoters and hormones;
- Endocrine-disrupting chemicals (EDCs), including estrogen (e.g.,17α-ethynylestradiol, which also is a PCPP, 17ß-estradiol, testosterone) and androgens (e.g., trenbolone, a veterinary drug), as well as many others (e.g., organochlorine pesticides, alkylphenols) capable of modulating normal hormonal functions and steroidal synthesis in aquatic organisms;
- Nanomaterials such as carbon nanotubes or nano-scale particulate titanium dioxide, of which little is known about either their environmental fate or effects.

Effluent discharged from wastewater treatment plants may be a major source of CECs to a receiving water. Because Hyperion's effluent is mostly domestic wastewater (~80%), CECs found in pharmaceuticals and personal care products are generally higher as opposed to CECs associated with industrial activities. Recent decades have brought rising concern over a list of the so-called "emerging" contaminants and other pollutants, including flame retardants (PBDEs and chlorinated organophosphates). Polybrominated diphenyl ethers (PBDEs) and organophosphates flame retardants have been used to protect or enhance the properties of plastics, fabrics, furniture and other materials as well as prevent fire or delay its initiation (Pantelaki and Voutsa 2020). Additive flame-retardants can readily dissociate from the products they are added to and discharge into the environment. PBDEs (i.e. BDE-47 and BDE-100) and other fire retardants, such as TCEP and TCPP, were also consistently detected in Hyperion's effluent. SCCWRP also has documented PBDEs in sediment and fish tissue samples near Hyperion's outfall, reduced thyroid production in horny-head turbot at sites near Hyperion's outfall, and changes in gene expression when exposed to 5% of Hyperion effluent in a lab setting (Bay et al 2011, Maruya et al 2011, and Vidal-Dorsch et al 2011). In addition, the results from previous CEC monitoring studies in 2014, conducted by the Regional Water Board/Environmental Monitoring Division, indicated the presence of PFAS, PFAA and PFOS in Hyperion effluent.

The 2017 NPDES permit included a requirement for the City to complete a special study of constituents of concern (CECs). The special study sought to determine the mass loadings of five hormones, three chlorinated phosphate flame retardants, and eight polybrominated diphenyl ethers (PBDEs) in secondary and tertiary treated wastewaters released from Hyperion Water Reclamation Plant. As shown in Table 10, four hormones (estriol, estrone, 17β-estradiol, and

17α-ethynylestradiol) and two PBDEs were detected. Regardless of location or sampling date, the three chlorinated phosphate flame retardants, tris(2-carboxyethyl)phosphine (TCEP), tris(1,3-dichloroisopropyl)phosphate (TCPP), and tris(1,3-dichloro-2-propyl)phosphate (TDCPP) were universally detected in every sample. Based on mass loading calculations, average mass loadings were the highest for TCPP in Hyperion's effluent (approximately five pounds per day) (City of LA 2020). PBDEs flame retardants were detected at much lower frequencies in the low parts per trillion (ng/L) level.

Due to restrictions on the use of brominated forms of flame retardant (e.g., PBDEs), increased use of alternative flame retardants, such as chlorinated organophosphate esters, has most likely occurred to meet flammability standards for many consumer products, such as mattress pads, furniture, or automobile seating (EPA 2015).

In 2019, the City of Los Angeles proposed a Per- and polyfluoroalkyl substances (PFAS) special study for the years 2020-2021 and 2021-2022 to fulfil the mandate in the monitoring reporting program of the 2017 NPDES permit and the State Water Board's Phase III PFAS investigative order (WQ 2020-0015-DWQ). Main purpose of this special study is to evaluate PFAS concentrations in the influent and effluent between 2020 and 2022 for Hyperion Water Reclamation Plant and Terminal Island Water Reclamation Plant. Additionally, the City proposed a special study for the year 2022-2023 to develop and validate the USEPA draft method 1633 for monitoring and determining PFAS concentrations in the influent and effluent of Hyperion. These ongoing and upcoming CEC special studies will quantify PFAS concentrations in advanced-treated recycled water produced at the Advanced Water Purification Facility (AWPF), which will provide useful information about the near-future AWPF projects at Hyperion.

Table 10. Effluent CEC results for Hyperion in 2019 (dry and wet events)

Use	Contaminant of Emerging Concern (CEC)	Dry Event 1 March 2019 (ng/L)	Dry Event 2 Oct. 2019 (ng/L)	--	--
Hormones	Estriol	1.64[1]	ND[1,2] (MDL= 0.09)	--	--
	Equilin	ND[2] (MDL= 0.08)	ND[2] (MDL= 0.08)	--	--
	Estrone	43.6	154	--	--
	17b–Estradiol	3.20	ND[2] (MDL= 0.10)	--	--
	17a–Ethynyl Estradiol	14.2	10	--	--

Use	Contaminant of Emerging Concern (CEC)	Dry Event 1 Sep. 2019 (µg/L)	Dry Event 2 Oct. 2019 (µg/L)	Wet Event 1 Nov 2019 (µg/L)	Wet Event 2 Dec. 2019 (µg/L)
Flame retardants	TCEP	0.11	0.10	0.10	0.15
	TCPP	2.44	2.43	3.12	2.08
	TDCPP	0.38 (DNQ[3])	0.39 (DNQ[3])	0.42 (DNQ[3])	0.29 (DNQ[3])

Use	Contaminant of Emerging Concern (CEC)	Dry Event 1 Sep. 2019 (ng/L)	Dry Event 2 Oct. 2019 (ng/L)	Wet Event 1 Nov 2019 (ng/L)	Wet Event 2 Dec. 2019 (ng/L)
Flame retardants	BDE-28	ND	ND	ND	ND
	BDE-47	12	9.5	7.3	ND
	BDE-99	ND	ND	ND	ND
	BDE-100	11	8.7	6.1	ND
	BDE-153	ND	ND	ND	ND
	BDE-154	ND	ND	ND	ND
	BDE-183	ND	ND	ND	ND
	BDE-209	ND	ND	ND	ND

1 Estriol is denoted as suspect matrix as a result of matrix spike failures.
2 ND – Not Detected: analyte was not detected at levels above established MDLs (value provided).
3 DNQ – Detected, but Not Quantified: concentration detected is higher than MDL, but less than RL.

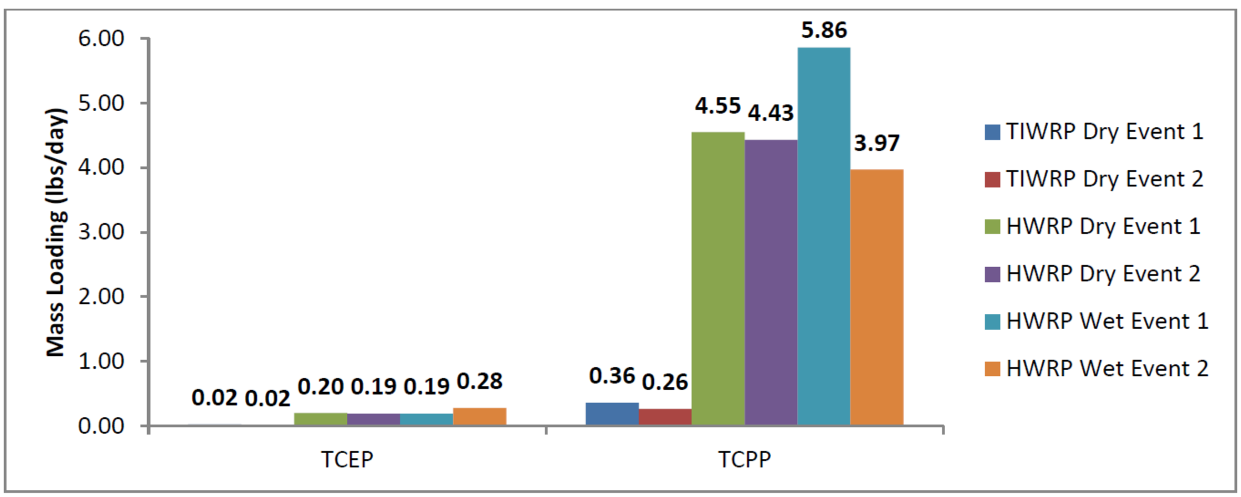

Figure F. Mass loading calculations of chlorinated phosphate flame retardants found in Hyperion and the Terminal Island Water Reclamation Plant (TIWRP) effluents.

Per the 2017 permit, City of LA completed a special study of monitoring CECs and flame retardants in the effluent. This monitoring included measurements via two dry weather and two wet weather events. The 2018 Biological Opinion estimated the Hyperion facility could discharge approximately 62 pounds (28 kg) per year of total PBDEs into Santa Monica Bay. This equates to approximately 310 pounds (140 kg) over a five-year permit term. Figure F. above shows the measured TCEP and TCPP mass loads in effluent per sampling event.

2.3 Ambient Water Quality

The Santa Monica Bay Restoration Commission identified 19 pollutants of concern for the Bay: DDT, PCBs, PAHs, chlordane, tributyltin, cadmium, chromium, copper, lead, nickel, silver, zinc, pathogens, TSS, nutrients, trash and debris, chlorine, oxygen demand, and oil and grease. The sources for these pollutants are varied, as the Bay receives pollutants from urban runoff, atmospheric deposition, two marinas, and seven major point sources (i.e. three wastewater treatment plants, three generating stations, and an oil refinery), and over 160 smaller commercial and industrial facilities. (SMBRC 2013).

Santa Monica Bay is listed as a section 303(d) impaired water body under the Clean Water Act, largely due to sediment contamination (i.e. sediment toxicity) resulting from the historic discharge of primary treated wastewater and sludge. As a result, a fish consumption advisory exists for Santa Monica Bay. Also, three TMDLs are applicable to the Bay and address the impacts of marine debris, DDT/PCBs, and bacteria to the Bay.

The City monitors for ammonia in the receiving waters. Ammonia was detected at all stations and depths for winter and summer 2020, with the highest concentrations located deeper than 66 feet at sites nearest the outfalls. Detections at all depths is not typical and was determined to be due to unknown contamination or lab error. For all other surveys, recorded ammonia values were typically one to two orders of magnitude lower than the 2019 COP water quality objectives. The receiving water monitoring data shows ammonia concentrations to be below concentrations required by the ammonia water quality objectives. Many of the ammonia detections at the surface occurred at stations without clear indicators of plume presence at midwater depths. See next figure.

The draft 2022 NPDES permit also requires the City to continue monitoring DO, chlorophyll-a, and ammonia concentrations in the receiving water.

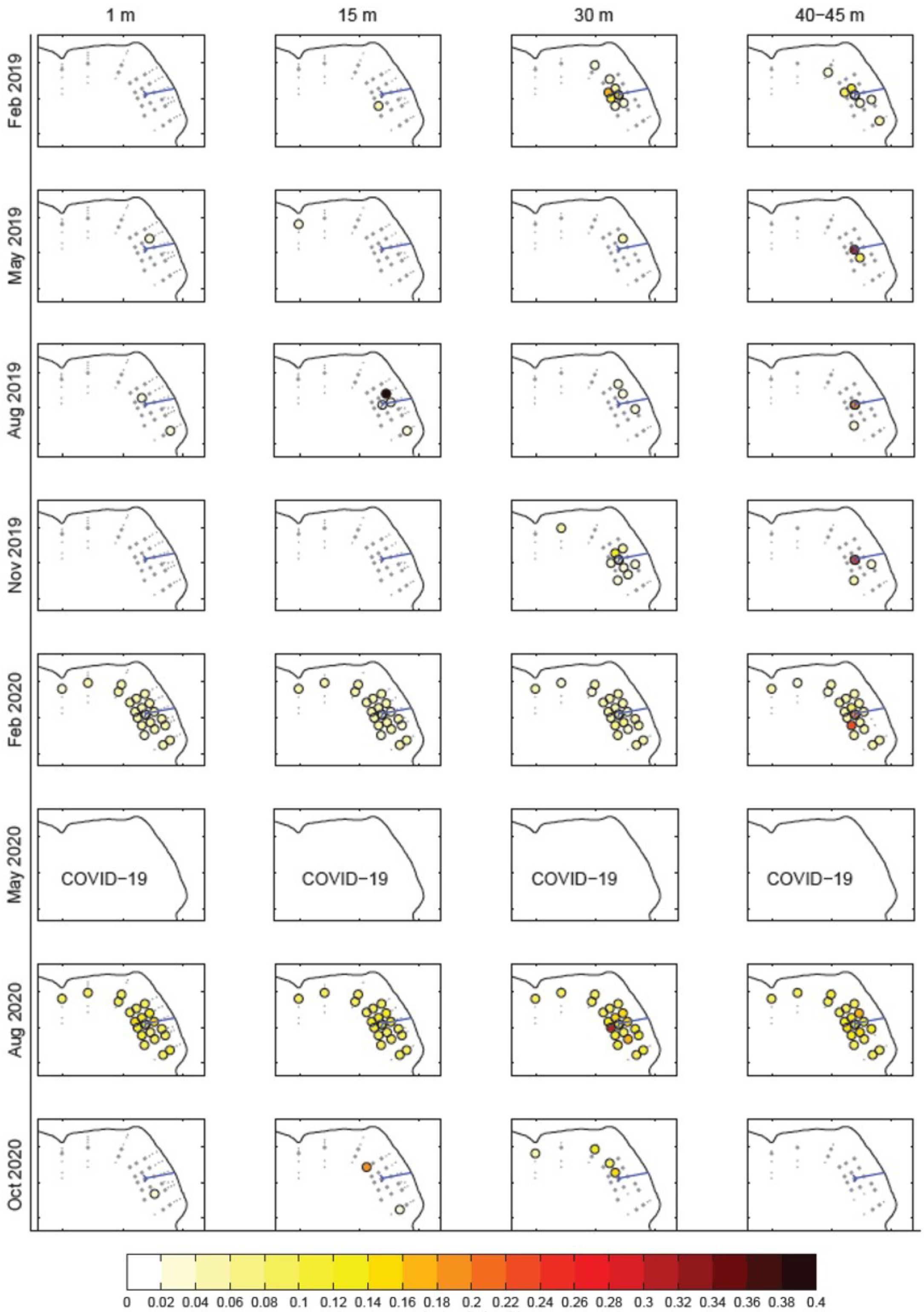

Figure A. Ammonia concentrations in Bay at nominal sampling depths for each survey during 2019-2020. The 5-mile outfall is in blue. Small gray dots indicate CTD stations where no ammonia samples are collected, and larger gray dots indicate discrete samples that were lower than the ammonia detection limits. Other colors represent the concentration of ammonia detected. Data for Spring and Summer 2020 is reported here but detection at all depths is due to unknown contamination or lab error. (City of LA 2021).

2.4 Sediment Quality

Wastewater discharges may change the properties of bottom sediments next to outfalls and can affect natural biological communities. As explained above, wastewater discharges are generally high in suspended solids and organic matter and may contain metals, petroleum hydrocarbons, and other toxic compounds, which can adhere to sediments. Metals and organic contaminants, which are hydrophobic, have a greater affinity for finer grained sediments like silts and clays than for coarse sediments like sand and gravels.[18] As a result, increased levels of fine sediments should have correspondingly higher levels of contaminants.

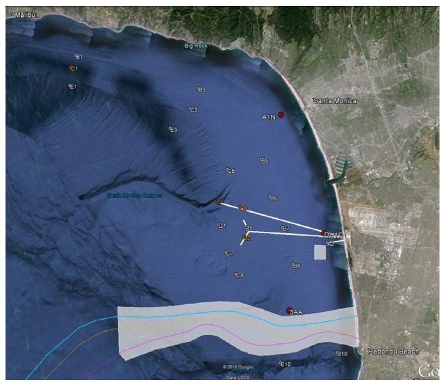

Figure 22. Benthic fixed monitoring locations. These locations are included every year. An additional 20 to 22 locations are used in alternating years. Colored lines (and grey area) denote communication wires.

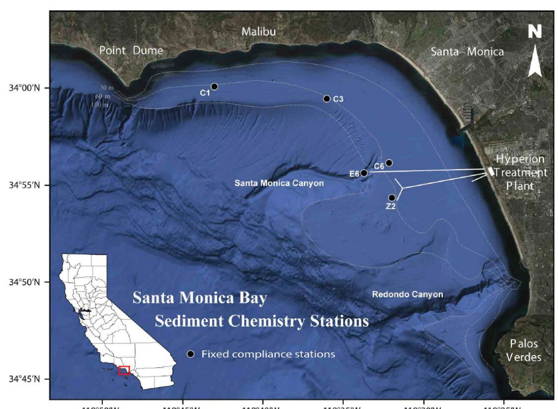

Figure 23. Sediment chemistry fixed monitoring locations. These locations are included every year. C1, the reference location is off the coast of Malibu.

The draft 2022 permit retains sediment monitoring requirements, which consists of annual DDT, PCB (as aroclors and congeners), and metals (arsenic, cadmium, chromium, copper, lead, nickel, silver, mercury, and zinc) monitoring. Grain size, total organic carbon, and dissolved sulfide is also analyzed at four (out of 44) monitoring locations. The draft 2022 permit also retains sediment toxicity monitoring, consistent with the Ocean Plan 2012 amendment. Monitoring locations discussed in this BE are shown in figures 22 and 23.

[18] Of the sediments discussed in this section, clay is the smallest grain size, followed by silt, sand, and then gravel. Sediment around the 5-mile outfall was also higher in 2012 than in 2011.

Sediment sampling generally found finer grained sediments, mostly silt, in the northwestern part of the Bay. Sandy silt is common in the central and southern portions of the Bay. Sand is dominant nearshore and in portions of the Short Bank, including areas around the 5-mile outfall. Higher percentages of sand around the 5-mile outfall are characteristic of the last twelve years. (City of LA 2015). Previously, higher percentages of clay were present associated with the discharge of sludge, and in 1989, higher percentages of silty sediment were present. (City of LA 2013).

Sampling results during the last permit cycle also fit this sediment size pattern, with the exception of 2012. In 2012, the reference location had unusually fine sediment and likely due to re-ballasting of the 5-mile outfall. Since 2011, sediment around the 5-mile outfall had less fine particles than the reference stations and the area around the now inactive 7-mile outfall.[19] (City of LA 2013 and City of LA 2015). The area around the 5-mile outfall had slightly more fine sediment in 2014 than 2013. However, in both of these years, sediment is composed primarily of sand, with silt and clay fractions less than 20%. Areas southeast of the 5-mile outfall between depths of 98 to 197 feet (30 to 60 m) contained significant amounts of gravel.[20]

Table 11 shows sediment chemistry concentrations for the 5-mile outfall (Station Z2), City Reference station C1, Bight'18 Reference mid shelf stations and certain sediment quality benchmark values.

Sediment metal results at the 5-mile outfall (Z2) are lower than the Reference site (C1) as well as the Bight 2018 Reference mid-shelf average, with the exception of copper which are slightly higher than those two reference locations. All sediment metal values at Z2 are below the ERL sediment quality benchmark values. Historical data for the 5-mile outfall, the 7-mile outfall show decreasing levels over the past 30 years. Metal levels have decreased more at Station Z2 than Station C1.

Sediment PCBs and DDT results at Z2 are generally lower than reference C1 as well as the 7-mile sludge outfall site. The Z2 results are also lower or comparable to the ERL values for these two parameters. It appears the ongoing discharge from 5-Mile Outfall (Station Z2) does not contribute to elevated PCB and DDT levels in sediments through SMB, but rather the legacy contaminants arise from the Palos Verdes shelf, historic sludge discharge from Hyperion, and possibly stormwater runoff.

The City collects sediment samples at nine monitoring stations (RW-Z2, C1, C3, C6, C7, C8, C9B, D1, and E6) for numerous chemical parameters. Total PCBs (via congeners) are measured and reported values include dry weight/kg as well as dry weight normalized to organic carbon content. Those results are presented in Appendix 9.6

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[19] The reference station in 2013 was C1, located in the northern part of the Bay at greater than 196 feet but less than 328 feet in depth. In 2014, an additional reference station (to C1) was included – B1, which is also located in the northern part of the Bay at depth less than 196 feet but greater than 98 feet. The station closest to the 7-mile outfall is E6.

[20] Stations FA10, FA13, FA15, and FB12 had high gravel, and stations Z2 and D1had less than 20% silt and clay.

For 2019 and 2020, to assess sediment quality, sediment contaminant concentrations of DDT and PCBs were evaluated against the TMDL targets. The TMDL sets targets for water quality and sediment contaminant concentration to meet fish tissue concentration targets that would allow safe human fish consumption. The TMDL targets (From Point Vicente to Point Dume) are 2.3 µg DDT g-1 OC and 0.7 µg PCBs g-1 OC for the sediment based on normalized results with organic carbon (USEPA 2012). See Table 11. Organic normalized results for DDTs were detected at levels above the TMDL target of 2.3 µg g-1 OC in 2019 and below the TMDL in 2020. Similarly, total PCBs were detected above the TMDL target level of 0.7 µg g-1 OC in both years.

Table 11. Metals and Persistent Organic Pollutants in Sediments (2019-2020)

Pollutants	No. Stations with Detection[a]		Santa Monica Bay						Reference Site	Benchmark Value		
			7-Mile Sludge Outfall Station E6		5-Mile Outfall Station Z2		Reference Station C1		Bight'18 (Mid shelf)[b]	ERL[c]	ERM[c]	TMDL Target[d]
	2019	2020	2019	2020	2019	2020	2019	2020	2018			
Metals (mg kg^{-1} dry wt)												
Arsenic	6	8	24.16	4.50		1.21	16.84		4.40	8.2	70	
Cadmium	9	9	9.19	9.57	0.88	1.54	2.32	4.71	0.56	1.2	9.6	
Chromium	9	9	189.23	173.71	23.93	31.67	43.42	49.28	28.0	81	370	
Copper	9	9	172.49	144.61	8.92	14.86	7.35	9.84	6.80	34	270	
Lead	9	9	49.28	45.26	4.53	6.75	10.07	10.25	6.40	46.7	218	
Mercury	9	9	0.99	0.78	0.11	0.09	0.10	0.11	0.05	0.15	0.71	
Nickel	9	9	33.97	32.33	7.40	9.21	23.76	27.70	12.0	20.9	51.6	
Silver	6	6	13.71	11.79	0.43	1.08			0.08	1	3.7	
Zinc	9	9	186.84	142.89	27.96	36.67	57.78	59.35	45.0	150	410	
Pesticides and PCBs (µg kg^{-1} dry wt)												
Total DDT	9	9	12.67	49.14	9.45	6.06	65.34	16.60	13	1.58	46.1	
Total PCB	9	8	173.64	818.97	11.82	19.72	7.47	44.96	4.3	22.7	180	
Pesticides and PCBs (µg g^{-1} OC)												
Total DDT	9	9	4.38	1.92	2.34	1.60	6.99	1.82				2.3
Total PCB	9	8	6.06	31.93	2.92	28.94	0.80	4.94				0.7

ND values (<MDL) are shown as blank space. [a] A total of nine stations were sampled for these analyses in both 2019 and 2020. [b] Southern California Bight 2018 Regional Monitoring Program, Volume II. Sediment Chemistry (SCCWRP 2020). [c] Effects Range-Low; Effects Range-Median (Long et al. 1995). [d] Santa Monica Bay Total Maximum Daily Loads for DDTs and PCBs (USEPA 2012).

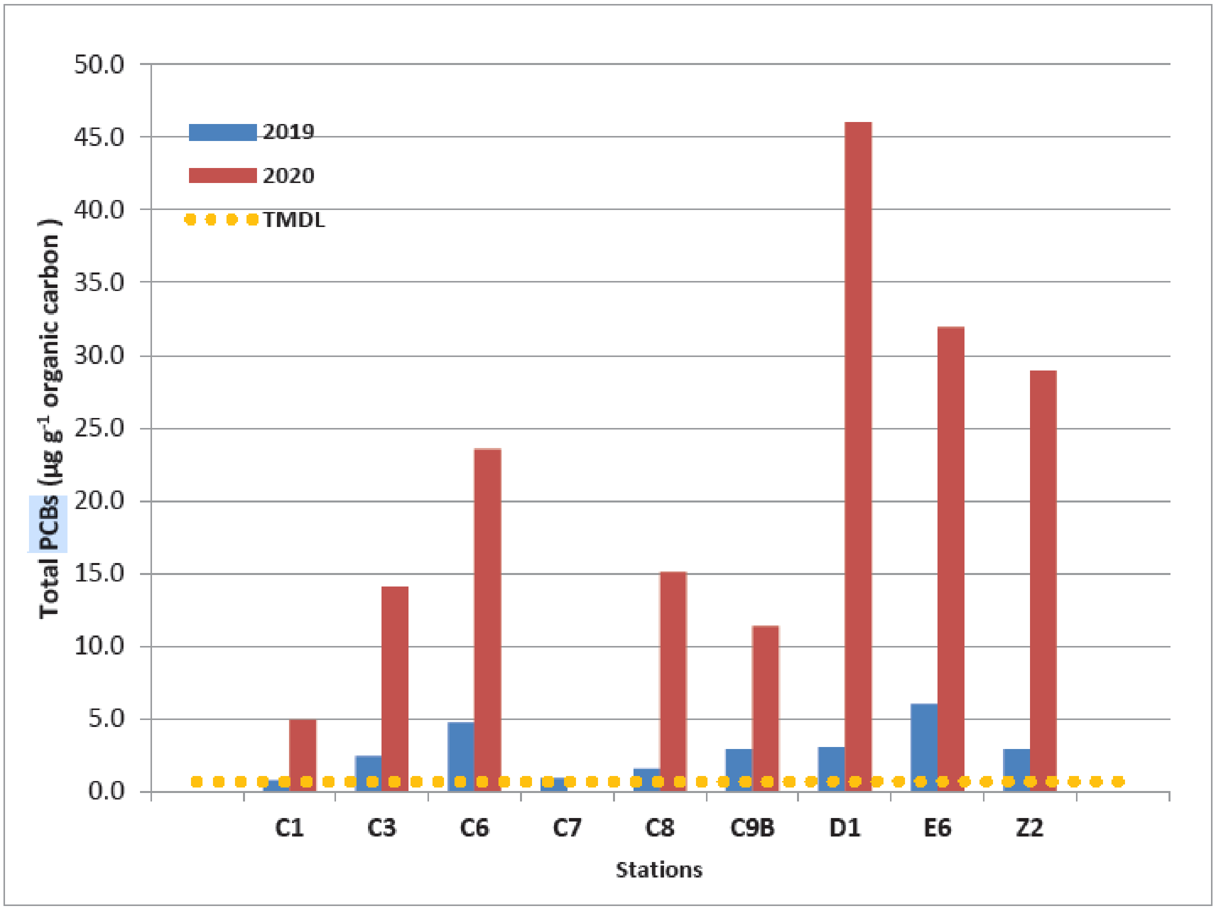


Figure 6-7. Total PCBs (µg g^{-1} organic carbon) normalized for organic carbon content in SMB sediments surveyed in 2019 and 2020. Orange dashed line is the Total PCB TMDL target of 0.7 µg g^{-1} OC (USEPA 2012).

As for the historical trends for DDT and PCBs in sediments, Figures below show the 1989-2020 dry weight results for Reference Station C1, the 5-mile outfall site and 7-mile sludge outfall site E6. There is a general decline in these two pollutants in sediments at the 5-mile outfall station (Z2).

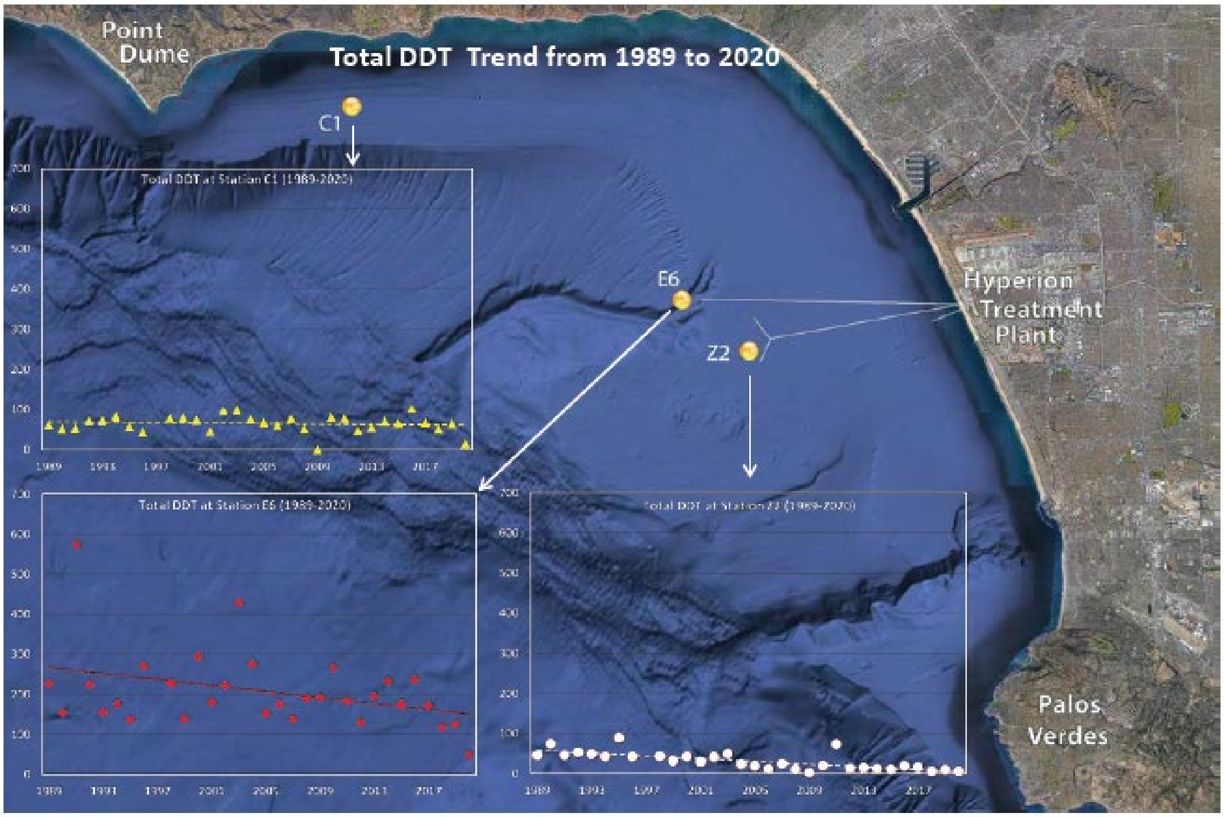


Figure 6-10. Trend line for total DDTs (ug kg^{-1} dry wt) present in sediment samples from SMB at three stations from 1989-2020.

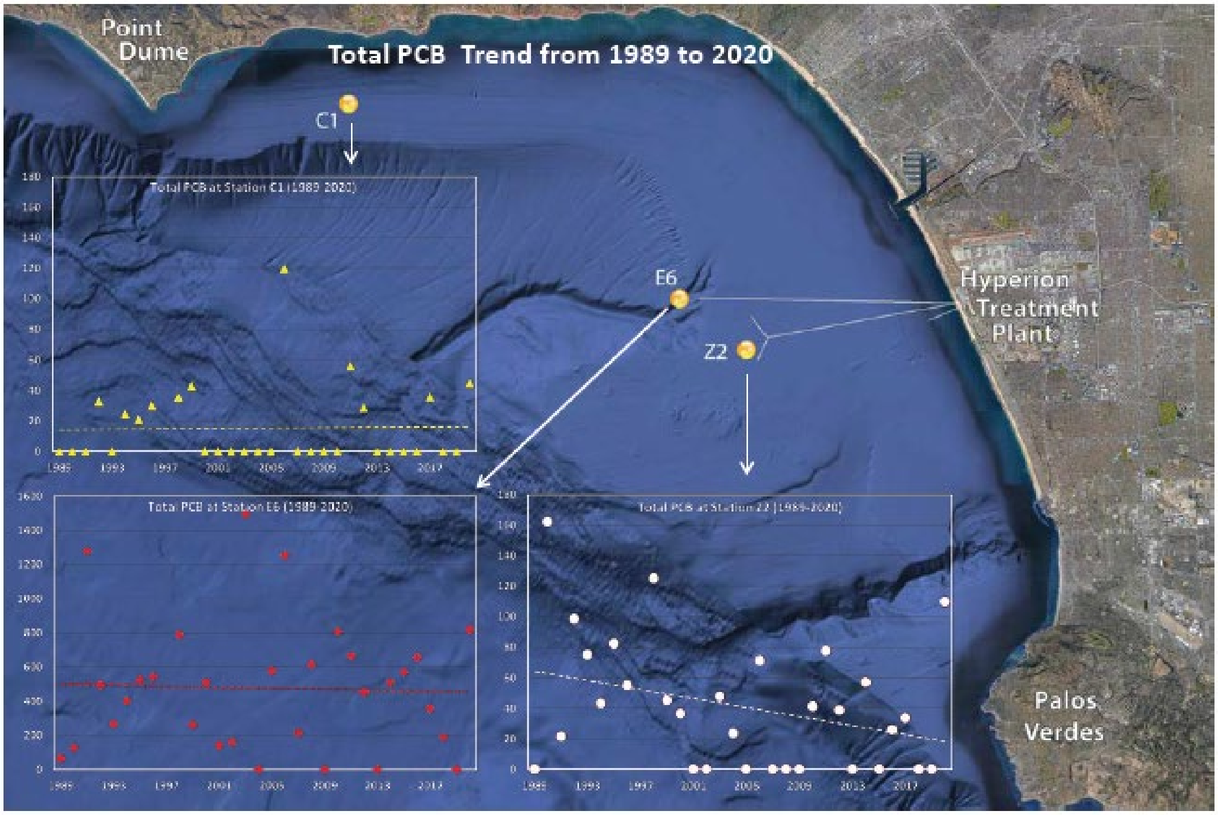


Figure 6-11. Trend line for total PCBs (ug kg^{-1} dry wt) present in sediment samples from SMB at three stations from 1989-2020.

2.5 Sediment Toxicity

The 2017 permit also required sediment sampling and testing for acute toxicity annually at nine (9) benthic monitoring stations (RW-Z2, C1, C3, C6, C7, C8, C9B, D1, and E6) and in the fifth year of the permit at 24 fixed benthic monitoring stations. See Figures below. Sediment toxicity was determined on the basis of test species percent survival and significant difference from the control. In the amphipod test, the sediment is considered non-toxic if the survival is between 90% and 100% and the results do not differ significantly from the control. If the survival is 82-89% and the results are significantly different from the control, then the sediment is categorized as having low toxicity. If the sample does not differ significantly from the control, then 82 to 100% indicates non-toxic sediment.

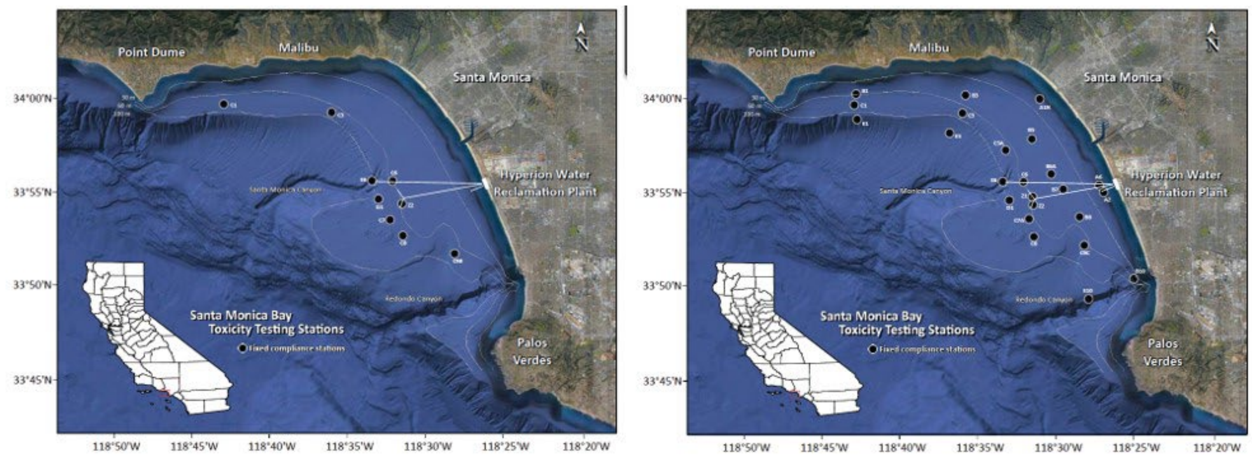


Figure X. Maps of 9 sampling stations (left) and 24 sampling stations (right) for acute sediment toxicity in the Santa Monica Bay.

As shown in Table 12, the percent survival of the sediment samples ranged from 92% to 100% from 2018 to 2020 and all sediment station results were non-toxic, which indicates that the response was not substantially different from that expected in sediments that are uncontaminated and have optimum characteristics for the test species.

Table 12. Acute toxicity in sediment (2018-2020)

Station	Percent survival (%)		
	July-Sep. 2018	**July 2019**	**August 2020**
C1	96	97	96
C3	95	92	100
C6	98	95	99
C7	95	96	99
C8	99	99	99
C9B	95	99	100
D1	92	97	98
E6	98	95	99
Z2	95	99	96

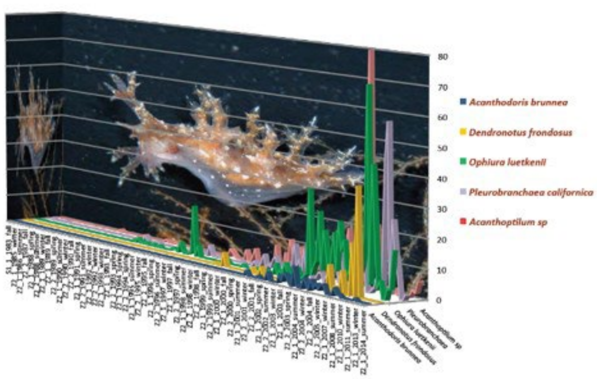
2.6 Invertebrate and Fish Species Abundance and Diversity

Santa Monica Bay is home to a majority of invertebrates and fish species found in California waters. For example, nine phyla of benthic invertebrates (i.e. more than 5,000 species) and 129 families of California marine fishes (i.e. 481 species) occur in the Bight, indicating great diversity. The City of LA has recorded a wide variety of species and has mapped various community parameters around the 5-mile outfall.

Plant upgrades, including full secondary treatment, led to positive responses for species diversity and abundance.[21] Small invertebrate species numbers may have leveled off since these improvements, with 126 different taxa being observed around the 5-mile outfall during 2013 and 2014. This leveling off also may correlate with reduced upwelling associated with El Niño events. The epibenthic mega-invertebrates sampling in 2013 and 2014, reported seven new invertebrate species and the same 17 fish species reported in previous sample years around the 5-mile outfall sample locations. The reference location (i.e. station C8) had 150 taxa and also had the highest abundance.

Higher abundances of white urchin, a pollution-sensitive species, was recorded in 2014 (and in 2009). See figure 26. Another pollution-sensitive species, the brittle star, remains absent. However, the higher sand fractions may be driving the absence of the brittle star, as opposed to effluent quality. Similarly, the decrease (or absence in some cases) of pollution-tolerant species, such as the clam *Parvilucina tenuisculpta*, suggest the conditions around the 5-mile outfall are progressing toward background conditions. Figure 27 also indicates that the effluent is not impacting species diversity near the outfall as trophic complexity is increasing over time. Other ecological parameters (such as the Shannon index and evenness) at the 5-mile outfall location were comparable, and sometimes slightly higher than, those measured throughout the Bay. This further supports the observation that impacts from the 5-mile outfall are decreasing.

Improvements around the 7-mile outfall are less dramatic. Only a few different species have been found during 1996 to 2014 (compared to species observed during 1989 and 1995). The lowest number of small invertebrates (64) were associated with the locations around the 7-mile outfall (i.e. E6).



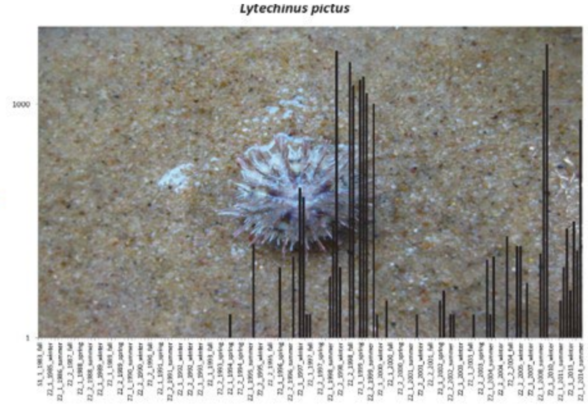


Figure 26. Invertebrate and white urchin species abundance. Abundance of select invertebrate at 5-Mile Outfall Station Z2 over time. City of LA 2015. (Left). Abundance of *Lytechnius pictus* at 5-mile outfall station (Z2) over time. (Right).

[21] After secondary treatment was fully implemented, new species were detected around the outfall. Specifically, 46 percent (278 out of 600) of small invertebrates (i.e. organisms retained on a 1-mm2 screen) and 35% (46 out of 145) of mega-invertebrates and fish species were observed around the 5-mile outfall only after 1999, corresponding with full secondary treatment.

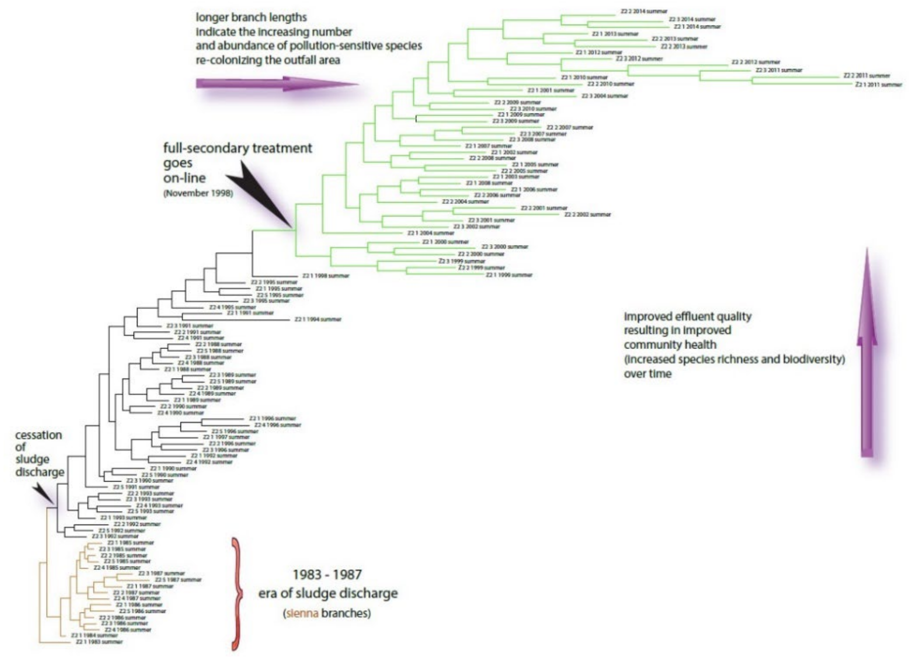


Figure 27. Cladistic analysis of 31-years of data from the 5-mile outfall station indicates that the biological community at the end of the outfall has increased in diversity, both in the number of species and abundance.

2.7 Bioaccumulative Pollutants in fish tissue

Bioturbation driven by bottom-dwelling species are contributing to pollutants being released from the sediment, specifically DDT, PCBs, and metals. Because DDT and PCBs are lipid soluble, they bioaccumulate. The City of LA monitors fish tissue (i.e. hornyhead turbot and a variety of sportfish) for DDT and PCBs as well as arsenic, selenium, and mercury. All of these pollutants have been detected in fish tissue throughout the action area, and a fish consumption (and sediment toxicity) impairment exists for the Bay. For example, the 2015 State of the Bay report that mercury contamination is mostly due to large-scale contamination patterns and not related to specific sources in the Bay. (SMBRC 2015).

The 2017 Permit required the City to complete an annual Local Bioaccumulation Trends Survey (LBTS) and a biennial Local Seafood Safety Survey (LSSS) to be conducted in Santa Monica Bay (SMB), during which fish muscle and liver tissues are collected and analyzed. The LBTS is designed to determine what effects the effluent discharged from Hyperion's 5-Mile Outfall has on fish tissues over time. Historic results date back to 2006, although 2018 data is missing due to participation in the Bight Monitoring Program. The 2017-2020 LBTS have been conducted with the option of capturing English Sole in lieu of Hornyhead Turbot which has been increasingly difficult to catch in sufficient sample sizes. Tissue chemistry results are compared for three areas: Nearfield is 2 km radius around the 5-mile outfall; Zone 5 which is northern region of SMB; and Zone 4 which is southern region (but does not include Palos Verdes area/Zone 3). See figure X.

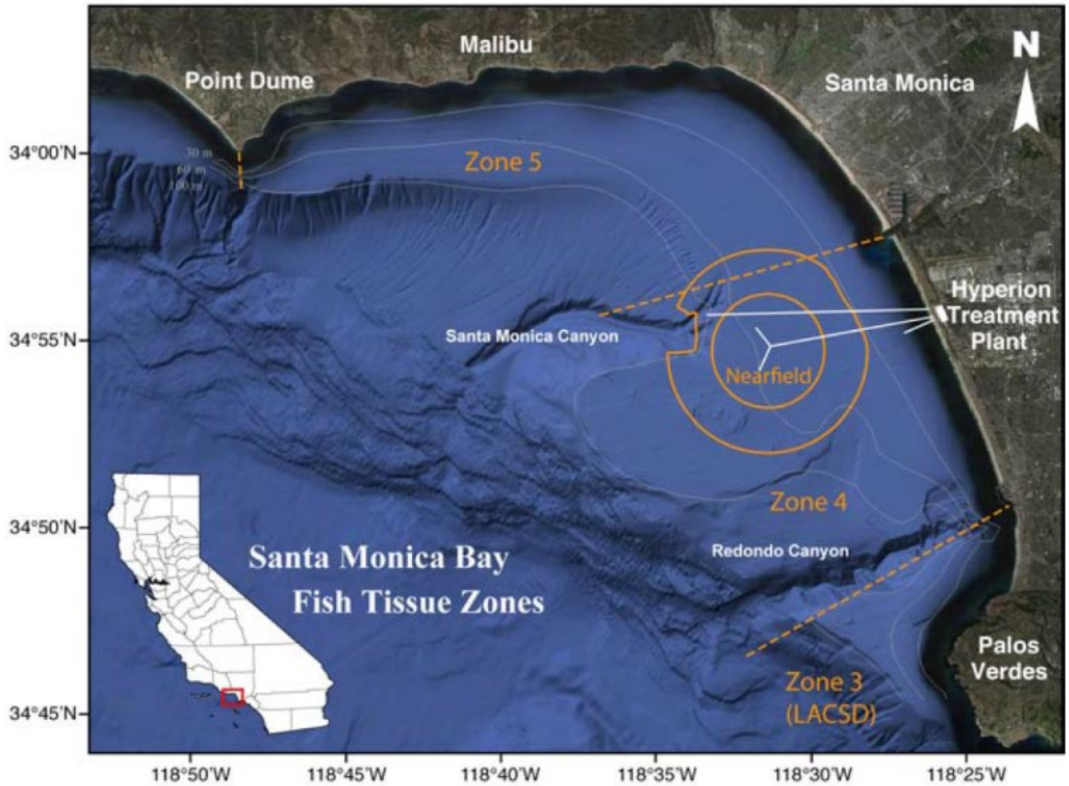


Figure 25. Tissue collection zones in Santa Monica Bay.

Overall, fish tissue metal concentrations are the same at the sample locations. There is no discernible outfall effect, and concentrations in the Bay are similar to those measured since 2001. Concentration of metals in fish tissue did not correspond to areas where sediment concentrations are highest. Temporal differences are likely due to natural variability and species selection. Fish are mobile and therefore, not necessarily representative long-term residents of the locations from where they are collected. Data is likely reflective of general conditions of the region as opposed to the discharge from the 5-mile outfall. See Tables 11 and 12.

Summary data for total DDT and total PCBs in fish tissue in 2017 to 2020 are presented in Appendix 9.7. Trends analyses for muscle tissue and liver tissue within the three sampling areas are provided in Figure immediately below. As the monitoring progressed from 2006-2020, total PCB congeners and Aroclors trended downward, with Aroclors in Zone 4 shifting from 4,200 µg/kg in 2006 to 510 µg/kg in 2020, and congeners shifting from 2,011 µg/kg in 2010 to 257 µg/kg in 2020. The trends depicted in Figure 9-5a suggest that both congeners and Aroclors bear no indication that pollutant levels may rise to the initial levels shown in 2006. Total DDTs also bear promising results, given that both 2019 and 2020 had similar, if not less, pollutant levels to those in 2017. From 2019 to 2020, Nearfield pollutants have been decreasing consistently since 2015 with the recent adoption of monitoring English Sole; however, there was a slight increase in total DDT in Zones 4 and 5.

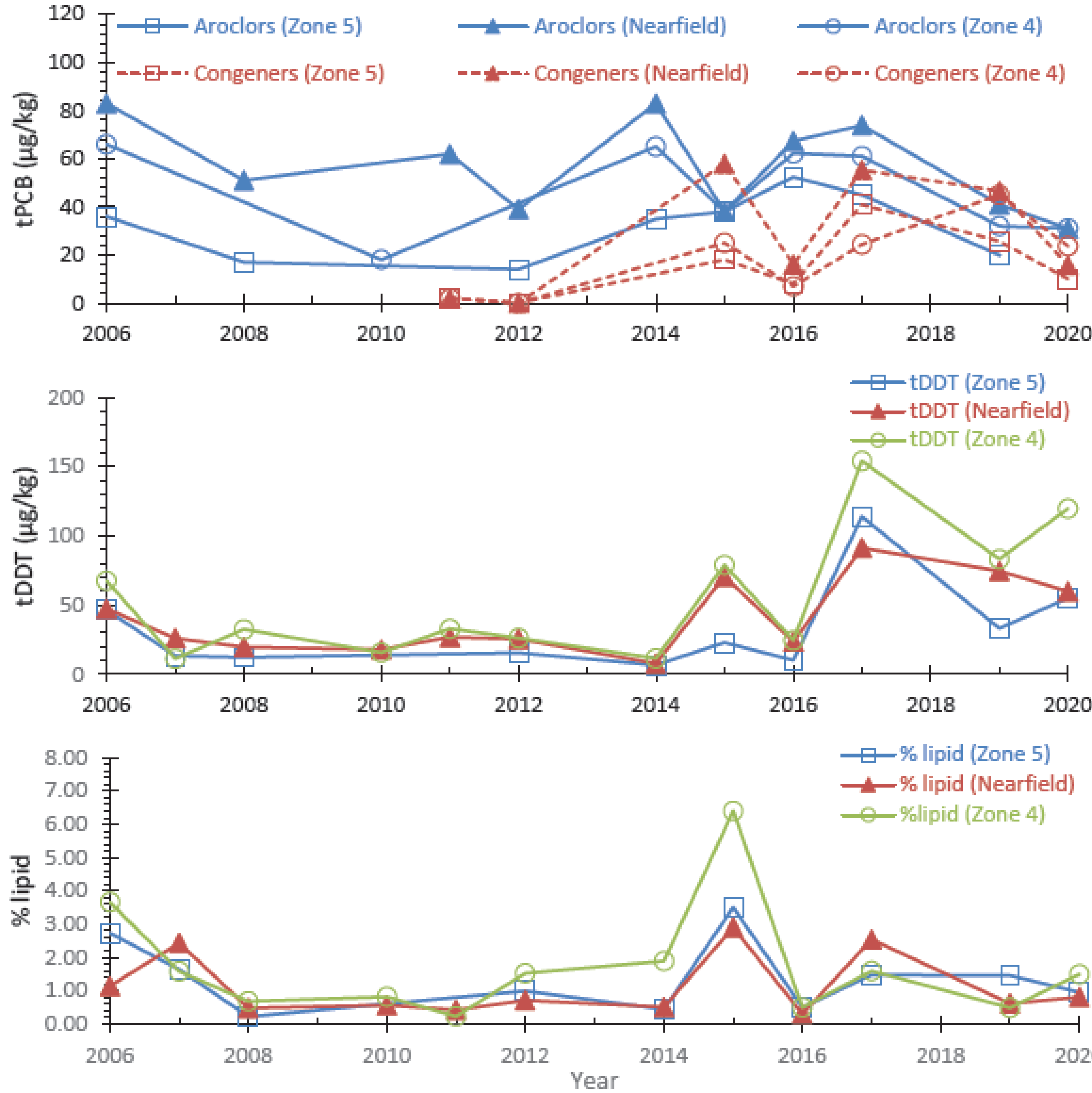


Figure 9-4a. Temporal contaminant level trends in muscle tissues of Hornyhead Turbot (2006-2016) and English Sole (2017-2020) from three SMB Zones (5, Nearfield, and 4). Values are plotted in wet weight. The PCB congener data is only available starting in 2011. The 2011-2012 PCB congener results are only available as the average of three zones.

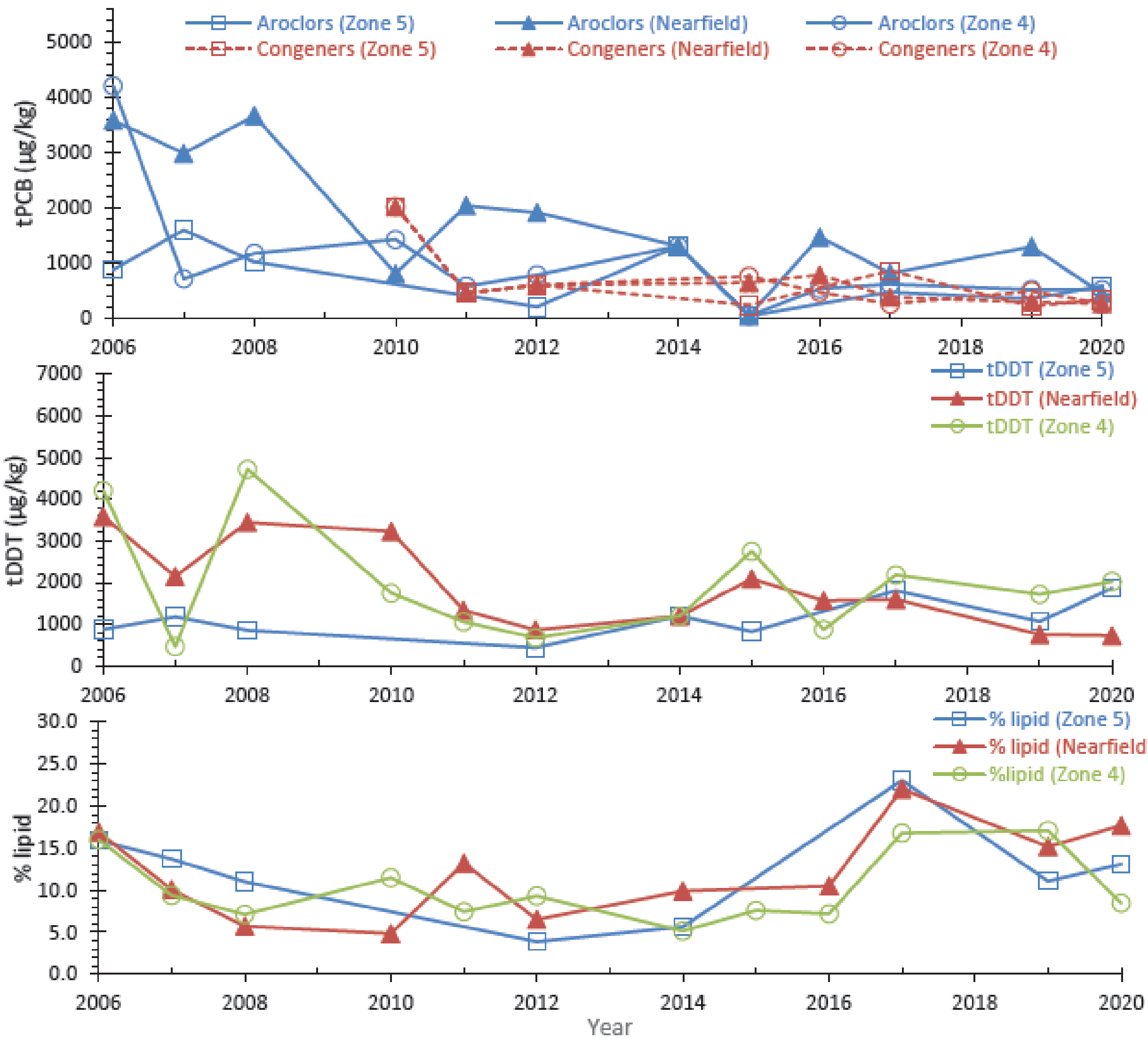


Figure 9-5a. Temporal contaminant level trends in liver tissues of Hornyhead Turbot (2006-2016) and English Sole (2017-2020) from three SMB Zones (5, Nearfield, and 4). Values are plotted in wet weight. The PCB Congener data is only available starting in 2010. The 2010-2012 PCB congener, 2014 PCB Aroclors, and 2014 DDT results are only available as the average of three zones.

2.8 Harmful Algal Blooms

In the 2018 Hyperion Biological Opinion, NMFS noted that HAB occurrences appear to be increasing in frequency, duration, size, and severity throughout the Bight, with chronic outbreaks in areas that receive anthropogenic nutrient inputs. Past research assumed that nitrogen inputs from seasonal upwelling, typically in the spring and early summer months in the Bight, dwarfed the contribution of anthropological nitrogen sources. However, more recent studies challenge this assumption, especially in localized areas during non-peak upwellings. Nitrogen inputs from anthropological sources, particularly wastewater treatment plants with continuous discharges, are approximately equal to nitrogen inputs from upwelling at the spatial scales relevant to the formation of HABs. In the Bight, the largest four wastewater treatment plants, which includes Hyperion, account for 90% of the total wastewater treatment plants discharges and contribute to nitrogen loads in the Bay. Specifically, the 2018 Biological Opinion notes that the nitrogen loads found in the Bight could be doubled due to wastewater inputs and could affect the spatial extent and duration of algal blooms. (NMFS 2018).

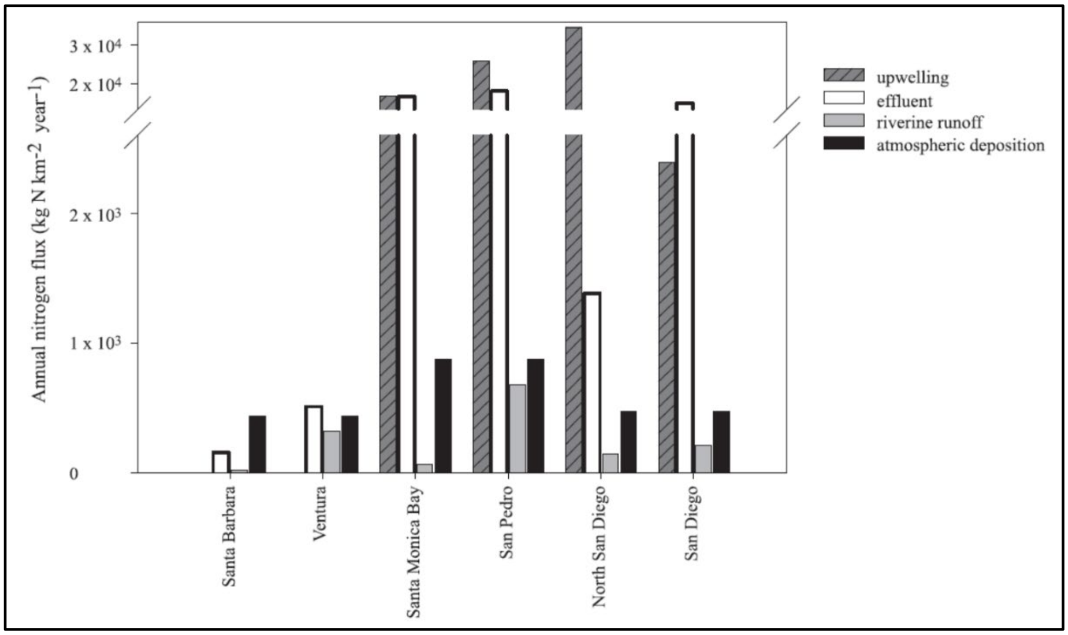


Figure X. Figure 15a. Total annual nitrogen inputs into each of the six subregions in the Southern California Bight, attributed to different sources. Effluent and upwelling are the two most important contributions of nitrogen in Santa Monica Bay. (Howard et al. 2014).

Several studies have been conducted to assess effects associated with nutrient loads. The 2015 State of the Bay report assessed nutrient levels in the Bay as fair with an increasing trend. Other monitoring programs, such as the Cooperative Oceanic Fisheries Investigations, show nitrate concentrations present in most areas in the Bight, even those areas away from ocean outfalls and show a trend of increasing concentrations with depth. (City of LA 2014). Further, SCCWRP examined HABs as part of their 2018 Bight monitoring. Specifically, the study examined whether marine sediments act as a reservoir for domoic acid. The study concluded that domoic acid was widespread in continental shelf Bight sediments, with the highest concentrations observed in regions with histories of water column blooms and retentive circulation patterns. See figure below. Domoic acid was most prevalent in the mid-shelf strata compared to the spatial extent observed in the inner and outer shelf strata. This observation also aligns for the most part with horizontal patterns in domoic acid distributions observed during blooms. However, SCCWRP noted that observations of domoic acid in sediments were did not always have an apparent water column source. SCCWRP also consistently found domoic acid in benthic infauna tissues and that the persistence of domoic acid found in lower ecosystems pose a risk for transfer to higher trophic levels. (Smith et al 2021).

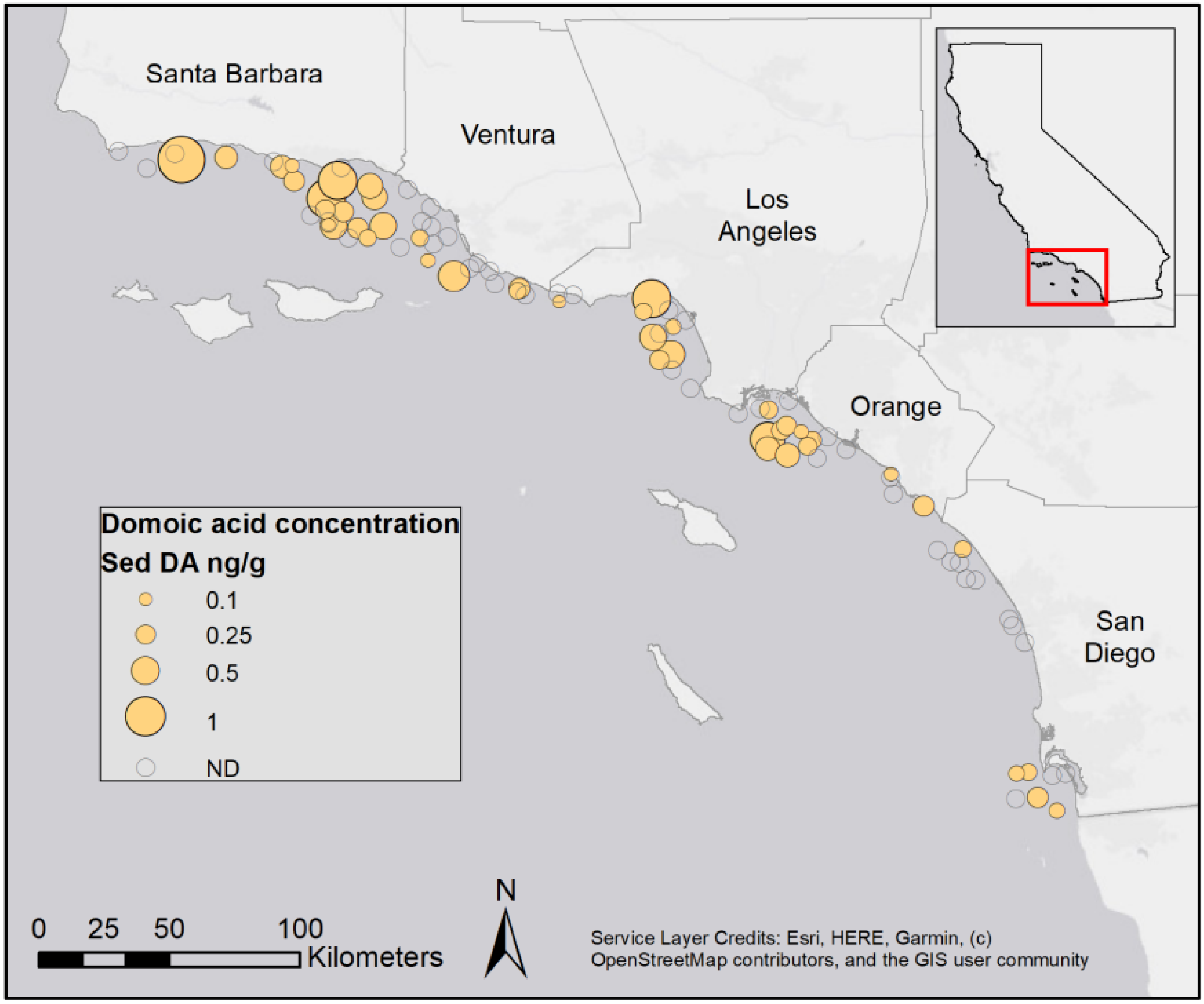


Figure X. Location and relative concentration of domoic acid in 90 sediment samples collected as part of the 2018 Bight Study. An empty circle indicates the location of stations where domoic acid was not detected.

Some phytoplankton contain harmful toxins, which can impact the marine environment. Blooms of the marine diatom genus *Pseudo-nitzschia* that produce the neurotoxin domoic acid have been documented with regularity along the coast of southern California since 2003, with the occurrence of the toxin in shellfish tissue predating information on domoic acid in the particulate fraction in this region. Domoic acid concentrations in the phytoplankton inhabiting waters off Southern California during 2003, 2006, 2007, 2011 and 2017 were comparable to some of the highest values that have been recorded in the literature. (Smith et al. 2018). Anderson et al. (2012) notes that there are multiple reasons for this increasing bloom trend, including: natural dispersion of algal species, dispersal via human activities such as ballast water, improved detection of HABs and their toxins, increased aquaculture operations, and stimulation due to cultural eutrophication and climate change. Recent studies have also indicated that marine sediments may be a long-term source of domoic acid, extending the risk of food web contamination and human and wildlife health even long after water column HABs end, which may result in severe ecological and socioeconomic impacts for a long period.

The City also conducted a special study during 2016 to obtain a snapshot of the ichthyoplankton population within the Bay and assess whether meta-barcoding-based ichthyoplankton community analysis would allow a meaningful status and trends monitoring program.

2.9 Habitat Conditions in and Adjacent to the Action Area

Santa Monica Bay includes several types of marine habitats, supporting more than 5,000 species of plants and animals, most of which are temperate species with geographic ranges extending far beyond the action area. The oceanic habitat types within and adjacent to the action area are the 1) pelagic ecosystem; 2) soft bottom ecosystem; 3) hard bottom ecosystem, and 4) rocky and sand intertidal ecosystem.

Pelagic Ecosystem

Pelagic, or open water, habitat is the most extensive of any of the habitats in the Bay. The pelagic habitat is from the sea surface to the ocean bottom and is free of direct influence from the shore or ocean bottom. The vast majority of life in the Bay depends on phytoplankton found in the pelagic realm.

The pelagic realm is home to 40% of the total fish species in the Bight. Small fish, such as northern anchovies, pacific sardines, and pacific mackerel school reside in the pelagic realm. Several species of rockfish release larvae in pelagic waters. Because of the large number of fish in the pelagic ecosystem, this habitat also supports numerous species of seabirds, including the California brown pelican and California least tern, as well as some marine mammals.

The 2015 State of the Bay report concluded the pelagic habitat ranges from fair to good conditions. The habitat extent, as measured by dissolved oxygen, is good and appears to be improving over time. Habitat conditions related to biology are fair, but trends differ. Specifically, the abundance, measured by total landings, is declining, but impacts to phytoplankton is constant.[22] (SMBRC 2015).

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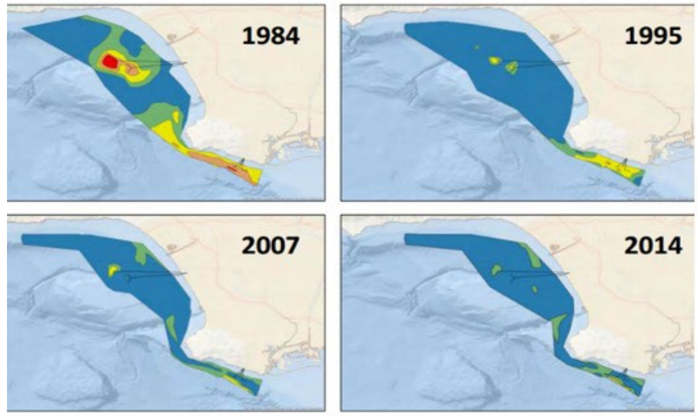
[22] Confidence in habitat extent is moderate due to a lack of reference conditions and limited monitoring (i.e. quarterly). Confidence in abundance is low due to incomplete data, lack of thresholds, and use of two of the four indicators for this category. Confidence in the availability of phytoplankton is moderate due to high quality data but lack of a good upper threshold value.

Soft Bottom Ecosystem

Soft bottom areas and associated habitat make up most of the Bay's seafloor and is comprised of soft sediment like sand, silt, and clay. The soft bottom habitat supports all life stages for more than 100 species of bottom-dwelling fish species. Eelgrass also grows in the soft bottom habitat in the Bay but is unlikely in the action area. Eelgrass grows in Malibu and at Mother's Beach in Marina del Ray. The soft-bottom habitat in Santa Monica Bay ranges in depth from the mean lower water line to deeper than 1,640 feet (or 500 meters) in the outer portions of the Bay and the submarine canyons.



Area coverage in percentage				Benthic Response Index (BRI) Threshold Intervals	
1984	1995	2007	2014		
1.6%	0.0%	0.0%	0.0%	>=72	Defaunation
7.9%	0.2%	0.0%	0.0%	44-71	Loss of community function
13.7%	5.1%	1.5%	0.4%	34-43	Loss of biodiversity
26.0%	6.1%	13.4%	12.1%	26-33	Marginal deviation from reference
50.7%	88.7%	85.1%	87.2%	<=25	Reference conditions

Figure 7. Benthic response index in action area over time. The table shows the percentage of area in each class defined by the index values. The monitoring area has declined over time and is responsible for the small decline in the reference area coverage (from 1995 to 2014). (SMBRC 2015 and City of LA 2015).

Fish species associated with soft bottom habitats are generally the target of environmental assessment studies concerned with the effects of human activities. This is largely because these benthic fish are more likely to be resident to an area than pelagic fishes and hence more likely to respond to local disturbances. Most sewage outfalls in Southern California are located on soft bottoms, and they are easier to sample using trawls. (City of LA 1990).

Demersal fish catches are generally larger and more diverse in the center of the mainland shelf near LA. Fish abundance and diversity is generally higher on the shelf but decreased below 328 feet. (City of LA 1990).

The 2015 State of the Bay report concluded the extent of the soft bottom habitat to be in excellent condition with no change in the last five years and structure and ecological disturbance as fair with the conditions improving.[23] The benthic community is also assessed as excellent. The benthic community has been relatively constant over the last 10 years.[24] (SMBRC 2015). The 2018 Bight demersal fish study showed that 98.8% of the Bight shelf was in reference

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[23] Confidence in the extent of soft bottom habitat score is moderate due to the use of only one of the two indicators for this category. Confidence in the structure and ecological disturbance is high as all 3 indicators were scored in this category with 2 being high and the other being moderate.

[24] Confidence in the benthic community condition is high due to the established and accepted thresholds and availability of high-quality long-term monitoring data. This conclusion is based on the levels of disturbance, including the presence, abundance, and pollution tolerance level of species, compared to a reference site.

condition, with the percentage of area in reference condition ranging from 92.3% on the Outer Shelf to 100% on the Inner and Middle Shelf (Wisenbaker 2021). (Note the action area encompasses the inner and middle shelf areas).

The physical, chemical, and biological properties of the soft-bottom habitats have continued to improve, primarily due to the shrinking of surface areas with high DDT, PCBs, and mercury concentrations, even though concentrations are still higher compared to the rest of the Southern California Bight. (SMBRC 2015). See figure 7 showing benthic response index values over time. This index is one measure to assess community health, or the degree to which a biological community has been modified relative to its natural state. Hyperion's 5-mile outfall is "y-shaped" in the figure.

Hard Bottom Ecosystem

Although scare in the Bay, the hard bottom environments include the shallow kelp-covered areas adjacent to rocky headlands, submarine canyon walls, and the deep-water plateau called Short Bank, which is surrounded by a large gravel bed. Rocky bottom fish such as sculpins and bass utilize the rocky sea bottom for food and cover, and many are common in kelp beds. (City of LA 1990). Giant kelp beds[25] in Santa Monica Bay are limited to two areas - the Palos Verdes Shelf and the area from Malibu west to Point Dune. Kelp beds grow on hard bottoms at depths ranging from 26 to 59 feet (eight to 18 meters). Kelp extends the available benthic habitat into the water column, thereby increasing overall productivity by increasing the surface area for invertebrate settlement and habitat for fishes. Several species of rockfish live and forage in hard bottom habitats.

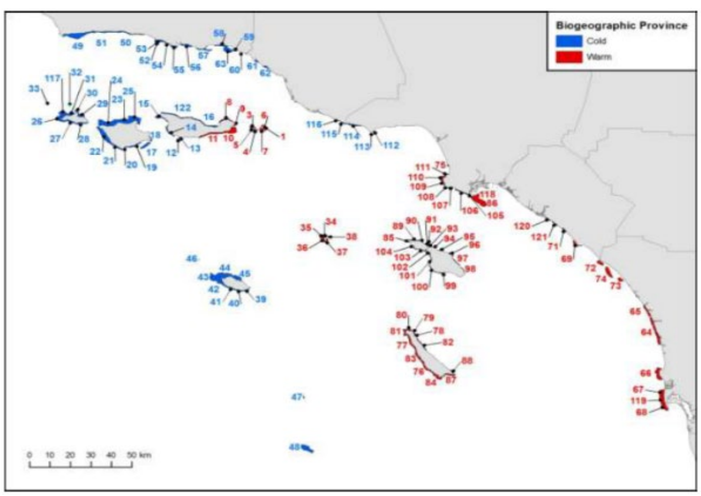

Figure 8. Nearshore rocky reefs of the Bight. Reefs are color coded by province (cold vs. warm). (Howard *et al*. 2012).

The other habitat type associated with hard bottom areas is rocky reefs. One hundred and twenty natural rocky reefs exist in the Bight. (Pondella et. al 2010). See figure 8 and 9. Rocky

[25] The 2019 Ocean Plan and draft 2022 permit defines kelp beds as "…significant aggregations of marine algae of the genera *Macrocystis* and *Nereocystis*. Kelp beds include the total foliage canopy of *Macrocystis* and *Nereocystis* plants throughout the water column."

reef habitat extends across 46% of the region's coastline, with rocky reefs being more prevalent at the offshore islands than along the mainland (75% to 25%). (Howard et al. 2012). The groundfish fishery management plan also identified habitat areas of particular concern, including rock reef habitat. Deep rocky reefs usually occur at depths greater than 66 feet and occurs in the middle of the Bay at Short Bank. A large gravel bed surrounds the rocky outcrops here. The Short Bank ranges from 66 to 328 feet in depth. The outfall structure itself may also create an artificial hard bottom and an artificial reef. The outfall provides a hard substrate that extends across a broad soft bottom, attracting many fish of the same species (as those found at rocky bottoms). See figure 9. (Pacific Fishery Management Council 2005).

A recent study categorized the habitat into six categories and identified that lower relief reefs are relatively more common along the mainland. Low relief sites tend to be at greater risk from stressors such as burial and sedimentation. (Howard et al. 2012*)*.

Along the entire continental shelf, rock sea bottoms are common to most of the offshore islands and banks, but on the mainland shelf they are limited to rocky headlands, submarine canyon edges, and some deep areas with rocky outcrops. (City of LA 1990).

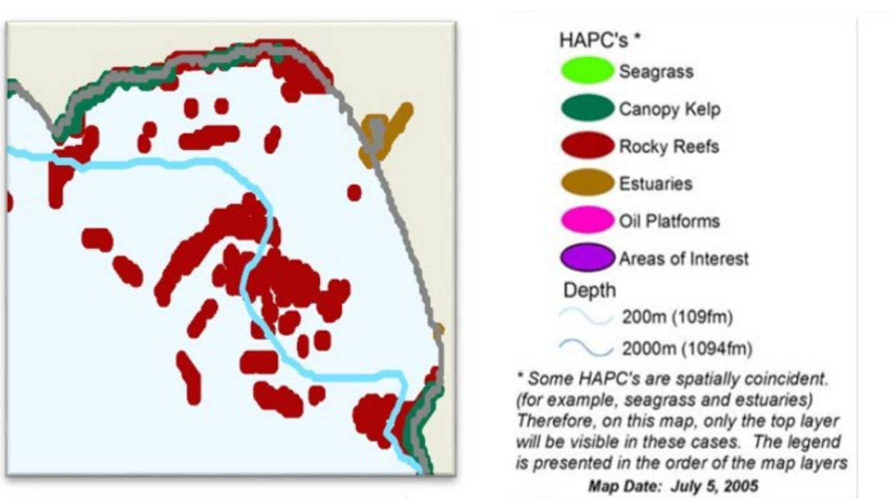

Figure 9. Habitat areas of particular concern, from the groundfish fishery management plan. Red areas are rocky reef habitat.

Intertidal Ecosystem

Rocky intertidal areas and areas of mixed rocky and sandy shoreline cover approximately 30%, or 20 miles, of the Bay's coastline. Rocky intertidal areas support rockfish and black abalone species. Rocky intertidal areas also provide tide pools. The nearest rocky bottom area is about 1.2 miles (or 2 km) southwest of the end of the south diffuser leg (i.e. 5-mile outfall). The soft-bottom intertidal areas of the Bay consist of sandy beaches extending from Palos Verdes to Point Dume and provide forage habitat for California halibut, English sole, and the leopard shark. (CA RWQCB- LA Region 2010).

2.10 Beach Water Quality

Elevated bacteria counts are known to occur along the beaches in the action area. In 2002, the Regional Water Board established a TMDL for bacteria, which included 44 beaches in the Santa Monica Bay. These beaches were listed on the state's 1998 303(d) list as impaired due to bacteria for two reasons – the total and/or fecal coliform water quality standards were exceeded based on shoreline monitoring data or there were one or more beach closures during the period assessed. (LA RWQCB 2002).

The discharge plume from the 5-mile outfall has not been detected in the nearshore environment largely due to outfall design, distance from shore, prevailing currents, and oceanographic parameters such as density stratification. (City of LA 2020 and City of LA 2021). The City of LA monitors bacteria at the Santa Monica Bay shoreline stations, as required under the Los Angeles County MS4 permit (NPDES No. CAS004001). The 2022 permit (and the MS4 permit) includes shoreline monitoring to ensure that Hyperion meets zero days of exceedances, consistent with the wasteload allocation in the Santa Monica Bay Bacteria TMDL.

3.0 Threatened and Endangered Species and Critical Habitat

On July 25, 2022, NMFS provided an updated species list. Twenty-three listed, proposed, or candidate species could occur within the action area. See table below.

Table 13. ESA species and critical habitat in action area

Type	Common Name	Scientific Name	Status[1]	Critical Habitat[2]
National Marine Fisheries Service				
Fish	Steelhead, Southern California DPS	*Oncorhynchus mykiss*	E	No
	Green sturgeon (Southern DPS)	*Acipenser medirostris*	T	No
	Scalloped hammerhead shark, (Eastern Pacific DPS)	*Sphyrna lewini*	E	No
	Giant manta ray*	*Mobula birostris*	T	No
	Oceanic whitetip shark*	*Carcharhinus longimanus*	T	No
Marine Mammals	Blue whale	*Balaenoptera musculus*	E	No
	Fin whale	*Balaenoptera physalus*	E	No
	Humpback whale (Central American DPS and Mexico DPS)	*Megaptera novaeangliae*	E/T	No
	Sei whale	*Balaenoptera borealis*	E	No
	Sperm whale	*Physeter macrocephalus*	E	No

Type	Common Name	Scientific Name	Status[1]	Critical Habitat[2]
	Gray whale, Western North Pacific DPS	*Eschrichtius robustus*	E	No
	Guadalupe fur seal	*Arctocephalus townsendi*	T	No
	North Pacific Right whale	*Eubalaena japonica*	E	No
Sea Turtles	Leatherback turtle	*Dermochelys coriacea*	E	No
	Loggerhead turtle, North Pacific Ocean DPS	*Caretta caretta*	E	No
	Olive ridley sea turtle	*Lepidochelys olivacea*	T	No
	Green sea turtle, East Pacific DPS	*Chelonia mydas (incl. agassizi)*	T	No
Invertebrates	White abalone	*Haliotis sorenseni*	E	No
	Black abalone	*Haliotis cracherodii*	E	Yes[3]
U.S. Fish and Wildlife Service Species Associated with Ocean Habitats				
Crustaceans	Riverside fairy shrimp	*Streptocephalus woottoni*	E	No
Birds	CA least tern	*Sterna antillarum browni*	E	No
	Coastal CA gnatcatcher	*Polioptila californica californica*	T	No
	Least bell's vireo	*Vireo bellii pusillus*	E	No
	Western snowy plover	*Charadrius alexandrines nivosus*	T	Yes[4]

[1] Status is either threatened (T) or endangered (E).
[2] Critical habitat is defined as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. A "Yes" means that designated critical habitat for the species occurs within the action area; a "No" means it does not.
[3] Black abalone critical habitat is along the Palos Verdes Peninsula, 30 miles south of the 5-mile outfall.
[4] Western snowy plover critical habitat along the coastline on Dockweiler State Beach and El Segundo State Beach.
(Source: U.S. FWS 2016 and NMFS 2015).

As explained in section 1.1. Consultation History, EPA and NMFS have been consulting on several southern California wastewater discharges and have received biological opinions for the Hyperion treatment plant (NMFS 2018), Orange County (NMFS 2021), and Point Loma (NMFS 2022). Each of these biological opinions contains substantial information related to species ranges, descriptions, and threats to the species. The following section highlights key information from each of these biological opinions.

3.1 Description of Fish Species

The southern California steelhead is a salmonid (i.e. *Oncorhynchus spp*.) found in Santa Monica Bay. The Southern California Steelhead Distinct Population Segment (DPS) was listed as an endangered species under the ESA in 1997 (62 FR 43937) and subsequently affirmed in 2006 (71 FR 834) and 2014 (79 FR 20802). A recovery plan for Southern California Steelhead was published in 2012. The geographic range of this DPS extends from the Santa Maria River, near Santa Maria, to the California–Mexico border. Southern California steelhead are categorized as "winter run" because adult migration from the ocean into freshwater rivers and streams generally occurs between December and April, arriving in reproductive condition and spawning shortly thereafter. Adult migration to freshwater depends on physical factors such as the magnitude and duration of instream flows and sand-bar breaching. Adults may migrate several miles, hundreds of miles in some watersheds, to reach their spawning grounds.

Once they reach their spawning grounds, females will use their caudal fin to excavate a nest in streambed gravels where they deposit their eggs. Males will then fertilize the eggs and, afterwards, the females cover the nest with a layer of gravel, where the embryos then incubate within the gravel. After emerging from the gravel, juvenile steelhead rear in freshwater for one to three years before migrating to the ocean (as smolts), usually in late winter and spring, and grow to reach maturity at age two to five before returning to freshwater to spawn. The timing of emigration is influenced by a variety of parameters such as photoperiod, temperature, breaching of sandbars at the river's mouth and streamflow.

Adult and juvenile steelhead migrating through the action area in coastal waters are expected to primarily occupy the upper water column. Tagging studies on the vertical distribution of adult steelhead have shown that adult steelhead spend on average approximately 95 percent of the time within 20 feet of the ocean surface, and 72 percent of the time within 3 feet of the surface. Juvenile steelhead also appear to primarily occupy the upper water column (e.g., 3 feet from the surface) based on the prey species they consume. (NMFS 2018). Thus, steelhead likely have limited exposure to the proposed action and its effects. The action area does not include critical habitat. (NMFS 2009).

The North American green sturgeon (*Acipenser medirostris*) is a long-lived (54 years), anadromous fish that occurs from the Bering Sea, Alaska to Ensenada, Mexico in <361 feet depth as non-spawning adults and subadults, occupying freshwater rivers from the Sacramento River up through British Columbia as larvae, juveniles, and spawning adults (NMFS 2009; NMFS 2018a). This species commonly occurs from British Columbia southward to San Francisco Bay (Love 1996). Green sturgeons tend to migrate northward from their natal habitats after their freshwater life (Lee et al. 2015).

Two distinct population segments of the North American green sturgeon are recognized based on genetic data and spawning site fidelity: a northern DPS (nDPS) and a threatened southern DPS (sDPS) (75 FR 30714; NMFS 2010). The latter consists of populations originating from coastal watersheds south of the Eel River, California, with the only known spawning population reported in the Sacramento River (NMFS 2009). sDPS individuals reach sexual maturity at roughly 15 years of age (or at 59 inches TL) and spawn every 3-4 years (NMFS 2015a). Adult and subadult green sturgeon in nearshore habitats feed on shrimp, clams, and benthic fishes (NMFS 2018a). Green sturgeons have few known predators, although some observations suggest predation by some marine mammals and shark species may occur (FOC 2016).

The number of adults and subadults of the sDPS is estimated to be about 2,100 and 11,000 individuals, respectively (NMFS 2018). Critical riverine, estuarine, and coastal marine habitats for the sDPS of green sturgeon include: U.S. marine waters within 600-foot depth from Cape Flattery, Washington to Monterey Bay, California; the Sacramento, Feather, and Yuba Rivers in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; and certain coastal bays and estuaries in Washington (lower Columbia River estuary, Willapa Bay, and Grays Harbor), Oregon (Coos Bay, Nehalem Bay, Winchester Bay, and Yaquina Bay), and California (Humboldt Bay) (NMFS 2009). These areas have elements essential for conservation of the sDPS such as abundant prey items, good water flow, an unobstructed migratory corridor, and good water and sediment quality. None of these critical habitats is located within the action area. A recovery plan was published for the southern DPS of green sturgeon.(NMFS 2018).

The scalloped hammerhead shark (*Sphyrna lewini*) is a circumglobal migratory species that lives in coastal warm temperate and tropical seas, from the intertidal and surface to up to 1,680 feet deep. The Eastern Pacific Distinct Population Segment (DPS) scalloped hammerhead shark was listed as an endangered species under the ESA in 2014 (79 FR 38213). There is no designated critical habitat for this species. A Recovery Plan is currently under development by NMFS. Currently no recovery plan exists for EP DPS scalloped hammerhead shark. Scalloped hammerhead sharks (i.e. *Sphyrna lewini*) are moderately large sharks with a global distribution. They are highly mobile and partly migratory, along continental margins as well as between oceanic islands. Females typically attain maturity between 79-98 inches Total Length (TL) whereas males reach maturity at 50-79 inches TL; however, the age at maturity differs by region, with estimates ranging from 4-15 years for females and 4-11 years for males. Females give birth to 1-41 live pups near shore after a gestation period of 9-12 months (Miller et al. 2014). Scalloped hammerhead sharks are apex predators, often feeding opportunistically on cephalopods, crustaceans, teleosts, and rays (NMFS 2014a).

While larger sharks, including adult scalloped hammerhead sharks, prey upon scalloped hammerhead pups, there are no known predators of adult scalloped hammerhead sharks. The mortality rate of adults (0.28/year) is considerably lower than for age 0 individuals (0.56/year to 0.93/year) (Miller et al. 2014). Six Distinct Population Segments[26] (DPSs) of scalloped hammerhead shark are recognized based on genetic diversity of subpopulations, geographic isolation, and differences in international regulatory policies (NMFS 2014a). Only the endangered Eastern Pacific DPS, which ranges from California (40°N) to Chile (36°S), is relevant to this BE. Scalloped hammerhead sharks are known to occur sporadically in Southern California during some El Niño events (NMFS 2015). While global declines in abundances have been documented, there is currently no estimate of population abundances for the Eastern Pacific DPS (Miller et al. 2014). No marine habitat occupied by the Eastern Pacific DPS scalloped hammerhead shark in U.S. territory qualifies as critical habitat (NMFS 2015).

The scalloped hammerhead shark is highly desired for the shark fin trade because of its fin size and high fin ray count. They are caught in a variety of fisheries. The eastern Pacific

[26] Listing, delisting, or reclassifying Distinct Population Segments of vertebrates allows NMFS to protect and conserve species and the ecosystems upon which they depend before largescale declines occur that would necessitate listing a species or subspecies throughout its entire range (NMFS 1996).

distinct population segment (DPS)[27] is at a high risk of extinction (i.e. risk 4), largely due to low abundance and a low intrinsic rate. Habitat loss and competition does not seem to be an issue in this risk assessment. (NMFS 2013d).

Giant manta rays were listed as threatened in 2018 (83 FR 2916). There is no designated critical habitat for this species. A Recovery Plan is currently under development by NMFS. The giant rays are slow growing and highly migratory, with small, fragmented populations distributed throughout the world's oceans. They inhabit tropical, subtropical, and temperate waters and are commonly found offshore and in productive coastal areas, although they can also be observed in estuaries, inlets, bays, and intercoastal waterways. As filter feeders, they eat large quantities of zooplankton. The main threat to the species is targeted and incidental catch in commercial fisheries.

In U.S. west coast fisheries, giant manta rays are occasionally observed as bycatch in the California drift gillnet fishery that targets swordfish and thresher sharks; however, they have only been observed in low numbers and only during El Niño events (Miller and Klimovich 2017). Observer records for this fishery from 1990-2006 contain only 14 documented observations of giant manta rays; however, no giant manta rays have been observed in the California drift gillnet fishery since 2010. Although the presence of giant manta rays in the action area is possible, the possibility of such an occurrence during the course of the proposed action is extremely unlikely. Consequently, the risks of exposure to the proposed action are very low.

Oceanic whitetip sharks were listed as threatened in 2018 (83 FR 4153). There is no designated critical habitat for this species. A Recovery Plan is currently under development by NMFS. Oceanic whitetip sharks are long-lived, pelagic, surface-dwelling top predators with late maturation and low to moderate productivity. They are found in tropical and subtropical oceans throughout the world, including the Pacific Ocean, where they have declined by approximately 80 to 95% since the mid-1990s (Young et al. 2018). In the eastern Pacific Ocean, the species' range extends from southern California to Peru (Compagno 1984). Oceanic whitetip sharks typically occur offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water greater than 184 meters (Young et al. 2018). The primary threat to oceanic whitetip sharks is bycatch in commercial fisheries. Their tendency to remain at the surface makes them particularly susceptible to interactions with fisheries.

Although oceanic whitetip sharks can occur as far north as southern California, their distribution is concentrated farther south and in more tropical waters (Young et al. 2018). A recent review of California drift gillnet fishery observer records also show no observations of oceanic whitetip sharks for this fishery from 2015-2021. Based on the rare occurrence of oceanic whitetip sharks off the southern California coast, EPA expects the likelihood of their presence in the action area to be extremely low.

[27] The definition of a species in the ESA includes "any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." (ESA, Section 4). In 1996, U.S. FWS and NOAA developed a joint policy to clarify the meaning of DPS, which includes 3 elements – discreteness of the population segment, significance of the population segment to the species to which it belongs, and population segment's conservation status in relation to the Act's standards for listing. *See 61 FR 4722*.

3.2 Description of Marine Mammal Species

All whale species considered in this BE are endangered, except for the Mexico DPS of humpback whales, which are threatened. The action area does not overlap with any designated critical habitat. All listed whale species considered in the BE pass through the Southern California Bight and potentially thru Santa Monica Bay during annual migrations. Guadalupe fur seals may also occur in the action area and are listed as threatened under the ESA.

Humpback whales were listed as endangered under the Endangered Species Conservation Act in June 1970 (35 FR 18319), and remained on the list of threatened and endangered species after the passage of the ESA in 1973 (35 FR 8491). A recovery plan for humpbacks was issued in November 1991 (NMFS 1991). On September 8, 2016, NMFS published a final rule dividing the globally listed endangered humpback whale into 14 distinct population segments (DPSs) and categorizing four DPSs as endangered and one as threatened (81 FR 62259). NMFS identified three humpback whale DPSs that may be found off the coasts of Washington, Oregon, California, and southern British Columbia: the Hawaii DPS (not ESA-listed), the Mexico DPS (ESA-listed as threatened), and the Central America DPS (ESA-listed as endangered). Both the Mexico and Central America DPSs are composed of demographically independent populations (DIPs) of humpback whales and are likely in the action area). Specifically, we assume that 42% of the humpback whales present in the California (CA) and Oregon (OR) waters would be Central America DPS, and 58% would be associated with the Mexico DPS.

On April 21, 2021, NMFS designated critical habitat for the Mexico and Central America DPSs in the North Pacific Ocean that include portions of the CCE, including areas off the coasts of Washington, Oregon, California, and Alaska (for the Mexico DPS) (86 FR 21082). However, the proposed action does not occur within designated critical habitat for either the Mexico or Central America DPSs.

The Humpback whale is a large baleen whale found in all ocean waters. With one exception, humpback whales are highly migratory, spending spring, summer, and fall feeding in temperature or high-latitudes areas. Humpback whales travel great distances during migration, the farthest migration of any mammal.

They are "gulp" feeders, capturing large mouthfuls of prey during feeding rather than continuously filtering food, such as other large baleen whales. These whales feed on krill and small schooling fish. In California waters, humpback whales likely feed on anchovies, sardines, mackerel, and euphausiids (i.e. small shrimp-like crustaceans). In many locations, feeding in the water column can vary with time of day – bottom feeding at night and surface feeding near dawn. During feeding, and breeding, humpback whales are found in coastal waters over continental shelves. Shallow banks or ledges with high sea-floor relief characterize feeding grounds. Humpbacks generally feed for six to nine months in cold, productive coastal waters. Humpback whales are often sighted eight to 20 miles from shore.

Although there has been substantial research on the identification and quantification of contaminants on individual whales, no detectable effect from contaminants has been identified in baleen whales. There may be chronic, sub-lethal impacts that are currently unknown. Threats to the humpback whales includes bycatch, ship strikes, whale watching harassment, habitat impacts, and harvest. Killer whales also prey on humpback whales. (NMFS 2015) NMFS (2022) provides population estimates to be 1,809 for the Central America DPS and 6,891 for the Mexico DPS.[28] NMFS (2022) also reported a recent study found that the combined stock of these two DPS is 4,973 (i.e. for the CA, OR, WA humpback whale stock).

Blue whales were listed as endangered worldwide under the precursor to the ESA, the Endangered Species Conservation Act of 1969, and remained on the list of threatened and endangered species after the passage of the ESA in 1973 (35 FR 8491). Currently there is no designated critical habitat for blue whales. The blue whales most likely to be observed within the proposed action area are identified as part of the Eastern North Pacific stock. Tagging and photo identification studies have shown that the feeding population off southern California also migrates as far south as the equator to feed in the eastern tropical Pacific (Mate et al. 1999).

Blue whale distribution is governed largely by food requirements and populations are seasonally migratory. Like other baleen whales, the seasonal and inter-annual distribution of blue whales is strongly associated with both static and dynamic oceanographic features such as upwelling zones that aggregate krill (NMFS 2022). Poleward movements in spring allow blue whales to take advantage of high zooplankton in the summer. Blue whale migrate near the action area May to October, but are mostly commonly seen in summer months when krill are abundant. The U.S. Department of the Navy (2009) reported studies showing blue whales diving to an average of 462 feet when feeding, 100 feet when traveling, and 222 feet during other dives. Primary threats facing the blue and fin whales include vessel strikes and fisheries interactions. (35 CFR 18319). NMFS (2022) provided population status and trends ranging from 670 whales to 1,898 whales for the U.S. west coast. The blue whale recovery plan (NMFS 2020a) describes recommended actions to determine the level of threat fishery entanglements, vessel strikes, and other potential threats pose to the likelihood of survival and recovery of the species.

Fin whales were listed as endangered worldwide under the precursor to the ESA, the Endangered Species Conservation Act of 1969, and remained on the list of threatened and endangered species after the passage of the ESA in 1973 (35 FR 8491). Currently there is no designated critical habitat for fin whales. Fin whales are distributed widely in the world's oceans. They are found in continental shelf and oceanic waters. They do aggregate in locations where prey is plentiful, irrespective of water depth, although these locations may shift annually or seasonally. Fin whales feed on planktonic crustaceans and schooling fish, such as herring and mackerel. Association with the continental slope is common, perhaps due to prey abundance (NMFS 2022). The U.S. Department of the Navy (2009) reported various research studies indicating various depths for fin whales. For example, fin whales are found in shallower depths during daytime feeding than night time dives (i.e. less than 330 feet as opposed to greater than 1,320 feet). This same report identified that fin whales off the coast of southern California spend 60 % of the time diving and 40% of the time near the surface. When diving, fin whales were found at depths less

[28] NOAA also stated that the entire Mexico DPS is 6,981 but only a portion occur along the U.S. west coast.

than 165 feet 44% of the time. (U.S. Department of the Navy 2009). Threats to the fin whales also include entanglement in fishing gear, habitat degradation, and disturbance from low-frequency noise (NMFS 2011b). NMFS (2022) provided best estimates of fin whale abundance off the U.S. west coast to be 11,065 whales. A comprehensive list of general threats to fin whales is detailed in the Recovery Plan (NMFS 2010) and in the most recent 5-year status review (NMFS 2019a).

Western North Pacific (WNP) DPS gray whales were originally listed as endangered under the Endangered Species Conservation Act in June 1970 (35 FR 18319). WNP gray whales remain listed as endangered under the ESA (35 FR 8491). Currently there is no recovery plan for this population. There is no designated critical habitat for the WNP DPS.

The gray whale was the most commonly observed whale species and seen near the limits of Santa Monica Bay (as opposed to within the Bay itself). Prime migration occurs December through April. However, there have been isolated reports of gray whales swimming within several hundred yards of Bay shoreline. (City of LA 1990). They are frequently observed traveling alone or in small groups. When feeding or breeding, larger groupings have been observed.

Gray whales are also baleen whales yet they feed differently from other whales. They are bottom feeders, stirring up shallower coastal areas. They suck in sediment and benthic amphipods from the sea floor. Feeding grounds are generally in Alaska and breeding areas are in Mexico. The WNP DPS gray whales are found mainly in shallow coastal waters in the North Pacific Ocean and estimated to include fewer than 100 individuals. Current threats are collisions with vessels, entanglement, habitat degradation, disturbance from whale-watching and low frequency noise, and illegal whaling. (NMFS 2013c). The estimated population size for WNP DPS gray whales is 270 whales (Cooke et al. 2018) and a current population of non-ESA listed gray whales of 26,960 (Caretta et al. 2021b). The probability that any gray whale observed along the U.S. west coast would be a WNP gray whale is extremely small, less than 1% (NMFS 2022).

Guadalupe fur seals were listed as threatened under the ESA on December 16, 1985 (50 CFR 51252) and consequently, are listed as depleted and a strategic stock under the MMPA. The population is considered a single stock because all are recent descendants from one breeding colony at Guadalupe Island, Mexico. No critical habitat exists within U.S. jurisdiction. According to a NMFS status report (2021) there is no recovery plan for this species.

Little is known about the Guadalupe fur seal because they were hunted almost to extinction. They are the rarest of all fur seal species. There is evidence that the seal bred as far North as Point Conception in central CA. Today, the only known breeding colony is on Guadalupe Island, off the Mexican coast. Increasing numbers have been seen on California's Channel Islands, and in recent years, several Guadalupe fur seals have been stranded along the central California coast. It is not yet known whether these strandings are a result of El Niño events (i.e. warmer water pushing their prey northward) or a sign of Guadalupe fur seals returning to their former range. Strandings can also occur due to malnutrition, and bacterial and parasitic infections. In 2015, an unusual mortality event occurred where strandings were eight times higher than the historical average.

Guadalupe fur seal are occasional summer visitors to the Bay. Little is known about their behavior or their diet, but they seem to eat cephalopods, squids, and lanternfish. These seals feed at night and dive to depths of 65 feet (20 meters). Dives can last approximately 2.5 minutes (NMFS 2022). Guadalupe fur seals are pelagic, living almost all of the time in the open ocean. They are not migratory. Threats include marine debris and oil production as well as low prey availability. NMFS (2022) estimates the population to be at least 31,091 based on 2013 pup count data.

The following three whale species (North Pacific right whales, sperm whales, and sei whales) could also occur within the action area, but we expect their occurrence to be rare, limiting their exposure to the proposed action and its effects.

North Pacific Right whales were listed as endangered under the precursor to the ESA, the Endangered Species Conservation Act of 1969, and remained on the list of threatened and endangered species after the passage of the ESA in 1973 (73 FR 12024, March 6, 2008). A final recovery plan for North Pacific Right whales was published in 2013 (NMFS 2013). North Pacific right whales are extremely rare in the action area: only 14 North Pacific right whales have been sighted off California since 1950 (NMFS 2017). As a result, EPA does not expect these whales to be exposed to any stressors deriving from the proposed action. (NMFS 2022).

Sperm whales has been listed as endangered under ESA since 1970 (35 FR 18319). There is no critical habitat for this species. NMFS provided a final recovery plan for Sperm whales in 2010 (NMFS 2010). The sperm whale (*Physeter macrocephalus*) is the largest toothed whale. Sperm whales reach peak abundance in waters offshore California from April through mid-June, and from the end of August through mid-November (Carretta et al. 2020). Sperm whales are typically found foraging offshore in deep waters and/or canyons and are more commonly sighted off central California. Sperm whales primarily prey on medium and large-sized squid (e.g., the giant squid) and fishes (e.g., sharks) that occupy deep ocean waters. Sperm whale occurrence in nearshore waters of Southern California is relatively rare; no sperm whales have been sighted during dedicated marine mammal surveys by NMFS in Southern California since 1991 (Carretta et al. 2020). Little is known about impacts to sperm whales. (NMFS 2015c). Although the action area does include some areas of deep water canyons, occurrence of sperm whales foraging in the action area would be very rare and may involve prey that are not as directly connected to the food web in nearshore waters that are most likely to be impacted by wastewater discharge. As a result, we do not anticipate exposure of these whales to the stressors of the proposed action.

Sei whales were originally listed as endangered under the Endangered Species Conservation Act in June 1970 and remain listed as endangered under the ESA (35 FR 8491). There is no critical habitat for this species. NMFS provided a final recovery plan for Sei whales in 2011 (NMFS 2011). Sei whales are usually observed individually or in small groups with less than five animals but occasionally found in larger, 30 to 50, loose aggregations. Sei whales prefer to feed at dawn and may exhibit unpredictable foraging and feeding behavior. (NMFS 2012). Off the California coast, sei whales feed on pelagic fish and invertebrates. Similar to sperm whales, sei whale are usually observed in deeper waters far from the coastline. Specifically, sei whales appear to prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins situated between banks and ledges. Little is known about the possible long-term and trans-generational effects of exposure to pollutants. Sei whales have not been sighted during dedicated marine mammal surveys by NMFS in Southern California since 1991 (Carretta et al. 2020). Therefore, we do not anticipate exposure of these whales to the stressors of the proposed action.

3.3 Description of Sea Turtle Species

The olive ridley and green sea turtle are listed as threatened, and the leatherback and loggerhead turtle (North Pacific DPS) are listed as endangered. Threats to all sea turtles include direct harvest, incidental capture in fishing gear, and loss of nesting habitat.

The olive ridley turtle has been listed as endangered along the Pacific Coast since 1978. (43 FR 32800). A recovery plan for the U.S. Pacific populations of olive ridleys was completed in 1998 (NMFS and USFWS 1998d). A 5-year status review of olive ridley sea turtles was completed in 2014 (NMFS and USFWS 2014). No critical habitat is designated. (U.S. FWS 2012). The olive ridley sea turtle is regarded as the most abundant sea turtle in the world. Olive ridley nesting populations on the Pacific coast of Mexico are listed as endangered under the ESA; all other populations are listed as threatened. NMFS (2022) assumes that olive ridley turtles that may occur in the action area along the U.S. west coast are most likely from the Pacific Coast of Mexico given the relative proximity of the action area to the Pacific coast of Mexico compared to other nesting populations in the North Pacific Ocean.

Olive ridley turtles are found in coastal waters of over 80 countries and nest in nearly 60 countries. They do not nest in the U.S. These turtles typically occur in tropical and warm temperature waters and may extend up to waters offshore of Oregon. Migration routes vary but all stay within 30 to 150 miles (50 to 240 km) of the coast (NMFS 2014). Like leatherback turtles, most olive ridley sea turtles lead a primarily pelagic existence. It is estimated that there are over one million female olive ridley sea turtles nesting annually along the Pacific coast of Mexico (NMFS 2022).

In 2016, NMFS finalized new listings for 11 green sea turtle DPSs, including listing the East Pacific DPS as threatened (81 FR 20057). A recovery plan for the U.S. Pacific populations of green sea turtles was completed by NMFS (1998). There is no designated critical habitat in the action area. The East Pacific DPS includes turtles that nest on the coast of Mexico which were historically listed under the ESA as endangered. The green turtle is globally distributed and generally found in tropical and subtropical waters along continental coasts and islands. Those green turtle found foraging offshore of California originate primarily from the rookeries of the Islas Revillagigedos (NMFS 2022). Nesting occurs in over 80 countries and thought to inhabit coastal areas of more than 140 countries. In the eastern North Pacific Ocean, green turtles have been sighted from Baja California to southern Alaska but most commonly occur from San Diego south.

Green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrass and marine algae. Green turtles are generally found in fairly shallow waters, except when migrating (i.e. depts less than 5 meters below the surface). Critical habitat is designated in waters around Puerto Rico. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is a mortality factor and has seriously affected green turtle populations in Florida, Hawaii, and other parts of the world. (U.S. FWS 2012b). Threats include coastal development, incidental capture, climate change, habitat destruction and alteration.

Loggerhead Sea Turtles were listed globally as a threatened species under the ESA in 1998 (NMFS and USFWS 1998c). In 2011, a final rule was published describing ESA-listings for nine DPSs of loggerhead sea turtles worldwide (76 FR 58868). The North Pacific Ocean DPS of loggerheads, which is the population of loggerheads likely to be exposed to the proposed action, was listed as endangered. A recovery plan for the U.S. Pacific populations of loggerheads was completed in 1998 (NMFS and USFWS 1998) when loggerheads were listed globally as a threatened species under the ESA. Since the loggerhead listing was revised in 2011, however, a recovery plan for the North Pacific loggerhead DPS has not been completed. There is no designated critical habitat in the action area.

Loggerheads are long-lived, slow-growing animals using multiple habitats across entire ocean basins. (NMFS 2007). In the U.S., occasional sightings are reported from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California. Loggerheads documented off the U.S. west coast are primarily found south of Point Conception, California, in the Bight (NMFS 2022). In the North Pacific, no nesting occurs within U.S. jurisdiction. Critical habitat has only been designated for the Northwest Atlantic loggerhead. In the central North Pacific Ocean, foraging juvenile loggerheads congregate in the boundary between the warm, vertically-stratified, low chlorophyll water of the subtropical gyre and the vertically-mixed, cool, high chlorophyll transition zone water. (NMFS 2013). Major nesting grounds are generally located in temperate and subtropical regions, with scattered nesting in the tropics. Juvenile loggerheads originating from nesting beaches in the western Pacific Ocean appear to use oceanic developmental habitats and move with the predominant ocean gyres for many years before returning to their neritic foraging habitats (NMFS 2022).

Recent analysis of loggerhead sea turtle presence in the Bight suggests that loggerhead presence offshore of Southern California is tied not just to warm temperatures, but to persistently warm temperatures over a period of months such as what occurred during the recent large marine heatwave in the Eastern North Pacific Ocean. NMFS conducted aerial surveys of the Bight in 2015 (a year when sea surface temperatures were anomalously warm and an El Niño was occurring) and estimated more than 70,000 loggerheads throughout the area, likely feeding on pelagic red crabs and pyrosomes, the species' preferred prey. (NMFS 2022)

The leatherback turtle is listed as endangered under the ESA throughout its global range (NMFS and USFWS 2020a). A recovery plan for the U.S. Pacific populations of leatherbacks was completed in 1998 (NMFS and USFWS 1998b). In 2012, NMFS revised critical habitat for leatherbacks to include additional areas within the Pacific Ocean, including the San Francisco Bay down to Santa Barbara (77 FR 4170). The proposed action does not occur within designated critical habitat for Pacific leatherbacks.

Increases in the number of nesting females have been noted at some sites in the Atlantic, but there have been substantial declines or collapse of some populations throughout the Pacific, such as in Malaysia, Mexico and Costa Rica. The most recent Status Review (NMFS and USFWS 2020a) found that all population segments have been and are impacted, to varying degrees, by habitat loss and modification, overutilization, predation, inadequate regulatory mechanisms, fisheries bycatch, pollution, and climate change.

Leatherbacks are commonly known as open ocean animals, but they also forage in coastal waters. The leatherback turtle preys on invertebrates, algae, seaweed, and fish. Within neritic central California waters[29], leatherbacks spend approximately 50% of their time at or within three feet of the surface while foraging and over 75% of their time within the upper 16 feet of the water column.

Leatherbacks are the most migratory and wide ranging of sea turtle species, largely because of adaptions such as having a circulatory system. These turtles can inhabit cold water allowing them to extend their geographic range. While their range spans the entire Pacific, occupation of the California Current is highly seasonal. Leatherbacks are commonly found in Monterey Bay because of prey populations. (NMFS 2012). In 2012, the National Marine Fisheries Service designated critical habitat along the west coast, including the San Francisco Bay down to Santa Barbara, which is well north of Santa Monica Bay. (77 FR 4170). Leatherback populations are characterized by low resiliency and redundancy. Using the best data available for the East Pacific population, NMFS and USFWS (2020) calculated the index of total nesting females to be a minimum of 755 females. Previous surveys indicated that approximately 180 leatherbacks would be expected to be found off the CA coast each year (Benson et al. 2007). In recent years, surveys of leatherback abundance off the U.S. west coast have detected a decline similar to what has been documented at the nesting beaches (Benson et al. 2020). The updated analysis from Benson et al. (2020) estimates the average number of leatherbacks off central California each year has dropped from 128 to 55 since 2003.

3.4 Description of Marine Invertebrates

There are seven species of abalone found in California. Two are listed under the ESA and known to occur in the action area: white abalone (*Haliotis sorenseni*) and black abalone (*Haliotis cracherodii*). The black abalone was listed as endangered on January 14, 2009 (74 FR 1937), and the white abalone was listed as endangered on May 29, 2001 (66 FR 29046). In addition, critical habitat was designated for the black abalone on October 27, 2011 (76 FR 66806). NMFS established a Recovery plan for white abalone in 2008 (NMFS 2008) and a Recovery Plan for black abalone in 2020 (NMFS 2020).

Abalone are in the same taxonomic class as snails and slugs. Abalone consumes a variety of seaweeds and small incidental organisms and is an important food source for sea otters, lobsters, and octopods. Abalone are broadcast spawners that reproduce by ejecting large numbers of gametes into the water column, where fertilization takes place externally. Abalone

[29] Neritic zone is the relatively shallow part of the ocean above the drop-off of the continental shelf, approximately 600 feet (200 m) in depth.

larvae do not feed during their one to three weeks in the plankton. They exist on energy stored in the yolk sack, supplemented perhaps by the uptake of dissolved amino acids. Once larvae come into contact with suitable substrate, they metamorphose and begin to consume benthic algae. Abalone become reproductive after about five years and can live for 30 years.

White abalone occur in open, low relief rocky reefs or boulder habitat surrounded by sand. Suitable habitat is patchy and therefore, the distribution of white abalone is also patchy. White abalone are found at depths ranging from 16 – 197 feet (i.e. 5-60 meters). Current remnant populations are most common between 98 and 197 feet (i.e. 30-60 meters) depth and a recent survey found the highest densities at depths of 131 – 164 feet (i.e. 40-50 meters). Factors controlling the depth distribution of white abalone are poorly known. Biological factors, such as competition and predation, have been implicated as factors controlling the upper limit, while water temperature and food availability have been implicated as factors controlling the lower limit. (NMFS 2011).

Historically, white abalone were found from Point Conception, California, to Punta Abreojos, Mexico, in the Pacific Ocean. In the northern part of the California range, white abalone were reported as being more common along the mainland coast. However, in the middle portion of the California range, they were noted to occur more frequently at the offshore islands (especially San Clemente and Santa Catalina Islands). It is unknown whether this distribution pattern resulted because of lack of suitable habitat along the mainland coast in the middle portion of the range or is due to overfishing in these more accessible mainland regions.[30] Currently, white abalone occur on the U.S. west coast, offshore islands and banks (particularly Santa Catalina and San Clemente islands), and along the mainland shores from Point Conception, California south to Punta Abreojos, Baja California, Mexico.

White abalone declined because of overfishing. In Southern California during the 1970s, white abalone was fished commercially. The fishery was managed using size limits and seasons, but such methods failed because they did not account for density-dependent reproduction and assumed regular successful recruitment. Overfishing reduced numbers to very low levels, resulting in a fragmented population. Fishery closure in 1997 has not led to an increase in populations, and in 2001, white abalone was the first marine invertebrate to be listed as endangered under the ESA. (NMFS 2016).

The most significant threat to white abalone is related to the long-term effects that overfishing has had on the species. Due to their life history characteristics as long-lived, slow moving bottom dwellers, with external fertilization and variable recruitment rates, abalone are particularly susceptible to the pressures imposed by intense commercial and recreational fishing. The low densities of the animals in nature, resulting in repeated reproductive failure, make it unlikely that the species will recover on its own. Because current populations are only small

[30] Santa Monica Bay generates perhaps the greatest fishing pressure in the Bight. Kelp bass and CA sheephead had significantly smaller size structure compared to other mainland and island reefs, clearly indicating fishing pressure on these kelp bed species. Barred sand bass, which is not primarily a kelp bed species, was not significantly different from other mainland sites. Red urchins, a commercially harvested species, were significantly larger in the Bay than other mainland sites. (Howard *et al.* 2012).

fractions of former numbers, recovery of the species will be complicated by genetic drift, founder effects, and a loss of genetic diversity. Abalones are also vulnerable to various bacterial and parasitic infections (NMFS 2016b). NMFS (2022) reported that from 2010 to 2016, white abalone populations had been reported in areas where they had not been observed for 10 or more years (n=67), including Palos Verdes Peninsula, La Jolla and Point Loma.

The fragmented populations of white abalone that remain in the wild are likely unable to reproduce successfully or at levels needed for recovery (NMFS 2021a). Much progress has been made toward recovery since 2001. Expanded field monitoring off southern California and Mexico supports improved assessments of the species' status in the wild (NMFS 2021a). Recovery efforts aim to increase densities in the wild, to support successful reproduction and establish self-sustaining populations. The increased success and expansion of captive production led to the first ever outplanting of captive-bred white abalone to the wild in 2019 at two sites, including one site off Point Loma (NMFS 2021a). Several outplanting efforts have been conducted since 2019, with several more planned over the next five years.

The black abalone (*Haliotis cracherodii)* is a shallow-living marine gastropod with a black to slate blue colored univalve shell and a muscular foot that allows the animal to clamp tightly to rocky surfaces without being dislodged by wave action. Black abalone historically occurred from Crescent City, California, to southern Baja California, Mexico, but today ranges from Point Arena, California, to Bahia Tortugas, Mexico, and it is rare north of San Francisco, and south of Punta Eugenia, Mexico.

Black abalone generally inhabit coastal and offshore island intertidal and shallow subtidal habitats on exposed rocky shores where bedrock provides deep, protective crevices for shelter. These complex surfaces with cracks and crevices in intertidal habitats appear to be crucial for juvenile recruitment and adult survival. Black abalone range vertically from the high intertidal zone to a depth of 20 feet (as measured from mean lower low water[31] line) and are typically found in middle intertidal zones. However, variation in wave exposure and where drift kelp (an important food item for black abalone) accumulates may result in animals being distributed primarily in high or low intertidal zones depending on the local conditions at particular locations.

Black abalones are herbivores. They primarily eat giant kelp and feather boa kelp in southern California (i.e., south of Point Conception) habitats, and bull kelp in central and northern California habitats. Black abalone can withstand extreme variation in temperature, salinity, moisture, and wave action (NMFS 2011).

The main sources of mortality for black abalone have been historical overfishing and, more recently, mass mortalities caused by the disease known as withering syndrome. The disease is caused by a Rickettsia-like prokaryote, and full manifestation of the disease appears to be more prevalent in the southern portion of black abalone range (south of Point Conception, CA) where water temperatures are relatively warmer. Die-offs also seem to occur in habitats where water temperatures are elevated by thermal discharge of power plants.

[31] The mean lower low water (MLLW) line is the arithmetic mean of the lower low water heights (i.e. tides) of each tidal day observed over a specific 19 year cycle.

As a result of the disease, black abalone populations in Southern California have declined by 90 to 99% since the late 1980s. Black abalone have been important to commercial and recreational fishing in California since the mid-1800s, but it was not until the late 1970s that significant declines in black abalone populations were detected. Increasing distance among potentially spawning males and females, has led to reproductive failure as the population density decreases. Other factors responsible for the decline of black abalone are illegal harvest and habitat destruction. Natural predation by a variety of predators (sea stars, the southern sea otter, and striped shore crab) as well as competition with purple and red sea urchins for space also threaten their survival. (NMFS 2013b).

Although some sites in southern California have shown evidence of recruitment, natural recovery of severely-reduced black abalone populations will likely be a slow process. Recovering the species will involve protecting the remaining healthy populations to the north that have not yet been affected by the disease, and increasing the abundance and density of populations that have already been affected by the disease.

NMFS designated critical habitat for black abalone in 2011 (76 FR 66806). The designation encompasses rocky intertidal and subtidal habitat (from the mean higher high water, MHHW, line to a depth of -6m relative to the mean lower low water, MLLW, line) within five segments of the California coast between Del Mar Landing Ecological Reserve to the Palos Verdes Peninsula, as well as on the offshore islands. Essential habitat features include rocky substrate; food resources (e.g., macroalgae); juvenile settlement habitat (rocky substrates with crustose coralline algae and crevices or cryptic biogenic structures); suitable water quality (e.g., temperature, salinity, pH) for normal survival, settlement, growth, and behavior; and suitable nearshore circulation patterns to support successful fertilization and larval settlement within appropriate habitat. Threats to black abalone critical habitat include coastal development or in-water construction projects; activities that can increase sedimentation; oil or chemical spills and response activities; and vessel grounding and response activities. Operations that involve withdrawing water from and/or discharging water to marine coastal waters may also affect black abalone critical habitat by increasing local water temperatures (e.g., discharge of heated effluent), introducing elevated levels of metals or other contaminants into the water, or altering nearshore circulation patterns.

The rocky intertidal and shallow subtidal habitats surrounding the Palos Verdes Peninsula (from the Palos Verdes/Torrance border to Los Angeles Harbor in southwestern Los Angeles County) are designated as critical habitat for black abalone and overlap with the action area in Santa Monica Bay. Past long-term monitoring data (primarily at sites downcoast of the Bay) indicate that Palos Verdes supported dense black abalone populations. Populations have declined severely due to disease, but critical habitat remains in fair to excellent condition. In particular, the area continues to provide good to high quality rocky substrate and food resources and fair to good settlement habitat for black abalone (NMFS 2011).

3.5 Description of Crustacean Species

The Riverside fairy shrimp is an inland water crustacean and requires vernal pool habitat to grow and reproduce. Therefore, Riverside fairy shrimp, and designated critical habitat, are not within the action area.

3.6 Description of Bird Species

Many bird species known to inhabit the Bight use specific areas for foraging, roosting, loafing, and nesting. One permanent resident is the snowy plover, discussed below. Because Santa Monica Bay lies beneath the Pacific Flyway (a north-south pathway used by migrating birds), the Bay is especially important for migrating species, such as terns, including the California least tern.

The California least tern is listed as endangered and is the only subspecies found in California. The California least tern ranges from Baja to Alta California, south of the San Francisco Bay area. Nesting is sporadic and occurs in San Francisco Bay, Sacramento River Delta, and along the coast from San Luis Obispo County to San Diego County. Nesting in recent years is increasing at inland sites in the Bay-Delta. Breeding birds are present at the colony from April through September. Nesting starts in mid-May.

The habitat of the species is described as nearshore with foraging occurring within approximately two miles of shore. The tern feeds on small fish caught in estuaries, bays, and nearshore marine waters. When looking for prey, they hover above the water and plunge to its surface when fish are spotted. Management consists of actions to limit disturbance and predation. (U.S. FWS 2006 and U.S. FWS 2009).

The coastal California Gnatcatcher and the least bell's vireos diet consists of small insects, spiders, and/or caterpillars. The distribution is restricted to Baja, California and areas of southern California, mainly in shrub or lowland riparian habitat. Therefore, these species are not present in the action area.

The western snowy plover is listed as threatened. The Pacific coast population of western snowy plovers consists of birds nesting in coastal areas, peninsulas, offshore islands, bays, estuaries, or rivers of the Pacific coast from southern Washington to southern Baja California, Mexico. They are distinct from western snowy plovers that breed inland. Suitable nesting habitat is distributed throughout the listed range but may be widely separated by areas of rocky shoreline. In California, there has also been a significant decline in breeding locations, especially in southern California. The breeding season in the U. S. extends from March 1 through September 30, although courtship activities have been observed during February. Pacific coast plovers typically forage for small invertebrates in wet or dry beach-sand, among tide-cast kelp, and within sand dune vegetation, specifically low foredunes, which are sand dunes closest to the sea. Some plovers use dry salt ponds and river gravel bars. The reasons for decline and degree of threats vary by geographic location; however, the primary threat is habitat destruction and degradation. (U.S. FWS 2007).

4.0 POTENTIAL ADVERSE EFFECTS OF THE ACTION ON ESA-LISTED SPECIES

Under the recently revised ESA Section 7 regulations, two analyses are required in evaluation the "effects on an action."[32] The first analysis is "activities caused by the proposed action." A proposed federal action may cause other associated or connected actions, which are referred to as "*activities* caused by the proposed action." 50 C.F.R. § 402.17(a). The agency must evaluate whether (1) the proposed action will be the but-for cause of the activity and (2) if so, whether the activity is reasonably certain to occur.[33] The agency must make its determination based on clear and substantial information and using the best scientific and commercial data available. 50 C.F.R. § 402.17.

The proposed action will authorize, for another five years, the continued discharge of treated wastewater effluent from the Hyperion WRP into Santa Monica Bay. Impacts from discharges via the 5-mile outfall have decreased in spatial extent and improved in quality over the last few decades.[34] These improvements are associated with full secondary treatment and a decrease in effluent volume (i.e. 28% less over the past 10 years). (SMBRC 2015). The plume mostly stays on the continental shelf and rarely reaches the continental slope of Santa Monica Canyon. The peak pollutant concentrations occur over the shelf and upper part of the slope. Low pollutant concentrations occur in the open ocean. (Uchiyama et al. 2014).

The activities caused by the proposed action are related to the pollutants being discharged into the Bay. EPA evaluated effluent quality based on common pollutants of concern for wastewater discharges as well as the top pollutants being discharged (See Appendix 9.1).

4.1 2018 Biological Opinion

In 2018, NMFS and EPA completed a formal consultation for the Hyperion WRP NPDES permit issuance.[35] During the Hyperion consultation process, NMFS noted in the 2018 Hyperion Biological Opinion that the absence of current data regarding the discharge of polybrominated

[32] The Services' implementing regulations define the "effects of the action" as "all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action." 50 C.F.R. § 402.02.

[33] In evaluating whether the activity is reasonably certain to occur, agencies are directed to consider the following factors (but may also consider others): (1) past experiences with activities that have resulted from actions that are similar in scope, nature, and magnitude to the proposed action; (2) existing plans for the activity; and (3) any remaining economic, administrative, and legal requirements necessary for the activity to go forward. 50 C.F.R. § 402.17.

[34] For example, the City compared effluent quality during partial secondary (1994-1996) and full secondary treatment (199-2011). Turbidity declined by 65%, TSS declined by 34%, and BOD declined by 74%. All changes in these pollutants were statistically significant. (City of LA 2014).

diphenyl ethers (PBDEs) makes it very difficult to draw conclusions regarding the magnitude of exposure of ESA-listed species or potential responses to this constituent in Santa Monica Bay. In the 2018 Hyperion Biological Opinion, NMFS concurred with EPA's not likely to adversely affect determinations for the southern California steelhead, green sturgeon, and scalloped hammerhead shark. NMFS determined that white abalone, black abalone, sea turtles and marine mammals were likely to be adversely affected due to diminished health, reduced fitness, and even mortality from the result of exposure to PBDEs and to harmful algal blooms.[36] Therefore, in section 4.3 Consequence Analysis of this BE, EPA specifically considered and evaluated these three ways the discharge could impact ESA-listed species.

4.2 Activity Analysis

The proposed action (the re-issuance of the NPDES permit) may cause an activity. Here, the activity is the continuing operation of the existing Hyperion WRP and its effluent discharge to Santa Monica Bay through the 5-mile outfall and rarely thru the 1-mile outfall. Specifically, the offshore discharge of treated wastewater can introduce nutrients, oxygen-demanding wastes, particulate matter, pathogens, and inorganic and priority organic toxicants that may be detrimental to marine organisms (Anderson et al. 1993; Clark 2001). These constituents could modify the physiology, growth, reproduction, and behavior of individual species as well as alter the composition of ecological communities (Gray and Elliott 2009; Weis 2014). Certain marine mammals and sea turtles that are found off the coast of California can be exposed to relatively high levels of water borne pollutants because they are generally long-lived species and arein close proximity to urban areas with high human activity (NMFS 2017). Both abalone species are within the action area, have shorter life spans yet they also have limited range of habitat.

4.3 Consequence Analysis

The consequence is an effect on any of the ESA-listed species. If an effect to species occurred, then EPA's re-issuance of the NPDES permit would be the but-for cause of that effect, because the continued existence of the treatment plants, and the discharge to the Pacific Ocean, would not occur but-for EPA's approval and re-issuance of the NPDES authorizing the discharge. EPA identified the following potential consequences associated with the re-issuance of the NPDES permit and continuation of the discharge to Santa Monica Bay:

- Toxicity associated with exposure to the discharge plume pollutants,
- Accumulation of other pollutants that may persist, be potentially harmful in low amounts, or otherwise emerging as concerns for marine life, and
- Exposure to environmental conditions created by the discharge of nutrients, including increased instances of harmful algal blooms.

However, these consequences are offset by limited species occurrence as well as limited exposure. Many of the marine mammal and sea turtle ESA-listed species are highly migratory and may only be exposed to the action area once or twice per year during migration and thus have low frequency of occurrence in the action area. When present, EPA expects that the duration of exposure to the proposed action will be variable but can be expected to be as little as an hour up to 4 days for these highly mobile species. ESA-listed species considered in this BE are not likely to be adversely impacted from direct exposure to certain toxic pollutants (e.g., metals and ammonia) in the effluent plume for the same reasons provided in the 2018 Hyperion Biological Opinion, which concluded the following:

> The available data indicate that ESA-listed marine mammals and sea turtles are generally not at a risk of health effects from most of the pollutants (typically metals) measured in the effluent (i.e., including ammonia, nickel, silver, and zinc) because most metals don't appear to biomagnify and are regulated and excreted by a host of marine life. Similarly, cadmium, chromium, copper, and lead do not appear to biomagnify and the available data does not indicate that low levels measured in their tissues pose a health risk. Ammonia does not build up the food chain and is not anticipated to accumulate in marine mammals and sea turtles. For these reasons, NMFS does not anticipate that marine mammals and sea turtles will experience any toxic health effects associated with most of the potentially toxic pollutants in the discharge as a result of occasional exposure to them when foraging in the action area.

Both white and black abalone are localized, relatively sedentary species and thus may endure longer exposures in the action area. The 2018 Hyperion Biological Opinion provides the information regarding exposures of metals to abalone:

> [As for effects on juvenile and adult abalone]….Overall, the levels of copper, zinc, silver, and cadmium reported in the effluent are lower than the levels found to cause mortality or sublethal effects on abalone. Taking into account the dilution of effluent outside of the ZID (a dilution of at least 84:1), the levels of these metals in the plume are expected to be well below those documented to cause mortality or sublethal effects on abalone. Based on this, we would not expect exposure to the levels of these metals in the plume to inhibit growth, behavior, or survival of white abalone or black abalone. The level of risk would be lower for black abalone, given their location in nearshore habitats and likely exposure to lower concentrations of the effluent. We also would not expect exposure to the levels of these metals in the ZID to inhibit growth, behavior, or survival of white abalone juveniles and adults, should individuals be present within the ZID (i.e., on the outfall structure). …
>
> Within the ZID, abalone larvae could be exposed to higher concentrations of the discharge effluent that can cause reduced or abnormal shell growth and development. … However, reported concentrations of the pollutants in the effluent plume (outside of the ZID) were below the values found to cause adverse effects on larvae, and chronic toxicity tests conducted by the City [of LA] indicate that exposure of abalone larvae (early stages from the fertilized egg to veliger) to the effluent concentrations within the plume (outside the ZID) is not likely to result in an observable effect on larval development. Larvae may pass through the

ZID and be exposed to higher effluent concentrations; however, the likely short duration of their exposure to the ZID indicates that effects on development would also be low. Based on this information, we would not expect reduced larval development or survival in abalone larvae exposed to the discharge plume. In addition, although larvae passing through the ZID would be exposed to higher effluent concentrations, we also do not expect this exposure to reduce larval development or survival given the likely short duration of the exposure compared to the 48-hour exposure times shown to cause adverse effects.

> We [NMFS] note two sources of uncertainty. First, abalone may be able to develop increased tolerance to heavy metal exposure via chronic exposure to sublethal levels; this has been indicated in chronic exposure studies involving copper (Martin et al. 1977; Viant et al. 2001), silver, and cadmium (Huang et al. 2010). Increased tolerance would further reduce the effects of exposure on abalone, although further studies are needed to better understand how tolerance may develop and whether it compromises other aspects of the individual's health (e.g., growth, reproductive development, immunity). Second, little is known about the effects of exposure to multiple metals and other pollutants on abalone, or the cumulative levels to which abalone are exposed in [Santa Monica] Bay. Synergistic effects could increase the potential for adverse effects on abalone. Unlike for larval stages, studies have not been conducted to directly evaluate the effects of Hyperion's discharge effluent on juvenile and adult abalone.

It is likely that some persistent organic pollutants (POPs), including legacy organochlorine compounds and flame retardants, are being accumulated by ESA-listed species in part as a result of wastewater discharge and that accumulation poses a threat to ESA-listed species, especially long-lived species such as marine mammals and sea turtles. The Hyperion discharge has not detected DDT compounds between 2017-2020 and it has intermittently detected PCBs congeners (yes in 2017-18, no in 2019-2020). See section 2.3.6 in this document. With respect to PBDE flame retardants, the discharge is a source of PBDEs since the compounds were detected in the effluent from 2018 to 2021. (City of LA special study, 2020)

Here is NMFS' (2018) summary information regarding priority organic pollutants including PCBs and PBDEs, currently found in measurable amounts in wastewater effluent.

> ESA-listed species may receive the majority of these [chlorinated and brominated organic compounds] from their diet, it is important to understand how these pollutants from wastewater effluent move through the food web in order to estimate the potential for exposure of pollutants from the proposed action to ESA-listed species. One study cited therein described that relatively small concentrations of PBDEs in the blubber of grey seal pups were significantly related to circulating thyroid hormone levels, suggesting that toxic effects may occur at body concentrations as low as one part per billion….
>
> Numerous organophosphate flame retardants (e.g., diphenylcresyl phosphate (DCP), triphenyl phosphate (TPP), TPPO, TNBP, IPPP) were also detected in muscle tissues of North Atlantic fin whales as well as their prey in Iceland (Garcia-Garin et al. 2020).

Pinnipeds have also been detected carrying organophosphate loads, including ringed and harbor seals from Norway (Hallanger et al. 2015). Additionally, four organophosphate flame retardants (triphenyl phosphate (TPhP), TCPP, TDCPP, TCEP) were detected in blubber of harbor seals near San Francisco Bay (Sutton et al. 2019).

Furthermore, there may be synergistic effects between PBDE and PCB congeners likely increasing the health risk to the marine mammals and sea turtles. See BiOp section 2.4.2.1.

Studies evaluating the effects of more persistent and potentially harmful contaminants such as priority organic pollutants on white abalone, black abalone, and other California abalone species are lacking. In 2018, NMFS found that potential exposure to endocrine disruptors, organotin compounds TBT and triphenyltin, diallypl-phthalate, etc. in the effluent could have a harmful effect on white and black abalone growth and reproductive development, based on studies involving other abalone species and depending on the concentrations in the effluent and to which abalone are exposed.

The 2022 draft permit includes continued monitoring requirements for flame retardants (both PBDEs and chlorinated organophosphates). The draft permit also requires annual monitoring for per- and polyfluoroalkyl substances (PFAS) to evaluate the potential exposure of these emerging pollutants from the 5- mile outfall discharge to ESA-listed species.

Nutrients are continuously discharged from the Hyperion WRP and may cause phytoplankton production to increase, potentially reaching levels so high that they may cause localized areas of lower dissolved oxygen or trigger harmful algae blooms (HABs). It has been well documented that nutrients are affecting algal dynamics in the Bight with chronic HAB outbreaks in areas that receive nutrient inputs from anthropological sources, particular WWTPs (Booth 2015; Howard et al. 2014, 2012). Some phytoplankton contain harmful biotoxins (e.g., domoic acid), which are known to be toxic to marine mammals in the Bight. Repeated blooms of the domoic acid-producing marine diatom *Pseudo-nitzschia* spp. have been documented along the Bight since 2003 (Smith et al. 2018). Domoic acid poisoning has been linked to mass mortalities of marine mammals (primarily pinnipeds) and seabirds in California (Work et al. 1993; Torres de la Riva et al. 2009). Lefebvre et al. (2002) showed that blue whales can be exposed to domoic acid (via uptake of krill) during toxic blooms of *Pseudo-nitzschia australis* in Monterey Bay, California.

The proposed 2023 permit includes nutrient monitoring requirements in the effluent and receiving water to further evaluate the effect of nitrogen discharges and potentially associated HABs. Also, the City of LA/Hyperion WRP also continues to participate in SCCWRP Bight projects associated with HABs surveys to investigate the relationship between nutrients discharged through POTW outfalls, upwelling, and HABs.

EPA notes the Whole Effluent Toxicity results from 2017 to 2020 showed "PASS" and thus no toxicity was observed. See Section 2.3.4 of this document. These results affirm the discharge is not posing a toxic effect on tested species, including Topsmelt (*Atherinops affinis)*, the red abalone (*Haliotis rufescens*), and the giant kelp (*Macrocystis pyrifera*).

Fishes

EPA expects giant manta rays, oceanic whitetip sharks, scalloped hammerheads, steelhead, and southern DPS green sturgeon to experience little to no exposure to the proposed action and its effects. Giant manta rays occasionally move northward into California waters during warm water influxes (Eschmeyer and Herald 1983). In addition, they are rarely caught by fishermen in California: only 14 giant manta rays were caught in the California drift gillnet fishery targeting swordfish and thresher sharks from 1990-2006 and none has been observed in this fishery since 2010 (Miller and Klimovich 2017). Although the presence of giant manta rays in the action area is possible, the possibility of such an occurrence during the course of the proposed action is extremely unlikely. Consequently, the risks of exposure to the proposed action are very low. EPA finds that the potential for the proposed action to affect this species is discountable and determines that the proposed action may affect but is not likely to adversely affect giant manta rays.

As for the scalloped hammerhead shark, only 26 confirmed sightings of this species in Southern California have been documented since 1977 (NMFS 2015). The action area is within the known range of the Eastern Pacific DPS of scalloped hammerhead sharks, but is located at the extreme northern end of their range and their presence anywhere off California has been only been rarely documented. To date no scalloped hammerheads have been documented as captured in fisheries along the U.S. west coast (NMFS 2015). Although the presence of scalloped hammerheads in the action area is possible, the possibility of such an occurrence during the course of the proposed action is extremely unlikely given that scalloped hammerheads sharks favor warmer waters more often located in lower latitudes. Consequently, the potential for the proposed action to affect the species is discountable. EPA determines that the proposed action is not likely to adversely affect the Eastern Pacific DPS of scalloped hammerhead sharks.

While there is considerable uncertainty regarding the current abundance of the oceanic whitetip shark throughout its entire range, the oceanic whitetip shark has a strong preference for the surface mixed layer in warm water above 20°C.[37] Therefore, these sharks are a surface-dwelling shark, and the action area is located at the extreme northern end of their range (similar to the scalloped hammerhead shark). Several archival satellite tagging studies from various regions of the species range indicate that the oceanic whitetip shark spends most of their time at depths of less than 200 meters. Furthermore, the species is considered to be highly migratory, which movements of up to 4,285 to 6,000 km in the open ocean. However, information on potential migratory corridors and seasonality is lacking (NMFS 2020). As stated above, EPA expects the likelihood that oceanic whitetip sharks would be present in the action area to be extremely low, based on the species rare occurrence off the southern California coast. Given these circumstances, EPA finds that the potential for the proposed action to affect this species is discountable and determines that the proposed action may affect but is not likely to adversely affect oceanic whitetip sharks.

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[37] Several studies (Young et al 2017, Clarke et al 2011, Clarke et al 2013) have documented declines of the oceanic whitetip shark as bycatch, but no studies were found near the action area.

The green sturgeon occurs occasionally in Southern California (Adams et al. 2002), but telemetry and genetic analyses of southern DPS green sturgeons indicate that subadults and adults occur most frequently in coastal waters ranging from Northern California northward to Vancouver Island (NOAA 2015). Southern DPS green sturgeon are likely extremely rare in Southern California, with a very low probability of occurrence in Santa Monica Bay and exposure to Hyperion's discharge effluent. Reports of green sturgeon along the Southern California coast are infrequent and speak to the rarity of the species in the geographic region (NMFS 2009). Furthermore, the likelihood that Southern DPS green sturgeon would stay in this specific area for any length of time, thereby being exposed to potentially harmful effluent, is low given the rarity of observations this far south in recent decades. As a result, we conclude that potential for the proposed action to affect Southern DPS green sturgeon is discountable, because the likelihood that green sturgeon occur in the action area is extremely low based on the species' distribution and habitat use. Therefore, EPA determines that the proposed action is not likely to adversely affect Southern DPS green sturgeon.

Similarly, NMFS recently concluded that a discharge located in Santa Monica Bay, would have discountable or insignificant effects on steelhead in the 2018 Hyperion Biological Opinion. (NMFS 2018).[38] Because juvenile and adult steelhead are reported to occupy the near-surface water column, EPA expects exposure to effects of the proposed action to be discountable or insignificant and determines that the proposed action is not likely to adversely affect Southern California steelhead.

As such, the potential for the proposed action to affect these ESA-listed fish species is discountable as exposure to the proposed action would be exceedingly rare. In contrast, fishing (both targeted and bycatch) is considered the primary threat to the giant manta ray, the oceanic whitetip shark, and scalloped hammerhead shark (NOAA 2017; Marshall et al. 2018) whereas alterations to water flow, prey base, water temperatures, water quality and depth, and sediments in riverine habitats are recognized as major stressors to green sturgeon (NMFS 2018). The critical habitats noted above for the southern DPS green sturgeon will not be affected by the proposed action and therefore, there is no impact on critical habitat for the green sturgeon.

Sea turtles

The distribution of all four sea turtle species encompasses California: juvenile and adult green, leatherback, and olive ridley sea turtles occur at least occasionally in the Bight, as do juvenile loggerhead sea turtles as well. Although their occurrence in the action area is known to be likely rare and there are no known nesting sites in the U.S. west coast for all four sea turtle species, it can be expected that these species migrate through the Bight and potentially visit Santa Monica Bay over the course of relatively long-lived lifetimes of migrations in the Bight.

As noted above, direct exposure to toxic pollutants that are detected in the effluent discharge plume such as ammonia and metals does not appear to pose a threat to sea turtles due to limited direct uptake of pollutants from the water column. Ammonia does not build up in the food

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[38] Discountable effects are those extremely unlikely to occur. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated.

chain, and is not anticipated to accumulate in sea turtles. While metals can bioaccumulate in the aquatic environment, most metals do not appear to biomagnify and cause adverse health effects for sea turtles. However, the legacy organochlorines (e.g., PCBs and DDTs) and the POPs of emerging concern (e.g., PBDEs, chlorinated organophosphates, and PFAS) have been well documented to pose a risk to marine species, especially long-lived species such as sea turtles, due to bioaccumulation through the food web. In addition, the effluent discharge contributes additional nitrogen and other nutrients to the action area, increasing the frequency and/or extent of HABs that potentially pose a threat to sea turtles that may occur in the action area. Therefore, EPA made a likely to adversely affect determination for ESA-listed sea turtles.

Whales

Humpback whales migrate through the action area in late April to early December. The current abundance estimate for the Central America DPS is approximately1800 individuals, which is relatively low compared to most other North Pacific breeding populations. For the Mexico DPS, the current abundance estimate is approximately 7,000 individuals (NOAA 2018). Blue whales aggregate with regularity to feed at specific areas of the continental shelf off California in the summer and fall before migrating south to spend the winter and spring in high productivity areas off Baja California, the Gulf of California, and on the Costa Rica Dome (Calambokidis et al. 2015; Caretta et al. 2019). One of these feeding areas, designated the Santa Monica Bay to Long Beach Biologically Important Area (Calambokidis et al. 2015), is near the action area and the discharge could impact this area.

Fin whales may occasionally enter the action area at any time during the year. Fin whales can occur year-round off California, Oregon, and Washington (Carretta et al. 2021a). Recent information suggests that fin whales are present year-round in southern California waters, as evidenced by individually-identified whales being photographed in all four seasons (Falcone and Schorr 2013). The fin whales most likely to be observed within the action area are identified as part of the CA/OR/WA stock.

At any given time during the migration, WNP gray whales could be part of the approximately 20,000 gray whales migrating through the California Current Ecosystem. Although the ESA-listed WNP gray whale population are expected to constitute not more than a small fraction of all the gray whales that migrate past and through the action area during a year, the fact that all of those gray whales will pass close to or into the action area makes it highly likely that at least some WNP gray whales will visit the action area during the 5-year period of the proposed action. WNP gray whale exposure is expected to be minimal as the animals would only potentially pass through the action area twice during the biannual migrations for very limited durations lasting no more than a number of hours each time. The probability that any gray whale observed along the U.S. west coast would be a WNP gray whale is extremely small - less than 1% even if the entire population of WNP gray whales were part of the annual gray whale migration in the eastern North Pacific. (NMFS 2018).

NMFS (2018) concluded the humpback, fin, blue and WNP gray whale species, specifically the ESA-listed populations of these species, are likely to be in the action area and susceptible to impacts associated with the proposed action. While we do not expect any individuals of these whale species to take up extended residence in the Bay based on the highly migratory nature of their ecology, we do expect that some individuals could make numerous or possibly frequent and extended visits to the Bay over the course of relatively long-lived lifetimes of extensive migrations that include the Bight. The duration of exposure to the proposed action (duration of visits) for individuals of all species may be variable, but generally can be expected to be as little as an hour up to several days a time.

Although sperm whales and sei whales occur year-round in California, sightings and/or telemetry data indicate that they generally forage well offshore of the action area (Schorr et al. 2010; Falcone et al. 2011; Falcone and Schorr 2013; Wells et al. 2017; Caretta et al. 2019). Only 14 North Pacific right whales have been sighted off California since 1950 (NMFS 2017). Similarly, sei whales have not been sighted in Southern California since 1991 (Caretta et al. 2019). As discussed in Section 3.2, EPA does not expect North Pacific right whales, sei whales, and sperm whales to be exposed to any stressors deriving from the proposed action. (NMFS 2022).

Similar to sea turtles, either direct exposure or indirect exposure through the food web to toxic pollutants (metals and ammonia) in the effluent discharge plume is not expected to cause adverse health effects to ESA-listed whales. However, whales are affected indirectly by consuming prey that has accumulated POPs from wastewater discharge, which expedites the potential or timing for adverse health effects in whale species. Persistent organic pollutants (e.g., DDT) and metals are known to accumulate in tissues of blue and humpback whales in various oceans of the world (O'Shea and Brownwell 1994; Muñoz-Arnanz et al. 2019). DDT in humpback whales off California were remarkably high, especially in southern California where levels were more than 6 times those in whales feeding in northern California (NOAA 2018).

NMFS 2018 BiOp states:

> What is clear is that HABs pose a significant health risk for ESA-listed marine mammals and sea turtles; that increasing the probability of HAB occurrence further increases the likelihood of adverse effects from HABs that include impaired health and mortality, and that Hyperion's discharge increases the possibility of this occurrence. As described above, we expect that all of the ESA-listed marine mammal and sea turtle species that may occur in the action area have individuals that may make numerous or possibly frequent and extended visits to the Bay and be exposed to increased frequency or extent of HABs during those visits, increasing the risks of adverse effects that HABs are known to present.

In addition, several studies have shown that the discharge of treated wastewater via ocean outfalls in the Bight can provide a significant source of nitrogen and other nutrients for the development of toxic algal blooms in the region (Howard et al. 2014; McLaughlin et al. 2017). Repeated blooms of the domoic acid-producing marine diatom *Pseudo-nitzschia* spp. have been documented along the Bight since 2003 (Smith et al. 2018). Domoic acid poisoning has been linked to mass mortalities of marine mammals (primarily pinnipeds) and seabirds in California (Work et al. 1993; Torres de la Riva et al. 2009). Lefebvre et al. (2002) showed that blue whales can be exposed to domoic acid during toxic blooms of *Pseudo-nitzschia australis* in Monterey Bay, California. Likewise, Bargu et al. (2002) demonstrated that krill, the predominant prey of blue whales, can also accumulate domoic acid during *Pseudo-nitzschia* blooms in Monterey Bay.

Therefore, EPA believes that the proposed action is likely to adversely affect ESA-listed blue, fin, humpback (Central American DPS and Mexico DPS), and WNP gray whales that occur within the action area.

Seals

Guadalupe fur seals are concentrated on several islands off Baja California, Mexico, as noted above and they forage offshore along the coast of California during warm-water years presumably as a result of the northward movement of prey into more productive waters (Hanni et al. 1997; Aurioles-Gamboa and Hernández-Camacho 1999; Lander et al. 2000; Elorriage-Verplancken et al. 2016) Guadalupe fur seals are likely to be in the action area and exposed to the proposed action and its effects. While we do not have any information that suggests any individuals from this species take up extended residence specifically within the Bay, we do expect that individuals could make numerous or possibly frequent and extended visits to the Bay over the course of relatively long-lived lifetimes of extensive migrations or residence in the Bight. The duration of exposure to the proposed action generally can be expected to be as little as an hour up to several days at a time and could include multiple times for individuals that may be utilizing Southern California waters more regularly or for extended foraging activities.

Similar to sea turtles, either direct exposure or indirect exposure through the food web to toxic pollutants (metals and ammonia) in the effluent discharge plume is not expected to cause adverse health effects to Guadalupe fur seals. With regard to the potential impacts of toxic pollutants including POPs and algae-producing biotoxins, little is known about these toxic pollutant exposure and effects in Guadalupe fur seals that may occur in the action area. Thus, the best available information from studies involving other similar species is used to infer potential effects of exposure on Guadalupe fur seals. Considering California sea lions which have similar migration habits and patterns and prey species, it is reported that levels of PCBs and DDTs in dead California sea lions were higher than the health effects threshold established for marine mammals. Domoic acid caused the mortality event in 1998 off the central California coast, resulting in most of the stranded sea lions' deaths. A bloom of *Pseudo-nitzschia australis* occurred in Monterey Bay was also implicated in the sea lion mortality event. Like other marine mammals, EPA determines that the proposed action is likely to adversely affect Guadalupe fur seals.

Invertebrates

The historic and current range of the endangered black abalone (*Haliotis cracherodii*) and endangered white abalone (*Haliotis sorenseni*) extends along the Bight coastline (Hobday et al. 2001; Neuman et al. 2010). Although individual black abalone have been observed along the Palos Verdes Peninsula, viable populations of black abalone have not been observed in rocky intertidal and subtidal habitats of the action area since 2005 (NMFS 2011a). In recent years, wild white abalone individuals have been observed within the action area and captive-bred white abalone have been outplanted to subtidal reefs within the action area to enhance the populations (NMFS 2021).

Studies evaluating the effects of more persistent and potentially harmful contaminants such as POPs on white abalone, black abalone, and other California abalone species are lacking. For the previous NPDES permit reissuance for Hyperion, NMFS concluded that potential exposure to endocrine disruptors, organotin compounds TBT and triphenyltin, diallypl-phthalate, etc. in the effluent can affect abalone growth and reproductive development. (NMFS 2018). Heavy metals could also affect shell development, growth, behavior, and survival in abalone; however, concentrations outside of the ZID would be below those that affect larval abalone, juveniles, and adult abalone. Overall, the levels of heavy metals are lower than the levels found to cause mortality or sublethal effects on abalone. Within the ZID, abalone could be exposed to higher concentrations, but given the limited extent of the ZID and planktonic nature of abalone larvae, exposure time within the ZID would likely be less than 48 hours due to the spatial extent of the ZID and ocean currents (section 1.3 of this BE). The likelihood of occurrence within the ZID offshore is lower for black abalone larvae than white abalone larvae given that the ZID, associated with the 5 -mile outfall is at a depth of approximately 187 feet (57 meters), much deeper than the depth range of black abalone (intertidal to 6 m depth).

Documented abalone mortality events have been linked to HABs, including two recent events along the California coast: (a) a *Cochlodinium* bloom in 2007 that killed red abalone at the Monterey abalone farm (Howard et al. 2012, Wilkins 2013) and (b) a dinoflagellate bloom off Sonoma County in 2011 that produced high levels of yessotoxin, killing abalone and several other invertebrates species in coastal waters (Rogers-Bennet et al. 2012; DeWit et al. 2014). Because black abalone occur in nearshore, shallow waters, they may be relatively more at risk to the effects of HABs than white abalone. Other HAB related toxins, such as domoic acid and saxitoxins, have been detected in abalone tissues (Shumway 1995; Harwood et al. 2014; Malhi et al. 2014), but the effects on abalone health are not known. Overall, EPA determines that the proposed action is likely to adversely affect white abalone and black abalone.

Based on these modeled plume probabilities, black abalone critical habitat along the Palos Verdes coast would be exposed to the discharge plume, though at highly diluted concentrations that are not likely to have a measurable effect on the growth of crustose coralline algae (an important component of juvenile settlement habitat). Historical wastewater discharges (prior to full secondary treatment) contributed to declines in water quality and kelp growth along the Palos Verdes Peninsula in the 1940s to 1960s, likely reducing this important food source for black abalone (Leighton 1959; Cox 1962; Leighton and Boolootian 1963; Wilson et al. 1979; Miller and Lawrenz-Miller 1993). Improvements in wastewater treatment, particularly implementation of full-secondary treatment, have reduced the adverse effects of wastewater discharge on kelp growth and allowed recovery of kelp beds along the Palos Verdes Peninsula (Wilson et al. 1979). Chronic toxicity testing using Hyperion's discharge effluent have found no observable effects on giant kelp sporophytes when exposed to concentrations as high as 10% effluent (compared to concentrations of 1.19% effluent expected in the plume; City of LA 2015). Based on these results, we would not expect exposure to the discharge plume to reduce the growth of giant kelp and the availability of this food resource in black abalone critical habitat. Overall, the discharge may affect critical habitat, but at an insignificant level that is not likely to affect the quality of the habitat and its conservation value for black abalone. As a result, EPA determines that the proposed action is not likely to adversely affect black abalone critical habitat.

Birds and Crustaceans

EPA makes a "no effect" determination for these listed crustacean and bird species: Riverside fairy shrimp, California least tern, California coastal gnatcatcher, Least bell's vireo, Western snowy plover.

EPA's Determinations

For these reasons and out of an abundance of caution, EPA makes a no effect determination for listed bird species; a not likely to adversely affect determination for listed fish species (i.e., giant manta ray, scalloped hammerhead shark, oceanic whitetip shark, green sturgeon, and the southern California steelhead) and three whale species (North Pacific right whales, sei whales, and sperm whales); and a likely to adversely affect determination for listed sea turtles, certain marine mammals (blue, fin, WNP gray, and humpback whales and Guadalupe fur seals), and two abalone species (white abalone and black abalone). EPA also makes a not likely to adversely affect determination for black abalone critical habitat.

4.4 Cumulative Effects

Over 400 square miles of land area drains to Santa Monica Bay. This area is known as the Santa Monica Bay Watershed. There are 28 separate sub-watersheds within the Santa Monica Bay Watershed, with the 2 largest being Ballona Creek and Malibu Creek watersheds (i.e. drains 127 and 110 square miles, respectively). Because of its large size, urban land use, and loss of wetlands, Ballona Creek contributes significantly to total loads of several pollutants to the Bay and to the Marina del Rey Harbor. (State Water Board 2011). About 16 MGD of runoff flows from Ballona Creek into the Bay during dry weather and 10 times higher or more during larger storms. Pollutants of concern for Ballona Creek include heavy metals, trash and debris, pathogens, oil and grease, PAHs, and chlordane. Pollutants of concern for Malibu Creek watershed include nutrients, sediments, pathogens, TSS, trash and debris, and oil spills. This region has the second highest loading of TSS in the Santa Monica Bay watershed, which may be due in part to natural causes.

In 2011, the State Water Board identified the following permitted discharges into the Santa Monica Bay Watershed:

- 193 traditional NPDES discharges
- 18 minor NPDES discharges covered under individual permits
- 87 industrial stormwater NPDES discharges
- 401 construction stormwater NPDES discharges
- 175 discharges covered under other NPDES general permits

Over half of these discharges are related to stormwater and are discharged to the Bay through more than 200 outlets. Each year, an average of 30 billion gallons of stormwater and urban runoff can flow through the storm drain system. (State Water Board 2011). Figure 29 shows known locations of stormwater and non-stormwater discharges in 2011 to the Bay.

Because stormwater is a significant source of pollutants to the Bay, over 40 low-flow diversions or runoff treatment facilities exist. While these were mainly implemented to reduce beach closures, low flow diversions and treatment facilities are part of an approach to source reduction and has been effective at reducing bacteria levels. (State Water Board 2011 and SMBRC 2015). See Figure 30. These low-flow diversions along with other stormwater management practices, such as the development of Watershed Management Program/Enhanced Watershed Management Programs to ensure compliance with TMDLs and stormwater NPDES permits, will improve Bay water quality.

Figure 29. Locations of Stormwater ((a) and (b)) and Non-stormwater (c) discharges in Santa Monica Bay Watershed. The Malibu Creek and Ballona Creek Subwatersheds boundaries are shown red. (Source: State Water Board 2011).

While stormwater and urban runoff are significant sources of pollutants in the nearshore environment, 7 major NPDES permittees are significant sources of pollutants in the offshore environment. See figure 31. All of these facilities have NPDES permits and applicable effluent limits. These include a refinery, 3 generating stations (Scattergood, El Segundo, and AES generating station), recycled water from the West Basin Edward C Little Water Recycling Plant (i.e. brine discharges via the 5-mile outfall), and two POTWs – Hyperion and Los Angeles County Sanitation Districts' Joint Water Pollution Control Plan.

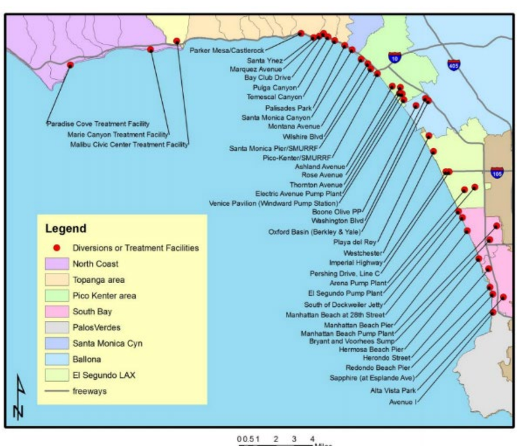

Figure 30. Low flow diversions or runoff treatment facilities in Santa Monica Bay Watershed. As explained in section 1.2, Hyperion treats dry weather urban runoff and low stormwater flows. The storm drain system is completely separate from the sewer system except where storm drain diversions have been installed.

These two POTWs discharge directly to the Bay, but the amount of the discharge and the amount of associated pollutants have been decreasing. For example, in 2014, the City of LA's four wastewater treatment plants recycled 76.2 MGD of wastewater and LA County recycled 155 MGD that would have otherwise been discharged into the Ocean and local rivers. (SMBRC 2015). In addition, all once-through cooling water power generation facilities with ocean intakes are scheduled to be phased out by December 31, 2023. The reduced POTW flows and associated pollutants, discharge prohibitions, and other NPDES permit requirements will help improve water quality in the Bay. See appendix 9.3 for a list of jointly issued NPDES permits (i.e. issued by EPA and the Regional Boards) for California waters as well as permits issued by the Regional Board.

Since the West Basin Edward C. Little Water Recycling Plant discharges via Hyperion's 5-mile outfall, cumulative impacts associated with brine discharges mixed with effluent are most relevant. As explained in section 1.2, Hyperion provides secondary effluent to the West Basin facility. At the West Basin recycling plant, the secondary effluent is treated and brine is discharged to a brine line that leads to the Hyperion Treatment Plant effluent pump station where it immediately commingles with secondary effluent and is discharged via the 5-mile outfall. The discharge design flow of West Basin is 5.2 MGD of untreated brine, which is less than 2 percent of the total discharge from the Hyperion Treatment Plant 5-mile outfall.

The main impact of the brine effluent mixed with Hyperion's effluent would be buoyancy, which drives initial dilution. Buoyancy depends on the relative difference in density between the effluent and ambient water. Freshwater effluent, such as Hyperion's effluent, is less dense than marine waters, causing the plume to rise upon discharge. This movement entrains ambient water, causing dilution. Brine effluents are denser than freshwater effluents and may sink in the receiving water.

Figure 31. Portion of California Ocean Plan Coastal Map of Regions 4, 8, & 9 and Southern Channel Islands depicting Ocean Outfalls (Source: Modified from the 2015 California Ocean Plan).

West Basin's brine undergoes two mixing events during discharge. The first event occurs when the brine and effluent combine and the second occurs when discharged via the 5-mile outfall. Co-disposal of brine discharges with cooling water from power plants or domestic wastewater via a multiport diffuser is a desirable method because salinity is reduced. Because the brine effluent (~5MGD) is such a small portion of the combined discharge flow (~240 average MGD), density (and temperature) of the discharge via the 5-mile outfall is not impacted. The results from the dilution study provide conservative estimates of changes to effluent density and consider future expansion of water recycling at West Basin. Once water recycling has reached plant capacity at West Basin (i.e. 80 MGD), there would be a more dense plume based on less secondary effluent (i.e. 50 MGD less) and additional brine (8.25 MGD more of brine) in the discharge via the 5-mile outfall. Using the highest monthly average temperature, estimates of density changes were only slightly impacted, ± 0.39 kg/m^3, with a calculated dilution factor of 147:1. However, the NPDES permit contains a dilution factor much lower than this value (i.e.

96:1 and 84:1) and therefore, increases in brine flow are not expected to impact the available mixing in the receiving water.

The other main pollutant in brine is ammonia. From the receiving water monitoring conducted by the City of LA, ammonia and salinity of the discharge is monitored. Impacts to the receiving water are minimal. As described in the effluent quality section of this BE, offshore ammonia was detected at 22% of receiving water sample sites and most results are at or below the method detection limit of 0.02 mg/L. The highest concentrations are detected near the 5-mile outfall (as ammonia has been detected near the outfall 120 times since 1998). However, all detected values are below the values provided in the California Ocean Plan. Figures 17 and 18 illustrate that ammonia concentrations meet water quality objectives and therefore, are protective of aquatic life in the Bay.

In addition to the City of LA's monitoring program, SMBRC completed the 2015 State of the Bay Report. See discussion in Section 4.4. The report points out that most habitats in most areas of the Bay and its watershed are degraded to some degree due to human activities. However, with a growing population, it would be nearly impossible for this not to be the case. The report also highlighted some of the successes, such as soft-bottom habitat improvement with no dead zones, primarily due to reductions in DDT, PCB and mercury concentrations in the sediment, coupled with considerable reduction in suspended solids in wastewater treatment effluent. Specifically, the hypoxic conditions in the Bay were assessed as good and improving, with a moderate confidence level. The report also demonstrated a lack of sediment toxicity in most areas. (SMBRC 2015). The Hyperion sediment toxicity results from 2018 to 2020 also show non-toxicity with survival rates ranging from 92 to100% at all sites.

For the reasons stated above, EPA has determined that the effects of the proposed action, when added to the effects of non-federal actions, is not likely to result in cumulative effects that would change EPA's determinations for the ESA-listed resources in the action area.

4.5 Crustaceans

EPA makes a "no effect" determination for the Riverside fairy shrimp because these species are not known to occur in the action area. The Riverside fairy shrimp is an inland water crustacean that requires vernal pool habitat. Any prey species would not be in the vicinity of the outfall, located 5 miles offshore, at a depth of 187 feet. Therefore, EPA is not consulting with the USFWS on these species.

4.6 Bird Species

EPA makes a "no effect" determination for the bird species (i.e. California clapper rail, coastal California gnatcatcher, least bell's vireo, western snowy plover) because these species are not known to occur in the action area. The bird species require shrub or lowland riparian habitat and feed non-marine species, such as insects, spiders, and caterpillars. Any prey species would not be in the vicinity of the outfall, located 5 miles offshore, at a depth of 187 feet. Therefore, EPA is not consulting with the USFWS on these species.

5.0 Essential Fish Habitat Assessment

The MSA requires federal agencies to consult with NMFS on activities that may adversely affect EFH. An adverse effect is any impact that reduces quality and quantity of EFH. Adverse effects many include direct or indirect physical, chemical, or biological alternations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. (50 CFR 600.810).

For California coastal waters, the Pacific Fisheries Management Council is responsible for managing commercial fisheries resources and designating EFH. The action area is located within multiple areas identified as EFH for various life stages of fish species managed by the council. EFH in and near the action area are managed through three separate fishery management plans: the Coastal Pelagics, the Pacific Coast Groundfish, and the Highly Migratory Species Fishery Management Plan. In addition, the proposed project occurs within, or in the vicinity of, rocky reef and canopy kelp habitats, which are designated as habitat areas of particular concern (HAPC) for various federally managed fish species within the Pacific Coast Groundfish FMP.

5.1 Coastal Pelagic Species and Fishery Management Plan

The Coastal Pelagic Fishery Management Plan covers all species of krill and four finfish species: Pacific sardine, Pacific mackerel, Northern anchovy, and Jack mackerel. Coastal pelagic species are most common in the upper mixed layer of the ocean (above the thermocline) and may occur in in shallow embayments, although coastal pelagic species don't depend on these areas for habitat.

The EFH covers all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the economic exclusion zone and above the thermocline where sea surface temperatures range between 50°F to 79°F. The southern boundary is the United States-Mexico maritime boundary. The northern boundary is more dynamic and defined as the position of the 50°F (or 10°C) isotherm, which varies seasonally and annually. (Pacific Fishery Management Council 2011).

All of the finfish species in the management plan are schooling fish. The Pacific mackerel may school with other schooling fish species, such as sardines. The finfish species are also usually smaller size fish and are important prey species, with the exception of the adult jack mackerels (i.e. about two feet). Because of their large size, jack mackerels are not an important food source for marine mammals, sea birds, or small predators.

Non-fishing effects on finfish EFH may not be as adverse relative to other fish types, such as groundfish, because adults and juveniles are mobile, and all life stages are pelagic. The populations of finfish are also dispersed in a wind band along the west coast of North America. However, impacts to finfish prey are conceivable.

Pelagic fishes are not abundant along the inshore portion of the outfall pipes but increase in abundance with depth. Schools and aggregations of fish near the outfall pipes in deep water may be using the pipes as point of reference for their schools or may be feeding there. (City of LA 1990).

The fishery management plan says that localized sources of pollution may affect coastal pelagic species in bay and harbors along the coast. Prior to regulatory controls and plant upgrades, anchovies tended to congregate around sewage outfalls, such as White's Point off Palos Verdes Peninsula and around the outfalls of the Terminal Island fish processors and sewage treatment plant. However, overall stocks are not likely affected because of their widespread distribution, and coastal pelagic species respond quickly to adverse changes in their environment by swimming away. (Pacific Fishery Management Council 1998).

Table 14. Summary of EFH species in Coastal Pelagics FMP

Species	Geographic Extent of EFH	Water Location	Water Column Depth	Water Temperature
Pacific sardine	Marine and estuarine waters from the shoreline along the Coasts of California to the limits of the EEZ and above the thermocline, where sea surface temperatures range between 10°C to 26°C.	Pelagic	Above thermocline and upper 164 feet	14 ^{0}C to 16 ^{0}C 10 ^{0}C to 26 ^{0}C
Pacific mackerel			Surface	10 ^{0}C to 26 ^{0}C 10 ^{0}C to 22.2 ^{0}C
Northern anchovy			Near surface < 164 feet	12 ^{0}C to 21.5 ^{0}C
Jack mackerel			NA	10 ^{0}C to 26 ^{0}C
Krill species	Extends the length of the West Coast from the shoreline to the 1,000 fm isobath and to a depth of 1,312 feet (400 meters).	NA	NA	NA

5.2 Pacific Coast Groundfish and Fishery Management Plan

Groundfish covered by this fishery management plan include over 90 different species that, with a few exceptions, live on or near the bottom of the ocean. The species are rockfish, flatfish, roundfish, sharks and skates, and other species, such as ratfish and finescale. Because of the number and diversity of groundfish, a summary table is not included here. However, the fishery management plan specifically identifies the Santa Monica Bay as habitat for the English sole, gopher rockfish, pacific cod, leopard shark pups, and sub-adult cowcods associated with white sea anemones on outfall pipes in the Bay.

With respect to habitat associations, a few broad generalizations can be made. All rockfish, with the exception of the longspine thornyhead, have one or more life history stages associated with hard bottoms or bottoms with mixtures of hard and soft substrata on the continental shelf. Similarly, all of the flatfish, shark, and skate species have one or more life history stages associated with soft bottoms or bottoms with mixtures of soft and hard substrata on the continental shelf (depths out to 656 feet or 200 m). These same types of soft and mixed substrata on the slope/rise component of the coastline (656 feet to approximately 11 feet or 200 to 3,200 meters) are home to all the flatfish species, with the exception of starry flounder, and home to all of the skate species.

Wastewater discharges, at certain concentrations, can modify EFH by altering the following characteristics of finfish, shellfish, and related organisms: growth, visual acuity, swimming speed, equilibrium, feeding rate, response time to stimuli, predation rate, photosynthetic rate, spawning seasons, migration routes, and resistance to disease and parasites. Pollutants either suspended in the water column or settled to the bottom can affect habitat. Many benthic organisms are quite sensitive to grain size and accumulation of sediments can also submerge food organisms.

5.3 Highly Migratory Species and Fishery Management Plan

The Magnuson-Stevens Act defines highly migratory species as tuna species[39], marlin (*Tetrapturus* spp. and *Makaira* spp.), oceanic sharks, sailfishes (*Istiophorus* spp.) and swordfish (*Xiphias gladius*). Within the U.S., highly migratory species fishery management in the Pacific area is the responsibility of three regional fishery management councils, the Western Pacific Regional Fishery Management Council, North Pacific Fishery Management Council, and Pacific Fishery Management Council, and the adjacent states. Defining EFH for highly mobile species such as tuna, swordfish, and sharks is a challenging task. These species range widely in the ocean, both in terms of area and depth. No habitat areas of particular concern are identified in the plan.

Highly migratory species are usually not associated with the features that are typically considered fish habitat (such as seagrass beds, rocky bottoms, or estuaries). Their habitat may be defined by temperature ranges, salinity, oxygen levels, currents, shelf edges, and seamounts. Little is known about why highly migratory species frequent particular areas. Nevertheless, these species may be affected by actions close to shore or on land, such as fishing, dredging, wastewater discharge, oil and gas exploration and production, aquaculture, water withdrawals, release of hazardous materials, and coastal development. Specific conservation measures discussed in the plan mainly relate to fishing (i.e. gear restrictions, area closures, and harvest limits). However, the plan identified high contaminant values and nutrient concentrations, turbidity plumes, and thermal effects as potential impacts of wastewater discharges on highly migratory species.

Non-fishing related effects on EFH for HMS may not be as adverse relative to other fish, such as groundfish, because adults and juveniles are highly mobile, and all life stages are pelagic (in the water column near the surface and not associated with substrate) and dispersed in a wide band along the West Coast. High discharge velocities may cause scouring at the discharge point as well as entrainment of particles with resulting turbidity plumes. Turbidity plumes may reduce light penetration and decrease the rate of photosynthesis and lower the primary production in an area if suspension persists. Fish may suffer reduced feeding ability, especially if suspended particles persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

6.0 POTENTIAL ADVERSE EFFECTS ON ESSENTIAL FISH HABITAT

Point-source discharges from municipal sewage treatment facilities (i.e., wastewater discharge) or storm water discharges can adversely affect EFH by: 1) reducing habitat functions necessary for growth to maturity; 2) modifying community structure; 3) bioaccumulation; and 4) modifying habitat. At certain concentrations, wastewater discharge can alter ecosystem properties, including diversity, nutrient and energy transfer, productivity, connectivity, and species richness. These discharges can impair functions of finfish, shellfish, and related organisms, such as growth and egg development, visual acuity, swimming speed, equilibrium, feeding rate, response time to stimuli, predation rate, photosynthetic rate, spawning seasons, migration routes, and resistance to disease and parasites.

Point-source discharges may also affect the growth, survival and condition of EFH-managed species and prey species if high levels of contaminants (e.g., chlorinated hydrocarbons, trace metals, PAHs, pesticides, and herbicides) are discharged. If contaminants are present, they may be absorbed across the gills or concentrated through bioaccumulation as contaminated prey is consumed (Raco-Rands 1996).

EPA determined an adverse effect to EFH for variously federally managed fish species identified in the coastal pelagic, groundfish, and highly migratory species fishery management plans. The basis of this determination is based on information within NMFS' 2018 Biological Opinion and EFH response.

Adverse effects to EFH for species managed under the Pacific Coast Groundfish, CPS, and HMS FMPs associated with the proposed project would be primarily limited to the ZID and to the influence of the discharge on HAB formation and prevalence. Due to the high site fidelity of many species managed under the Pacific Coast Groundfish FMP (e.g., rockfish), they may be at risk of greater localized impacts from wastewater discharges relative to other fish species with a more dispersed, pelagic distribution, such as those managed under the CPS and HMS FMPs.

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8.0 APPENDICES

8.1 Appendix 1. Mass loadings (2017-2021)

For Hyperion WRP from EPA's DMR pollutant loading tool in pounds per year**.**

Chemical Name	2017 DMR	2018 DMR	2019 DMR	2020 DMR[1]	2021 DMR
Ammonia as N	30,245,965	30,052,805	31,778,765	30,381,575	28,350,980
Antimony	1,497	1,266	1,806	1,231	2,215
Arsenic	2,131	1,254	1,212	1,050	1,398
BOD_5	11,930,150	11,993,030	14,889,580	13,247,980	25,940,240
Cadmium	0	0	0	0	0
Copper	7,081	9,359	12,708	8,975	34,738
Cyanide	0	0	0	0	0
Lead	0	0	0	0	287
Mercury	2	2	2	2	2
Nickel	6,050	8,322	5,231	4,751	4,042
Organic Nitrogen	2,760,794	1,436,063	3,081,100	2,560,183	1,783,015
Phosphorus	2,242,598	2,014,405	2,122,972	2,132,992	3,845,110
Selenium	524	966	380	433	1,090
Silver	0	0	144	59	126
TSS	11,084,010	11,002,140	13,333,290	11,045,400	24,663,160
TCDD Equivalents	0	0	0	0	0
Zinc	13,617	17,665	18,237	17,641	25,421

[1] On July 11 and 12th, the Discharger released untreated wastewater through Discharge Point 001 during an emergency. This resulted in approximately 17 million gallons (MG) of untreated wastewater being discharged as a controlled emergency measure through its 1-Mile Outfall relief system to prevent Hyperion WRP from going completely offline and to minimize the volume of untreated wastewater discharged. Certain pollutants like BOD5, TSS, and metals are elevated due to the spill and wash out of some of the treatment facilities.

DMR Pollutant Loading Tool available at:
http://cfpub.epa.gov/dmr/compare_dmr_tri_multiyr.cfm

8.2 Appendix 2. Diagram of the 5-mile and 1-mile outfall

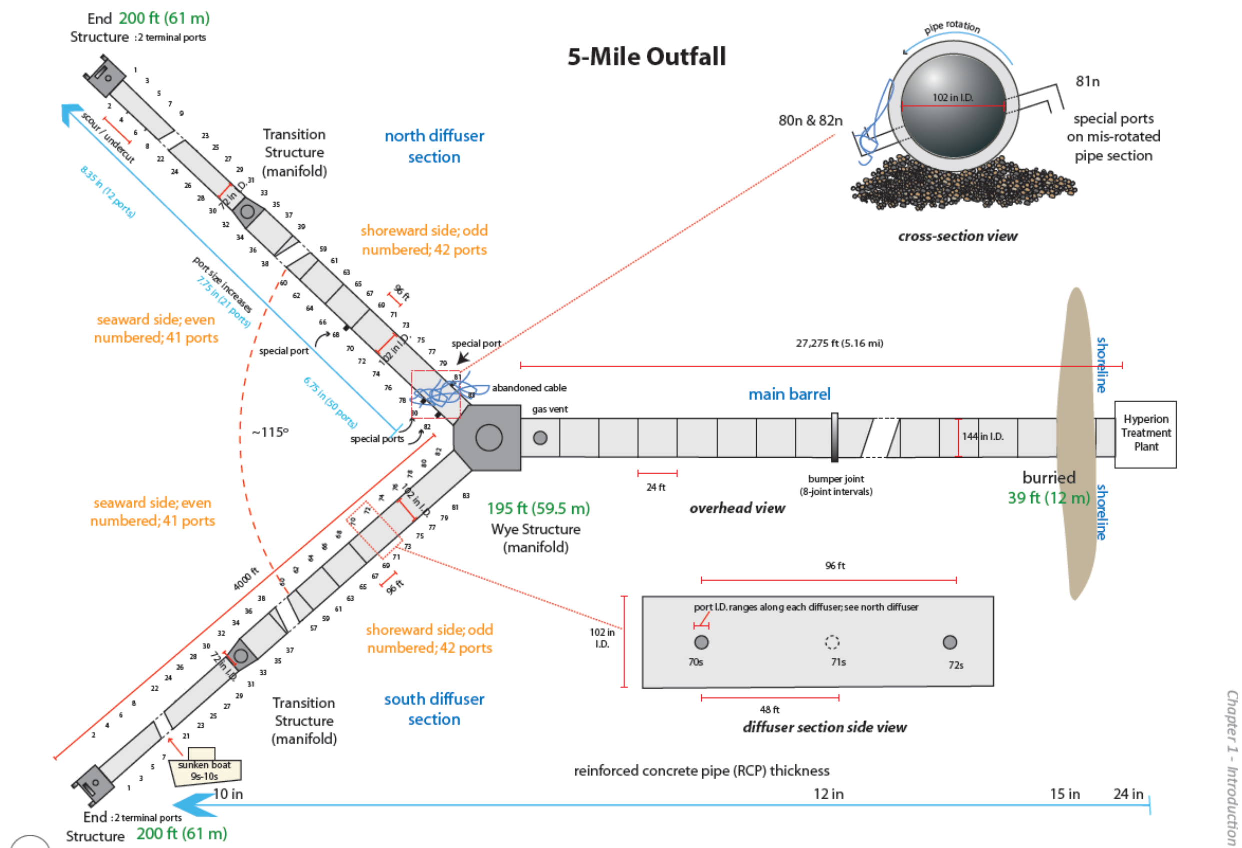

Figure 1-2. Characteristics and features of the Hyperion Treatment Plant -Mile Outfall. Inside diameters (I.D.) of pipes and ports are indicated.

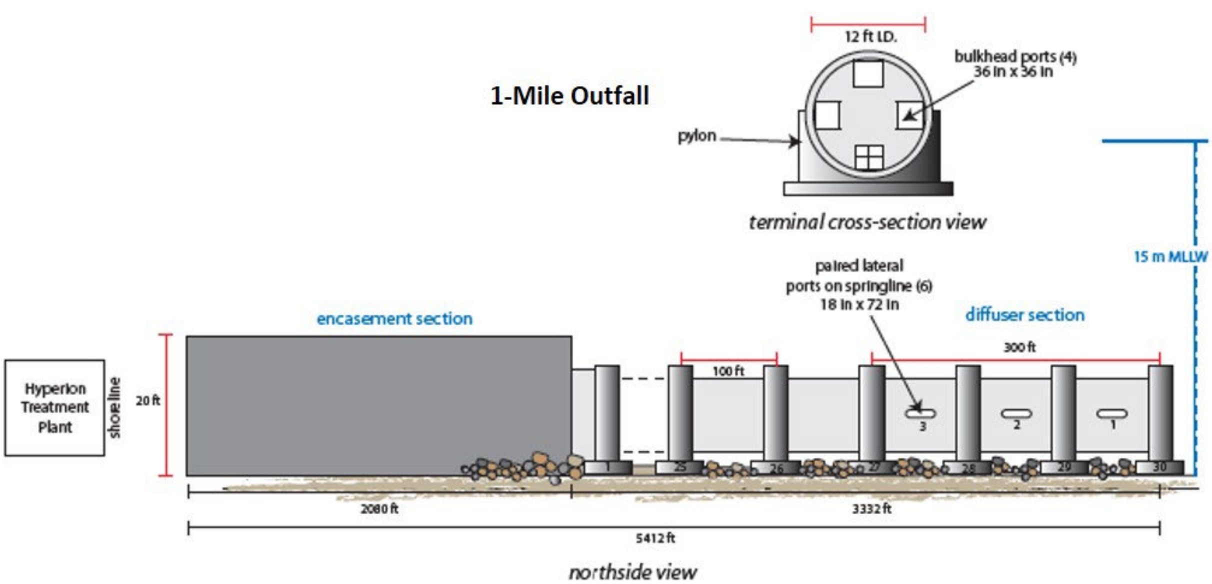

Figure 1-2. Characteristics and features of the Hyperion Treatment Plant -Mile Outfall. Inside diameters (I.D.) of pipes and ports are indicated.

8.3 Special Study of Contaminants of Emerging Concern (CECs) for Hyperion WRP, April 30, 2022. (separate attachment)

8.4 Special Study of Toxicity for Hyperion WRP, March 2020. (separate attachment)

8.5 Effluent results - PCB congeners in effluent for Hyperion WRP, 2019-2020 (separate attachment)

8.6 PCB congeners in sediment in Santa Monica Bay, 2019 & 2020

Table 6-8b. PCB congeners (µg kg^{-1} dry wt) concentrations in sediments from select stations surveyed in 2019.

Station	C1	C3	C6	C7	C8	C9B	D1	E6	Z2	MDL[a]
PCB18	0.70			0.16						0.04
PCB28			1.08					6.56		0.15
PCB37										0.14
PCB44								6.10		0.06
PCB49						0.33			0.55	0.06
PCB52			0.53					10.57		0.07
PCB60/99[b]									1.66	0.20
PCB66			1.87	0.34		1.36		12.56		0.09
PCB70		0.58	1.01				0.35	11.46		0.08
PCB74									0.76	0.08
PCB77										0.13
PCB81										0.15
PCB87	0.67		0.97		0.45	0.73		8.16	1.09	0.07
PCB101		1.08	1.44			1.26		15.26	0.86	0.10
PCB105		0.37	0.69		0.36	0.77		7.01	0.89	0.10
PCB110		1.84	2.49			2.10		18.25		0.19
PCB114										0.08
PCB118		2.82	3.20	0.69	1.81		1.67		1.69	0.08
PCB119										0.09
PCB123		0.39			0.23	0.33			0.62	0.07
PCB126										0.18
PCB128	0.79	0.65	0.84	0.21	0.50	0.97	0.49	5.26		0.11
PCB138				0.74	1.94	2.90	1.75		2.05	0.11
PCB149	1.62	1.51	2.25		1.24	2.05	1.15			0.11
PCB151	0.67		0.73		0.37	0.59	0.40			0.12
PCB153/168[b]	2.22	2.01	3.20	0.73	1.75	2.75	1.63	20.31		0.16
PCB156	0.36	0.28				0.38		3.11	0.26	0.07
PCB157								0.81		0.08
PCB158										0.14
PCB167	0.43							1.01		0.09
PCB169										0.18
PCB170		0.69	1.14	0.16	0.63		0.62	8.49	0.49	0.08
PCB177										0.10
PCB180		0.95	1.79	0.44		1.67	0.95	15.33	0.89	0.09
PCB183								3.71		0.07
PCB187			0.66			0.64		8.88		0.08
PCB189										0.07
PCB194			0.93	0.24	0.41	1.00	0.37			0.10
PCB201			0.98		0.61	0.31		6.63		0.08
PCB206		0.29	0.64				0.25	4.16		0.08
Total PCBs	**7.47**	**13.47**	**26.45**	**3.71**	**10.29**	**20.13**	**9.62**	**173.64**	**11.82**	

ND values (<MDL) are shown as blank space. [a] Method detection limit, µg kg^{-1} dry wt. [b] Coeluting congeners.

Table 6-8c. PCB congeners ($\mu g\ kg^{-1}$ dry wt) concentrations in sediments from select stations surveyed in 2020.

Station	C1	C3	C6	C7	C8	C9B	D1	E6	Z2	MDL[a]
PCB18										0.08
PCB28										0.18
PCB37										0.12
PCB44	0.43	0.61	0.43			0.62		3.97	0.26	0.08
PCB49	0.50	0.63	0.51					4.31		0.17
PCB52			0.77					5.67		0.16
PCB60/99[b]										0.25
PCB66										0.09
PCB70			1.02		0.58	0.80		7.93		0.08
PCB74			0.45					3.84		0.09
PCB77										0.09
PCB81										0.11
PCB87										0.06
PCB101	1.24	0.99	1.33		1.04	1.69	1.21	10.56	1.30	0.18
PCB105										0.12
PCB110										0.13
PCB114	0.21	0.26		0.38						0.11
PCB118	1.40	1.55	1.51		1.26		1.42	10.28	1.38	0.10
PCB119										0.08
PCB123										0.09
PCB126										0.10
PCB128	0.35	0.37	0.42		0.40			2.67		0.12
PCB138										0.18
PCB149										0.10
PCB151		0.26	0.35			0.68				0.11
PCB153/168[b]										0.27
PCB156								1.70		0.08
PCB157										0.09
PCB158										0.10
PCB167								0.65		0.08
PCB169										0.12
PCB170			0.63			1.32	0.51	3.88	0.52	0.10
PCB177		0.54	0.76		0.86	1.09	0.83	2.65	0.42	0.15
PCB180	1.03		1.72		1.65	2.68	1.26	7.78	1.92	0.11
PCB183										0.15
PCB187		0.62	0.93		0.83	1.59	0.61	4.05	0.61	0.11
PCB189										0.10
PCB194		0.29	0.46		0.40	0.86		2.80	0.51	0.12
PCB201		0.44	0.54		0.53	0.75	0.33		0.34	0.14
PCB206						0.60		2.07		0.13
Total PCBs	**5.16**	**6.56**	**11.84**	**0.38**	**7.55**	**12.68**	**6.18**	**74.81**	**7.26**	

ID values (<MDL) are shown as blank space. [a] Method detection limit, $\mu g\ kg^{-1}$ dry wt. [b] Coeluting congeners.

8.7 PCB congeners, DDT isomers, metals in fish liver and muscle in Santa Monica Bay, 2019 & 2020

Table 9-7. Levels of PCB congeners in English Sole tissues collected from three SMB zones during the 2019 LBTS.[a]

Tissue Type	Liver			Muscle			
Zone	5	Nearfield	4	5	Nearfield	4	MDL[c]
PCB 18	0.56	0.70	0.73	0.17	0.07	0.31	0.04
PCB 28	1.47	0.99	1.34		0.25		0.15
PCB 37	3.83	4.88	6.50	1.49	0.67	2.57	0.14
PCB 44	2.76	3.15	3.47	0.43	0.36	1.17	0.06
PCB 49	1.46	3.05	4.21	0.12	0.84	0.33	0.06
PCB 52	2.36	3.85	2.83	0.30	0.78	0.84	0.07
PCB 66	7.51	11.3	17.4	0.78	1.70	1.66	0.09
PCB 70	1.46	3.04	3.26	0.15	0.69	0.27	0.08
PCB 74	1.19	2.51	3.61		0.77	0.19	0.08
PCB 77[b]			3.38				0.13
PCB 81[b]		0.54		0.21		0.20	0.15
PCB 87	5.06	7.28	11.7	0.45	1.08	0.95	0.07
PCB 99							0.0[d]
PCB 101	4.98	11.3	20.3	1.25	3.96	1.99	0.1
PCB 105[b]	**5.06**	**7.48**	**13.2**	**0.48**	**1.00**	**0.93**	0.1
PCB 110	13.2	19.3	31.6	1.43	2.94	2.78	0.19
PCB 114[b]							0.08
PCB 118[b]	**10.8**	**17.5**	**31.1**	**1.1**	**2.78**	**2.36**	0.08
PCB 119	4.44	1.40	0.78	0.11	0.12	0.10	0.09
PCB 123[b]	**1.18**	**1.36**		**0.13**	**0.24**	**0.25**	0.07
PCB 126[b]							0.18
PCB 128	3.95	5.14	9.4	2.09	0.96	1.37	0.11
PCB 138	22.2	29.7	52.7	2.83	5.58	4.97	0.11
PCB 149	14.0	17.4	32.8	1.78	2.93	2.21	0.11
PCB 151	2.87	3.84	7.02	0.26	0.92	0.54	0.12
PCB 153/168	43.4	53.5	102	4.11	6.1	7.14	0.16
PCB 156[b]	**0.73**	**2.3**	**3.39**	**0.26**	**0.46**	**1.83**	0.07
PCB 157[b]	**0.31**	**0.35**	**0.88**		**0.12**	**0.18**	0.08
PCB 158	1.24	1.88	4.19	0.18	0.38	0.33	0.14
PCB 167[b]	**0.23**	**0.62**	**1.12**	**0.47**	**0.26**	**0.19**	0.09
PCB 169[b]	0.25	0.39	0.57	0.61	0.69	0.80	0.18
PCB 170	4.59	5.98	10.6	0.60	1.11	1.04	0.08
PCB 177	4.19	4.67	10.7	0.18	0.88	0.69	0.1
PCB 180	11.9	18.5	25.8	1.76	3.49	2.92	0.09
PCB 183	4.81	5.56	9.65	0.36	0.81	0.68	0.07
PCB 187	11.8	14.3	26.6	1.23	2.03	1.89	0.08
PCB 189[b]	**0.09**	**0.12**	**0.12**				0.07
PCB 194	5.19	6.03	9.28	0.45	0.53	0.60	0.1
PCB 201	5.18	6.43	10.1	0.67	0.89	0.94	0.08
PCB 206	6.76	7.09	10.5	0.37	0.53	0.70	0.08

[a] Values are reported in wet weight, units are µg/kg. ND values (<MDL) are depicted as a blank space.

[b] Dioxin-like PCB congeners, non-*ortho* substituted congeners listed in red and mono-*ortho* substituted congeners listed in bold, were identified as a health risk by the WHO (Van den Berg et al. 2006).

[c] Method detection limit.

[d] MDL not provided.

Table 9-8. Levels of PCB congeners in English Sole tissues collected from three SMB zones during the 2020 LBTS.[a]

Tissue Type	Liver			Muscle			
Zone	5	Nearfield	4	5	Nearfield	4	MDL[c]
PCB 18	2.70	2.71	3.44				0.16
PCB 28		3.59					0.36
PCB 37							0.24
PCB 44	2.29	1.96	1.82		0.25		0.16
PCB 49	8.86	6.01	4.62	0.76			0.34
PCB 52	4.06	4.39			0.41		0.32
PCB 66							0.18
PCB 70	4.77	3.06		0.31	0.43		0.16
PCB 74	4.44	3.07			0.43	0.65	0.18
PCB 77[b]							0.18
PCB 81[b]							0.22
PCB 87		7.59					0.12
PCB 99		14.7					0.0[d]
PCB 101	30.9	19.8	19.4	1.74	2.22	3.14	0.36
PCB 105[b]				**0.44**			0.24
PCB 110		19.6					0.26
PCB 114[b]							0.22
PCB 118[b]	**32.9**	**25.5**	**25.6**	**1.14**	**2.48**	**2.56**	0.2
PCB 119	1.77	0.86	1.36				0.16
PCB 123[b]		**3.57**					0.18
PCB 126[b]							0.2
PCB 128	10.4	6.26	7.83	0.42	0.69	1.23	0.24
PCB 138							0.36
PCB 149		24.4					0.2
PCB 151	9.03	6.11	6.98	0.34		1.10	0.22
PCB 153/168	80.3	57.4	65				0.54
PCB 156[b]	**3.35**	**2.23**	**3.46**		**0.316**	**0.556**	0.16
PCB 157[b]	**1.74**		**2.69**				0.18
PCB 158							0.2
PCB 167[b]	**3.82**						0.16
PCB 169[b]							0.24
PCB 170	9.80	7.00	9.52	0.48	0.83	1.52	0.2
PCB 177	10.6	7.55	8.64	0.62	0.69	1.45	0.3
PCB 180	34.0		31.8	1.68	3.97	4.61	0.22
PCB 183	10.2	7.10	8.82				0.3
PCB 187	29.1	19.5	23.5	1.07	1.65	3.13	0.22
PCB 189[b]		**0.61**					0.2
PCB 194	10.3	6.91	10.1	0.31	0.41	1.14	0.24
PCB 201	12.0	7.50	11.1	0.38	0.59	1.58	0.28
PCB 206	12.7	7.63	11.5	0.36	0.41	1.00	0.26

[a] Values are reported in wet weight, units are µg/kg. ND values (<MDL) are depicted as a blank space.
[b] Dioxin-like PCB congeners, non-*ortho* substituted congeners listed in red and mono-*ortho* substituted congeners listed in bold, were identified as a health risk by the WHO (Van den Berg et al. 2006).
[c] Method detection limit.
[d] MDL not provided.

Table 9-4. Levels of DDT derivatives, PCB Aroclors, and metals in SMB English Sole tissues collected during 2019 LBTS.[a]

Tissue Type	Liver			Muscle			
Zone	5	Nearfield	4	5	Nearfield	4	MDL[b]
2,4'-DDE	49.1	76.4	133	2.72	6.42	8.82	0.34
4,4'-DDE	973	616	1,500	30.4	68.2	74.5	0.45
2,4'-DDD							0.46
2,4'-DDT	38.2	58.0	79.2				0.37
4,4'-DDD							0.24
4,4'-DDT							0.49
PCB 1016							2.0
PCB 1221							30
PCB 1232							19
PCB 1242							13
PCB 1248							7.6
PCB 1254							2.8
PCB 1260	340	1,290	510	20.0	41.0	32.0	1.8
Hg	27.8	62.7	58.3	14.2	29.6	46.3	various
As	2,790	3,290	3,130	4,450	5,530	5,170	various
Se	2,930	2,940	2,940	520	410	660	various

[a] Values are reported in wet weight, units are µg/kg. ND values (<MDL) are depicted as a blank space.
[b] Method detection limit.

Table 9-5. Levels of DDT derivatives, PCB Aroclors, and metals in SMB English Sole tissues collected during 2020 LBTS.[a]

Tissue Type	Liver			Muscle			
Zone	5	Nearfield	4	5	Nearfield	4	MDL[b]
2,4'-DDE	131	48.1	135	4.30	4.72	10.1	1.5
4,4'-DDE	1,630	637	1,830	49.1	50.3	104	1.0
2,4'-DDD			4.77				1.5
2,4'-DDT	89.5	39.0	39.4	1.84	4.91	5.79	0.78
4,4'-DDD	12.1		10.6				0.68
4,4'-DDT							1.5
PCB 1016							10
PCB 1221							17
PCB 1232							17
PCB 1242							17
PCB 1248							17
PCB 1254							17
PCB 1260	580	440	510		31.0	31.0	17
Hg	71.5	47.6	AE[c]	42.1	33.6	69.3	2
As	6,050	4,540	AE[c]	7,890	7,660	11,900	various
Se	2,970	6,410	AE[c]	630	550	740	various

[a] Values are reported in wet weight, units are µg/kg. ND values (<MDL) are depicted as a blank space.
[b] Method detection limit.
[c] Sample not analyzed by CLAEMD due to laboratory error.

8.8 List of Permittees

NPDES permits issued by EPA and the Regional Boards in California
EPA intends to reissue these permits in future. EPA also issues a general permit to offshore oil and gas facilities, which expired on 2/28/2019 and has been administratively extended.

Facility Name/Location	NPDES Permit Number	Effective Permits Dates
San Diego, City of / E.W. Blom Point Loma Metropolitan WWTP and Ocean Outfall	CA0107409	01/01/2017—9/30/2022
West Basin Municipal Water District/Edward C. Little WRP	CA0063401	09/01/2018—08/31/2023
San Francisco, City and County of / Oceanside (Southwest Ocean Outfall) and Westside Wet Weather Facilities	CA0063401	02/07/2020—10/31/2024
Orange County Sanitation District/Orange County SD RP1 & TP2	CA0110604	08/01/2021—07/31/2026

List of NPDES permits and other state issued permits for discharges into Santa Monica Bay Watershed
Source:
http://www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/Water_Quality_and_Watersheds/santa_monica_bay/permits.shtml
Dark peachcells are NPDES permittees
Light peach cells are state issued permits (i.e. WDRs and land disposal)
Dark blue cells are Industrial Stormwater NDPES permittees
Light blue cells are Construction NPDES permittees

Facility Name	Order No	Facility Name	Receiving Water
Maple Plaza - CI 7738	R4-2008-0032	Redondo Union High School	Santa Monica Bay
407 North Maple Drive	R4-2008-0032	Refinery Optimization Center	Santa Monica Bay
4733 Elmwood Avenue Residential Project	R4-2008-0032	LAX TBIT Expansion Bradley West Continental City	Santa Monica Bay
512 Rose LLC	R4-2008-0032	Santa Monica High School	Santa Monica Bay
620 Gramercy Place	R4-2008-0032	Palisades Garden Walk	Santa Monica Bay
8500 Burton Way, LLC	R4-2008-0032	1328 22Nd St	Santa Monica Bay
Wilshire Robertson Office Bldg	R4-2008-0032	17433 Tramonto Drive	Santa Monica Bay
960 N. Doheny Homeowners Association	R4-2008-0032	Bel Air Residence	Santa Monica Bay
Redondo Generating Station	00-085	Ocean Avenue Hotel	Santa Monica Bay
Comstock Building	R4-2008-0032	Los Angeles International Airport Taxilane S	Santa Monica Bay
Villas at Park La Brea	R4-2008-0032	Bert Lynn MS Mod	Pacific Ocean
Wilshire/Carson Office Building	R4-2008-0032	Chevron Co Gen D Train	Pacific Ocean
ADL Building	R4-2008-0032	Del Rey Shores Project	Pacific Ocean
Former Aramark Magazine & Book Facility	R4-2013-0042	13900 Tahiti Harbor LTD	Pacific Ocean

Facility Name	Order No	Facility Name	Receiving Water
Atria Building II	R4-2008-0032	South Region Elementary School No 10	Pacific Ocean
Atria West Building	R4-2008-0032	1800 Stewart Street	Pacific Ocean
B. N. Y. California Inc	R4-2008-0032	Five Acre Ramirez Estate LLC	Pacific Ocean
Belmont Village Westwood	R4-2008-0032	Cirlin Residence	Pacific Ocean
Bevcon 1 Project	R4-2008-0032	Rappaport Residence	Pacific Ocean
Beverly Connection Mall	R4-2008-0032	Oranjeboom	Pacific Ocean
Beverly Atrium	R4-2008-0032	Wilshire Robertson Office Bldg	Pacific Ocean
City Production Wells of Beverly Hills	R4-2003-0108	East Canyon & St Cloud Rd	Pacific Ocean
Parking Site "A" South	R4-2008-0032	WMA Project	Pacific Ocean
Reverse Osmosis Water Treatment Plant	R4-2008-0032	West Hollywood City Library Construction Project	Pacific Ocean
Beverly Place	R4-2008-0032	UCLA Santa Monica Orthopaedic Hospital	Pacific Ocean
Beverly Wilshire-William Morris Agency Project	R4-2008-0032	1659 Bel Air Rd	Pacific Ocean
Braille Institute of America	R4-2008-0032	COC 100 254	Pacific Ocean
Tiffany Court Apartments	R4-2008-0032	Central Region Elementary School No 14 56 40002	Pacific Ocean
Wilshire LaBrea	R4-2008-0032	Plaza El Segundo Phase 1B	Pacific Ocean
5901 Center Drive Project	R4-2008-0032	Chang Residence	Pacific Ocean
Brentwood on Wilshire LLC	R4-2008-0032	Golden Cove Center	Pacific Ocean
William Morris Plaza	R4-2008-0032	General Classroom & Student Services Building	Pacific Ocean
Malibu Lagoon State Park	R4-2008-0032	South Los Angeles High School No 3	Pacific Ocean
Solstice Canyon Creek Culvert Project	R4-2008-0032	5610 5620 & 5630 Kanan Dume Rd	Pacific Ocean
Brewer Desalter (Reverse Osmosis Plant)	R4-2009-0047	S Region HS #15	Pacific Ocean
Dohney 9090 Wilshire Building	R4-2008-0032	La Tijera K 8 School	Pacific Ocean
CBS Corporation	R4-2008-0032	Sisters of Nazareth House Renovation	Pacific Ocean
Advanced Health Sciences Pavilion Project	R4-2008-0032	Point Vicente Animal Hospital	Pacific Ocean
Cedars Sinai-North Care Tower	R4-2008-0032	April Ranch Proj	Pacific Ocean
Cedars-Sinai Medical Center	R4-2008-0032	1111 Wilshire	Pacific Ocean
Center For Early Education	R4-2008-0032	UCLA Pauley Pavilion Renovation and Exp	Pacific Ocean
El Segundo Refinery	R4-2006-0089	USC All Sports Building	Pacific Ocean
Maplewood Apartments	R4-2008-0032	Bixel & Lucas @ 6th St.	Pacific Ocean
Clarity Partners, LP	R4-2008-0032	MacArthur Park Phase A Apartments	Pacific OCean
Cochran Island Apartments	R4-2008-0032	Halbreich Residence	Pacific Ocean
76 Station #0981	R4-2013-0042	W Washington Blvd & New England St	Pacific Ocean
328 Cloverdale Apartments	R4-2008-0032	Rose Avenue Parking Lot	Ocean
Del Rey Shores Project	R4-2008-0032	East LA Star Project	Ocean
Unocal SS #1715	R4-2013-0042	Central Region MacArthur Park Elementary School	Ocean
Doheny Estates	R4-2008-0032	Central Region Elementary School #20 Parking Lot	Ocean
Westlake Village Hotel & Spa	R4-2008-0032	Phase I Site Preparation	Ocean
Sterling Ambassador Towers	R4-2010-0180	Vine St Gar	Ocean
Century Park Plaza	R4-2008-0032	Kims Residence	Pacific Ocean Indirectly
San Vicente Plaza	R4-2008-0032	Rancho Francisco Ranch & Single Family House Pad	Pacific Ocean via Malibu Creek
Wilshire Landmark II Building	R4-2008-0032	Slauson Avenue Fleet Vehicle Parking Lot	Ballona Creek
9601 Wilshire	R4-2008-0032	Promenade	Ballona Creek
5055 Wilshire Limited Partnership	R4-2008-0032	La Cienega	Ballona Creek
EI Segundo Generating Station Project	R4-2008-0032	Midtown Plaza	Ballona Creek

Facility Name	Order No	Facility Name	Receiving Water
El Segundo Generating Station	00-084	Wilshire and La Brea	Ballona Creek
Equitable City Center	R4-2008-0032	Lot 26	Ballona Creek
Wilshire Renaissance Apartments	R4-2008-0032	Beverly Hills BMW Sales	Ballona Creek
Huntley Drive Apartment Building	R4-2008-0032	Crescent Heights Pipe Jacking Proj	Ballona Creek
Office Building Parking Garage	R4-2008-0032	LRM Town Plaza	Ballona Creek
La Cienega Center	R4-2008-0032	Beverly Hills BMW Service Center	Ballona Creek
Admiralty Apartments	R4-2008-0032	LCIS Relocation Rodeo To Jefferson	Ballona Creek
Goodyear Site	R4-2003-0108	Sycamore Truck Line	Ballona Creek
Museum Terrace Apartment	R4-2008-0032	13250 Jefferson Blvd	Ballona Channel
Hamilton Development LLC	R4-2008-0032	Staples & Pad F	Ballona Creeck
Villa Marina East V HOA, Villa Marina East V	R4-2008-0032	Villa Venetia	Ballona Creek and Marina Del Rey Channel
Babylon Apartments	R4-2008-0032	Runway Lofts at Playa Vista	Ballona Creek Santa Monica Bay
Burnside Apartments	R4-2008-0032	Del Rey Square Senior Housing	Ballona Creek Wash
Santa Monica Gateway	R4-2008-0032	Layola Marymount University Gersten Annex	Centinela Ballona Creek
Office Building	R4-2008-0032	Punch Studio	Centinela Creek
Ivy Property Group	R4-2008-0032	Buckingham Place Senior Housing	Domiguez Channel LA Harbor
Wilshire-Highland Building	R4-2008-0032	Fern Trail	Dry Canyon Creek tributary to Upper Los Angeles River
8833 Cynthia Street Condo Building	R4-2008-0032	Kenworthy Residence	Kenter Creek
6100 Wilshire	R4-2008-0032	Mission	La Co Flood Control Channel
Great Western Savings Center	R4-2008-0032	Saint John Fisher Catholic Church	LA Harbor Long Beach Harbor
L.A. Museum of the Holocaust	R4-2008-0032	I 405 Sepulveda Pass Widening	LA River Balloona Creek
LA Park La Brea "A" LLC	R4-2008-0032	300 W Potrero Rd	Lake Sherwood
Palazzo East at Park La Brea	R4-2008-0032	Bob Byers	Lake Sherwood
Tapia WRF Groundwater Discharge	R4-2008-0032	Lindero Canyon Middle School	Lindero Canyon Malibu Creek Pacific Ocea
Masselin Park West	R4-2008-0032	Reyes Adobe Rd OC Widening over the US101 Fwy	Lindero Creek Ranch 1
10350 Santa Monica	R4-2008-0032	7929 West Third Street	Los Angeles River
Linde LLC	R4-2009-0047	700 Corporate Pointe	Los Angeles River
Fisher Property	R4-2008-0032	Hollywood Reservoir Landslides & Slope Improvement	Lower Hollywood Reservoir
Scattergood Generating Station	R4-2000-0083	Vermont Ave Widening	Machado Lake
Manhattan Wells Rehabilitation & Startup Project	R4-2003-0108	Cross Creek	Malibu Creek
Crescent Heights Jacking Project	R4-2008-0032	Interagency Visitor Center at King Gillette Ranch	Malibu Creek
First Street Trunk Line Project	R4-2008-0032	Malibu Legacy Park Project	Malibu Creek
MWD-LA 30 Connection Project	R4-2008-0032	2615 Malibu Canyon Rd	Malibu Creek via Sheet Flow
Westside Water Recycling Project	R4-2008-0032	Agoura High School	Medea Creek
Crescent Heights Jacking Project	R4-2009-0068	CNHF Office Campus	Medea Creek Malibu Creek Pacific Ocean
First Street Trunk Line Project	R4-2009-0068	South Campus Student Center	San Diego Creek
MWD-LA 29 Connection Modification Hydrostatic Test Project	R4-2009-0068	Pier Ave Improvement Project	Santa Monica Bay Hermosa subwatershed
Santa Ynez Reservoir	R4-2009-0068	Malibu Valley Farm Inc	Stokes Creek
Palms Service Center	R4-2013-0042	Parcel 2	Topanga Creek
West Coast Barrier Proj, 6	R4-2003-0108	Parcel 3	Topanga Creek
West Coast Barrier Proj, 9	R4-2003-0108	Bunke & Stehelin Residence	Topanga Creek

Facility Name	Order No	Facility Name	Receiving Water
West Coast Barrier Proj, 9	R4-2003-0108	Trancas Country Market	Trancas Creek
West Coast Barrier Project 7	R4-2003-0108	Trancas Canyon Park	Trancas Creek Pacific Ocean
West Coast Barrier Project, Unit 5	R4-2003-0108	Hidden Park	Triunfo Creek
West Coast Basin Barrier Project, Unit 1	R4-2003-0108	512 Rose	Venice Beach
West Coast Basin Barrier Project, Unit 2	R4-2003-0108	South Los Angeles Animal Care Center	
West Coast Basin Barrier Project, Unit 3 & 4	R4-2003-0108	LAX IWBT Interim W Busing Terminal	
West Coast Basin Barrier Project, Unit 8	R4-2003-0108	AA Low Bay & H3 Hangar Relocation	
Malibu Mesa Wastewater Reclamation Facility	R4-2007-0002	Inglewood Park Cemetary	
Fire Station No. 89	R4-2008-0032	Sepulveda Blvd Widening Project	
The Broad Contemporary Art Museum	R4-2008-0032	Penmar Water Quality Improvement Project Phase I	
Page Museum @ La Brea Tar Pits	R4-2008-0032	USC University Club Relocation	
Los Angeles Southwest College	R4-2009-0068	USC Student Health Center	
Gratts Elementary School	R4-2013-0043	Metro Exposition LRT Proj	
Maple Plaza - CI 6704	R4-2008-0032	Learning Assistance Center Library Renovation	
Marsel Plaza	R4-2008-0032	Rambla Pacifico	
Home Office Building	R4-2008-0032	Irvin Residence	
Venice Power Plant	R4-2009-0047	Saint Sophia Cathedral	
Wells Fargo Bank (Garland Center)	R4-2009-0047	Good Samaritan MOB	
Wishire/La Cienega Building	R4-2008-0032	SSR Miracle Mile LLC Wilshire Lofts Project	
Detroit Apartments	R4-2008-0032	Los Angeles National Cemetery	
Wavebreak, LLC	R4-2008-0032	LACMA Heizer Rock Project	
Century Plaza Towers	R4-2008-0032	Edie & Lew Wasserman Building	
Pacific Design Center Red Bldg (Pacific Red Construction)	R4-2008-0032	California Market	
Palm Meridian Association	R4-2008-0032	The Wetherly	
Marathon Office Building	R4-2008-0032	Cedars Sinai Medical Center AHSP	
Picasso Auto Body Shop	R4-2008-0032	Pacific Design Center Red Bldg (Pacific Red Construction)	
Inglewood Oil Field (Baldwin Hills) Units	94-028	Los Angeles City College Student Union	
Parking Structure	R4-2008-0032	Life Sciences Chemistry Buildings Modernization and New Construction of Health Fitness and PE Bldg	
Playa Phase I Commercial	R4-2008-0032	Calle Vista Trust	
Playa Vista Site	R4-2013-0043	Proposed Const	
6500 Wilshire	R4-2008-0032	Kaiser LAMC Stage 2	
Ralphs Grocery Co. Store #289	R4-2008-0032	Nurol Residence	
RAR2 - Marina Marketplace	R4-2008-0032	Bowmont Slope Repair	
Sapphire Storm Drain Low Flow Diversion Project # 60210	R4-2008-0032	Lobo Canyon Rd	
Seaside Lagoon	R4-2010-0185	Agoura 1 Agoura 2	
Puerco Canyon Landslide Project	R4-2008-0032	Agoura Business Center West	
The Rossmore	R4-2008-0032	Westlake Village Community Park Project	
435 Detroit	R4-2008-0032	TTM 2006 70266 Tract No 5377	
630 Hauser	R4-2008-0032	Conifer Tank Replacement	
Charnock Pilot Test Plant Groundwater Pilot Testing Project	R4-2008-0032	Wallis Annenberg Center for the Performing Arts	
Hydraugers Installation Project	R4-2008-0032	Tract 45465 02	
Santa Monica Water Treatment Plant	R4-2008-0032	Childrens Hospital of Los Angeles	

Facility Name	Order No	Facility Name	Receiving Water
Seminole Springs Mobile Home Park	2004-0009-DWQ	Verham Residence	
Shell Service Station #204-1944-0100	R4-2008-0007	Los Angeles Country Club	
Sikh Study Circle, Inc., Sikh Temple	R4-2008-0032	Kroh Residence	
Two Rodeo Drive Building	R4-2008-0032	Santa Monica Place	
Snyder 959 Seward LLC	R4-2008-0032	Nathan Residence	
Park Hamilton Project	R4-2008-0032	The Estates at Trump National Golf Club	
The Marlowe	R4-2008-0032	Central Region Middle School #7	
Seacastle Apartments	R4-2009-0047	Equinix LA4	
S. Mark Taper Foundation Transplant Center	R4-2008-0032	620 & 518 Stone Canyon Rd	
Melrose Triangle Project	R4-2008-0032	Los Angeles International Airport Crossfield Taxiway Project	
Temple Beth Am	R4-2008-0032	Santa Ynez Floating Cover Proj	
The Californian on Wilshire	R4-2008-0032	Por Block 42 Lot PT MR 78 44 49	
750 Garland, LLC	R4-2006-0053	Central Region Elementary School 22	
Fremont Plaza	R4-2008-0032	Nalin Dr	
Westfield Building	R4-2010-0178	John Thomas Dye School	
Gateway East Office Bldg	R4-2008-0032	8461 Warner Drive	
Wilshire Rodeo Plaza "Rodeo Building"	R4-2008-0032	Barbara Bollenbach Trust	
11601 Wilshire Blvd	R4-2008-0032	Dziadalewicz Residence	
Multifamily Residential Development Project	R4-2008-0032	Gibson Residence	
Stella Apartments	R4-2008-0032	Blvd 6200 N	
Washington Gas Station	R4-2008-0032	Best Western Jamaica Bay Inn	
Madrona Well No. 2	R4-2003-0108	Calpine Residence	
Regional GW monitoring - Ballona Creek	R4-2003-0108	Hollywood Bungalows	
Barrier Injection Monitor Well Project	R4-2003-0108	Trifish LLC	
Edward C. Little Water Recycling Facility	R4-2006-0067	Gratt PC EEC	
Carson Regional WRP	R4-2007-0001	Paramount Post Production Village	
Edward C. Little Water Recycling Facility- West Coast Basin Barrier Project	R4-2008-0032	33051 Mulholland Hwy	
Edward C. Little Water Recycling Facility	R4-2009-0068	24950 Pacific Coast Hwy	
Temporary Ocean Water Desalination Demonstration	R4-2009-0086	Residential	
West Hollywood City Library Project	R4-2008-0032	South Region Elementary School #11	
Westlake Well	R4-2003-0108	Weber Residence	
Westmount Oasis	R4-2008-0032	Northwest Student Housing Infill Proj	
Wilshire Borgata Condominiums	R4-2008-0032	455 Crescent Garage	
Wilshire Le Doux Medical Plaza Project	R4-2008-0032	University High School	
Wilshire Owners Association - The Dorchester	R4-2008-0032	Craig Pica	
Wilshire Vermont Station	R4-2008-0032	Villa Marina	
City of Santa Monica - Charnock Well Field	R4-2008-0032	Westside Park Rainwater Irrigation Project	
Fairfax Plaza	R4-2008-0032	Adams Middle School new Gymnasium	
Joint Water Pollution Control Plant, Carson	R4-2011-0151	Mulholland Hwy Permanent Rd Repair	
Tapia WRF	R4-2010-0165	The Learning Center	
Hyperion WWTP	R4-2010-0200	West Los Angeles Community College Watson Center	
PC Green	01-031	Weyburn Terrace Graduate Student Housing	

Facility Name	Order No	Facility Name	Receiving Water
Residence of Nathan Ahdoot	R4-2004-0146	Agoura Business Center North Industrial Park	
3 Unit Apartment Complex	01-031	West Los Angeles College N Parking Structure FMO Building	
The Odyssey Program, LLC	01-031	South Bay Galleria Mall Southern	
Barry Avenue Plating	R4-2007-0019	Wilshire Barrington	
Topanga State Park	01-031	El Segundo Power Redevelopment Proj	
Malibu Pier State Park	R4-2002-0153	El Segundo High School Track & Field Replacement	
Residence of Charles Weiss and Diana Brown	R4-2004-0146	Kaidin Residence	
O'Neil Data Systems, Inc.	R4-2007-0019	Resnick Residence	
76 Products Service Station No. 250703 (dba Avis Union 76)	R4-2007-0019	DP 1999 759 Westlake Park Place	
76 Station No 252021 (dba Jacobs Union 76)	R4-2007-0019		
Former Tosco Station No. 6878	R4-2007-0019	**Facility Name**	**Receiving Water**
Electrical Resistive Heating System	R4-2007-0019	University of Califonia - Los Angeles	Santa Monica Bay
Culver Motor Clinic	R4-2007-0019	Don Lee Farms	Santa Monica Bay
Malibu Shores Motel	97-010-DWQ	Santa Monica Airport	Santa Monica Bay
Cheviot Hills Shopping Center	R4-2007-0019	LA West Vmf	Santa Monica Bay
Duke's Malibu	R4-2002-0200	US Army Reserves 63Rd Rsc Hold	Santa Monica Bay
Point Dume Plaza Shopping Center	97-010-DWQ	Palos Verdes Sch Credi	Pacific Ocean
Residence at 3565 Mandeville Canyon Road	R4-2004-0146	Ocean Desalination Demonstration	Pacific Ocean
Residence at 3685 Mandeville Canyon Rd	R4-2004-0146	Alcast Foundry Inc	Pacific Ocean
Deepwater Building	01-031	Scattergood Generating Station	Pacific Ocean
Former Exxon Retail Store #7-9477	R4-2007-0019	Int Rectifier Corp El Segundo	Pacific Ocean
Serra Retreat Center	01-031	Hyperion WWTP	Pacific Ocean
Geoffreys of Malibu	97-010-DWQ	LA World Airport	Pacific Ocean
Former Burton Plating Facility	R4-2007-0019	Inglewood City Small Volume Waste Transfer Station	Pacific Ocean
HRL Labs, LLC - Malibu Facility	98-013	Foster Planing Mill Co	Pacific Ocean
Tract 46277	91-021	Culver City City Trans Facilit	Pacific Ocean
Jack in the Box #160	97-010-DWQ	Palace Plating	Pacific Ocean
Residence at 3715 Mandeville Canyon Rd	R4-2004-0146	Met L Chek Co	Pacific Ocean
Commercial Bldg. 28925 PCH	97-010-DWQ	Santa Monica Malibu Usd	Pacific Ocean
Kentucky Fried Chicken-Malibu	01-031	Standard Concrete Products Inc - Santa Monica Plant	Pacific Ocean
Malibu Colony Plaza	00-182	Allan Co	Pacific Ocean
The Enclave in Malibu	01-031	Gebe Electronic Serv Inc	Pacific Ocean
Rancho Las Virgenes Farm	79-107	Barry Avenue Plating	Pacific Ocean
Tapia WWRP, Las Virg, Malibu	94-055	United Parcel Ser Cabay	Pacific Ocean
Tapia WRF	97-072	AES Redondo Beach LLC	Ocean
Topanga Library	01-031	Seamark	Ocean
Point Dume Co Comf/Lifeguard Station	01-031	Plastique Unique Inc	Ocean
Trancas WWTP	00-030	Gas Co Playa Del Rey	Ballona Creek
Malibu Mesa WWRP	00-167	Teledyne Reynolds Inc	Ballona Creek
Fire Station # 71	01-031	Teledyne Electronic Tech	Ballona Creek
Fire Station #99	01-031	Basic Fibers Inc Recycling	Ballona Creek
Malibu Administrative Center	01-031	Basic Fibers Inc	Ballona Creek
Nicholas Cyn Beach Lifeguard	01-031	Active Recycling MRF and Transfer Station	Ballona Creek

Facility Name	Order No	Facility Name	Receiving Water
Road Maintenance Yard 336	01-031	Omega Tech Inc	Ballona Creek
Topanga Beach Lifeguard (Grp 1)	01-031	Culver City City Refuse Transf	Ballona Creek
Zuma Beach Restroom Station #2	01-031	Hain Celestial Group Inc	Ballona Creek
Fire Station No. 88	97-010-DWQ	Spraylat	Ballona Creek
Surfrider County Beach, Lifeguard & Bathhouse	97-010-DWQ	MV Transportation	Ballona Creek
Zuma Beach Lifeguard HQ	97-010-DWQ	Allan Co	Ballona Creek
Zuma Beach Restroom #3 & 4, Food Stand 1	97-010-DWQ	Cemex Construction Materials Pacific LLC	Ballona Creek
Zuma Beach Restroom #6, FD Std 2,St yrd	97-010-DWQ	Hain Celestial Group	Ballona Creek Watershed
Zuma Beach Restroom Station #1	97-010-DWQ	St James Oil Corp - Broadway Lease	Balona Creek
Zuma Beach Restroom Station #7	97-010-DWQ	LA Cnty Sanitation Dist Missio	Bolona Creek
Zuma Beach Restroom Station #8	97-010-DWQ	Cemex Construction Materials Pacific LLC	Centinela Creek
Zuma Beach Restroom Station #9	97-010-DWQ	Southwest Plating	Compton Creek
Malibu WWRP	98-088	United Parcel Ser Cadly	L.a. River
Fire Camp #8, Malibu	95-046	Moldex Metric Inc	La Bollona Creek
Forester & Fire Warden Camp 13	00-110	Interstate Brands Corp Hostess	La River
Camp Miller-Kilpatrick, Malibu	95-164	Highland Plating Co Inc	La River
Carson-Gore Academy of Environmental Studies	R4-2007-0019	Maintenance Yard	Las Virgenes Creek
Proposed Central Region Elementary School #20	R4-2007-0019	Blue Diamond Hot Mix Asphalt	Los Angeles Flood Control
Trancas Center	97-010-DWQ	Electrolizing Inc	Los Angeles River
Malibu Cantina LLC	R4-2010-0072	Naturalife Eco Vite Labs Inc	Los Angeles River
Malibu Colony West Home Owners Association	95-060	First Student Inc #20424	Los Angeles River
Malibu Country Mart III	R4-2002-0196	Bestway Recycling of West LA	Los Angeles River
Malibu Country Mart I	R4-2003-0029	West Los Angeles Recycling	Los Angeles River
Malibu Country Mart II	R4-2003-0031	Sungro Products LLC	Los Angeles River
Malibu Gardens Condominiums	94-137	Allenco Energy	Los Angeles River
Malibu Highlands	01-031	LA Unified Sch Dist Business S	Los Angeles River
Malibu La Paz Ranch	R4-2010-0107	C & C Mountaingate Inc Mission	Los Angeles River
Malibu Seafood Restaurant	97-010-DWQ	Malibu Masonry Supply Inc	Malibu Creek
Malibu Outrigger Condos	97-010-DWQ	Tapia WRF	Malibu Creek
Malibu Racquet Club	01-031	LA Cnty Sanitation Dist Calabasas Landfill	Malibu Creek
Malibu Village	R4-2001-0010	Windward Yacht & Repair Inc	Marina Del Rey Harbor
Property	R4-2004-0146	Boatyard	Pacific Ocean Via Marina Del Rey Harbor
Malibu Beach Inn	R4-2003-0047	King Harbor Marine Ctr	Redondo Beach Harbor
Miramar Building (23805-15)	01-031	Santa Monica Maintenance Yard	Santa Monica
Moon Shadows Restaurant	97-010-DWQ	Big Blue Bus	Santa Monica Bay/pacific Ocean
23730 Malibu Road	97-010-DWQ	Mountaingate Gas Plant	Unnamed Ditch. Ultimately Pacific Ocean
Malibu Lumber - City of Malibu Legacy Park	R4-2008-0211	Mws Wire Industries	Westlake
Former Test Site 2 and Former Fire Safety Training Areas	R4-2007-0019	Sunrise Wood Prod	
Campus Area Remediation System	93-010	Basic Fibres Inc	
Point Dume Club WWRP	R4-2005-0041	Fed Ex	
Portico at Malibu	97-010-DWQ	CA Metal Processing Co	
Power Gas Company Service Station	R4-2007-0019	Metro Division 5	
Prudential Malibu Realty	01-031	Metro Division 6	

Facility Name	Order No	Facility Name	Receiving Water
Our Lady of Malibu Catholic Church	01-031	Perfection Machine	
City of Santa Monica Big Blue Bus	R4-2007-0019	Fed Ex	
City of Santa Monica Big Blue Bus	R4-2007-0019	Unified Western Grocers	
Santa Monica Maintenance Yard	R4-2007-0019	Unified Grocers Inc	
Malibu Beach R.V. Park	01-005	Fed Ex	
Sinai Temple Expansion	93-010	Metro Division 2	
Former Sunshine Cleaner	R4-2007-0019	Catalina Pac Concrete	
Paradise Cove Beach Cafe	97-010-DWQ	Hillcrest Beverly Oil Corp Ran	
Paradise Cove Mobile Home Park	R4-2002-0108	Metro Division 7	
The Pointe at Malibu	90-036	Fed Ex	
Tivoli Cove WWTP	00-053		
Topanga Canyon Mobile Homes	97-071		
Tentative Tract 32415	01-135		
Vista Pacifica at Broad Beach	97-028		
Residence of Vladimir and Luba Tomalevski	R4-2004-0146		
Wavebreak, LLC	R4-2010-0073		
Edward C. Little Water Recycling Facility	01-043		
Edward C. Little Water Recycling Facility	R4-2006-0069		
Calabasas Landfill No. 5	R4-2009-0088		
Inglewood Oil Field (Baldwin Hills)	01-054		

Dark green cells are NPDES permittees
Light green cells are state issued permits (i.e. WDRs and land disposal)
Dark blue cells are Industrial Stormwater NDPES permittees
Light blue cells are Construction NPDES permittees

City of Los Angeles
Los Angeles Sanitation
Hyperion Treatment Plant (NPDES CA0109991, CI-1492)
Terminal Island Water Reclamation Plant (NPDES CA0053856, CI-2171)

Special Study Final Report
Constituents of Emerging Concern (CECs) Special Study
April 30, 2020

Abstract

This special study sought to determine the mass loadings of five hormones, three chlorinated phosphate flame retardants, and eight polybrominated diphenyl ethers (PBDEs) in secondary and tertiary treated wastewaters released from Hyperion Water Reclamation Plant (HWRP) and Terminal Island Water Reclamation Plant (TIWRP). This was achieved by implementing three United States Environmental Protection Agency methodologies: (i) EPA 539, Determination of Hormones in Drinking Water by Solid Phase Extraction (SPE) and Liquid Chromatography Electrospray Ionization Tandem Mass Spectrometry (LC-ESI-MS/MS), (ii) modified EPA 1694 (1694M), Pharmaceutical and Personal Care Products in Water, Soil, Sediment, and Biosolids by High Performance Liquid Chromatography Tandem Mass Spectrometry (HPLC-MS/MS), and (iii) modified EPA 1614 (1614M), Brominated Diphenyl Ethers in Water, Soil, Sediment, and Tissue by High Resolution Gas Chromatography Combined with High Resolution Mass Spectrometry (HRGC/HRMS). Methods (i) and (ii) were developed in-house; whereas, analysis using Method 1614 was outsourced.

Through our analysis, TIWRP treated wastewater contained a significantly lower concentration of hormones than HWRP treated wastewater. In TIWRP treated wastewater, only one hormone, estrone was detected, while in HWRP treated wastewater, four hormones were detected, estriol, estrone, 17β-estradiol, and 17α-ethynylestradiol. This difference in hormone concentrations is to be expected as TIWRP produces tertiary treated wastewater whereas HWRP currently produces secondary treated wastewater. Similar observations were made when assessing PBDE concentrations. The only samples with detectable PBDE values were those originating from HWRP. Even then, only two PBDEs were detected in the low parts per trillion (ng/L) level. The compounds which were universally detected in all samples regardless of location or sampling event were the three chlorinated phosphate flame retardants tris(2-carboxyethyl)phosphine (TCEP), tris(1,3-dichloroisopropyl)phosphate (TCPP), and tris(1,3-dichloro-2-propyl)phosphate (TDCPP). There were no clear differences in the daily concentrations of these flame retardants between HRWP and TIWRP as evident with other constituents.

Overall, we were successful in developing two in-house methods based on EPA method 539 for the analysis of hormones and EPA method 1694M for the analysis of chlorinated phosphate flame retardants. We also determined that the mass loadings of the selected target CECs from treated wastewater discharges were low or non-existent.

Introduction

The Los Angeles Regional Water Quality Control Board (LARWQCB) has required that National Pollution Discharge Elimination System (NPDES) dischargers, including LA Sanitation and Environment, City of Los Angeles, conduct special studies in treated wastewaters discharged into the ocean to quantify constituents of emerging concern (CECs), which include pharmaceuticals and personal care products (PPCPs), and endocrine disrupting compounds (EDCs). This CEC special study fulfills the mandate in the Monitoring and Reporting Program (MRP) of the HWRP NPDES Permit (Order No. R4-

2017-0045, NPDES Permit No. CA0109991) as well as the TIWRP NPDES Permit (Order No. R4-2015-0119, NPDES Permit No. CA0053856).

Recently, the City has undertaken several projects relating to wastewater infrastructure including constructing Advanced Water Purification Facilities (AWPF) at HWRP and having a functional AWPF at TIWRP to perform additional treatment of secondary or tertiary effluent, from these two water reclamation plants. At HWRP, approximately 35 MGD of secondary effluent is delivered to West Basin Municipal Water District (WBMWD) to produce Title 22-compliant, high purity recycled water, for beneficial irrigation, industrial applications, and injection into the West Coast Basin Barrier Project to prevent seawater intrusion. Additionally, 35 MGD of filtered secondary effluent is used at HWRP for in-plant purposes. Future plans include supplying high quality recycled water to the Los Angeles World Airport, as well as improving the quality and quantity of recycled water delivered to the WBMWD in order to enhance water recycling efforts. At TIWRP up to 12 MGD AWPF water will be used for injection into the Dominguez Gap Seawater Intrusion Barrier, for replenishment at Machado Lake, and various non-potable uses throughout the harbor area. With the City's push toward more recycled water endeavors, the monitoring of micro-pollutants and CECs has become essential in assessing the efficacy of our water treatment processes. This monitoring will allow us to better determine our impacts on the environment as well as better inform future recycling water projects.

Materials and Methods

Materials

Extraction procedures utilized a Dionex AutoTrace 280 Solid Phase Extraction Instrument equipped with 47 mm diameter, octadecyl (C18), (3M Empore, Cat. No. 66883-U) extraction disks. The extraction solvent used was methanol (Fisher Chemical LCMS Grade Part No. A456-4). Samples were concentrated using an Organomation Associates, Inc., N-EVAP 112 or FMS, Inc. SuperVap Concentrator with low streams of nitrogen. Sample Analyses was accomplished with a liquid chromatography electrospray ionization tandem mass spectrometry system (LC-ESI-MS/MS) (Agilent 1290 Infinity II, 6470 Triple quadrupole) fitted with an Acclaim™ PolarAdvantage II C18 3µm 120Å column. Mobile phase solvents included acetonitrile (CH3CN, CASRN 75-05-8) and Methanol (CH3OH, CASRN 67-56-1), both LCMS grade or better. Analyte free reagent water produced by an in-house system (Thermo Scientific Barnstead E-Pure, Mod. D4641) was coupled with high purity ammonium fluoride (NH4F, CASRN 12125-01-8) to be used as the mobile phase modifier.

Methods

To accomplish this special study three methods were implemented. Two were developed in-house by City's Environmental Monitoring Division (EMD); EPA Method 539 (US EPA 2010) and EPA 1694M (US EPA 2008), and EPA 1614M (US EPA 2007) was outsourced to a certified laboratory. Reporting Limits (RLs) and Method Detection Limits (MDLs) for the methods developed in-house are summarized in Table 1. Where necessary, dilutions were applied to samples in to minimize issues associated with heavier matrix samples. In these situations, reporting limits were adjusted accordingly. Reporting limits and method detection limits for EPA Method 1614M can be found within the reports generated by the contract laboratory.

Each method that was developed in-house involved writing a standard operating procedure (SOP), method validation data, initial demonstration of capability (IDC), MDL determination, and method reporting limit studies. These were submitted to and approved by EMD's Quality Assurance Quality Control (QA/QC) Unit. Please note that Environmental Laboratory Accreditation Program (ELAP) does not offer certifications for methods EPA 539 and 1694M; therefore, the methods are reviewed by EMD QA/QC Unit strictly following the criteria stated within the methods and are approved internally. As an additional quality control criterion, EMD conducted a parallel study with a contract laboratory utilizing the finalized methods. The same sample was analyzed in-house and through a contract lab and our results were very comparable to those of the contract lab.

Table 1. MLs and MDLs

EPA 539 Compound	RL (ng/L)	MDL (ng/L)
Estriol	1.00	0.09
Equilin	1.00	0.08
Estrone	1.00	0.05
17β-Estradiol	1.00	0.10
17α-Ethynylestradiol	1.40	0.22
EPA 1694M Compound	RL (ng/L)	MDL (ng/L)
TCEP	10.0	1.2
TCPP	20.0	1.9
TDCPP	100.0	11.7

Sampling

Samples from TIWRP and HWRP were collected in individual glass bottles containing appropriate preservatives in accordance to method requirements. Each sampling event consisted of 12 bottles, each collected every two hours over 24 hours. All samples were manually composited in-house utilizing hourly flow data. Each sampling event produced one 24-hour flow weighted composite effluent sample which was then analyzed. A summary of sampling events and processing can be found in Table 2.

Table 2. Summary of Sample Events and Processing

EPA 539

	TIWRP		HWRP	
Weather Event	Dry Event 1	Dry Event 2	Dry Event 1	Dry Event 2
Sampling Date	03/24/19	10/03/19	03/24/19	10/03/19
Avg Monthly Flow	11.8 MGD	14.0 MGD	254 MGD	219 MGD
Extracted	04/05/19	10/31/19	04/05/19	10/31/19
Analyzed	04/30/19	11/27/19	04/30/19	11/27/19
Lab ID	4211101	4999201	4211001	4999101

EPA 1694M and EPA 1614M

	TIWRP		HWRP			
Weather Event	Dry Event 1	Dry Event 2	Dry Event 1	Dry Event 2	Wet Event 1	Wet Event 2
Sampling Date	9/28/19	10/3/19	9/25/19	10/3/19	11/20/19	12/4/19
Avg Monthly Flow	17.2 MGD	14.0 MGD	224 MGD	219 MGD	225 MGD	229 MGD
Extracted	1/31/20	1/24/20	1/31/20	1/24/20	1/25/20	1/25/20
Analyzed	1/31/20	1/31/20	1/31/20	1/31/20	1/31/20	1/31/20
Lab ID	4970601	4999201	4959701	4999101	5235801	5283401

The sampling schedules for EPA 1694M and EPA 1614M were adjusted to accommodate for technical difficulties encountered during method development. This resulted in all dry and wet weather events having a collection date from September to December 2019. For this sampling program samples were considered dry weather samples if there was no rain event during the 24-hour sampling period and wet weather samples if a rain event that produced runoff occurred during the 24-hour sampling period.

Results and Discussion

Method Development

Many matrix interference issues were encountered during development of methods EPA 539 and 1694M hindering the ability of the methods to analyze at their initially determined MDLs. Matrix complexities led to responses for many of our analytes and internal standards not meeting method criteria. The following options were explored in attempt to minimize these matrix effects and improve the resolutions:

EPA 539

Matrix issues were addressed by applying a 2x dilution factor post extraction as well as extract filtration using a 0.4 um syringe filter. Following dilution, internal standard responses met acceptable method criteria. Estriol could not be verified in the sample matrix as the compound failed in the LFSM/LFSMD by approximately 50%. As stated in Section 6.2.2 of the method, the analyte will be reported as “suspect matrix” as a consequence of failing to meet the 70-130% recovery criteria. All other analytes successfully met matrix criteria and will be reported without flags.

EPA 1694M

Various attempts were made to increase internal standard response that included:

1. Sample filtering using various size filters (8 um, 2 um, 0.7 um, 0.45 um, and 0.22 um) prior to extraction utilizing a vacuum filtration apparatus equipped with appropriate filters.
2. Sample extraction under different pH conditions to investigate whether extraction of matrix contributing components is limited at particular conditions.
3. Sample extraction at a smaller volume than initially used to produce MDLs. Sample size was reduced from 1000 mL to 100 mL.

Of the listed modifications, only sample size reduction yielded better responses. This ten-fold dilution factor inherently raised the established RLs by ten. Although the matrix presented issues even with reduced sample volume, quantitation remained accurate. This is the desired consequence of a method in which two compounds (TCEP and TDCPP) are quantified using isotope dilution techniques. Isotope dilution, the most favorable method for analytical quantification, produces the most accurate and reliable data. It relies on internal standards that are direct isotopic analogues of the native compounds. In this particular method, deuterium labeled standards (TCEP-d_{12} and TDCPP-d_{15}) are used to quantify TCEP and TDCPP, respectively. Since samples are fortified with internal standards prior to extraction, any matrix effect that hinders the extracted analytes equally affects the isotopic analytes. This creates a scenario in which the ratios between these remain constant and allows for any compensation in the extraction efficiency to be accounted for, thereby increasing accuracy in quantitation. Due to isotopic dilution rationale, EMD is confident in analytical results despite of any matrix suppression on internal standard responses.

Sample Analysis and Mass Loading Determination

Each of the sampled events was analyzed following the protocols written in the approved SOPs. A summary of effluent composite results are presented in Tables 3 and 4. Where noted, dilutions were made to reduce effects due to matrix complexity.

Table 3. Summary of Results for Hormones

EPA 539[1]

	TIWRP		HWRP	
Compound	Dry Event 1	Dry Event 2	Dry Event 1	Dry Event 2
	ng/L	ng/L	ng/L	ng/L
Estriol[2]	ND[2]	ND[2]	1.64[2]	ND[2]
Equilin	ND	ND	ND	ND
Estrone	2.06	7.90	43.6	154
17β-Estradiol	ND	ND	3.20	ND
17α-Ethynylestradiol	ND	ND	14.2	10

[1]Samples analyzed via EPA 539 utilized a dilution factor of two. Reported limits were adjusted accordingly.
[2]Estriol is denoted as suspect matrix as a result of matrix spike failures.
ND- Not Detected, analyte was not detected at levels above established MDLs.

Table 4. Summary of Results for Flame Retardants

EPA 1694M[1]

	TIWRP		HWRP			
Compound	Dry Event 1	Dry Event 2	Dry Event 1	Dry Event 2	Wet Event 1	Wet Event 2
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
TCEP	0.17	0.14	0.11	0.10	0.10	0.15
TCPP	2.52	2.26	2.44	2.43	3.12	2.08
TDCPP	0.51 (DNQ)	0.56 (DNQ)	0.38 (DNQ)	0.39 (DNQ)	0.42 (DNQ)	0.29 (DNQ)

EPA 1614M

	TIWRP		HWRP			
Compound	Dry Event 1	Dry Event 2	Dry Event 1	Dry Event 2	Wet Event 1	Wet Event 2
	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PBDE 28	ND	ND	ND	ND	ND	ND
PBDE 47	ND	ND	12	9.5	7.3	ND
PBDE 99	ND	ND	ND	ND	ND	ND
PBDE 100	ND	ND	11	8.7	6.1	ND
PBDE 153	ND	ND	ND	ND	ND	ND
PBDE 154	ND	ND	ND	ND	ND	ND
PBDE 183	ND	ND	ND	ND	ND	ND
PBDE 209	ND	ND	ND	ND	ND	ND

[1]Samples analyzed via EPA 1694M utilized a dilution factor of ten. Reporting limits were adjusted accordingly.
ND- Not Detected, analyte was not detected at levels above established MDLs.
DNQ- Detected, Not Quantified, concentration detected is higher than MDL, but less than RL

Results in Tables 3 and 4 were used to calculate the average mass loadings of each analyte in pounds per day using the formula:

$$Monthly\ avg.mass\ loading\ \left(\frac{lbs}{day}\right) = Monthly\ avg.conc.\left(\frac{mg}{L}\right) \times Monthly\ avg.flow(MGD) \times 8.34\left(\frac{lbs}{gallon}\right)$$

The resulting mass loading calculations are summarized in Tables 5 and 6.

Table 5. Summary of Average Mass Loadings for Hormones

EPA 539

	TIWRP		HWRP	
Compound	Dry Event 1 lbs/day	Dry Event 2 lbs/day	Dry Event 1 lbs/day	Dry Event 2 lbs/day
Estriol	ND	ND	0.003	ND
Equilin	ND	ND	ND	ND
Estrone	0.0002	0.001	0.092	0.281
17β-Estradiol	ND	ND	0.007	ND
17α-Ethynylestradiol	ND	ND	0.031	0.018

Table 6. Summary of Average Mass Loadings for Flame Retardants

EPA 1694M

	TIWRP		HWRP			
Compound	Dry Event 1 lbs/day	Dry Event 2 lbs/day	Dry Event 1 lbs/day	Dry Event 2 lbs/day	Wet Event 1 lbs/day	Wet Event 2 lbs/day
TCEP	0.02	0.02	0.20	0.19	0.19	0.28
TCPP	0.36	0.26	4.55	4.43	5.86	3.97
TDCPP	NQ	NQ	NQ	NQ	NQ	NQ

NQ- Not quantified because initial result was DNQ

EPA 1614M

	TIWRP		HWRP			
Compound	Dry Event 1 lbs/day	Dry Event 2 lbs/day	Dry Event 1 lbs/day	Dry Event 2 lbs/day	Wet Event 1 lbs/day	Wet Event 2 lbs/day
PBDE 28	ND	ND	ND	ND	ND	ND
PBDE 47	ND	ND	0.022	0.017	0.014	ND
PBDE 99	ND	ND	ND	ND	ND	ND
PBDE 100	ND	ND	0.021	0.016	0.011	ND
PBDE 153	ND	ND	ND	ND	ND	ND
PBDE 154	ND	ND	ND	ND	ND	ND
PBDE 183	ND	ND	ND	ND	ND	ND
PBDE 209	ND	ND	ND	ND	ND	ND

Hormones

Hormones were determined in both HWRP and TIWRP Effluents during dry events only. The collected data indicates that HWRP Effluent had a higher frequency of detections and at much higher concentrations for the five hormones tested. HWRP Effluent had four detections during Dry Event 1 and two during Dry Event 2. TIWRP discharge, in contrast, only had a single detection in both Dry Events. The most ubiquitous of the hormones tested was estrone; detected in TIWRP discharge at concentrations of 2.06 and 7.9 ng/L and in HWRP at 43.6 and 154 ng/L. The differences in concentrations and detections between the two plants can be attributed to two factors; source of influent and the level of wastewater treatment. TIWRP receives about 60% of its incoming wastewater from industrial sources, whereas HWRP has influent streams comprised mostly of residential origins. Hormones enter water sources through natural, biological sources or medical pathways such as prescriptions or hormone therapies. Hormones excreted from the body naturally or through unmetabolized medications can enter residential waste streams.

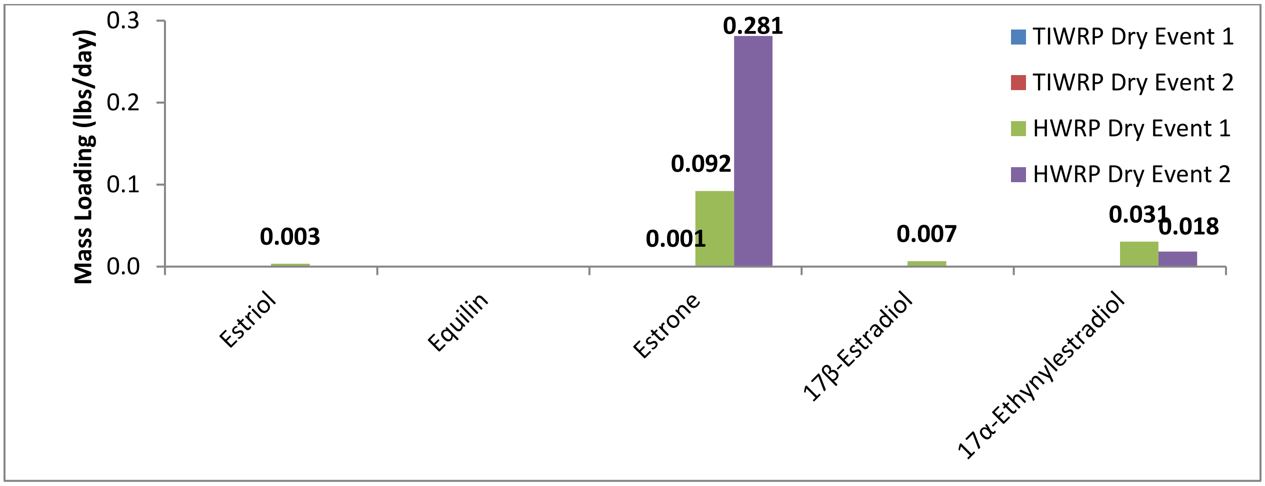

Figure 1. Mass loading calculations of hormones found in TIWRP and HWRP Effluents

Flame Retardants

Flame retardants were monitored during dry events at TIWRP and both wet and dry events at HWRP. Of all compounds tested, TCPP, TDCPP, and TCEP were the most prevalent. These chlorinated phosphate flame retardants were found in every sample regardless of location or date. These compounds have been used in many household products including furniture, construction products, and electronic products (EPA 2015). The pathways of these chemicals into the waste streams include leaching of spent or recycled products and at the manufacturing sites where these chemicals are applied as flame retardants. We observed the prevalence of these compounds first hand in the laboratory during method development when special measures had to be taken to reduce the contamination in blank samples to ND levels. In regards to daily concentrations for these three chlorinated flame retardants, there was no significant difference between TIWRP and HWRP. Mass loading calculations indicated increased impacts from HWRP (Figure 2).

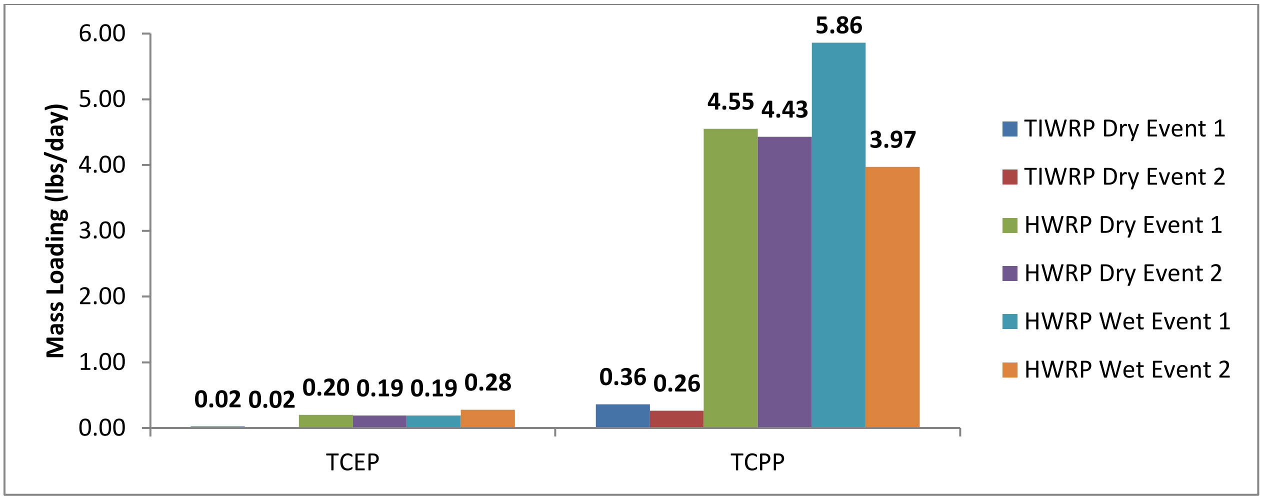

Figure 2. Mass loading calculations of chlorinated phosphate flame retardants found in TIWRP and HWRP Effluents.

Polybrominated diphenyl ethers (PBDEs) flame retardants were detected at much lower frequencies. Of the eight tested PBDEs (28, 47, 99, 100, 153, 154, 183, and 209) only two were detected (PBDE 47 and PBDE 100). These detections were at concentrations just above the reporting limits in three of the HWRP samples only.

The difference in levels of wastewater treatment plays a large role in removal efficiency of not only hormones, but for CECs in general. TIWRP plant produces tertiary-treated effluent that is compliant for non-potable recycled uses. The tertiary treatment leads to greater removal of CECs overall as is supported by the data in this report. HWRP had an average monthly flow of 230.2 MGD for the months March, September, October, November, and December 2019 while TIWRP had an average monthly flow of 14.3 MGD for the months March, September and October 2019. Higher monthly flows translate into higher mass loading hence the higher loading values for HWRP when compared to TIWRP. Figures 1, 2, and 3, compare the mass loading between HWRP and TIWRP for all sampling events. HWRP has initiated an Advanced Water Purification Facility (AWPF) Project, which will enhance the removal of these compounds. Efforts for better wastewater treatment and increased recycling will reduce the concentrations of these CECs directly in the environment.

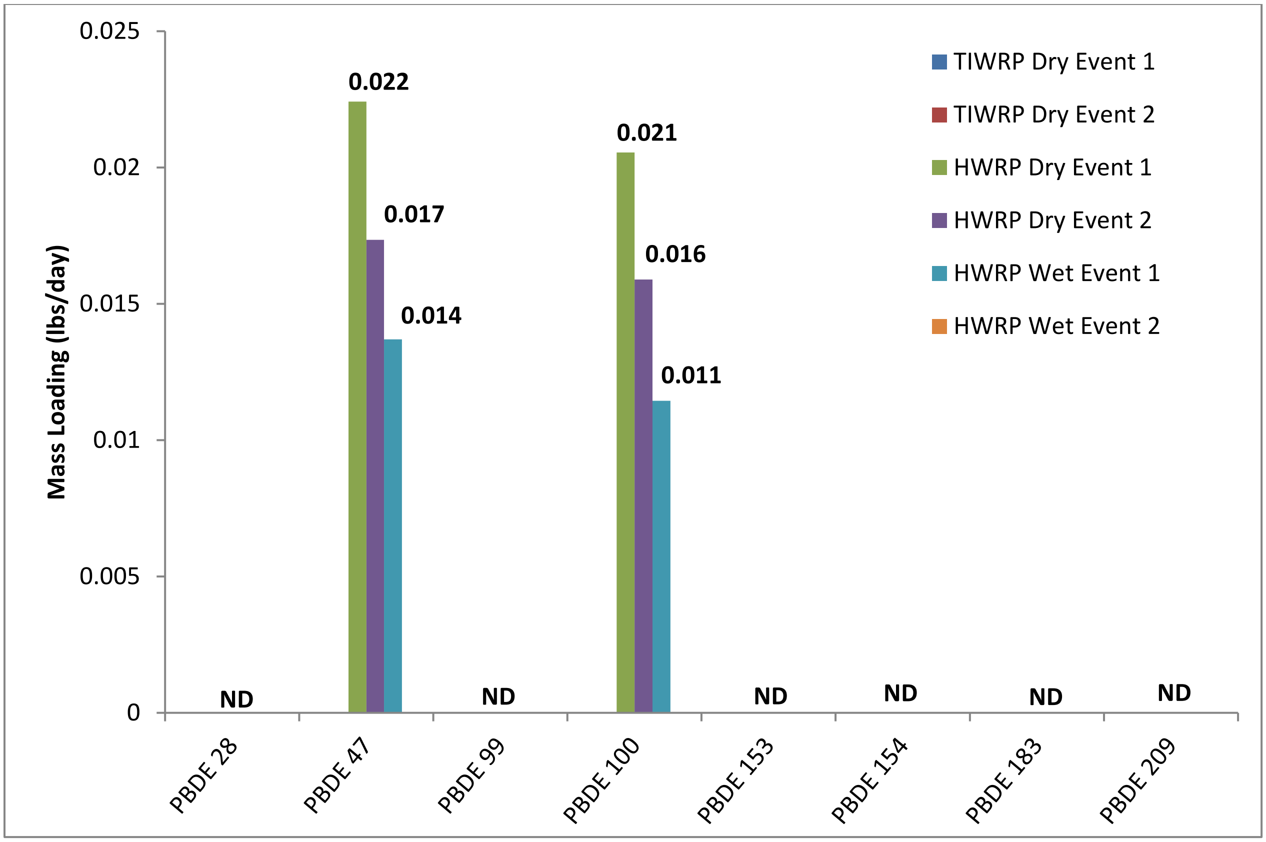

Figure 3. Mass loading calculations of polybrominated diphenyl ethers (PBDEs) found in TIWRP and HWRP Effluents.

Through the sampling program, there was an attempt to determine whether temporal changes would yield notable concentration differences in flame retardants. For methods EPA 1694M and 1614M sampling was conducted during both wet and dry events at HWRP only. There was no clear correlation between each event for either class of flame retardants. Daily concentrations remained similar during both wet and dry events. Monthly flows did not vary widely either with an average monthly flow of 221.5 MGD for the dry-sampling events and 227 MGD for the wet sampling events. Better correlations could possibly have been drawn had sampling been dispersed throughout the year as originally proposed.

Table 7. Comparison of Data with Local Studies

	SCCWRP[1] ug/L	HWRP[1] ug/L
TCPP	2.7	3.10
Estrone	0.12	0.15
TCEP	1.7	0.15
Estradiol	0.03	0.003

[1]Values from both studies are max values detected

In a study conducted by Southern California Coastal Water Research Project (SCCWRP), a suite of 56 CECs were tested in municipal wastewater effluents and marine waters in southern California (Vidal-Dorsch et al 2012). Results from that study align closely with results in this report for overlapping constituents (Table.7). In their analyses of effluents from four publicly owned treatment works (POTWs) they found a 100 percent occurrence of TCPP and Estrone much like we did in our analyses.

Conclusions

This special study evaluated the concentrations and mass loading of flame retardants and hormones into the environment from HWRP and TIWRP effluents. Results showed that CECs were more readily detected in HWRP secondary-treated effluent than TWRP tertiary treated effluent. TCPP, TCEP, TDCPP and Estrone were found to be the most prevalent of all CECs tested. We were also successful in developing in-house analytical methods for testing some constituents of emerging concern.

Studies such as this will help guide the City of Los Angeles in its effort to protect environmental and public health. It will help inform current and future recycling water projects as the City moves toward an increase in locally-sourced water

Acknowledgements

The Environmental Monitoring Division at the City of Los Angeles, LA Sanitation and Environment (LASAN) would like to thank all collaborators for their support. Special thanks for the project lead Jesus Rocha, Dr. Qiong Lei who initiated this special study, and Dr. Pranab Mishra for providing analytical input in resolving method issues. We would also like to also acknowledge analysts, supervisors, managers, and operational staff at both HRWP and TIWRP for organizational support for this study. Finally, we would like to thank all the reviewers of this document especially EMD management team. Contract laboratories used in this special study were Weck Laboratories, Inc. and Eurofins Eaton Analytical, LLC

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CITY OF LOS ANGELES

LA SANITATION

Toxicity Reduction Work Plan

Special Study

HYPERION TREATMENT PLANT

12000 VISTA DEL MAR, PLAYA DEL REY, CA

NPDES PERMIT NO. CA0109991

ORDER R4-2017-0045

MARCH 31, 2020

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AECOM Inc. assisted with the preparation of this report.

CITY OF LOS ANGELES
LA SANITATION

SPECIAL STUDY
Final Report

March 2020

HYPERION TREATMENT PLANT TOXICITY REDUCTION WORK PLAN SPECIAL STUDY

Executive Summary:

The Hyperion Treatment Plant (HTP) was mandated by the Los Angeles Regional Water Quality Control Board (RWQCB), under permit number CA0109991, to conduct, in coordination with the West Basin Municipal Water District (MWD), a special study that evaluates the projected effects of water conservation and planned recycling on effluent acute toxicity and ammonia. The study included a mass balance of nitrogen species through the treatment plant and an assessment of operational alternatives to ensure compliance with acute toxicity and ammonia water quality objectives.

This report summarizes the findings of acute toxicity testing, sampling activities, and mass balance calculations related to answer the questions posed by RWQCB. It also outlines the timeline of planned projects and their projected impacts on water flows and nitrogen concentrations.

Acute toxicity measured in six quarterly tests performed between July 2018 and October 2019 were below the acute toxicity requirement (< 3.2 TUa). In two of the six quarterly tests, brine from the West Basin MWD's Edward C. Little Water Recycling Facility (ECLWRF) was blended with HTP effluent in a volumetric percentage of 2.44 percent brine to 97.56 percent HTP undisinfected secondary effluent based on the historical maximum brine flow and minimum monthly average HTP effluent flow. One of the six quarterly tests also included samples supplemented with an ammonium salt to increase the ammonia-N (ammonium-N + ammonia-N) concentration to the HTP monthly average National Pollutant Discharge Elimination System (NPDES) limit of 58 mg/L. The "spike" test showed that ammonia at the permit concentration limit is not a concern for acute toxicity.

The flows and nitrogen concentrations established per September 11, 2018 sampling were used for developing a plant-wide flow and nitrogen mass balance for current conditions (baseline conditions). The mass balance demonstrated that the ammonia concentration changes from the plant influent to the secondary effluent due to the biological conversion of organically-bound nitrogen to ammonia as is typical of biological treatment systems in water reclamation plants. For every pound of nitrogen entering the HTP (ammonia-N plus organically-bound N), approximately 0.75 pounds of nitrogen is discharged in the secondary effluent (sent to the West

Basin ECLWRF and discharged to the ocean). Of this secondary effluent nitrogen, over 90 percent is in the form of ammonia-N. Most of the remaining nitrogen entering the HTP is removed from the facility in the form of organically-bound nitrogen in the Class A biosolids. A small fraction of plant influent nitrogen is nitrified and denitrified and destroyed by chlorination during disinfection.

Similar mass balances were also developed through a plant-wide process model for projected flows and nitrogen loadings throughout the HTP in 2035 after conversion of the HTP to 100% water recycling (nitrifying and denitrifying Membrane Bioreactors (MBR) followed by advanced treatment with reverse osmosis/UV/AOP) with diversion of 54 mgd of MBR effluent to the West Basin ECL facility. The ammonia concentration in the secondary effluent is projected to slightly increase over the 2020 to 2034 time period and drop dramatically once the MBR system becomes operational in 2035. The maximum projected ammonia concentration is approximately 44 mg/L without MBR in 2034. This value is well below the 6-month median final effluent limitation of 58 mg/L specified in NPDES NO. CA0109991. As the projected maximum effluent ammonia-N concentration and load through 2034 are well below the current permit limits, the TUa value is also expected to remain below 3.2. These projections suggest that there is no need to modify the treatment processes at the HTP for future compliance with ammonia toxicity.

In 2035 the City plans to treat the entire plant influent flow through a fully nitrifying MBR followed by RO/UV/AOP. After implementation of the new processes, there will be no risk of permit violations for ammonia-N as the ammonia-N concentration in the RO brine from the treatment of the MBR effluent is projected to be less than 3 mg/L.

In addition to the results described above, the West Basin MWD also collected monthly samples over a 12-month period to develop a nitrogen balance across the ECLWRF. Due to reasons noted in their report, incomplete nitrogen balances were obtained. However, based on brine flow and ammonia-N concentration data from 2018, approximately 40 percent of the ammonia-N load sent to the ECLWRF is returned in the brine discharged to the 5-Mile Outfall. The West Basin MWD has no plans to increase production over the next few years; hence, there will not be an increase in brine production that would invalidate the acute toxicity results summarized above and described in detail in this report. After implementation of 100 percent water recycling at the HTP in 2035, the brine produced at the ECLWRF and sent to the 5-Mile Outfall is anticipated to contain an ammonia-N concentration similar to the projected ammonia-N concentration in future HTP RO brine.

Introduction:

The 2017 Hyperion Treatment Plant (HTP) NPDES permit states "In coordination with the West Basin Municipal Water District, the Permittee shall propose a special study that evaluates the projected effects of water conservation and planned recycling on effluent acute toxicity and ammonia-N, including a mass balance of nitrogen species through the treatment plant and an assessment of operational alternatives (e.g. treatment optimization, additional treatment, additional dilution credits) to address projected compliance with acute toxicity and ammonia-N water quality objectives. A Special Study Work Plan, including a proposed schedule, shall be submitted for approval by the Regional Water Board Executive Officer and the USEPA Water

Division Director no later than one year from the effective date of this Order. The special study report shall be submitted no later than two years before the permit expires." On March 15, 2018, the City of Los Angeles, Environmental Monitoring Division (EMD), in coordination with HTP engineering and West Basin, submitted a draft work plan. After several revisions and conference calls, the final plan submitted on July 26, 2018 was approved on August 8, 2018. The final report for the study is provided herein.

Background:

The Hyperion Treatment Plant is part of a joint outfall system commonly known as the Hyperion Treatment System, which consists of the wastewater collection system, the HTP and three upstream water reclamation plants: Donald C. Tillman Water Reclamation Plant (DCTWRP), Los Angeles-Glendale Water Reclamation Plant (LAGWRP), Burbank Water Reclamation Plant (BWRP) (owned and operated by a contract city), and their associated outfalls. The Hyperion Treatment System collects, treats, and disposes of sewage from the entire city (except the Wilmington-San Pedro area, the strip north of San Pedro, and Watts) and from a number of cities and agencies under contractual agreements. Approximately 85% of the sewage and commercial/industrial wastewater comes from the City of Los Angeles. The remaining 15% comes from the contract cities and agencies. Sludge from the City's two upstream plants (DCTWRP and LAGWRP) and the BWRP are returned to the wastewater collection system and flows to HTP for treatment.

Approximately 35 MGD of HTP's secondary effluent is sent to West Basin Municipal Water District's Edward C. Little Water Recycling Plant (West Basin Plant) in El Segundo for advanced treatment and reuse. The West Basin Plant provides tertiary treatment and/or advanced treatment such as microfiltration and reverse osmosis (RO) to HTP secondary effluent to produce Title 22 and high purity recycled water. The Title 22 recycled water is beneficially reused for irrigation, industrial applications including cooling water, and other purposes. The RO-treated recycled water is primarily injected into the West Coast Basin Barrier Project to control seawater intrusion. The waste brine from the West Basin Plant is discharged to the ocean through Hyperion's 5-Mile Outfall (Discharge Point 002) via a waste brine line from the West Basin Plant. Although the waste brine is discharged through HTP's outfall, it is regulated under a separate NPDES permit and waste discharge requirements (WDRs).

Water conservation efforts and plans to increase water recycling prompted the Los Angeles Regional Water Quality Control Board (LARWQCB) to require the City of Los Angeles to conduct a special study to evaluate the projected effects of water conservation and planned recycling on effluent toxicity and ammonia-N water quality objectives at HTP. The 2017 HTP NPDES permit has an effluent 6-month median ammonia-N limit of 58 mg/L and 203,000 lbs/day. Previously, HTP had an ammonia-N monthly performance goal of 44.1 mg/L.

Special Study Objectives:

In accordance with the 2017 HTP NPDES permit requirements, the special study objectives are as follows:

1. Calculate and evaluate the mass nitrogen loading in the plant for past, current, and projected

flows to assess the effects of water conservation.

2. Evaluate projected compliance with acute toxicity due to ammonia by determining if HTP's final effluent will continue to meet the acute toxicity and ammonia water quality objectives.
3. Assess operational alternatives (e.g. treatment optimization, additional treatment, additional dilution credits) to address projected compliance with acute toxicity and ammonia water quality objectives.

The special study also addressed each of the following questions by the LARWQCB and USEPA as summarized in this final report:

- Where and by how much is nitrogen concentrating during biological treatment processes?
- What is the nitrogen load via the 5-Mile Outfall to the Santa Monica Bay?
- Does the HTP effluent quality meet the Ocean Plan objectives for nitrogen species and acute toxicity?
- Is the discharge via the 5-Mile Outfall acutely toxic?
- Are there any operational changes that may reduce nutrients discharged to the Bay?

The approach and methodologies used to address the above requirements and questions and the results of this study are presented in the sections below.

Study Approach and Methodologies:

Quarterly progress reports were submitted to the LARWQCB throughout the duration of the study.in accordance with the work plan sampling and reporting schedule presented in **Attachment 1**. The testing and calculation methodologies used in the study are described below.

Toxicity Testing and Analytical Methods

For the 18 months of quarterly acute toxicity testing (six tests), EMD used the USEPA's *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition, October 2002, USEPA, Office of Water, Washington D.C. (EPA/821/R-02/012). Tests were performed using *Atherinops affinis* (Topsmelt) and the effluent dilution series included the Instream Waste Concentration (IWC) of 31.2% which is calculated below.

Ce = Ca + (0.1) Dm (Ca) = 0.3 + [(0.1) x 96 (0.3)] = 3.2 TUa

Where:
Ce = the effluent limitation for the acute toxicity objective.
Ca = the concentration (water quality objective) to be met at the edge of the acute mixing zone.
Dm = minimum probable initial* dilution expressed as parts seawater* per part wastewater, or the dilution credit applied to toxicity in the Permit.
TUa = acute toxicity units.
Ce TUa = 100 ÷ (96-hr LC50, or IWC)

IWC = 100 ÷ 3.2 TUa = 31.2%

Where:
LC50 = the concentration at which 50 percent survival is observed.

The samples used for the monthly concurrent nitrogen species testing and acute toxicity testing were 24-hr effluent composite samples, collected from 00:00 to 23:00 hours. The 96-hr acute tests required daily renewals, resulting in a total of four effluent samples being collected. West Basin brine samples were coordinated with the collection of the effluent samples. The acute toxicity tests using West Basin brine were conducted in the second quarters of Year 1 (November 2018) and Year 2 (July 2019) of the study plan. In the acute toxicity tests conducted in November 2018, the tests included (1) HTP effluent, (2) HTP effluent spiked with ammonia to increase the concentration to the permit limit of 58 mg/L and (3) a blend of HTP effluent and West Basin brine (97.56% HTP effluent and 2.44% West Basin brine based on the minimum monthly average HTP undisinfected secondary effluent flow rate and maximum West Basin ECLWRF brine flow rate). In the tests conducted in July 2019, effluent spiked with ammonia was not included.

Testing for ammonia and nitrogen species were done on various stages of the HTP process and side streams and by the West Basin MWD at locations within the ECLWRF. The analytical methods were EPA 351.2 for Organic Nitrogen (Org-N) and Total Kjeldahl Nitrogen (TKN), EPA 300.0 for Nitrate Nitrogen and Nitrite Nitrogen, and EPA 350.1 for Ammonia Nitrogen.

Past, Current and Projected Nitrogen Concentrations and Loads

Historical average daily flows and monthly ammonia and organic nitrogen concentrations were used to establish historical trends in the average daily flow and loads of both nitrogen parameters for the influent to the HTP and effluent discharged to the 5-mile Outfall. As required under the work plan, monthly monitoring of effluent for the nitrogen species (ammonia, nitrate, nitrite, and organic nitrogen) was conducted.

For the current plant conditions, plant-wide composite sampling was conducted at the HTP on September 11, 2018 for measurement of ammonia-N, nitrite-N, nitrate-N and organic-N while recording the corresponding flows from the following locations to allow calculation of mass rates:

1. Plant Influent
2. Primary Effluent
3. Secondary Effluent to West Basin
4. Plant Effluent to 5-Mile Outfall
5. Primary Sludge Thickening Feed
6. Primary Sludge Thickening Bypass
7. Primary Sludge Thickening Centrate
8. Primary Sludge Thickening Sludge Feed to Digesters
9. Waste Activated Sludge (WAS) from Secondary Clarifiers
10. Thickened Waste Activated Sludge to Digesters
11. Thickened Waste Activated Centrate from WAS Centrifuges
12. Digested Sludge to Biosolids Dewatering Centrifuges
13. Biosolids Dewatering Centrate

14. Biosolids Reuse
15. Secondary Effluent to Hyperion Bioenergy Facility & Cryogenic Facility
16. Cooling Water Supply to Cryogenic Facility and DGUP
17. HTP Secondary Effluent Sample at West Basin

The nitrogen concentrations for one location (primary sludge thickening bypass) were estimated by calculation.

The West Basin MWD also collected monthly composite samples from November 2018 through October 2019 at the following locations within the ECLWRF to establish nitrogen mass balances.

1. ECLWRF Plant Influent (HTP Secondary Effluent)
2. Microfiltration Permeate
3. Reverse Osmosis Permeate
4. Reverse Osmosis Concentrate (Brine)

Several water management strategies were developed by the 2015 Urban Water Management Plan (UWMP), One Water LA Plan, Los Angeles Department of Water and Power (LADWP), and LASAN which may impact HTP's effluent ammonia concentrations and loads as well as the acute toxicity in the future. In addition to projects regarding additions or modifications to HTP and upstream treatment plants, significant projects include any projects outside the City of Los Angeles' jurisdiction that may impact the quality of HTP's final effluent (e.g. Santa Monica's Sustainable Water Infrastructure Project, etc.). Information from these various sources were used to develop future HTP influent, 5-mile Outfall effluent and sidestream flows and loads. Where process modeling was used for water recycling feasibility studies, the information was adapted for the mass balance calculations.

Impact of Effluent Flow Changes on the 5-Mile Outfall Dilution Credits

The projected 5-mile Outfall flows were used in the CORMIX model to determine the influence of changes in the flow rate on dilution credits with a specific emphasis on the 2035 scenario when 100% recycling will be implemented. Before the effluent dispersion modeling was conducted, hydraulic modeling of the 5-mile outfall was performed to determine the impact of implementing advanced water treatment at the HTP on the effluent flow distribution through the outfall ports. Based on the hydraulics calculations, flow distribution assumptions were modified in the CORMIX model. Due to the seasonality experienced in Santa Monica Bay, monthly conditions for the 100% recycling scenario were investigated to simulate different density stratifications present in the receiving water. The ambient current was set to zero for all dilution simulations per California Ocean Plan requirements. The specific gravity of the RO concentration (brine) was estimated based on the current inorganic total dissolved solids and an anticipated water recovery efficiency of 80 percent.

Results and Discussion

The work plan officially began in July of 2018. Quarterly progress reports were submitted to the LARWQCB and the USEPA throughout the study work plan period according to the schedule presented in **Attachment 1**. The results of this special study are summarized and presented in the sections below.

Four quarterly progress reports progress reports were submitted to the LARWQCB and the USEPA throughout the study work plan period. Special Study First, Second and Third Quarter Reports of Year 1 were submitted on November 30, 2018, February 28, 2019, and May 31, 2019, respectively and the First Quarter Report of Year 2 was submitted on August 31, 2019. The final assessment report was submitted in March 2020.

Addressing Specific Objectives and Questions Stated in the LARWQCB Special Study Work Plan

This section of the report addressed the specific objectives stated by the LARWQCB and question by the LARWQCB and USEPA in the Special Study Work Plan.

The preliminary changes/activities identified that will have impact on HTP's influent or effluent or both are summarized in **Table 1**. These changes/activities will impact HTP's influent and effluent flow rates, and ammonia-N levels and are accounted for in addressing the specific questions in the LARWQCB Special Study Work Plan. The flow rates presented in **Table 1** include flow variations due to the effects of population growth, 5% per capita water conservation from 2017 to 2035 (as outlined in the 2018 One Water LA 2040 Plan), and the design basis assumptions for the various projects shown in the table. Due to the uncertainties in the construction schedule, commissioning and startup of new facilities for 100% water recycling, only the final flows after startup is completed in 2035 are shown in the table.

Table 1: Planned Significant Projects and Identified Sources that Have Impact on HTP Flows, Ammonia-N Levels and Acute Toxicity

Planned Projects	Timeframe	Impact on HTP Effluent
1. Flow Diversion from HTP Sewage Collection to Elsewhere		
Diversion of additional 15 MGD sewage from HTP's collection System to the DCTWRP	2025	Reduction in ammonia and nitrogen loads to HTP influent and effluent. Slight decrease in HTP effluent ammonia concentration due to return of RO brine to collection system[1].
Flow diversion to LAGWRP for expanding reuse (3 MGD)	2035	Slight reduction in ammonia and nitrogen loads to HTP influent and effluent Slight increase in HTP effluent ammonia concentration due to reduction of flows
2. Flow Diversion to the HTP and Point Sources Entering to HTP		

Planned Projects	Timeframe	Impact on HTP Effluent
Stormwater low flow diversion from Los Angeles River and Arroyo Seco Creek to the HTP for treatment during dry weather (0.4 MGD)	2022	Slight increase in nitrogen loads to the HTP influent and effluent Slight reduction in HTP effluent ammonia concentration due to low ammonia content of the storm water (e.g.< 10 mg/L)
Storm water low flow diversion from Ballona Creek to the HTP for re-treatment during dry weather (5 - 6 MGD)	2024	Slight increase in nitrogen loads to the HTP influent and effluent. Slight reduction in HTP effluent ammonia concentration due to low ammonia content of the storm water (e.g.< 10 mg/L)
3. Planned Changes at HTP		
Current operation	2017-2019	264 MGD influent average flow 35 MGD average flow to West Basin – 2.7 MGD[2] average brine flow returns to HTP 5-mile Outfall 36 MGD average flow for in-plant use ~232 MGD average flow to 5-Mile Outfall
1.5 MGD advanced water purification facility (AWPF) will be operational to provide high quality recycled water to LAWA and HTP	December 2022	270 MGD influent average flow 35 MGD average flow to West Basin – 2.7 MGD[2] average brine flow returns to HTP 5-mile Outfall 36 MGD average flow for in-plant use 1.5 MGD average flow AWPF ~236 MGD average flow to 5-Mile Outfall
15 MGD average flow will be diverted to DCTWRP resulting in 12 MGD flow reduction to HTP[1]	2025	265 MGD influent average flow 35 MGD average flow to West Basin – 2.7 MGD[2] average brine flow returns to HTP 5-mile Outfall 36 MGD average flow for in-plant use 1.5 MGD average flow AWPF ~232 MGD average flow to 5-Mile Outfall
100 percent water recycling at HTP and 3 MGD diverted to LAGWRP	2035	272 MGD influent average flow 54 MGD MBR effluent average flow to West Basin – brine flow (3 mgd est.) returns to HTP 5-mile Outfall[3] 174 MGD from the Advanced Purification Facility to LADWP- brine flow (20% est.) to HTP 5-mile Outfall 36 MGD average flow for in-plant use ~ 44 MGD Average Brine Flow to 5- Mile Outfall

[1]The 15 MGD advanced treated water at DCTWRP will include RO technology. A water recovery efficiency of 80% is assumed, resulting in a 3 MGD brine discharge to the collection system. [2]Average brine flows (2.7 MGD) to HTP based on the monthly average brine data provided by West Basin for 2018. [3]54-mgd MBR treated flow will be sent to the West Basin. A portion of it will be treated through RO and brine will return to the HTP 5-mile Outfall. The brine flows projections will be made as part of this study.

To assess the impact of the activities listed in **Table 1** on the dilution credits for the 5-Mile Outfall, modeling using the CORMIX model was conducted for the 2035 conditions when the effluent to the outfall will be RO concentrate (brine). For this scenario, the discharge plume is trapped and does not breach the surface. The plume is also less dense than ambient conditions and does not interact with the ocean floor. Current NPDES permit dilution levels are 84:1 for all pollutants except ammonia and chronic toxicity and 96:1 for ammonia and chronic toxicity. The dilution ratios listed in the Permit are in terms of parts seawater to part effluent.

For the 100% recycle scenario in 2035, the lowest dilution value of 140.9 occurred in May under least stratified conditions. Under greatest stratified conditions, January had the lowest available dilution value of 188.4.

In conclusion, the simulated dilution values for the 2035 scenario are substantially greater than the dilution level for the 5-Mile Outfall currently specified by the NPDES permit.

Addressing Study Work Plan Specific Objectives

Objective 1: Calculate and evaluate the mass nitrogen loading in the plant for past, current, and projected flows to assess the effects of water conservation.

Nitrogen mass loadings for the HTP influent and effluent from 2008 to 2019 were summarized with historical data and data collected during the HTP ammonia toxicity special study. In the calculation of projected loadings and HTP effluent concentrations through 2035, the effects of population growth, 5% per capita water conservation from 2017 to 2035 (as outlined in the 2018 One Water LA 2040 Plan), and the activities outlined in **Table 1** were applied in the calculation of HTP influent and effluent flow rates.

Historical (2008 – 2019) and projected (2020 – 2035) HTP influent flows and mass nitrogen loadings are illustrated in **Figure 1**. In addition to water conservation and the planned projects listed in Table 1, projections include the following assumptions:

1. Projected population growth per 2015 Urban Water Management in conjunction with SCAG census data and the most recent updates to the LADWP service population. An additional 280,000 people are projected to be within the LADWP service area from 2019 to 2035. It was assumed that this population growth will occur within the Hyperion sewershed.
2. Continued water conservation of 5% per capita annually from 2017 to 2035 (as outlined in the 2018 One Water LA 2040 Plan).
3. 80% water recovery efficiency at DCTWRP (2025) and HTP (2035). RO brine from DCTWRP will be discharged to the sewer.
4. Nitrification/Denitrification at DCTWRP (2025) and HTP (2035), which generates MBR effluent Ammonia-N of 0.5 mg/L
5. AWPF (fully denitrified/MBR/RO/AOP) recycle flow is insignificant in comparison to the HTP flow
6. For diversion of Seco Creek and Ballona Creek flows to the sewer, concentrations of 2 mg/L ammonia-N and 10 mg/L organic nitrogen were assumed based on available historical records for Seco Creek.

Figure 1 shows historical and projected influent flows from 2008 through 2035. The historical trend suggests that major conservation efforts occurred after 2008, resulting in a 20% reduction in flow to the HTP over a 7-year period. When flows to the Burbank, Los Angeles-Glendale and DC Tillman WRPs are included, the overall flow reduction in the Hyperion sewershed was approximately 15%. As noted in the 2015 Urban Water Management Plan, the economic recession beginning in 2010 was also thought to contribute to a reduction in water usage, but the contribution of the recession to the flow reduction to the HTP is uncertain. Also shown in **Figure 1** are the historical and projected influent ammonia-N and organic-N loads. The data in the graph implies a reduction of approximately 8 percent in both loads occurred after 2008. However, the HTP influent loads are subject to some uncertainty due to the annual average daily loads being derived from twelve monthly composite samples. To improve the assessment of the historical influent ammonia loads to the HTP, the HTP, LA-Glendale and DC Tillman ammonia-N data were compared. Data collected at the LA-Glendale and DC Tillman facilities are from daily composite samples and should provide a better view of monthly averages in comparison to the single monthly samples collected at the HTP. Based on this data comparison, selected values in the HTP data set were removed since they did not appear to be representative of the true monthly averages. The ammonia loads in **Figure 1** reflect this data analysis method. If ammonia loads had decreased, this should be supported by other wastewater constituent data. An analysis of the Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) loads in the Hyperion sewershed indicated a reduction in the annual average daily loads of both parameters by approximately 9 percent after 2012-2013, although the historical service population was steady or growing over this period. The cause(s) of the disconnect between the service population and the annual average daily loads were not identified. Future increases in the ammonia and organic nitrogen loadings to the HTP are projected to be moderate and driven by service population growth. Projecting forward from 2020 through 2035, the flow trend at the HTP reflects on-going water conservation to meet the objective of 5% reduction in water usage per capita and flow diversions to DCTWRP, AWPF and LAGWRP. The addition of flows from Seco Creek (2022) and Ballona Creek (2025) is expected to have a dilution effect for both ammonia and organic nitrogen.

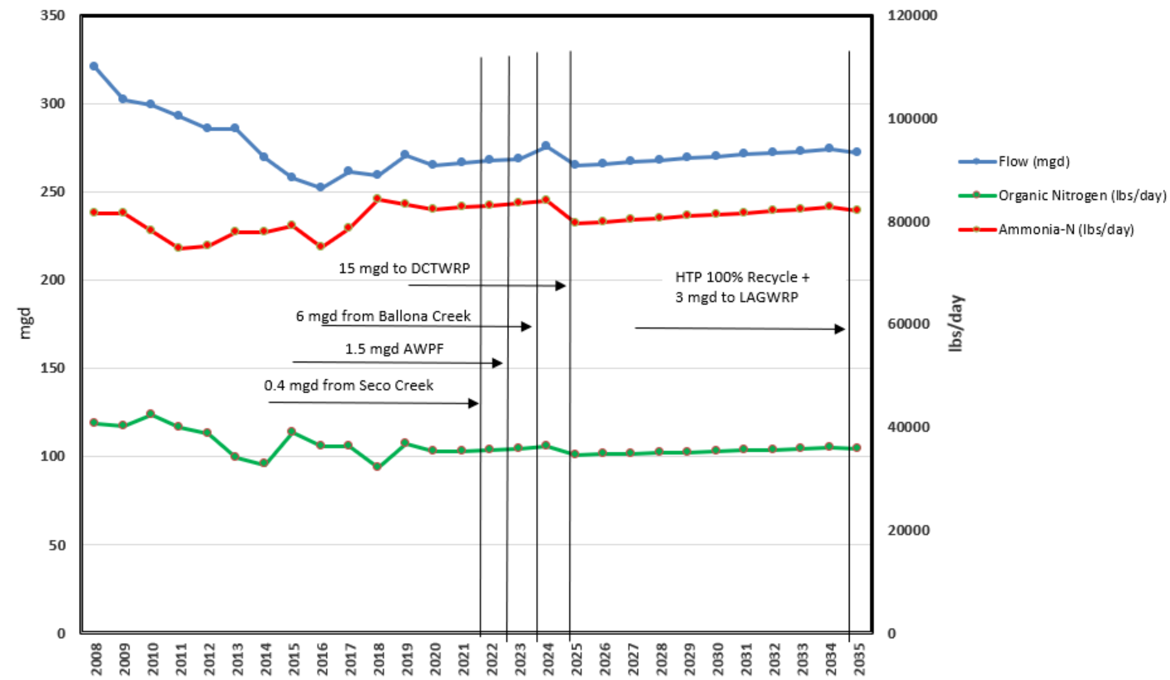

Figure 1: HTP Historical and Projected Daily Average Influent Flows (mgd), Ammonia-N and Organic Nitrogen Loadings (lbs/day)

In accordance with the work plan and the sampling and analytical schedule shown in **Attachment 1**, HTP monthly effluent composite samples were collected for measurement of ammonia-N, nitrite-N, nitrate-N and organic-N. The results are provided in **Table 2**.

Table 2: Monthly HTP Effluent Nitrogen Measurements for the HTP Ammonia Toxicity Special Study

Sample Date	LIMS ID	NH_3-N mg/L	NO_3-N mg/L	NO_2-N mg/L	Org-N mg/L
NPDES Permit Limit		58.0			
7/8/2018	2893901	41.1	0.46	1.30	3.1
8/2/2018	3016504	39.4	0.17	1.50	3.8
9/11/2018	3204101	42.8	<0.2	0.77	3.0
10/2/2018	3304401	40.2	<0.2	1.50	3.4
11/26/2018	3546901	44.2	0.61	1.09	2.4
12/1/2018	3570203	47.5	0.37	1.10	4.3
1/29/2019	3832901	48.4	0.53	0.42	2.1
2/3/2019*	3854103	33.0	0.09	0.54	3.6
3/5/2019	3934504	43.7	0.74	1.81	4.6
4/3/2019	4064203	45.1	<0.1	0.26	3.9
5/1/2019	4205503	45.9	<0.1	<0.1	4.7

6/2/2019	4205505	44.2	0.09	0.16	4.4
7/22/2019	4643301	47.4	0.58	<0.1	4.3
8/5/2019	4637903	41.9	0.2	1.59	3.6
9/1/2019	4776703	45.5	0.51	<0.1	3.9
10/9/2019	5023701	46.3	0.79	1.39	3.9
11/7/2019	5052903	42.3	0.15	1.82	NA**
12/6/2019	5220403	47	0.12	0.94	3.8
"<" or less than values mean the results were less than the Method Detection Limit (MDL).					
AVERAGE		**43.7**	**0.32**	**0.91**	**3.7**
MAXIMUM		**48.4**	**0.79**	**1.82**	**4.7**
MINIMUM		**33**	**<0.1**	**<0.1**	**2.1**

* Sample was collected on February 3rd, instead of originally scheduled date of February 2nd due to coordination issue.
** The analysis for Org-N was missed

Including the data in **Table 2**, historical (2008 – 2019) and projected (2020 – 2035) HTP effluent flows and nitrogen mass loadings are illustrated in **Figure 2**. In addition to water conservation and the activities of **Table 1**, projections were also based on the following assumptions:

1. Projected ammonia for 2020 through 2034 calculated based on multiplying the historical average ratio of HTP secondary effluent ammonia-N to plant influent TKN load (sum of ammonia-N and organic N) by the projected plant influent TKN load.
2. Projected organic nitrogen for 2020 through 2034 was calculated based speciating the organic nitrogen into estimated particulate and filtered organic nitrogen fractions. A constant particulate organic nitrogen concentration was assumed based on a historical average secondary effluent TSS concentration of 19 mg/L, a volatile content of 83 percent and volatile suspended solids nitrogen content of 10 percent. For the filtered organic nitrogen, the historical average ratio of secondary effluent filtered organic nitrogen to secondary effluent ammonia-N was multiplied by the projected secondary effluent ammonia-N concentration.
3. Projected nitrate for 2020 through 2034 is based on historical average concentration for 2008-2019
4. Nitrification and denitrification in the HTP resulting in MBR effluent ammonia-N and nitrate-N concentrations of 0.5 mg/L and 5 mg/L, respectively
5. RO brine ammonia-N and nitrate-N concentrations (2035) based on 80% water recovery efficiency and 100% rejection by the RO membrane

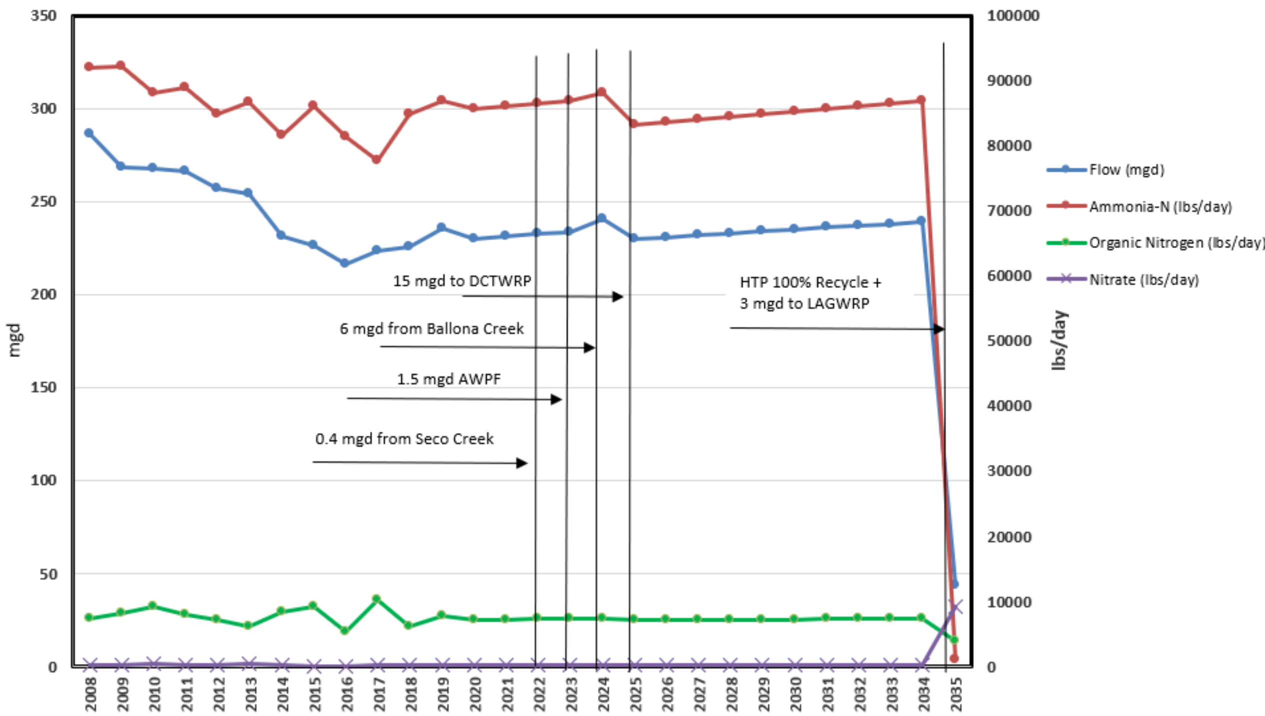

Figure 2- HTP Historical and Projected Daily Average Flow (mgd), Ammonia-N, Organic Nitrogen and Nitrate-N Loadings (lbs/day) to the 5-Mile Outfall

Figure 2 shows a decrease in effluent flow from 2008 through 2015 corresponding to the decrease in plant influent flows over the same period. Since 2015, the effluent flow has been increasing at a moderate rate. Projecting forward from 2020 through 2034, prior to complete conversion of the secondary treatment process at the HTP to an MBR process and implementation of advanced water treatment for 100% recycling, the flow discharged to the ocean is anticipated to follow a steady trend similar to what has been observed after 2015. The sudden decrease in flow after 2034 is the result of the conversion of the HTP to a nitrifying and denitrifying MBR process followed by advanced treatment with RO and UV/AOP. After startup of all the new processes, the average effluent flow from the HTP to the ocean will be RO concentrate (brine) from the advanced treatment process.

Ammonia-N loading in the HTP effluent sent to the 5-Mile Outfall decreased by approximately 9,000 lbs-N/day from 2008 through 2014 and has been relatively stable since 2015. When the ammonia-N load in the HTP secondary effluent flow sent to the West Basin ECLWRF is considered, the HTP secondary effluent ammonia-N load decreased by approximately 7,000 lbs/day or 6.7 percent. The future ammonia-N loads in the HTP secondary effluent and flow sent to the 5-Mile Outfall are expected to moderately increase though 2034 due to service population growth. When the HTP will be converted to 100 percent water recycling in 2035, ammonia loading to the 5-Mile Outfall is expected to drop sharply. **Figure 2** also shows that the projected mass of effluent ammonia discharged to the 5-mile outfall is always less than 80,000 lbs/day which is well below the 203,000 lbs/day monthly average limited listed in Table 5 (Final Effluent Limitations and Performance Goals for Discharge Point 002) in ORDER R4-2017-0045 NPDES NO. CA0109991.

The organic-N effluent concentration in the HTP secondary effluent has been stable through the years due to the stable operation of the HPO reactors and consistently good performance of the secondary clarifiers. Organic-N is expected to remain stable through 2034.

Nitrate-N is expected to remain relatively low through 2034 and increase due to complete nitrification and partial denitrification in the MBR process and concentration of nitrate in the RO process (five-fold increase in the brine for 80% water recovery efficiency).

The nitrogen mass balances in the HTP for 2018 and 2035 are illustrated in **Figures 3** and **4**, respectively, providing snapshots of the predominant nitrogen species into and out of the different process units. The flows and nitrogen concentrations established per September 11, 2018 sampling for the 17 locations were used for developing a plant-wide flow and nitrogen mass balance for current conditions (baseline conditions). The mass balance across the facility on this date did not close, with approximately 4,700 lbs/day, or 4 percent more nitrogen exiting the facility in the effluents sent to the West Basin ECLWRF and the 5-Mile Outfall and in the biosolids than entering the facility. The discrepancy is likely due to measurement error inherent in types of streams being sampled, particularly the dewatered biosolids. However, in general, based on the historical influent and effluent nitrogen data, for every pound of TKN entering the HTP (ammonia N plus organic N), approximately 0.75 pounds of nitrogen leaves the facility in the secondary effluent sent to West Basin ECLWRF and to the 5-Mile Outfall. Of this effluent nitrogen, over 90 percent is in the form of ammonia-N. The majority of the remaining nitrogen leaves the HTP as organically-bound nitrogen in the biosolids, plus ammonia-N in the water associated with the wet cake, and a relatively small amount is removed by nitrification and denitrification.

Similar mass balances were also developed by process modeling for projected flows and nitrogen loadings throughout the HTP in 2035 after the completion of the conversion of the HTP secondary system to a MBR process, diversion of 54 mgd of MBR effluent (permeate) to the West Basin ECLWRF, advanced treatment of the remaining MBR effluent with RO/UV/AOP, and 183 mgd of recycled water to LADWP (West Basin and HTP RO brines sent to the 5-Mile Outfall). In the process model, a 4-Stage Bardenpho configuration was selected for the secondary reactor upgrades, based on the MBR pilot plant design configuration. A commercial organic carbon source was added to the post-anoxic zone to ensure a MBR effluent nitrate-N concentration of 5 mg/L. RO brine mass balances were developed assuming 80% water recovery efficiency. Based on the mass balance presented in **Figure 4**, approximately 70% of the plant influent nitrogen load will be removed by nitrification and denitrification and as organically-bound nitrogen and ammonia-N in the wet biosolids cake hauled from the facility.

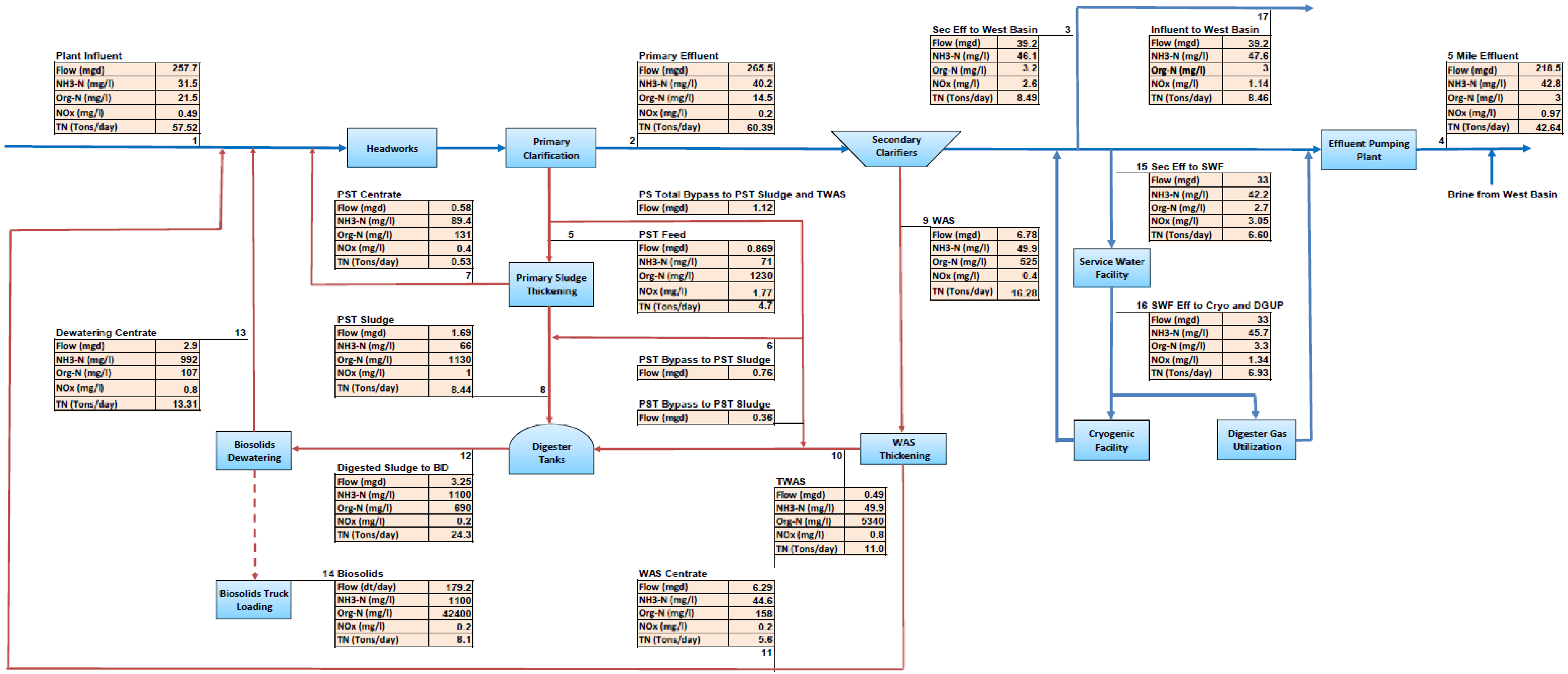

Figure 3 – September 11, 2018 HTP Flow and Nitrogen Balance - Current Operating Conditions (Baseline)

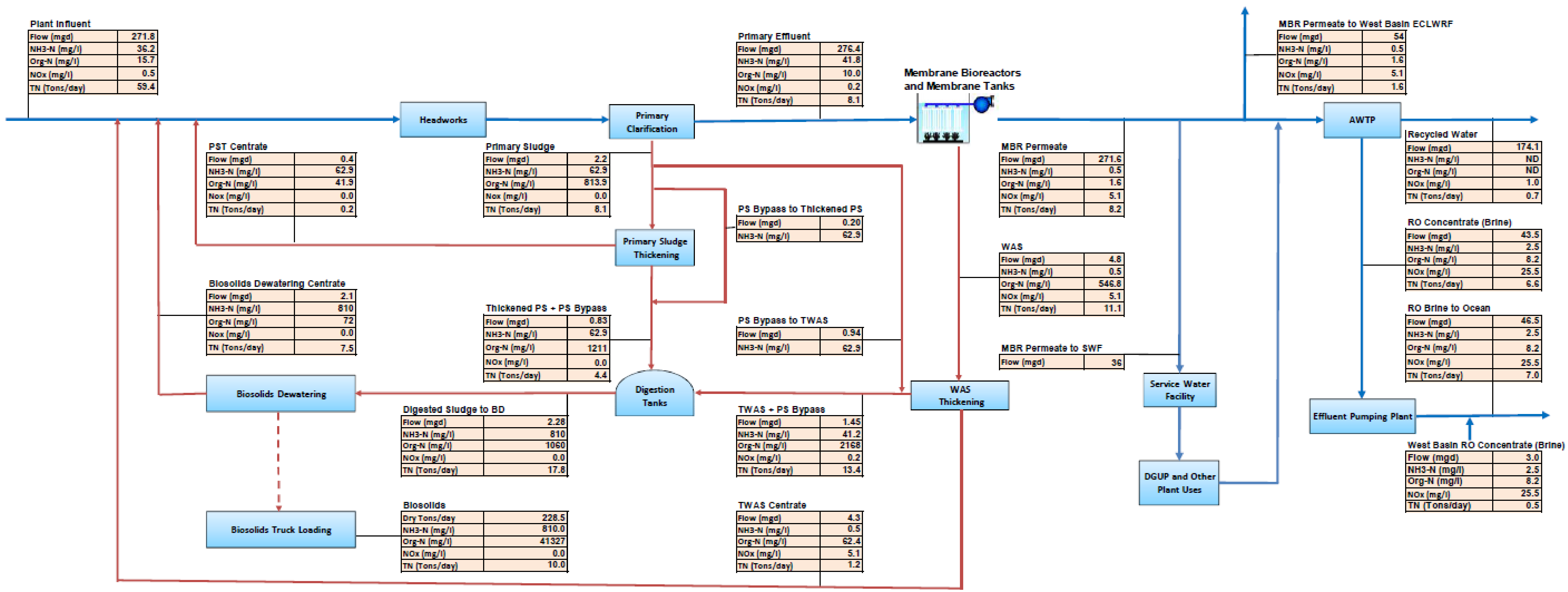

Figure 4 – 2035 HTP Flow and Nitrogen Balance – Projected Operating Conditions with 100 % Water Recycling

West Basin Municipal Water District ECLWRF Nitrogen Mass Balance

Similar to Hyperion, the West Basin MWD collected monthly samples at four locations within the ECLWRF from November 2018 through October 2019 to establish nitrogen masses across the facility. The Plant Influent, Microfiltration Filtrate (MF), the Reverse Osmosis (RO) Combined Permeate, and Reverse Osmosis (RO) Concentrate (brine) were sampled. Flow rates for these four locations were provided by the facility's SCADA system to calculate mass loads. The report summarizing the results of their study is provided in **Attachment 2**.

The report noted the Total Nitrogen (TN) from the influent did not balance with the results from MF filtrate, Combined RO permeate and RO Concentrate (brine). Specifically, TN that could not be accounted for ranged from 454 – 4,529 lbs/day. The variability and inconclusive results were attributed to five factors: dissolved/particulate TN fractions, variable influent water quality from HTP, adaptive plant operations, sampling challenges, and errors inherent in analytical methodology.

Additional data was provided by West Basin on their monthly brine volumes and monthly ammonia-N concentration data for 2018. The results are summarized in Table 3 along with the monthly volumes of HTP secondary effluent sent to the ECLWRF and the monthly ammonia-N concentrations. Based on the data in **Table 3**, approximately 40% of the ammonia load sent to the ECLWRF was discharged to the 5-Mile Outfall in the RO brine.

Table 3: 2018 HTP Secondary Effluent Flows and Ammonia-N Loads to West Basin ECLWRF and Brine Return Flows and Ammonia-N Loads to the 5-Mile Outfall

Month	HTP Secondary Effluent (Million Gallons)	HTP NH3-N (mg/L)	HTP NH3-N (lbs/month)	Total Monthly Brine Flow (Million Gallons)	Brine NH3-N (mg/L)	Brine NH3-N (lbs/month)
January 2018	1,137.7	48.2	457,342	107.26	233	208,430
February 2018	890.4	45.2	335,652	82.20	236	161,789
March 2018	1,004.4	49.9	417,997	83.66	270	188,386
April 2018	1,068.0	50.7	451,591	84.79	230	162,644
May 2018	1,156.3	47.8	460,961	87.81	270	197,731
June 2018	1,044.0	44.3	385,718	78.41	210	137,327
July 2018	1,209.0	41.1	414,414	85.92	200	143,315
August 2018	1,271.0	39.4	417,646	93.31	150	116,731
September 2018	981.0	42.8	350,170	77.21	230	148,104
October 2018	961.0	40.2	322,193	82.02	210	143,650
November 2018	1,023.0	44.2	377,106	78.06	240	156,245
December 2018	697.5	47.5	276,315	37.39	250	77,958
Total, gal/year or lb/year	12,443		4,667,104	978		1,842,309

Objective 2: Evaluation of projected compliance with acute toxicity due to ammonia by determining if HTP's final effluent will continue to meet the acute toxicity and ammonia water quality objectives

Figure 5 illustrates measured and projected flows for the HTP ocean discharge and ammonia concentration in the effluent. The ammonia concentration is projected to increase over the 2020 to 2034 time period and drop dramatically once the MBR system becomes operational in 2035. As discussed, the projected effluent ammonia concentrations do not reflect the schedules for commissioning and startup of the new MBR and advanced treatment facilities, which may occur in phases as the existing secondary treatment system is upgraded. The maximum projected ammonia concentration is approximately 44 mg/L in 2034. This value is below the peak concentrations of 45.7 and 47.7 mg/L recorded in 2016 and 2018, and well below the 6-month median final effluent limitation of 58 mg/L listed in NPDES NO. CA0109991.

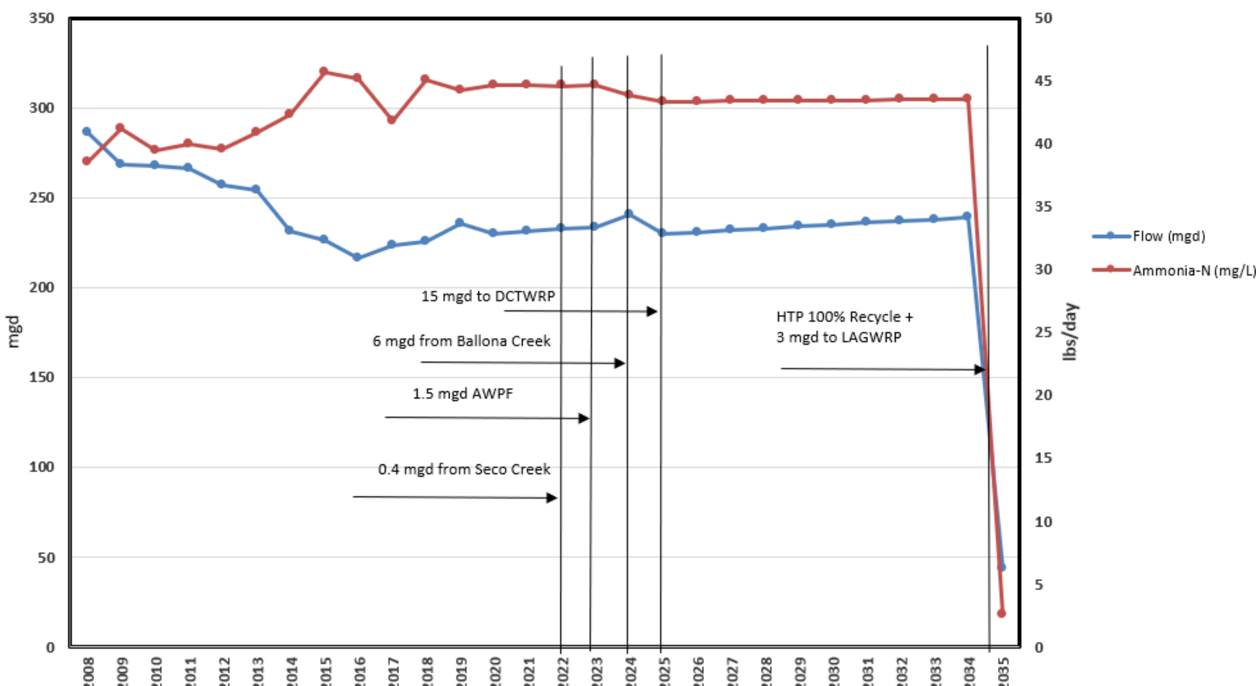

Figure 5: HTP Historical and Projected Annual Average Daily Flow to the 5-Mile Outfall (mgd) and Ammonia concentration (mg/L)

Table 4 shows that the acute toxicity objective for the California Ocean Plan (3.2 TUa) has been exceeded only once (June 2012) during the period of 2008 through 2019.

Table 4: HTP Effluent Acute Toxicity (TUa) - 2008 - 2017

	5-Mile Effluent Acute Toxicity										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
January		2.3	2.3	1.4	2.1	2.2	2.7	2.4	3.1	2.4	n/a
February	2.2	1.8	1.8	1.9	2.2	2.1	2.9	1.9	2.8	2.5	n/a
March	2.8	2.2	2.2	2.5	2.5	2.7	2.3	2.0	2.8	2.5	n/a
April	2.5	2.0	2.0	2.2	3.0	2.2	2.4	2.2	2.3	n/a	n/a
May	2.3	2.8	2.8	2.2	2.7	2.2	2.3	2.4	2.3	n/a	n/a
June	2.6	2.5	3.0	2.7	3.3	2.2	2.4	2.0	2.5	n/a	n/a
July	1.8	2.8	2.1	2.7	2.6	0.9	2.5	2.0	2.5	n/a	n/a
August	2.3	2.0	2.4	2.2	2.2		2.1	2.3	2.7	n/a	n/a
September		1.6	2.3	2.1	2.1	2.2	2.3	2.3	1.8	n/a	n/a
October	2.0	2.3		2.1	2.2		2.1		1.9	n/a	n/a
November		2.2	2.2	2.2	2.0		2.0	2.2	2.0	n/a	n/a
December	2.0	2.2	1.9	2.1		2.3	2.2	2.3	2.5	n/a	n/a

In accordance with the Work Plan for this Special Study and the sampling and analytical plan shown in **Attachment 1**, quarterly acute toxicity testing was performed. The results are presented in **Table 5**. As shown in the table, all tests, including the ammonia spike test at an ammonia-N concentration of 58 mg/L and the HTP effluent/West Basin brine mixtures were below the acute toxicity requirement (< 3.2 TUa).

Table 5: Acute Toxicity Test Results for the HTP Toxicity Reduction Special Study

Test Date	Sample Type	TUa
July 9, 2018	HTP effluent	1.994
November 27, 2018	HTP effluent - Baseline	2.369
November 27, 2018	HTP effluent - Ammonia spike	2.574
November 27, 2018	HTP effluent/West Basin Brine Mixture	2.549
January 29, 2019	HTP effluent	1.945
April 9, 2019	HTP effluent	2.1
July 23, 2019	HTP effluent - Baseline	2.427
July 23, 2019	HTP effluent/West Basin Brine Mixture	2.418
October 9, 2019	HTP effluent	2.556

In summary, acute toxicity due to ammonia is not expected to be an issue for the HTP through year 2035.

Objective 3: Assess operational alternatives (e.g. treatment optimization, additional treatment, additional dilution credits) to address projected compliance with acute toxicity and ammonia water quality objectives

Hydraulic modeling calculations were performed on the 5-Mile Outfall under the 2035 average flow condition to determine the distribution of flow through the existing outfall ports and if seawater intrusion into the far ends of the two legs of the outfall. This preliminary analysis determined that seawater intrusion is likely. For the purpose of moving forward with dilution analysis with the CORMIX model, it was assumed that eleven ports closest to shore would be plugged and RO brine will be discharged through the remaining seventy-four ports.

Based on the results from the outfall hydraulics calculations, dilution modeling was performed with the future RO brine flow from the HTP plus the RO brine flow from the West Basin Plant. Through the CORMIX modeling work, the minimum dilution factor of 140.9 is predicted to occur in May under the least stratified conditions. For reference, the current dilution factor for ammonia and acute toxicity in the NPDES permit is 96:1.

The ammonia concentration in the secondary effluent is projected to increase over the 2020 to 2034 time period and drop dramatically once the MBR system becomes operational in 2035. The maximum projected ammonia concentration is approximately 44 mg/L without MBR in 2034. This value is well below the 6-month median final effluent limitation of 58 mg/L specified in NPDES NO. CA0109991. As the projected maximum effluent ammonia-N concentration and load through 2034 are well below the current permit limits and the TUa value is expected to remain below 3.2. These projections suggest that there is no need to modify the process at HTP for future compliance with ammonia toxicity.

In 2035 the City plans to treat the entire plant influent flow through a fully nitrifying MBR followed by RO. After implementation of the new processes, there will be no risk of permit violations due to ammonia-N as the ammonia-N concentration in the RO brine is projected to be less than 3 mg/L with MBR.

Addressing Study Work Plan Additional Questions

Where and by how much is nitrogen concentrating during biological treatment processes?

As verified by present and projected mass balance, effluent ammonia concentration is not expected to exceed the permit limit. **Figures 3** and **4** shows nitrogen mass balances throughout the HTP for current (2018) and projected 2035 conditions (HTP flow nitrified / denitrified with MBR and subjected to advanced treatment with RO/UV/AOP). In the current HTP operations, total nitrogen (inorganic nitrogen plus organic nitrogen) is not concentrated from the plant influent to the effluent discharged to the 5-Mile Outfall. However, the ammonia concentration across the plant increases by approximately 27% due to biological conversion of organically-bound nitrogen in the raw plant influent to ammonia, both in the secondary treatment process and in the sludge anaerobic digestion process. In the future HTP operations in 2035, total nitrogen and ammonia-N concentrations will be reduced significantly across the plant because of the implementation of denitrification.

What is the nitrogen load via the 5-Mile Outfall to the Santa Monica Bay?

Figure 2 illustrates the current and projected nitrogen loadings to the Santa Monica Bay. Over the period of 2015-2019, the average ammonia-N to the outfall was approximately 82,000 lbs/day, with an average concentration of 44 mg/L. When organically bound nitrogen, nitrite and nitrate are included, the average total nitrogen load was 91,000 lbs/day. In 2019, the average daily ammonia-N to the outfall was approximately 87,000 lbs/day (44 mg/L concentration) and the total nitrogen load was 91,000 lbs/day. In 2035 after startup of the new facilities nitrogen discharge through the outfall will be minimal as the average daily ammonia-N and total nitrogen loads to the outfall are projected to decrease to 900 (3 mg/L concentration) and 4,700 lbs/day, respectively.

Does the HTP effluent quality meet the Ocean Plan objectives for nitrogen species and acute toxicity?

The information presented in **Figures 2** and **5** on the past, current and projected ammonia concentrations and in the discussion of acute toxicity above suggest that the HTP effluent quality has and will continue to meet the Ocean Plan objectives for nitrogen species and acute toxicity.

Is the discharge via the 5-Mile Outfall acutely toxic?

Based on the data presented in this report, the discharge to the 5-Mile Outfall is not acutely toxic. Based on the projected ammonia-N concentration in the brine, ammonia-related toxicity is not anticipated.

Are there any operational changes that may reduce nutrients discharged to the Bay?

Discharge of nutrients to the Bay is not expected to significantly increase. Population growth will result in a moderate increase of nutrients in the collection system. However, the diversion of wastewater to other treatment facilities (DCTWRP in 2025 and LAGWRP in 2035) is anticipated to largely offset the increase in nutrient loads due to population growth through 2035, resulting in minimal increases in nutrients to the HTP and in the effluent discharged to the 5-Mile Outfall from 2020 through 2034. Due to the diversion of flows from Arroyo Seco Creek in 2022 and Ballona Creek in 2024 to the collection system, the ammonia will be diluted, which will partially offset increases in ammonia concentration that is expected due to moderate decreases in per capita in-door potable water use through 2035. Finally, the planned conversion of the entire HTP to provide nitrification / denitrification by 2035 will greatly reduce nutrients discharged to the Bay. These projections are illustrated in **Figures 2 and 4**.

References:

1. U.S. Environmental Protection Agency Region IX and the Los Angeles Regional Water Quality Control Board, Order No. R4-2017-0045, NPDES Permit No. CA0109991, CI No. 1492. 2017. Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for the City of Los Angeles, HTP Treatment Plant Discharge to the Pacific Ocean.
2. California State Water Resources Control Board. 2019 Water Quality Control Plan: Ocean Waters of California, 2019 California Ocean Plan. California State Water Resources Control Board, California Environmental Protection Agency, CA, 109 pp.
3. One Water 2040, City of Los Angeles, Final Draft, April 2018.
4. Urban Water Management Plan, Los Angeles Department of Water and Power, 2015.

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ATTACHMENT 1

WORK PLAN SAMPLING AND REPORTING SCHEDULE

	HTP & EMD SAMPLING SCHEDULE TOXICITY REDUCTION WORKPLAN			
	DATE	**SAMPLE**	**ANALYTES**	**Status**
Q1 of 6				☑=done
QUARTERLY	7/8/2018 7/9/18 (renewal) 7/10/18 (renewal) 7/11/18 (renewal)	HTP Effluent Composite	96-hour Acute Toxicity (7/9 - 7/13)	☑
MONTHLY	7/8/2018	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
MONTHLY	August 2, 2018	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
MONTHLY	September 11, 2018	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
ONE-TIME	9/11/2018	17 Sample locations throughout plant for Nitrogen mass-balance.	Nitrogen Species: NH3, ORG-N, NO3-N	☑
Q2 of 6				
MONTHLY	October 2, 2018	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
	Quarterly report due November 2018 (for July - September 2018)			
QUARTERLY	11/26/2018 11/27/18 (renewal) 11/28/18 (renewal) 11/29/18 (renewal)	HTP Effluent Composite + West Basin BRINE with projected acute toxicity	96-hour Acute Toxicity (11/27 - 12/1)	☑
MONTHLY	11/26/2018	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
MONTHLY	December 1, 2018	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
Q3 of 6				
QUARTERLY	1/29/2019 1/30/19 (renewal) 1/31/19 (renewal) 2/01/19 (renewal)	HTP Effluent Composite	96-hour Acute Toxicity (1/30 - 2/3)	☑
MONTHLY	1/29/2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
	Quarterly report Due February 2019 (for October-December 2018)			
MONTHLY	February 2, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
MONTHLY	March 5, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑

Q4 of 6				
QUARTERLY	4/8/2019 4/9/19 (renewal) 4/10/19 (renewal) 4/11/19 (renewal)	HTP Effluent Composite	96-hour Acute Toxicity (4/9 - 4/12)	☑
MONTHLY	4/3/2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	done on 4/3
	Quarterly report due May 2019 (for January - March 2019)			
MONTHLY	May 1, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
MONTHLY	June 2, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
Q5 of 6				
QUARTERLY	7/22/2019 7/23/19 (renewal) 7/24/19 (renewal) 7/25/19 (renewal)	HTP Effluent Composite + West Basin BRINE	96-hour Acute Toxicity (7/23 - 7/26)	☑
MONTHLY	7/22/2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
	Quarterly report due August 2019 (for April - June 2019)			
MONTHLY	August 5, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
MONTHLY	September 1, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
Q6 of 6				
QUARTERLY	10/9/2019 10/10/19 (renewal) 10/11/19 (renewal) 10/12/19 (renewal)	HTP Effluent Composite	96-hour Acute Toxicity (10/10 - 10/13)	☑
MONTHLY	10/9/2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
	Quarterly report due November 2019 (for July - September 2019)			
MONTHLY	November 7, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
MONTHLY	December 6, 2019	HTP Effluent Composite	Nitrogen Species: NH3, ORG-N, NO3-N	☑
	Quarterly report due February 2020 (for October - December 2019)			
	FINAL report due MARCH 2020			

ATTACHMENT 2

West Basin Municipal Water District
Ammonia and Acute Toxicity Final Report

West Basin Municipal Water District
Ammonia and Acute Toxicity Final Report

Appendix in
Hyperion Ammonia and Acute Toxicity Special Study

Order R4-2018-0089
NPDES No. CA00634401

FINAL REPORT
West Basin Municipal Water District Ammonia and Acute Toxicity
Hyperion Ammonia and Acute Toxicity Special Study
Order R4-2018-0089
NPDES NO. CA0063401
February 2020

In the adopted NPDES Order No. R4-2018-0089 from the Los Angeles Regional Water Quality Control Board (LARWQCB) for the West Basin Municipal Water District (West Basin) Edward C. Little Water Recycling Facility (ECLWRF), West Basin was directed to participate in an Ammonia and Acute Toxicity Study (Study) with the City of Los Angeles' (City) Hyperion Treatment Plant (Hyperion).

During a conference call held on May 16, 2018 with representatives from LARWQCB, the EPA, the City of Los Angeles and West Basin, it was agreed that West Basin would participate for 12 months of the 18-month Study conducted by the City at Hyperion. West Basin began the 12-month study in November 2018 and took the final sample in October 2019. This is the final report which will be submitted to Hyperion. It will be included in their final report as an appendix for submittal to the LARWQCB and the USEPA in March of 2020.

West Basin submitted an Ammonia and Acute Toxicity Special Study Work Plan to both the LARWQB and the EPA on August 28, 2019. Approval was received from the LARWQCB on Sept. 5, 2018 and from the EPA on September 27, 2018.

I. Ammonia Study

West Basin and Hyperion coordinated sampling efforts with the intent to take samples on the same dates.

The West Basin sampling locations at ECLWRF are listed below and can be referenced on the schematic in Appendix A:

1. Plant Influent;
2. Microfiltration Filtrate (MF);
3. Reverse Osmosis (RO)Combined Permeate;
4. Reverse Osmosis (RO) Concentrate (brine).

West Basin took monthly 24-hour time-based composite samples from the above noted sampling points from November 2018 through October 2019. Samples were analyzed at the West Basin Water Quality Laboratory (WBWQL). Parameters were tested with the analytical methods described below:

Parameter	Analytical Method
Ammonia Nitrogen	EPA 350.1 Rev 2.0
Nitrate Nitrogen	EPA 300.0 Rev. 2.1.4
Nitrite Nitrogen	EPA 300.0 Rev 2.1.4
Organic Nitrogen	calculated
Total Kjeldahl Nitrogen / TKN	SM 4500B-N_{org} B
Total Nitrogen	calculated
Flows at sampling points	SCADA

A. Ammonia Study Focus

The goal of the mass balance study was to focus on the Total Nitrogen (T-N) at ECLWRF. There are no treatment processes that provide nitrogen removal at ECLWRF. The majority of the total nitrogen is concentrated up through the RO treatment process and discharged into the brine.

The only water treated by the RO process at ECLWRF is from Hyperion. Tracing the mass of nitrogen from the influent water through the microfiltration process, the reverse osmosis process, to the brine accurately reflected the path of nitrogen in the processes which affects the amount of nitrogen in the brine discharged into the Pacific Ocean via the Hyperion outfall.

B. Ammonia Study Results

1.1. Total Nitrogen Mass Balance

As discussed the focus of the study was to validate the nitrogen mass balance at ECLWRF. Table 1 lists the mass balance results for the study. For this study, the average reduction of total nitrogen through the MF was 10%. More detailed data can be found in Appendix B.

Table 1. Total Nitrogen, lb/day

Date	Plant Influent	MF Filtrate	RO Combined Perm	RO Conc
11/19/2018	10,200	8,610	441	6,160
12/10/2018	3,570	3,150	90	2,130
1/30/2019	8,560	6,780	284	5,620
2/20/2019	6,720	5,120	346	4,320
3/21/2019	10,100	8,910	441	7,000
4/10/2019	8,370	8,630	314	5,860
5/7/2019	11,500	10,700	421	5,750
6/18/2019	11,600	10,100	425	7,160
7/2/2019	11,000	10,100	477	8,320
8/5/2019	10,800	9,850	449	8,370
9/24/2019	10,400	10,000	589	7,630
10/23/2019	10,500	10,100	526	8,670

1.2. Discussion of Variability in Total Nitrogen Results

As shown in Table 1, the mass balance study from November 2018 - December 2019 provided variable results. Total nitrogen (T-N) from the influent did not balance with the results from MF filtrate, Combined RO permeate and RO Concentrate. T-N that could not be accounted for ranged from 454 – 4,529 lbs/day. The variability and inconclusive results from the study can be attributed to the following five factors: dissolved/particulate T-N fractions, variable influent water quality, adaptive plant operations, sampling challenges, and errors inherent in analytical methodology.

- Dissolved/particulate T-N fractions: T-N removal through the MF system is variable based on the amount of T-N that is present as particulate matter. MF has a nominal pore size of 0.2 um, so effectively all particulate matter is removed. On average, 10% of the T-N is removed from the Influent water and is removed through the solids that are hauled off-site.

- Influent water quality: The ECLWRF influent water quality from the Hyperion Treatment Plant (HTP) is highly variable. This has been observed for many years, and is noted in much of the data West Basin collects on influent water quality on a regular basis. The amount and composition of the T-N certainly varies from day to day.

- Adaptive Plant operations: The variability of the influent water quality results in a very adaptive approach to Operations. Maintenance repairs, equipment commissioning, and troubleshooting of treatment processes and their ancillary support systems may also require a change from steady-state Operations. Individual MF racks go into maintenance cleaning regimes throughout the day requiring them to be shutdown. RO trains are also cycled on and off based on demand. Some days the RO process may be producing lower flows, which leads to lower mass loading.

- Sampling challenges: Despite the utilization of 24-hour composite autosamplers, sampling the same slug of water as it passes through the plant is very difficult due to flow kinematics. Some water within may travel faster through the MF in the processes closer to the RO system. Composites are collected once an hour for 24 hours and that means a different slug of water is collected at each location. There is also no sampling location to collect all of the MF Filtrate, unlike the other sampling locations in this study (plant influent, combined RO permeate, RO Concentrate). For this study the Phase 4 MF location was used for sampling. This is important to note as ECLWRF is built under several phases and there are multiple MF systems which have different solids removal efficiencies; and their filtrate feeds to different RO Trains. The location of the sampling was selected because of its level of reliability and the thought it would be a good representative of the water quality in this phase of the process. Because of the design of the MF system, selecting one location to represent the entire process could rely too heavily on that one location. Multiple locations were not used due to the number of autosamplers available for sampling.

- Analytical methodology: T-N is calculated from four analyses for Nitrate, Nitrite, Ammonia and Organic-nitrogen. Org-N is separately calculated by subtracting Ammonia from TKN. Analyses for nitrate, nitrate and ammonia have an accuracy of +/- 10% and TKN is +/- 20% based on the QA/QC requirements. Inherent errors in the methods may be compounded as data are added and subtracted which may further explain the variability of the results.

II. Acute Toxicity Study

West Basin participated with the City in two acute toxicity tests (November 2018 & July 2019) which tested the combined brines from West Basin and Hyperion. The in-stream waste concentration (IWC) for West Basin was 1.04% of the total effluent. The combined effluent sample for acute toxicity was a manual composite comprised of 2.44% West Basin brine waste, and 97.56% Hyperion Treatment Plant un-disinfected secondary treated effluent. The Hyperion effluent was obtained at the Hyperion plant. These percentages are from West Basin's brine permit (R4-2018-0089).

The testing and analysis for acute toxicity was conducted by the Hyperion Treatment Plant Lab for consistency per recommendation from the RWQCB and the USEPA.

A. Methodology for Toxicity Testing

In the approval letter from the LARWQCB to HTP dated August 8, 2018 for this Special Study, Hyperion discussed the method for the acute toxicity testing. This method was the USEPA's *Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms*, Fifth Edition, October 2002, USEPA, Office of Water, Washington D.C. (EPA/821/R-02/012). Tests were performed using the Topsmelt, *Atherinops affinis*.

B. Acute Toxicity Results

The tests which included the West Basin brine all met acceptability criteria. The results are listed below, and can also be found in the Hyperion study report.

Test Date	Sample Type	TUa
27-Nov-18	HTP effluent - Baseline	2.369
27-Nov-18	HTP effluent - Ammonia spike	2.574
27-Nov-18	HTP effluent/West Basin Brine Mixture	2.549
23-Jul-19	HTP effluent - Baseline	2.427
23-Jul-19	HTP effluent/West Basin Brine Mixture	2.418

III. Initiatives, Operations and Plant Upgrades

A. Joint Interagency Treatment Initiatives

Additional treatment options that could improve water quality are dependent upon the processes at Hyperion. Currently, a joint, interagency Membrane Biological Reactor (MBR) pilot project is underway at HTP. This pilot is between West Basin, Hyperion, and the Los Angeles Department of Water and Power (LADWP). The goal for West Basin is higher quality feed water and lower future capital costs. Hyperion's goals include reduced ocean discharge and increased recycled water production. LADWP is seeking a reduction in imported water and increased local water supply. All of these goals would reduce the T-N load in the ocean discharge.

If the MBR process was to be implemented at HTP, the quality of the influent water West Basin could receive would significantly improve the water processes at ECLWRF. A few of the areas impacted include the ability to reduce the quantity of chemicals required, reduce the frequency of cleaning membranes, in addition to a reduction in the greenhouse gas emissions due to lower energy requirements to treat the water.

No significant changes have been made to the ECLWRF plant during the length of this study, nor are there any plans for major changes in the near future. Current projects deal with maintenance and routine upgrades to existing plant equipment.

B. Operational Alternatives and Optimizations

West Basin maintains an on-going philosophy of constantly searching for innovative ways to improve the water quality produced as well as the processes that produce the water. The Advanced Oxidation Process, of which the RO system is a part of, is a process designed with the intent to produce pure drinking water to help with the groundwater supply in the region. It was not designed to reduce T-N.

C. Current or Future Plant Upgrades

West Basin has no plans to increase production in the near future, therefore the quantity of brine will remain governed by the current brine permit (maximum flow 5.2 MGD). The brine from West Basin has historically been between 1 – 3% of the total discharge from the Hyperion 5-mile outfall resulting in a minimal effect on the total outfall at current flows.

Current projects that deal with maintenance and routine upgrades to existing plant equipment include:

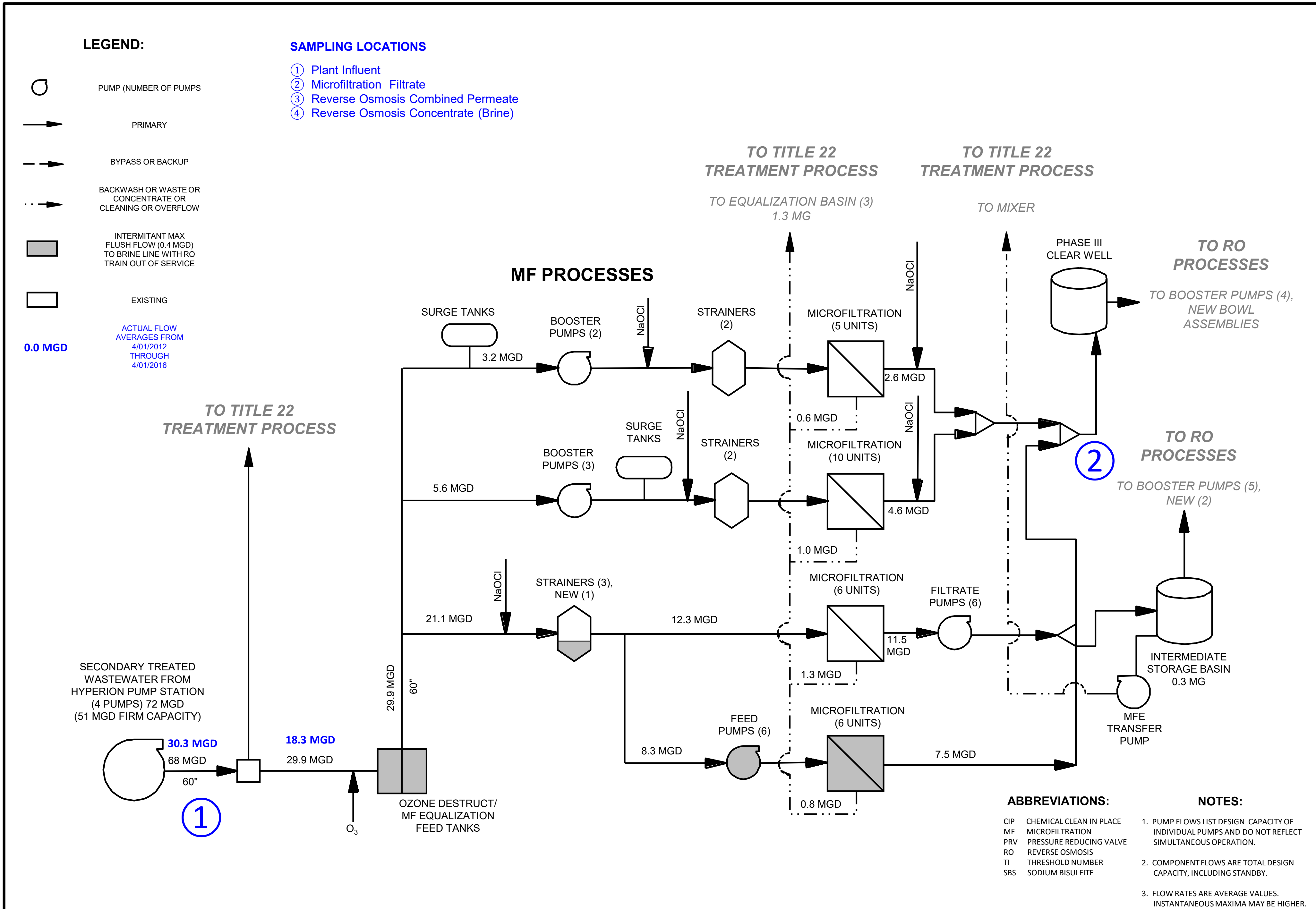
- PVDF membrane technology upgrades
- Hyperion Secondary Effluent Pump Station improvements
- Sodium Hypochlorite tank replacements
- T22 Anthracite Filters
- Pall Microfiltration Expansion Project

IV. FINAL CONCLUSIONS

The two acute joint acute toxicity studies with West Basin and HTP resulted in acceptable results for both tests.

The examination of T-N movement through ECLWRF is complex. There are many variables to take into consideration when analyzing the results. The results of this study demonstrate the brine from West Basin does not contribute to an increase in Total Nitrogen in the brine discharge that is part of the ocean discharge from Hyperion. In fact, the load is decreased by about 10%.

Appendix A – Process Flow Schematic



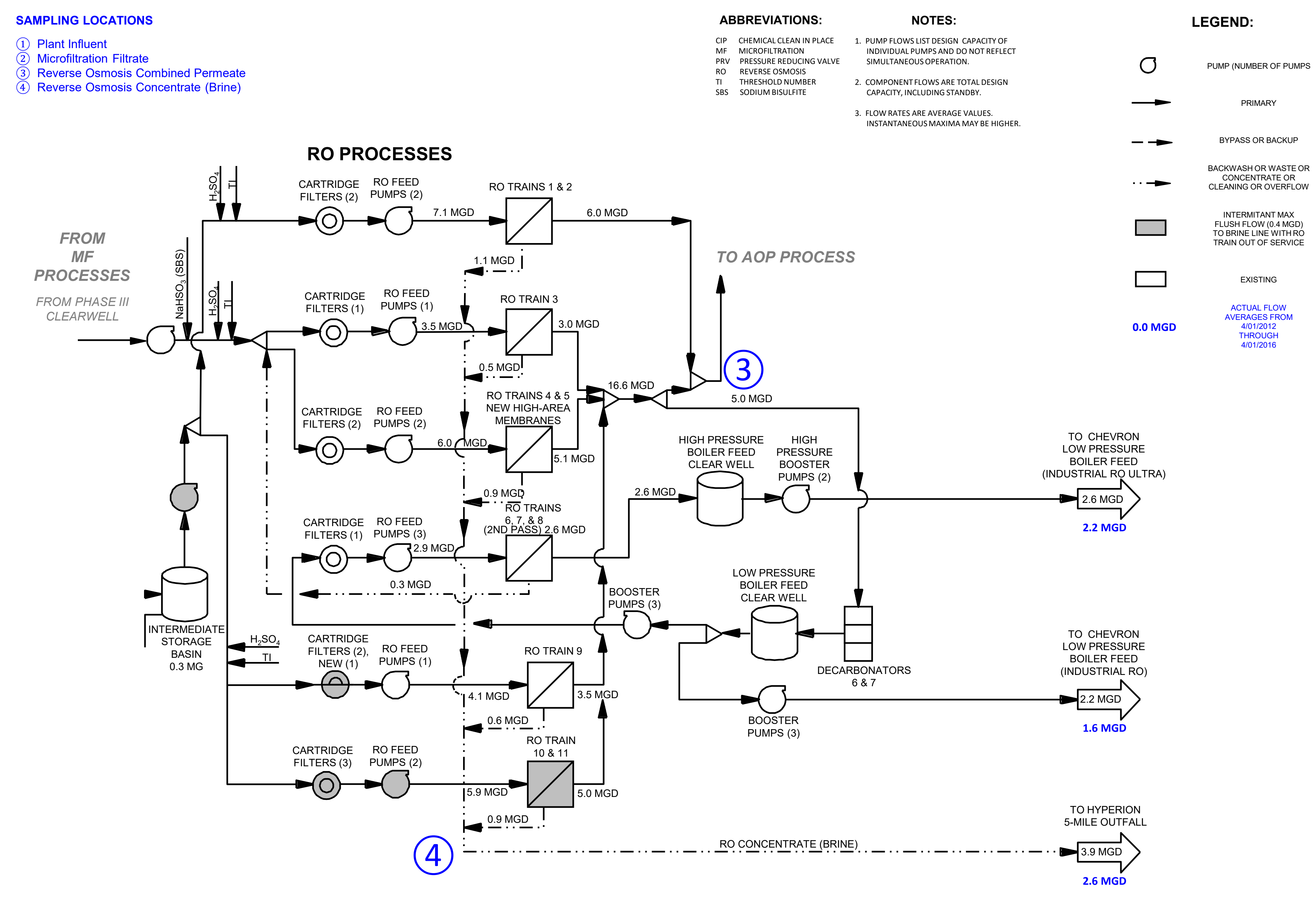
WEST BASIN MUNICIPAL WATER DISTRICT. CARSON, CALIFORNIA

EDWARD C. LITTLE WATER RECYCLING FACILITY

PROCESS FLOW SCHEMATIC PROCESS

ACUTE TOXICITY STUDY

LATE UPDATE: Aug. 27, 2018



WEST BASIN MUNICIPAL WATER DISTRICT. CARSON, CALIFORNIA

EDWARD C. LITTLE WATER RECYCLING FACILITY

PROCESS FLOW SCHEMATIC PROCESS

ACUTE TOXICITY STUDY

LATE UPDATE: Aug. 27, 2018

Appendix B – Raw Data

Raw Data for Ammonia and Acute Toxicity Special Study - Ammonia Data
West Basin MWD Order R4-2018-0089, NPDES No. CA0063401

Date	Total Nitrogen, mg/L: Parameter mg/L	Plant Influent	MF Filtrate	RO Combined Perm	RO Conc	Flow Data MGD: Plant Influent Flow	MF Filtrate	RO Combined Perm	RO Conc	Total Nitrogen, lb/day: Plant Influent	MF Filtrate	RO Combined Perm	RO Conc
11/19/18	Total N	57.85	48.62	3.86	285.30	21.08	21.23	13.69	2.59	10,170	8,609	441	6,163
12/10/2018	Total N	50.11	42.87	2.19	232.20	8.55	8.82	4.91	1.1	3,573	3,153	90	2,130
1/30/2019	Total N	61.09	49.27	3.19	329.00	16.8	16.5	10.69	2.05	8,559	6,780	284	5,625
2/20/2019	Total N	57.32	45.53	4.61	284.82	14.05	13.49	9.01	1.82	6,717	5,122	346	4,323
3/21/2019	Total N	59.36	55.22	3.91	317.72	20.37	19.36	13.51	2.63	10,084	8,916	441	6,969
4/10/2019	Total N	50.79	51.56	2.85	288.01	19.75	20.08	13.19	2.44	8,366	8,635	314	5,861
5/7/2019	Total N	53.50	50.59	2.93	214.93	25.70	25.25	17.21	3.21	11,467	10,653	421	5,754
6/18/2019	Total N	61.07	56.33	3.86	331.58	22.68	21.43	13.19	2.59	11,551	10,068	425	7,162
7/2/2019	Total N	58.00	55.00	3.51	347.65	22.70	22.03	16.28	2.87	10,980	10,105	477	8,321
8/5/2019	Total N	53.16	50.21	3.10	330.10	24.44	23.52	17.36	3.04	10,836	9,849	449	8,369
9/24/2019	Total N	52.04	50.91	4.14	301.85	24.06	23.63	17.05	3.03	10,442	10,033	589	7,628
10/23/2019	Total N	49.33	48.26	3.48	334.23	25.45	24.97	18.14	3.11	10,470	10,050	526	8,669