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Los Angeles Regional Water Quality Control Board

April 22, 2016

Mr. Enrique C. Zaldivar, Director  
Department of Public Works  
City of Los Angeles  
1149 South Broadway, 9<sup>th</sup> Floor  
Los Angeles, CA 90015

**ADOPTED RESOLUTION APPROVING SPECIAL STUDIES – HYPERION TREATMENT PLANT (NPDES NO. CA0109991, CI-1492) AND TERMINAL ISLAND WATER RECLAMATION PLANT (NPDES NO. CA0053859, CI-2171)**

Dear Mr. Zaldivar:

The Regional Water Quality Control Board, Los Angeles Region (Regional Water Board) transmitted a letter containing the tentative Resolution Approving Proposed Special Studies for the City of Los Angeles' Hyperion Treatment Plant and the Terminal Island Water Reclamation Plant, on February 12, 2016.

In accordance with administrative procedures, the Regional Water Board at a public hearing held on April 14, 2016, reviewed the tentative requirements, and considered all the factors in the case, and adopted Resolution No. R16-002.

The complete adopted Order will be sent only to the Permittee. However, these documents are available on the Regional Water Board's website for review. The Regional Water Board's web address is [www.waterboards.ca.gov/losangeles/](http://www.waterboards.ca.gov/losangeles/).

If you have any questions, please contact me at (213) 620-2083 or Steven Webb at (213) 576-6793.

Sincerely,



*for* Cris Morris, P.E., Chief  
Municipal Permitting Unit (NPDES)

Enclosures

Adopted Resolution for Proposed Special Studies  
Special Study Proposals

Mr. Enrique Zaldivar  
Hyperion Treatment Plant  
Terminal Island Water Reclamation Plant

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April 22, 2016

cc: Environmental Protection Agency, Region IX  
U.S. Army Corps of Engineers  
NOAA, National Maritime Fisheries Service  
U.S. Fish and Wildlife Service, Division of Ecological Services  
State Water Resources Control Board, NPDES Permitting Unit  
Frances McChesney, State Water Resources Control Board, Office of Chief Counsel  
State Water Resources Control Board, Division of Drinking Water  
California Department of Parks and Recreation  
California Coastal Commission  
California Coastal Conservancy  
California Department of Water Resources  
Santa Monica Bay Restoration Commission  
Los Angeles County, Department of Public Health  
Los Angeles County, Department of Public Works  
Los Angeles County Sanitation Districts  
City of Los Angeles, Department of Public Works  
Environment Now  
Heal the Bay  
Natural Resources Defense Council  
Santa Monica Baykeeper  
Resource Conservation District of Santa Monica Mountains  
Surfrider Foundation  
Southern California Coastal Water Research Project

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
LOS ANGELES REGION**

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**RESOLUTION NO. R16-002**

**CITY OF LOS ANGELES  
APPROVAL OF PROPOSED SPECIAL STUDIES FOR THE HYPERION  
TREATMENT PLANT AND THE TERMINAL ISLAND WATER RECLAMATION  
PLANT**

The California Regional Water Quality Control Board, Los Angeles Region (hereinafter Regional Water Board), finds:

1. The Regional Water Board adopted National Pollutant Discharge Elimination System (NPDES) permits for the City of Los Angeles' Hyperion Treatment Plant on November 4, 2010, and for the Terminal Island Water Reclamation Plant on June 11, 2015.
2. Both NPDES permits contain a requirement for the City of Los Angeles to consult annually with the Regional Water Board and the United States Environmental Protection Agency (USEPA) to determine the need for special studies. Detailed scopes of work for proposals must be presented to obtain Regional Water Board and USEPA approval and to inform the public. Special studies are intended to focus on refined questions regarding specific effects or development of monitoring techniques. Questions regarding effluent or receiving water quality, discharge impacts, ocean processes in the area of the discharge, or development of techniques for monitoring, arising out of the results of core or regional monitoring, may be pursued through these special studies.
3. On December 03, 2015, representatives from the City of Los Angeles met with Regional Water Board staff to discuss three proposed special studies for 2016: 1) *Pesticides/PCB Method Development for Wastewater, Receiving Water, Sediments, and Biosolids*, 2) *Levels of Dioxin in the Ambient Waters of the Los Angeles Harbor*, and 3) *Assessment of Ichthyoplankton Meta-barcoding for Routine Monitoring (JWSS-16-003)*.
4. Regional Water Board staff believe that these proposed special studies fulfill the requirements of the NPDES permits, will further the Regional Water Board's knowledge of the health of Los Angeles Harbor and Santa Monica Bay and of emerging issues associated with the discharges from both wastewater treatment plants, and recommend that they be approved by the Regional Water Board.

THEREFORE, BE IT RESOLVED THAT:

1. The Regional Water Board believes that the three Special Studies proposed for 2016, 1) *Pesticides/PCB Method Development for Wastewater, Receiving Water, Sediments, and Biosolids*, 2) *Levels of Dioxin in the Ambient Waters of the Los Angeles Harbor*, and 3) *Assessment of Ichthyoplankton Meta-barcoding for Routine Monitoring (JWSS-16-003)*, merit approval.
2. The Regional Water Board hereby approves the City of Los Angeles' proposals for these special studies.

I, Samuel Unger, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, Los Angeles Region, on April 14, 2016.

  
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Samuel Unger, P.E.  
Executive Officer

**City of Los Angeles  
Los Angeles Sanitation  
Hyperion Treatment Plant and Terminal Island Water Reclamation Plant**

**Special Study Proposal  
(April 1, 2016 to March 31, 2017)  
Pesticides/PCB Method Development for Wastewater, Receiving Water, Sediments, and  
Biosolids**

**Introduction:**

The U.S. EPA Methods for extracting and analyzing environmental samples for pesticides and PCBs have served the environmental community well. However, with advances in technology, and the desire to adopt safer and environmentally sustainable techniques, there is need to develop newer methods or update existing ones to meet current expectations. In Southern California, a highly reliable analytical method for DDT and PCB might assist U.S.EPA in solving the local contaminated sediments mystery of the Palos Verdes Shelf, which was declared a Superfund site in 1996 and there is no explanation for how almost 90 percent DDT might have vanished in a mere five-year period – between tests in 2004 and 2009 – after decades of a slow, gradual decline. Scientists have obtained three sets of DDT data collected in 2004, 2009, and 2013; however, each data set added mystery to the jigsaw puzzle in determining whether to deposit a sediment cap over the DDT field in deep ocean waters. The assessment of the DDT results for this Superfund project is a statistical anomaly involving variations of testing methods and sampling events.

To initiate a broader interest within our local peer laboratories, such as Los Angeles County Sanitation District (LACSD) and OCSB (Orange County Sanitation District), into adapting new pesticides and PCB analytical methods, we propose to improve the methods for Pesticides/PCB analysis in wastewater, receiving water, biosolids, and sediments to meet the lower detection limits required by the Southern California Bight Regional Monitoring Program and the wastewater treatment plant TMDL special studies.

We will modify the existing EPA Methods 3620B/C for sample preparation by incorporating a new Solid Phase Extraction (SPE) cleanup method for heavy matrix samples, including raw influent, industrial waste pretreatment, urban runoff, estuary sediments, and biosolids, that will reduce or eliminate the disadvantages of the current method. The disadvantage of the current EPA Method 3620B/C is that it limits the application of SPE cleanup to only light matrix samples amenable to minimal cleanup. We will develop the method to broaden the scope and application of SPE cleanup techniques to the samples typically processed for compliance monitoring of Publically Owned Treatment Works (POTWs). We will adopt a new pair of CLP columns for Pesticides/PCB analysis, and this will significantly reduce the GC instrumental runtime to less than 10 minutes per sample, an equivalence of 85% time-saving. The new configuration of Agilent GC/ECD instrument equipped with a capillary flow splitter will also significantly reduce maintenance cost and instrument downtime.

One to two publications based on this study will be expected in 2017, which will provide U.S. EPA with data to potentially update the current 8081A/8082 methods with the latest instrumental technology and improve laboratory efficiency.

### **Objectives:**

The objectives of this special study are:

- 1) To validate the proficiency and efficiency of the new instrument configuration.
- 2) To develop the SPE cleanup method for heavy matrix samples.
- 3) To evaluate the entire laboratory process for suitable adoption by peer agencies.

### **Benefits:**

The positive outcome of the study will be

- Better data quality;
- Reduction by approximately 80% of sample preparation and data analysis time;
- Reduction of instrument maintenance cost and sample total cost;
- Reduction by approximately 90% of hazardous waste generated; and
- Improved laboratory safety.

By adopting this new technology, we will reduce the amount of hazardous waste generated from sample preparation for pesticide analysis by ten times. Furthermore, the kinds of organic solvent used will be switched from the chlorinated carcinogenic methylene chloride to hexane/acetone; laboratory safety is enhanced with reduced risk associated with laboratory accidents caused by explosive and carcinogenic organic solvents spills and exposures. Other laboratories, e.g., Los Angeles County Sanitation District, Orange County Sanitation District, and City of San Diego that perform the Pesticides/PCB analysis will benefit from the method improvement achieved by this study.

### **Approach:**

1. During the **first quarter**, EMD's SVOC Unit will apply the new pair of GC columns to the EPA Methods 608, 8081A and 8082 for pesticide and PCB analyses.
2. During the **second quarter**, EMD's SVOC Unit will develop for pesticides/PCB analysis the SPE cleanup method for solid samples, including sediments and biosolids. A parallel comparison with our traditional cleanup method (EPA 3620B) will be conducted alongside the SPE method.
3. During the **third quarter**, EMD's SVOC Unit will develop for pesticides/PCB analysis the SPE cleanup method for liquid samples, including wastewater, receiving water and

storm water. A parallel comparison with our traditional cleanup method (EPA 3620B) will be conducted alongside the SPE method.

4. During the **fourth quarter**, we will tabulate the data collected and include them in the final report to be submitted to the Regional Board.

**Project Duration:**

This special study will begin in April, May, or June of 2016 and is expected to be completed in about one year. There is a possibility that this study may be extended beyond one year due to the complexity of different matrices.

**Deliverables:**

Three quarterly progress reports and a final report of the findings will be submitted to the LA RWQCB. Potentially laboratories could apply this method to NPDES compliance monitoring with the approval from RWQCB as an alternative testing procedures for preparing and analyzing environmental samples for pesticides and PCBs. The other potential deliverable is one to two publications based on this study.

**Collaborators:**

The Semi Volatile Organic Compounds Unit of EMD's Instrumental Chemistry Section will be spearheading the project.

**Literature Cited:**

US EPA SW-846 Method 3545A, 3620B/C.

US EPA SW-846 Method 8081A/8082.

**City of Los Angeles  
Los Angeles Sanitation  
Terminal Island Water Reclamation Plant**

**Special Study Proposal  
(April 1, 2016 to March 31, 2017)  
Levels of dioxin in the ambient waters of the Los Angeles Harbor**

**Introduction:**

The TIWRP NPDES Permit has set a conservative dilution credit of 65 for calculating the final effluent discharge limits; however, the dilution factor is not allowed for dioxin. The concerns are the impact of the final effluent on the ambient water quality and whether or not the ambient water has the capacity to accept a greater load of dioxin TCDD equivalent without exceeding the water quality objectives or negatively impacting the beneficial uses of the Los Angeles Harbor (LAH).

The Water Quality Objective (WQO) in the California Ocean Plan for dioxin TCDD equivalent is 0.0039 pg/L and in the California Toxic Rules (CTR) is 0.014 pg/L; both are lower than the detection limit of the current USEPA Method 1613. The detection limits of the City's contract laboratory, Test America, for dioxin congeners using high resolution GCMS method (USEPA Method 1613B) range from 5-100 pg/L. With this in mind, it will probably be "inconclusive" to state that the 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (TCDD) equivalent (dioxin) does not impact the water quality of the Los Angeles Harbor even when all test results from these ambient water samples are ND (Not Detected).

As a hydrophobic organic contaminant, dioxin binds with the colloids of sediments in LAH. The binding capacity, along with the size and quantity of these colloids, affect the sediment-bed-to-overlying-water dioxin fluxes in the pore-water colloids. The propensity for dioxin to bond with a colloid is dependent upon the aqueous solubility of dioxin, and the concentration of dioxin in pore water. We propose to use the sediment dioxin data collected from the three sediment stations annually and the ambient water dioxin data collected from three water quality stations quarterly from April 2016 to March 2017, along with the chemical properties of 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (TCDD) used in the publications of modeling for dioxin in sediment and water, such as the organic-carbon partition coefficient,  $K_{oc}$  (which measures the chemical partition between organic carbon in sediment and water) and the sediment-water distribution coefficient,  $K_d$  (which is the concentration ratio at equilibrium of dioxin attached to sediments to dioxin in water), to assess the lower dioxin concentration in ambient water of LAH. The  $K_{oc}$  and  $K_d$  change with sediment organic content; for LAH sediment, we will use a range of  $K_{oc}$  and  $K_d$  from review of the literature on similar bays and estuaries for dioxin and PCBs. We may also need to derive the PCB (as surrogate of dioxin) partition coefficient data from an in-house experiment of PCB congeners if the breadth of data available for dioxins is limited. For the in-house experiment, we will use an estimated  $K_d$ , which will be calculated based on sediment mass (organic content) and water volume (1 Liter) by spiking with various

amounts of PCB congeners. By either way, we will relate the water quality data and the sediment data, and use them together to determine the lower ambient concentrations of TCDD equivalents.

The ambient water dioxin data will be collected from the LAH water quality monitoring stations HW23, HW56 and HW62; and the sampling frequency will be quarterly for one year, which will fulfill the requirement specified in the TIWRP NPDES Permit, Footnote #5 of Table 4, on Page 6. The dioxin analysis of both water and sediment will be outsourced to Test America, using the USEPA Method 1613B.

With the ambient water and sediment sampling and in-house experiment or literature review for calculating the lower concentrations of dioxin in ambient water, this study will be useful in understanding the various processes that contribute to the transport of dioxin within and out of sediment beds in LAH. The processes together with the exchanges between water, colloids, and the contact phase, diffusion, the exchange with infauna, sediment turnover by infauna, and sediment re-suspension will contribute to the understanding of the “real-world” concentration of dioxin in ambient water of LAH. The ability to determine lower concentrations of TCDD equivalents in ambient water in this project may provide a study template useful to other laboratories in the future.

### **Objectives:**

The objectives are to conduct the quarterly dioxin monitoring of ambient water from three water quality stations and the annual dioxin monitoring of sediment from three sediment stations in the Los Angeles Harbor (LAH) and to perform modeling with partition coefficient of 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin (TCDD) on sediment, to substantiate negligible background concentration of dioxin in the LAH receiving waters. According to the current TIWRP NPDES Permit, promulgated on August 1, 2015, the Water Quality Objective will ultimately serve as the dioxin effluent limitation for the discharge. If this proposed study shows that the background concentration of dioxin in the Los Angeles Harbor receiving waters is lower than the CTR Water Quality Objective of 0.014 pg/L, the Regional Board may consider providing dilution credit for the final effluent limitation of dioxin.

### **Benefits:**

This study will:

- Provide data on dioxin levels of 12 ambient water samples collected from three stations of Los Angeles Harbor quarterly;
- Provide data on dioxin levels of 3 bottom sediment samples collected from three sediment stations of Los Angeles Harbor annually;
- Review various literature including CalTOX model related to the dioxin concentration relationships between an exposure medium (LAH sediment) and an environmental medium (ambient LAH water);

- Collect historical dioxin TCDD equivalent sediment data for LAH;
- Collect the organic-carbon partition coefficient (Koc) that measures the chemical partition between organic carbon in sediment and water for dioxin TCDD equivalent. The higher the Koc the more likely dioxin is to bind to the sediment than to the water; and
- Collect the sediment-water distribution coefficient (Kd) that is the concentration ratio at equilibrium of dioxin attached to sediments (mol/kg) to dioxin in water (mol/L).

The findings from this study may assist the Regional Water Board in establishing the dilution ratios, effluent discharge limit, and mass emission rates for dioxins, and provide a template for other monitoring agencies and private laboratories to utilize.

**Approach:**

1. During the **first quarter**, EMD’s Instrumental Chemistry Section will coordinate with EMD’s Ocean Assessments Unit to collect the ambient water from three sampling locations: HW23, HW56, and HW62 of Los Angeles Harbor. The sampling frequency will be quarterly. The dioxin TCDD equivalent analysis will be outsourced to Test America, using the USEPA Method 1613 with the required Minimum Levels (MLs) and Toxicity Equivalent Factors (TEFs) as listed in below:

	<b>ML</b>	TEF
	pg/L	
2,3,7,8-TCDD	<b>10</b>	1
2,3,7,8,-PeCDD	<b>50</b>	1
1,2,3,4,7,8 -HxCDD	<b>50</b>	0.1
1,2,3,6,7,8 -HxCDD	<b>50</b>	0.1
1,2,3,7,8,9 -HxCDD	<b>50</b>	0.1
2,3,7,8,HpCDDs	<b>50</b>	0.01
Octa CDD	<b>100</b>	0.0001
2,3,7,8 tetra CDF	<b>10</b>	0.1
1,2,3,7,8,PeCDF	<b>50</b>	0.05
2,3,4,7,8 Pe CDF	<b>50</b>	0.5
1,2,3,4,7,8-Hx CDF	<b>50</b>	0.1
1,2,3,6,7,8-Hx CDF	<b>50</b>	0.1
1,2,3,7,8,9-Hx CDF	<b>50</b>	0.1
2,3,4,6,7,8-Hx CDF	<b>50</b>	0.1
1,2,3,4,6,7,8-Hp CDF	<b>50</b>	0.01
1,2,3,4,7,8,9-Hp CDF	<b>50</b>	0.01
Octa CDF	<b>100</b>	0.0001

2. During the **second quarter**, EMD's Instrumental Chemistry Section will coordinate with EMD's Ocean Assessments Unit to collect the sediment samples from three sediment stations: HM2, HM3, HM13, or HM6 of Los Angeles Harbor. The dioxin TCDD equivalent analysis will be outsourced to Test America, using the USEPA Method 1613. EMD's SVOC Unit will perform a literature review for published dioxin partitioning data between sediment and water ( $K_{oc}$ ) to relate known sediment dioxin TCDD equivalent concentrations to ambient water concentrations. Additionally, three ambient water samples will be sent to Test America for dioxin analysis.

EMD's SVOC Unit will perform a literature search for published distribution or sorption coefficient ( $K_d$ ) between sediment and water for dioxin TCDD equivalent. Dioxin levels in sediment from the Los Angeles Harbor (HM2, HM3, HM13, or HM6) and a reference station outside the harbor breakwater will be collected.

3. During the **third quarter**, EMD's SVOC Unit will perform a literature review for the Los Angeles Harbor sediment dioxin data that was lower than 5.3 ug/kg as published in the Los Angeles Port Reports in recent years, and tabulate the data collected for this project, to assess the dioxin levels collected in the quarterly ambient water samples from stations HW23, HW56, and HW62 of Los Angeles Harbor in the final report to be submitted to the Regional Board. Additionally, three ambient water samples will be sent to Test America for dioxin analysis.
4. During the **fourth quarter**, the last three quarterly samples will be outsourced to Test America, data from Test America will be tabulated, and the final report prepared.

### **Project Duration:**

This project will be conducted from April 2016 to March 2017. There is a possibility that this study may be extended beyond one year due to the detection limit issue of dioxin higher than the WQO numeric target.

### **Deliverables:**

Three quarterly progress reports and a final report of the findings will be submitted to the Regional Board. This study will produce at least one-year monitoring data of dioxin TCDD equivalent, graphs of Los Angeles Harbor receiving water stations for dioxin TCDD equivalent, and a data assessment report to demonstrate to the Regional Board whether the ambient concentration of dioxin is negligible. The data will be tabulated and graphed in a summary of findings to be submitted to the Regional Board.

### **Collaborators:**

The Instrumental Chemistry Section of EMD will be spearheading the project with sample collection to be conducted by the Ocean Assessments Unit of the Biology Section of EMD.

**References Cited:**

Ports of Long Beach and Los Angeles. 2010. Year 2008 Biological Surveys of Los Angeles and Long Beach harbors. Prepared by Science Applications International Corporation and Seaventures, etc. in April 2010.

Ports of Los Angeles, 2005 Mid-water column monitoring results. 2005-2008.

Ports of Los Angeles, 2006 Mid-water column monitoring results. 2006-2008.

Ports of Long Beach and Los Angeles. 2002. Ports of Long Beach and Los Angeles Year 2000 Biological Baseline Study of San Pedro Bay. Prepared by MEC Analytical Systems.

Department of Toxic Substance Control and California EPA, 1994. Intermedia Transfer Factors for Contaminants Found at Hazardous Water Sites for 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin (TCDD).

**City of Los Angeles, Environmental Monitoring Division  
Proposed Special Study  
2016**

**ASSESSMENT OF ICHTHYOPLANKTON META-BARCODING  
FOR ROUTINE MONITORING (JWSS-16-003)**

**Goals and Objectives:**

Discharge of treated wastewater through deep ocean outfalls results in the creation of a rising diluted effluent plume that interacts with the pelagic ecosystem, yet little to no NPDES monitoring is conducted to assess potential impacts to this ecosystem. Recognizing this limitation, ichthyoplankton monitoring is a specific objective within the Pelagic Ecosystem component of the SMBRC Comprehensive Monitoring Program (CMP) for Santa Monica Bay. Further, support for implementing the CMP is a requirement in the NPDES permits for the Hyperion Water Reclamation Plant (HWRP) and Joint Water Pollution Control Plant (JWPCP). Historically, the number of samples combined with the time and specialized taxonomic skills needed to identify fish eggs and larvae, have made implementation of meaningful ichthyoplankton monitoring by POTW groups prohibitive. However, the use of genetic meta-barcoding may make analysis of samples collected at the intensive spatial and temporal scales required for such monitoring cost-effective.

The overall goal of this research is to develop a framework for cost-effective and informative ichthyoplankton monitoring within the coastal waters of Santa Monica Bay (SMB) and beyond. The main objectives for this Special Study are listed below:

1. build capacity among local NPDES monitoring groups to collect standardized ichthyoplankton samples for meta-barcoding, consistent with California Cooperative Oceanic Fisheries Investigations (CalCOFI) procedures, in the coastal ocean.
2. participate along with other large POTWs and other organizations to collect ichthyoplankton samples during the second quarter of 2016
3. obtain a snapshot of the ichthyoplankton population within SMB coastal waters
4. test if meta-barcoding is a viable method to identify ichthyoplankton compared to traditional methodology used by CalCOFI.
5. determine whether meta-barcoding significantly reduces time, cost, and specialized taxonomic expertise needed for ichthyoplankton monitoring; and
6. assess whether meta-barcoding-based ichthyoplankton community analysis would allow a meaningful status and trends monitoring program that could be implemented within SMB and or/ the Southern California Bight (SCB).

**Benefits:**

This study will provide a long overdue snapshot of the current ichthyoplankton community within SMB and allow comparison with other nearshore areas of the SCB using traditional morphological taxonomic identifications. If meta-barcoding is deemed an accurate and cost-effective substitute for traditional taxonomic analysis, monitoring may be incorporated within future Bight Regional Monitoring Programs

administered by the Southern California Coastal Water Research Project (SCCWRP) to assess the entire SCB and allow comparisons with conditions in SMB.

**Approach:**

Samples of ichthyoplankton, including fish eggs, will be collected from sites associated with our NPDES demersal fish and epibenthic invertebrate trawl program, plus Station A2 within the vicinity of the 1-Mile Outfall terminus (**Figure 1**). Similar samples will be collected on the same day by the Sanitation Districts of Los Angeles County Joint Water Pollution Control Plant (JWPC) from their trawl monitoring stations. Samples will be collected via vertical tows with a 150-um mesh paironet (25-cm diameter mouth) and placed in 95% ethanol. Samples will then be transported to SCCWRP where the ethanol will be changed over a series of days. Sample contents will be sorted and morphologically identified to the lowest possible taxonomic level by National Oceanic and Atmospheric Association (NOAA) Southwest Fisheries staff in La Jolla, CA.

After all of the individuals in a sample have been sorted and morphologically identified, the ichthyoplankton species will be reconstituted as a single sample and a random aliquot of the sample will be removed and homogenized for meta-barcoding analysis, while the remaining material will be archived. Meta-barcoding is the use of universal genetic markers to identify multiple species within a single sample, simultaneously. The work involves extraction, amplification, and sequencing of targeted pieces of DNA from a homogenized sample. A yet-to-be-determined contract laboratory will be selected by NOAA Southwest Fisheries to perform the meta-barcoding on these samples. The sequence data will be cleaned, filtered, and then queried against a reference library of adult fish from the Southern Californian region. The reference library is being constructed at SCCWRP by mining the Barcode of Life and GenBank databases for sequences from species known to be present in CalCOFi and Scripps Institution of Oceanography (SIO) pier sampling.

SCCWRP staff will compare ichthyoplankton sample composition, characterized by meta-barcoding, to that produced by traditional morphological methods to evaluate if the genetic-based methods can produce similar results. Similarity between the methods will be evaluated from ecological (e.g., species composition, functional composition, etc.), environmental assessment (e.g., species indicative of water quality issues), and fisheries (e.g., anchovies, Kelp Bass, sardines) perspectives.

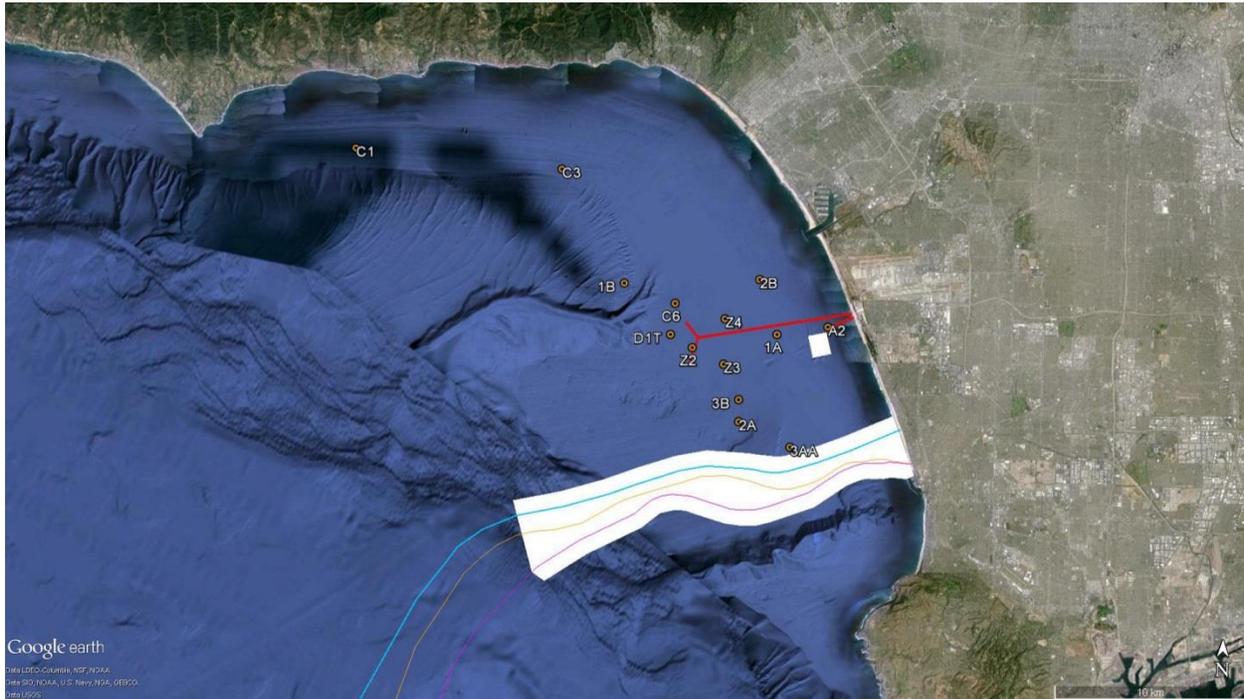
**Project Duration:**

Initial sample collection will occur in the second quarter of 2016. Samples will be processed for morphological and meta-barcoding identification by the first quarter of 2017. Analyses and manuscripts will be completed by the third quarter of 2017.

**Deliverables:**

The results, analyses, and conclusions of this Special Study will be documented in quarterly progress reports and a final comprehensive report will be submitted to the Los Angeles Regional Water Quality

Control Board by August 15, 2017. Moreover, at least two manuscripts will be submitted to major peer-reviewed scientific journals detailing the optimization of meta-barcoding methods for this type of ichthyoplankton community sampling, as well as an evaluation of the utility of meta-barcoding-derived information for regular monitoring and assessment of the pelagic fish community of the Southern California Bight.



**Figure 1** Map of the City of Los Angeles, Environmental Monitoring Division demersal fish and epibenthic invertebrate trawl stations. Ichthyoplankton samples will be collected from 10 of 13 sites, including one in the vicinity of the 1-Mile Outfall, during the second quarter of 2016 in coordination with simultaneous sampling by Sanitation Districts of Los Angeles County's JWPCP staff at their trawl sites. White polygons represent sampling exclusion zones due to the presence of trans-Pacific fiber optic cables and the Chevron Marine Terminal. Red-line features are HWRP outfalls.

### **Collaborators:**

The samples collected for this Special Study will be part of a larger effort by staff from SCCWRP, NOAA Southwest Fisheries, CalCOFI, UC Santa Barbara, Scripps Institution of Oceanography, and SCB POTWs, including the Sanitation Districts of Los Angeles County and the City of Los Angeles Environmental Monitoring Division.