

SAN DIEGO COUNTY PARTICIPATING AGENCIES BIGHT 2018 WORKPLAN

Prepared For:

County of San Diego Participating Agencies

May 2018



Prepared by:



TABLE OF CONTENTS

1	Introduction.....	1
1.1	Background.....	1
1.2	Regulatory Commitment.....	3
1.3	Technical Approach.....	3
2	San Diego Watershed Management Area Workgroups Bight '18 Participation	5
3	Sediment Quality Assessment Group Current Program Design	5
3.1	Sediment Sampling Design and Program	6
3.2	Water Quality Sampling	13
3.3	Prevention of the Spread of Aquatic Invasive Species	13
4	Data Management and Reporting	14
5	References.....	15

APPENDICES

Appendix A - Station Location Maps

Appendix B - Bight '18 Sediment Quality Assessment Workplan

LIST OF TABLES

Table 3-1.	San Diego Region Lagoon/Estuary Stations	5
Table 3-2.	Bight '18 Sediment Analytical List, Methods, and Reporting Limits.....	7

1 Introduction

The purpose of this workplan is to outline the activities that will be conducted by the San Diego County Participating Agencies (Participating Agencies) to contribute in-kind services to the Southern California Bight 2018 Regional Monitoring Program (Bight '18). This is a working document coinciding with the development of the Bight '18 Program.

1.1 BACKGROUND

The Bight Regional Monitoring Program (Bight Survey) is an assessment of the Southern California Bight (Bight) organized every five years by the Southern California Coastal Water Research Project (SCCWRP), conducted from Point Conception to the Mexican border. The Bight Surveys were initiated in 1994 based on recommendations received from marine monitoring program reviews by the National Academy of Sciences in 1989. SCCWRP is the lead coordinating agency for the Bight Surveys, bridging the regulated and regulatory communities. Previous surveys have been conducted in 1994, 1998, 2003, 2008, and 2013. Detailed information related to previous Bight Surveys as well as information regarding the current Bight '18 survey can be found on the SCCWRP website at: <http://www.sccwrp.org/Documents/BightDocuments.aspx>.

The aquatic health of the San Diego County estuaries and lagoons have been assessed as part of the previous Bight Surveys in 2003 (Bight '03), 2008 (Bight '08), and 2013 (Bight '13). It has also been assessed in the three-year Ambient Bay and Lagoon Monitoring (ABLM) Program from 2003-2005 and 2010-2012 and the follow-up study to Bight '13 conducted in 2014. Additionally, in 2008 and 2013, the sediment conditions within San Diego County estuaries were evaluated following the protocols of the State Water Resources Control Board's (SWRCB) *Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality* (referred to as Sediment Quality Objectives (SQOs)).

The Bight '08 Survey represented the first effort to monitor and evaluate results in accordance with the SQO Policy across Southern California's embayments. The SQOs are based on a multiple lines of evidence (MLOE) approach in which the lines of evidence (LOE) are sediment toxicity, sediment chemistry, and benthic infauna community condition. The MLOE results were integrated through the evaluation of the severity of biological effects and the potential for chemically mediated effects to provide a final station level assessment.

In Bight '13, the SQOs continued to be utilized to assess the aquatic health of estuarine and embayment habitats. The sediment chemistry, toxicity, and benthic communities were measured at 170 stations in estuaries and embayments throughout the Southern California Bight. Similar to Bight '03 and Bight '08 results, embayments were found to have lower sediment quality in comparison to nearshore and offshore environments. Approximately 18% of embayments within the Bight were considered to be impacted by sediment contamination, with marinas and estuaries exhibiting a substantially higher proportion of their area impacted by sediment contamination than ports and bays. Approximately one-half of assessed marina areas (48%) and one third of assessed estuary areas (35%) were assigned to SQO condition categories of either Possibly Impacted or Likely Impacted. Embayment sediment quality was found to have improved over time, having decreased in total area impacted by sediment contamination from nearly 50% in 1998 to 18% in 2013, and in magnitude of

impact from 20% of the embayment area being Likely or Clearly Impacted in 1998, to only 5% being Likely Impacted and 0% being Clearly Impacted in 2013 (SCCWRP, 2017).

The Bight '13 Survey was performed at 22 sample locations across nine lagoons/estuaries located throughout San Diego County. Eighteen of the sample locations were categorized as Likely Unimpacted or Unimpacted indicating that conditions at these locations were generally protective of beneficial uses. Four sample locations, however, were identified as Possibly Impacted. One of the four Possibly Impacted sites occurred in each of the following lagoons: Agua Hedionda Lagoon, Batiquitos Lagoon, San Dieguito Lagoon, and the San Diego River Estuary, and were recommended for follow-up activities. A Follow-Up Investigation was conducted in the summer of 2014 at these four locations to confirm the Possibly Impacted condition category at each site. Follow-up assessment scores indicated that Agua Hedionda and San Dieguito Lagoons were again categorized as Possibly Impacted; and Batiquitos Lagoon was considered Likely Unimpacted. Follow-up assessments at Agua Hedionda and San Dieguito Lagoons indicated that the Possibly Impacted condition category score was likely due to natural biological variation or physical disturbances. The final SQO assessment for the San Diego River Estuary site was not able to be determined because the salinity criteria for proper SQO assessment were not met (i.e. salinity was below 27 parts per thousand) and therefore the benthic LOE was not scored. Results of the chemistry and toxicity SQO LOEs indicated Minimal to Low categorical ratings for chemical exposure and a Nontoxic rating for toxicity among the three field replicates. The benthic infaunal community at the San Diego River Estuary site had low diversity and high abundance of a few dominant species (Weston Solutions Inc [Weston[®]], 2015).

Ambient Bay and Lagoon Monitoring

The San Diego Regional Copermittees (Copermittees) conducted a three-year ABLM program to assess San Diego's lagoons from 2003 through 2005. The ABLM program applied a weight of evidence approach using a triad assessment of indicators which included chemistry, toxicity, and benthic infaunal communities to evaluate the sediment quality in the lagoons and estuaries. The program design used a targeted approach to assess the finest grain size and highest total organic carbon. This approach was used to conservatively assess if the areas in the lagoons that were likely to be impacted exceeded published benchmarks or exhibited toxic effects. Three discreet samples were collected and composited into one sample for each lagoon or estuary per year. The three years of data were compiled to form a baseline of information, providing a benchmark for comparison of future sampling results. Based on the triad approach used in the ABLM study, San Diego County lagoon/estuary sediment health was rated as fair. Although sediment contamination and toxicity were found to be low during sampling years, benthic infaunal communities were generally more disturbed than would have been expected based on the chemistry and toxicity data (Weston, 2007). Given that the ABLM study utilized composite sampling, future studies were needed to better understand the spatial distribution of conditions within San Diego estuaries.

Subsequently, the Copermittees conducted a three-year ABLM program from 2010 through 2012. By building on information gained from the 2003-2005 ABLM and the Bight '08 Survey, it was determined that special studies within each lagoon would provide more relevant information for addressing the permit management questions (Order No. R9-2007-0001, RWQCB 2007). The refined approach used during the 2010-2012 ABLM Program focused on benthic community assessments. Priority was given to those lagoons that had impacted benthos with associated toxicity or with the presence of chemistry threshold exceedances. During the three-year period, five lagoons/estuaries were monitored including Agua Hedionda Lagoon, the Sweetwater River Estuary,

San Elijo Lagoon, Batiquitos Lagoon, and the Tijuana River Estuary. The sediment qualities of the five lagoons/estuaries were evaluated utilizing the SQO triad approach. Sampling consisted of water quality sampling for chemistry and physical parameters and sediment sampling for chemistry, toxicity, and benthic infaunal assessments. Each sampling site included three replicate samples analyzed for benthic community condition, sediment toxicity and sediment chemistry to evaluate benthic condition. Additionally, one water quality sample was collected for the site. Data for this study were collected using methods consistent with previous collection methods for this program, the Bight program, and SQOs to allow for comparisons to prior and likely future data needs. The majority of sites assessed exhibited little chemical or toxicity influence, being classified as Minimal to Low chemical exposure, and Nontoxic to Low Toxicity. The benthic infauna LOE scores among sites exhibited more variability, with categorical ratings of Low to High disturbance to the benthic community (Weston 2011, Weston 2012, and Weston 2013). Comparisons to the benthic community from previous studies, as well as the analysis of the water quality, revealed that disturbances to the benthic community at the majority of the sites were most likely associated with natural biological variation and physical disturbances rather than chemically mediated effects.

1.2 REGULATORY COMMITMENT

The San Diego Regional Municipal Separate Storm Sewer System (MS4) Permit (Order No. 2013-0001 as amended by Order Nos R9-2015-0001 and R9-2015-0100, SDRWQCB, 2013) (Permit) requires participation in the Bight program (Section D.1.e.(1).(b)) as well as sediment monitoring in accordance with the SQOs (Section D.1.e.(2)). Bight '18 monitoring in San Diego region lagoons and estuaries will be conducted after the expiration date of the current permit, June 27, 2018, but prior to approval of the new 2018 Permit. The San Diego Regional Water Quality Control Board clarified in an email response to the County of San Diego, dated January 30, 2018 that participation in Bight '18 will meet the requirements for the new 2018 Permit.

The Watershed Management Area workgroups have indicated they will participate in the Bight '18 Survey by providing in-kind services. The Participating Agencies have agreed to contribute to the Bight '18 Survey by sampling up to 22 lagoon/estuary stations within the San Diego Region.

The Participating Agencies' contributions to the Bight '18 Survey will provide useful data to address the goals of the WQIP Monitoring and Assessment Plans. Furthermore, the Agencies' participation in the Bight Survey will build on an existing dataset that provides a regional assessment of the coastal marine health, while simultaneously providing a local assessment of the San Diego Region's lagoons and estuaries.

1.3 TECHNICAL APPROACH

This workplan is designed to provide data needed to answer questions related to the Southern California Bight, the San Diego Region, and the individual lagoons/estuaries of the study. All sites assessed as part of the San Diego County Participating Agency Bight sampling program will fall within one of two Bight '18 strata: 1) the Estuary stratum, or 2) a new Brackish Estuary stratum not assessed in previous Bight programs. Each of the estuarine/lagoon sites have been pre-designated as residing in either a brackish estuary (salinity drops below 27 parts per thousand (ppt)) or estuary (salinity remains at or above 27 ppt) environment based on the site's tidal elevation or historical site

knowledge. The salinity regime designation of each Brackish Estuary site will be confirmed prior to sampling during a reconnaissance visit during low tide (at least 0.5 ft low tide). Should a site not meet the necessary salinity requirements during low tide, an alternate site within the same category (Estuary or Brackish Estuary) will be used. Estuary sites will undergo analysis according to established SQO guidelines and Bight '18 protocols. Brackish Estuary stations will undergo analysis using multivariate AZTI's Marine Biotic Index (M-AMBI) in accordance with Bight '18 protocols (SCCWRP, 2018). M-AMBI analysis will be conducted by SCCWRP.

Data collected from lagoons/estuaries during Bight '18 will be used to answer the following two questions:

- *What is the extent and magnitude of sediment quality impacts in the southern California Bight?*
- *How does the extent and magnitude of sediment quality impacts vary over time in the Southern California Bight?*

In addition, the estuary/lagoon sampling effort will be used to satisfy the anticipated sampling required for the 2018 Permit term in accordance with the Sediment Quality Monitoring requirements and the SQO Policy. Any sites within the Estuary stratum with SQO categorical results other than Unimpacted or Likely Unimpacted will require follow-up evaluations in subsequent monitoring years within the Permit term in accordance with the SQO Policy.

2 San Diego Watershed Management Area Workgroups Bight '18 Participation

The San Diego Regional Participating Agencies are participating in the Sediment Quality Assessment Planning Committee (formally Contaminant Impact Assessment/ Coastal Ecology Workgroup). This Committee is the core of the Bight Program for sediment quality. This study will be used to assess sediment quality (chemistry, toxicity, and benthic community health) in San Diego's lagoons/estuaries. The Sediment Quality Assessment Workplan is included in Appendix B.

3 Sediment Quality Assessment Group Current Program Design

Eleven lagoons/estuaries within San Diego County watersheds were selected for sampling in the Bight '18 program. Locations were selected using a stratified random sampling design consistent with Bight protocols. The design randomly selected station locations within pre-determined brackish and estuarine/marine environments. Sampling will occur one time at each location during the summer of 2018 and is tentatively scheduled to occur from July through September 2018. A list of alternate sites will be provided by SCCWRP in the event that a selected site does not meet sampling criteria, or is unable to be sampled.

The eleven lagoons/estuaries that were selected in the San Diego Region for inclusion in the Bight '18 program are presented in Table 3-1.

Table 3-1. San Diego Region Lagoon/Estuary Stations

Embayment	Number of Stations	Number per Strata Type	Sampling Team
Santa Margarita River Estuary	2	2 Estuary	Weston
San Luis Rey River Estuary	1	1 Brackish	Weston
Agua Hedionda Lagoon	3	3 Estuary	Amec Foster Wheeler
Batiquitos Lagoon	3	3 Estuary	Amec Foster Wheeler
Los Peñasquitos Lagoon	1	1 Estuary	Amec Foster Wheeler
San Dieguito River Estuary	2	1 Estuary; 1 Brackish	Amec Foster Wheeler
Rose Creek- Mission Bay Watershed	1	1 Brackish	Amec Foster Wheeler
San Diego River Estuary	5	1 Estuary; 4 Brackish	Weston
Sweetwater River Estuary	1	1 Brackish	Amec Foster Wheeler
Otay River Estuary	2	2 Brackish	Amec Foster Wheeler
Tijuana River Estuary	1	1 Estuary	Amec Foster Wheeler
Total	22	10 Brackish; 12 Estuary	

Maps of the eleven lagoons/estuaries are provided in Appendix A. The San Elijo Estuary will not be sampled during Bight '18. After discussions with the San Diego Regional Water Quality Control Board, it was determined that due to the ongoing major restoration within this estuary (scheduled to run through 2021), sampling the lagoon at this time would not provide an accurate representation of the estuary's natural ambient condition. During SCCWRP's initial random selection process, one site fell within San Elijo Estuary. This site was therefore reallocated to another lagoon/estuary within the Carlsbad WMA (i.e. Agua Hedionda or Batiquitos Lagoon). Utilizing the Bight program study design, the next randomly selected site in the alternate list within either of these waterbodies was in Batiquitos Lagoon, and was hence utilized as the replacement site.

Several of the other lagoons in San Diego County also require occasional annual maintenance dredging at the ocean inlet to ensure that flows are not restricted. This short-term dredging is typically restricted to the areas near the lagoon's mouth and often occurs in late spring. Maintenance dredging is not expected to affect stations selected for the lagoon sample draw. In the event a sample location occurs in an area that was recently dredged, an alternate back-up station within the same lagoon/estuary and strata (the next on the sample draw list) will be selected as the new sampling location.

3.1 SEDIMENT SAMPLING DESIGN AND PROGRAM

Sediment samples will be collected in accordance with the Bight '18 sampling protocols. Weston and Amec Foster Wheeler staff are participating in all Bight '18 field technical sub-workgroup meetings to ensure that samples will be collected following all Bight protocols. Sediment samples will be collected using a standard 0.1 m² Van Veen grab sampler, where possible, and will be analyzed for chemistry, toxicity, and benthic community. In the event that a Van Veen cannot be easily deployed at a given site, a suitable alternative, such as a ponar grab or push cores, will be used.

Chemistry

Sediment chemistry samples will be collected and analyzed following the Bight '18 protocols. The Bight '18 program core sediment chemistry list is presented in Table 3-2. Chemical analysis of sediment samples provides an assessment of contaminant exposure for bottom dwelling organisms. Sediment samples will be collected from the top 5 cm of the Van Veen grab sample, or similar device, taking care to avoid the sediment immediately adjacent to the side of the sampler to avoid potential metal contamination. The constituent list and associated reporting limits were specifically developed for comparison to sediment quality guidelines such as the State of California's SQOs (SWRCB 2008). Additionally, the chemical analyte list includes both inorganics and organics for comparison to local programs and to state and national monitoring datasets such as California's Surface Water Ambient Monitoring Program (SWAMP) or the National Oceanographic and Atmospheric Administration's (NOAA) Status and Trends program. All chemistry measurements will follow performance-based quality assurance guidelines described in the Bight '18 Chemistry Manual.

Table 3-2. Bight '18 Sediment Analytical List, Methods, and Reporting Limits

Group/Analyte	Method	Units	RL*	Laboratory
General Parameters				
Percent Solids	SM 2540 B	% Wet Weight	0.01	Physis
Particle Size Distribution	Laser Particle Size	µm	-	City of San Diego
Total Organic Carbon	EPA 9060	% Dry Weight	0.01	Physis
Total Nitrogen	EPA 9060	%	0.01	Physis
Trace Metals				
Aluminum (Al)	EPA 6020	ng/dry g	500	Physis
Antimony (Sb)	EPA 6020	ng/dry g	50	
Arsenic (As)	EPA 6020	ng/dry g	50	
Barium (Ba)	EPA 6020	ng/dry g	50	
Beryllium (Be)	EPA 6020	ng/dry g	5	
Cadmium (Cd)	EPA 6020	ng/dry g	5	
Chromium (Cr)	EPA 6020	ng/dry g	5	
Copper (Cu)	EPA 6020	ng/dry g	5	
Iron (Fe)	EPA 6020	ng/dry g	5000	
Lead (Pb)	EPA 6020	ng/dry g	5	
Mercury (Hg)	EPA 245.7	ng/dry g	0.02	
Nickel (Ni)	EPA 6020	ng/dry g	20	
Selenium (Se)	EPA 6020	ng/dry g	50	
Silver (Ag)	EPA 6020	ng/dry g	50	
Zinc (Zn)	EPA 6020	ng/dry g	50	
Synthetic Pyrethroids				
Bifenthrin	EPA 8270D-NCI	ng/dry g	0.50	Physis
Cyfluthrin (total)	EPA 8270D-NCI	ng/dry g	0.50	
Cypermethrin (total)	EPA 8270D-NCI	ng/dry g	0.50	
Lambda-Cyhalothrin	EPA 8270D-NCI	ng/dry g	0.50	
Cis-Permethrin	EPA 8270D-NCI	ng/dry g	0.50	
Trans-Permethrin	EPA 8270D-NCI	ng/dry g	0.50	
Deltamethrin	EPA 8270D-NCI	ng/dry g	0.50	
Esfenvalerate	EPA 8270D-NCI	ng/dry g	0.50	
Organochlorine Pesticides				
2,4'-DDT	EPA 8270D	ng/dry g	0.50	Physis
4,4'-DDT	EPA 8270D	ng/dry g	0.50	
2,4'-DDD	EPA 8270D	ng/dry g	0.50	
4,4'-DDD	EPA 8270D	ng/dry g	0.50	

Table 3-2. Bight '18 Sediment Analytical List, Methods, and Reporting Limits

Group/Analyte	Method	Units	RL*	Laboratory
2,4'-DDE	EPA 8270D	ng/dry g	0.50	
4,4'-DDE	EPA 8270D	ng/dry g	0.50	
4,4'-DDMU	EPA 8270D	ng/dry g	0.50	
cis-Chlordane	EPA 8270D	ng/dry g	0.50	
trans-Chlordane	EPA 8270D	ng/dry g	0.50	
Oxychlordane	EPA 8270D	ng/dry g	0.50	
cis-nonachlor	EPA 8270D	ng/dry g	0.50	
trans-nonachlor	EPA 8270D	ng/dry g	0.50	
Polychlorinated Biphenyls (PCBs) Congeners				
PCB-18	EPA 8270C	ng/dry g	0.25	Physis
PCB-28	EPA 8270C	ng/dry g	0.25	
PCB-37	EPA 8270C	ng/dry g	0.25	
PCB-44	EPA 8270C	ng/dry g	0.25	
PCB-49	EPA 8270C	ng/dry g	0.25	
PCB-52	EPA 8270C	ng/dry g	0.25	
PCB-66	EPA 8270C	ng/dry g	0.25	
PCB-70	EPA 8270C	ng/dry g	0.25	
PCB-74	EPA 8270C	ng/dry g	0.25	
PCB-77	EPA 8270C	ng/dry g	0.25	
PCB-81	EPA 8270C	ng/dry g	0.25	
PCB-87	EPA 8270C	ng/dry g	0.25	
PCB-99	EPA 8270C	ng/dry g	0.25	
PCB-101	EPA 8270C	ng/dry g	0.25	
PCB-105	EPA 8270C	ng/dry g	0.25	
PCB-110	EPA 8270C	ng/dry g	0.25	
PCB-114	EPA 8270C	ng/dry g	0.25	
PCB-118	EPA 8270C	ng/dry g	0.25	
PCB-119	EPA 8270C	ng/dry g	0.25	
PCB-123	EPA 8270C	ng/dry g	0.25	
PCB-126	EPA 8270C	ng/dry g	0.25	
PCB-128	EPA 8270C	ng/dry g	0.25	
PCB-138	EPA 8270C	ng/dry g	0.25	
PCB-149	EPA 8270C	ng/dry g	0.25	
PCB-151	EPA 8270C	ng/dry g	0.25	
PCB-153	EPA 8270C	ng/dry g	0.25	
PCB-156	EPA 8270C	ng/dry g	0.25	

Table 3-2. Bight '18 Sediment Analytical List, Methods, and Reporting Limits

Group/Analyte	Method	Units	RL*	Laboratory
PCB-157	EPA 8270C	ng/dry g	0.25	
PCB-158	EPA 8270C	ng/dry g	0.25	
PCB-167	EPA 8270C	ng/dry g	0.25	
PCB-168	EPA 8270C	ng/dry g	0.25	
PCB-169	EPA 8270C	ng/dry g	0.50	
PCB-170	EPA 8270C	ng/dry g	0.50	
PCB-177	EPA 8270C	ng/dry g	0.50	
PCB-180	EPA 8270C	ng/dry g	0.50	
PCB-183	EPA 8270C	ng/dry g	0.50	
PCB-187	EPA 8270C	ng/dry g	0.50	
PCB-189	EPA 8270C	ng/dry g	0.50	
PCB-194	EPA 8270C	ng/dry g	0.50	
PCB-201	EPA 8270C	ng/dry g	0.50	
PCB-206	EPA 8270C	ng/dry g	0.50	
Polynuclear Aromatic Hydrocarbons				
1-Methylnaphthalene	EPA 8270C	ng/dry g	0.50	Physis
1-Methylphenanthrene	EPA 8270C	ng/dry g	0.50	
1,6,7-Trimethylnaphthalene	EPA 8270C	ng/dry g	0.50	
2,6-Dimethylnaphthalene	EPA 8270C	ng/dry g	0.50	
2-Methylnaphthalene	EPA 8270C	ng/dry g	0.50	
Acenaphthene	EPA 8270C	ng/dry g	0.50	
Acenaphthylene	EPA 8270C	ng/dry g	0.50	
Anthracene	EPA 8270C	ng/dry g	0.50	
Benz[a]anthracene	EPA 8270C	ng/dry g	0.50	
Benzo[a]pyrene	EPA 8270C	ng/dry g	0.50	
Benzo[b]fluoranthene	EPA 8270C	ng/dry g	0.50	
Benzo[e]pyrene	EPA 8270C	ng/dry g	0.50	
Benzo[g,h,i]perylene	EPA 8270C	ng/dry g	0.50	
Benzo[k]fluoranthene	EPA 8270C	ng/dry g	0.50	
Biphenyl	EPA 8270C	ng/dry g	0.50	
Chrysene	EPA 8270C	ng/dry g	0.50	
Dibenz[a,h]anthracene	EPA 8270C	ng/dry g	0.50	
Fluoranthene	EPA 8270C	ng/dry g	0.50	
Fluorene	EPA 8270C	ng/dry g	0.50	
Indeno[1,2,3-c,d]pyrene	EPA 8270C	ng/dry g	0.50	
Naphthalene	EPA 8270C	ng/dry g	0.50	

Table 3-2. Bight '18 Sediment Analytical List, Methods, and Reporting Limits

Group/Analyte	Method	Units	RL*	Laboratory
Perylene	EPA 8270C	ng/dry g	0.50	
Phenanthrene	EPA 8270C	ng/dry g	0.50	
Pyrene	EPA 8270C	ng/dry g	0.50	
Polybrominated Diphenyl Ethers (PBDEs)				
PBDE 17	GCMS-NCI	ng/dry g	0.10	Physis
PBDE 28	GCMS-NCI	ng/dry g	0.10	
PBDE 47	GCMS-NCI	ng/dry g	0.10	
PBDE 49	GCMS-NCI	ng/dry g	0.10	
PBDE 66	GCMS-NCI	ng/dry g	0.10	
PBDE 85	GCMS-NCI	ng/dry g	0.10	
PBDE 99	GCMS-NCI	ng/dry g	0.10	
PBDE 100	GCMS-NCI	ng/dry g	0.10	
PBDE 138	GCMS-NCI	ng/dry g	0.10	
PBDE 153	GCMS-NCI	ng/dry g	0.10	
PBDE 154	GCMS-NCI	ng/dry g	0.10	
PBDE 183	GCMS-NCI	ng/dry g	0.10	
PBDE 209	GCMS-NCI	ng/dry g	0.10	

RL – reporting limit; µm – micrometer; ng/dry g – nanograms per dry gram

* Actual RLs provided by Physis may be lower than those required by the Bight '18 Monitoring Program.

Toxicity

Sediment toxicity samples will be collected and analyzed following the Bight '18 protocols. Sediment samples will be collected from the top 5 cm of the Van Veen grab sample, or similar device, taking care to avoid the sediment immediately adjacent to the side of the sampler to avoid potential metal contamination. The toxicity of bulk sediments from the Estuary strata will be assessed by measuring survival of the amphipod, *Eohaustorius estuarius*, after a 10-day sediment exposure, and development of bivalve embryos, *Mytilus galloprovincialis*, using the 48-hour sediment-water interface test. Both tests support the application of California's SQOs.

Sediment toxicity tests for brackish water samples have yet to be determined. Once determined they will follow Bight '18 protocols.

The following laboratories will be used to conduct toxicity sampling:

- Nautilus Environmental- Santa Margarita River Estuary, San Luis Rey River Estuary, San Diego River Estuary
- Amec Foster Wheeler, Inc.- Agua Hedionda Lagoon, Batiquitos Lagoon, Los Penasquitos Lagoon, San Dieguito River Estuary, Rose Creek, Sweetwater River Estuary, Otay River Estuary, Tijuana River Estuary

Benthic Community Assemblage

Benthic community assemblage samples will be collected and analyzed following Bight '18 protocols, using a standard 0.1 m² Van Veen for collection, but with gear-type substitutions allowed in difficult-to-access habitats. The entire volume of each grab will be processed for analysis. It will be the responsibility of each field team to ensure that surface area sampled is quantified so that all assemblage data will be comparable regardless of gear type utilized. Samples will be processed and preserved in the field. Samples initially will be sorted to five major phyletic groups for distribution to taxonomists who will identify organisms to species. For nomenclature and orthography, accredited taxonomists will utilize the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT) list for marine organisms or the Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) List of Freshwater Invertebrate Taxa (Richards and Rogers, 2011) for freshwater organisms. Bight '18 quality assurance/quality control (QA/QC) procedures will be followed both during sorting and during subsequent taxonomic identifications.

The following laboratories will be used to conduct taxonomic identifications:

- Dancing Coyote Environmental- Santa Margarita River Estuary, San Luis Rey River Estuary, San Diego River Estuary
- Dancing Coyote Environmental and Amec Foster Wheeler, Inc.- Agua Hedionda Lagoon, Batiquitos Lagoon, Los Penasquitos Lagoon, San Dieguito River Estuary, Rose Creek, Sweetwater River Estuary, Otay River Estuary, Tijuana River Estuary

Special Studies

There are four special, or “leveraged” studies planned for Bight ‘18. The special studies represent research that ranges across all 10 indicators being measured in Bight ‘18 that incorporate contaminant exposure, biological response, and habitat condition. Of these studies, only the Contaminants of Emerging Concern study will possibly use data collected from San Diego County lagoons and estuaries. The Contaminants of Emerging Concern study is a pilot project to explore new contaminants using cell assays and may serve as a tool to link contaminants to toxicity. It should be noted that since this study will use only a subset of the total number of Bight stations, it may or may not include lagoon and estuary stations from San Diego County. The incorporation of new measurements and methods into the Bight program benefits regulated participants in the Bight program because they can help determine if a perceived issue is a widespread environmental problem.

3.2 WATER QUALITY SAMPLING

Water quality parameters will be measured at each sampling location prior to sediment sample collection. Field parameters will be measured using a YSI 6920 data sonde, or similar water quality probe, at 6 inches below surface, mid depth, and 6 inches above the bottom. Data collected at each site will include temperature, depth, salinity, dissolved oxygen, and pH. Salinity measurements must be at or above 27 ppt in order to meet the acceptability criteria for sediment sampling at estuary sites and must be below 27 ppt in order to meet acceptability criteria for sediment sampling at brackish sites.

Table 3-3. Water Quality Parameters

Analyte	Method/Instrument	Units	Reporting Limit	Laboratory
pH	Field/ water quality probe	pH Units	1-14	Field
Salinity	Field/ water quality probe	ppt	1-75	Field
Temperature	Field/ water quality probe	°C	0-100	Field
DO	Field/ water quality probe	mg/L	0.2	Field

DO – dissolved oxygen; ppt – parts per thousand; mg/L – milligrams per liter

3.3 PREVENTION OF THE SPREAD OF AQUATIC INVASIVE SPECIES

Southern California marine waters are known to have a number of aquatic invasive species. Weston and Amec Foster Wheeler field scientists are aware of and can identify the macro flora and fauna in the region (e.g., *Caulerpa taxifolia*, *Musculista senhousia*, and *Mytilus galloprovincialis*). Since the vessels to be used in the project are routinely stored on dry land, fouling organisms are not anticipated to be an issue. However, many invasive species are difficult to detect and may be entrained in muds, sediment, or the water column, therefore additional preventative measures are recommended.

In order to prevent the spread of aquatic invasive species from one lagoon/estuary to another, the following precautions will be taken:

- All boat surfaces will be inspected for mud/sediment and aquatic vegetation when initially hauled out from a given water body. Any observed sediment or vegetation will be cleaned off the boat at the site, including the trailer wheels and frame.
- All sampling equipment will be inspected for mud/sediment and aquatic vegetation and cleaned as necessary. Most equipment will be rinsed and decontaminated at the completion of each sampling station, and a final inspection will be conducted prior de-mobilizing and before leaving each water body.
- All personal gear, especially footwear, will be inspected and cleaned before leaving each water body.
- No site water will be transferred between water bodies or discharged from one to another.

4 Data Management and Reporting

The Bight '18 monitoring program will provide the templates for data formatting and submittal of electronic deliverables to SCCWRP. All sample results will be reviewed for adherence to the quality guidelines provided by the individual technical workgroups. Results will undergo thorough quality control review, will be entered into the data sharing templates, and will be submitted to SCCWRP through their dedicated Bight '18 web portal.

Data analysis and reporting will be included in the 2018-2019 Water Quality Improvement Plan (WQIP) Annual Reports due to the RWQCB in January 2020 prior to the release of the Bight '18 work product by 2023.

5 References

- Richards, A.B. and D. C. Rogers. 2011. *Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) List of Freshwater Invertebrate Taxa from California and Adjacent States Including Standard Taxonomic Effort (STE) Levels*. March 2011.
- RWQCB (Regional Water Quality Control Board). 2007. *California Regional Water Quality Control Board San Diego Region, Order No. R9-2007-0001, NPDES No. CAS0108758, Waste Discharge Requirements For Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, The San Diego Unified Port District, and the San Diego County Regional Airport Authority*. January 2007.
- SCAMIT (Southern California Association of Marine Invertebrate Taxonomists). 2013. *A Taxonomic Listing Macro- and Megainvertebrates from Infaunal and Epibenthic Monitoring Programs in the Southern California Bight*. Edition 8. July 2013.
- SCCWRP (Southern California Coastal Water Research Project). 2017. *Southern California Bight 2013 Regional Monitoring Program: Volume VIII. Contaminant Impact Assessment Synthesis Report Technical Report 973*. March 2017.
- SCCWRP (Southern California Coastal Water Research Project). 2018. *Sediment Quality Assessment Field Operations Manual*. May 2018.
- SDRWQCB (San Diego Regional Water Quality Control Board), 2007. *Order No. R9-2007-0001, NPDES NO. CAS0108758. Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer System (MS4s) Draining the Watersheds of the County of San Diego, the San Diego Unified Port District, and the San Diego County Regional Airport Authority*. January 24, 2007.
- SDRWQCB (San Diego Regional Water Quality Control Board), 2013. *Order No. R9-2013-0001, NPDES NO. CAS0109266. National Pollutant Discharge Eliminations System (MPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer System (MS4s) Draining the Watersheds within the San Diego Region*. June 27, 2013.
- SWRCB (State Water Resources Control Board). 2009. *Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality*. August 25, 2009.
- WESTON (Weston Solutions, Inc.). 2007. *San Diego County Municipal Copermittees 2003-2005 Ambient Bay and Lagoon Monitoring Review and Recommendations*. Final Report. Prepared for County of San Diego. January 2007.
- WESTON (Weston Solutions, Inc.). 2011. Appendix H in *San Diego County Municipal Copermittees 2009-2010 Urban Runoff Monitoring*. Prepared for the County of San Diego. January 2011.
- WESTON (Weston Solutions, Inc.). 2012. Appendix H in *San Diego County Municipal Copermittees 2010-2011 Urban Runoff Monitoring*. Prepared for the County of San Diego. January 2012.

WESTON (Weston Solutions, Inc.). 2013. Appendix H in *San Diego County Municipal Copermittees 2011-2012 Urban Runoff Monitoring*. Prepared for the County of San Diego. January 2013.

WESTON (Weston Solutions, Inc.). 2015. *Sediment Monitoring Report*. Prepared for the County of San Diego. January 2015.

APPENDIX A

Station Location Maps



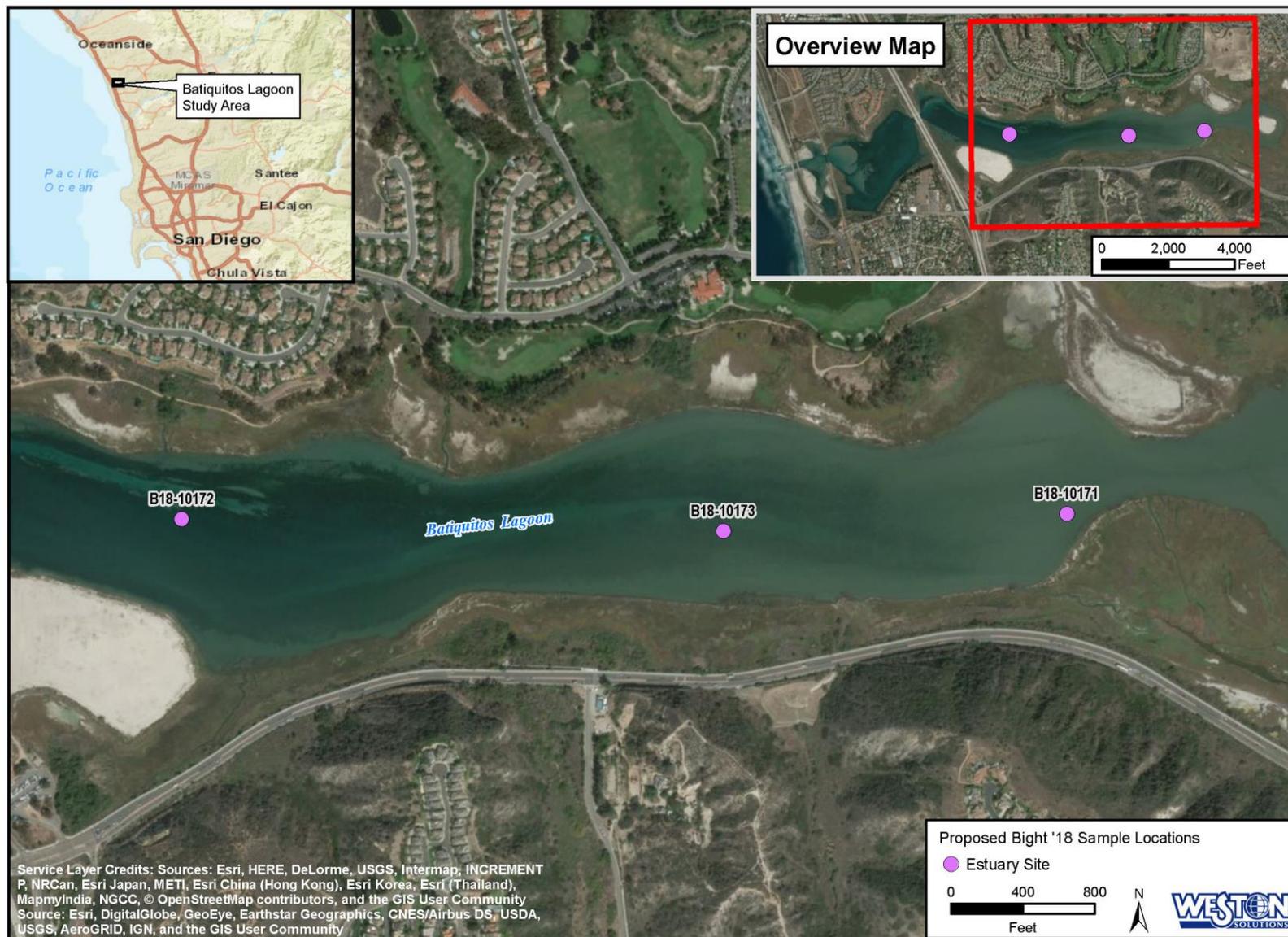
Santa Margarita Estuary



San Luis Rey River Estuary



Agua Hedionda Lagoon



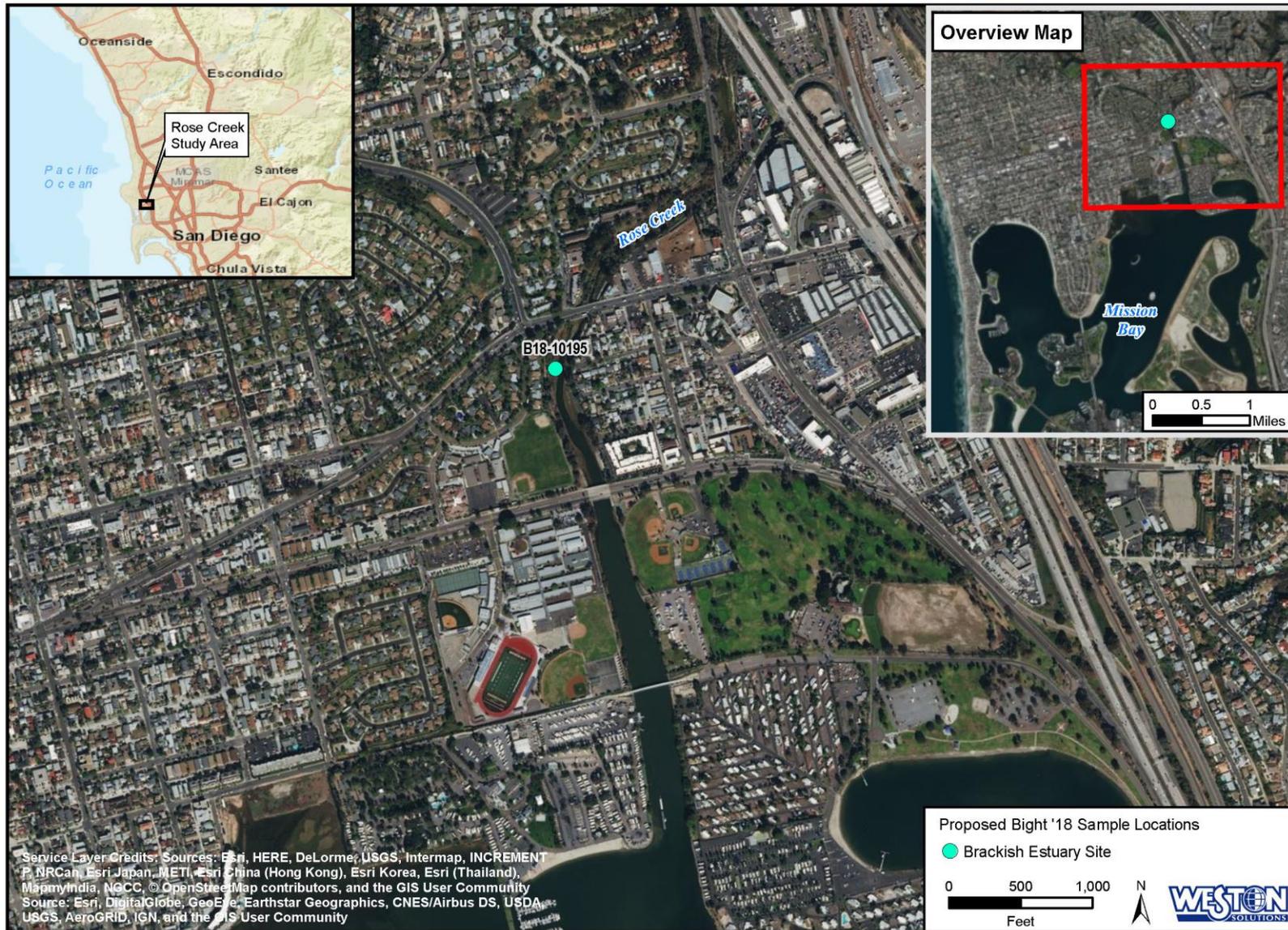
Batiquitos Lagoon



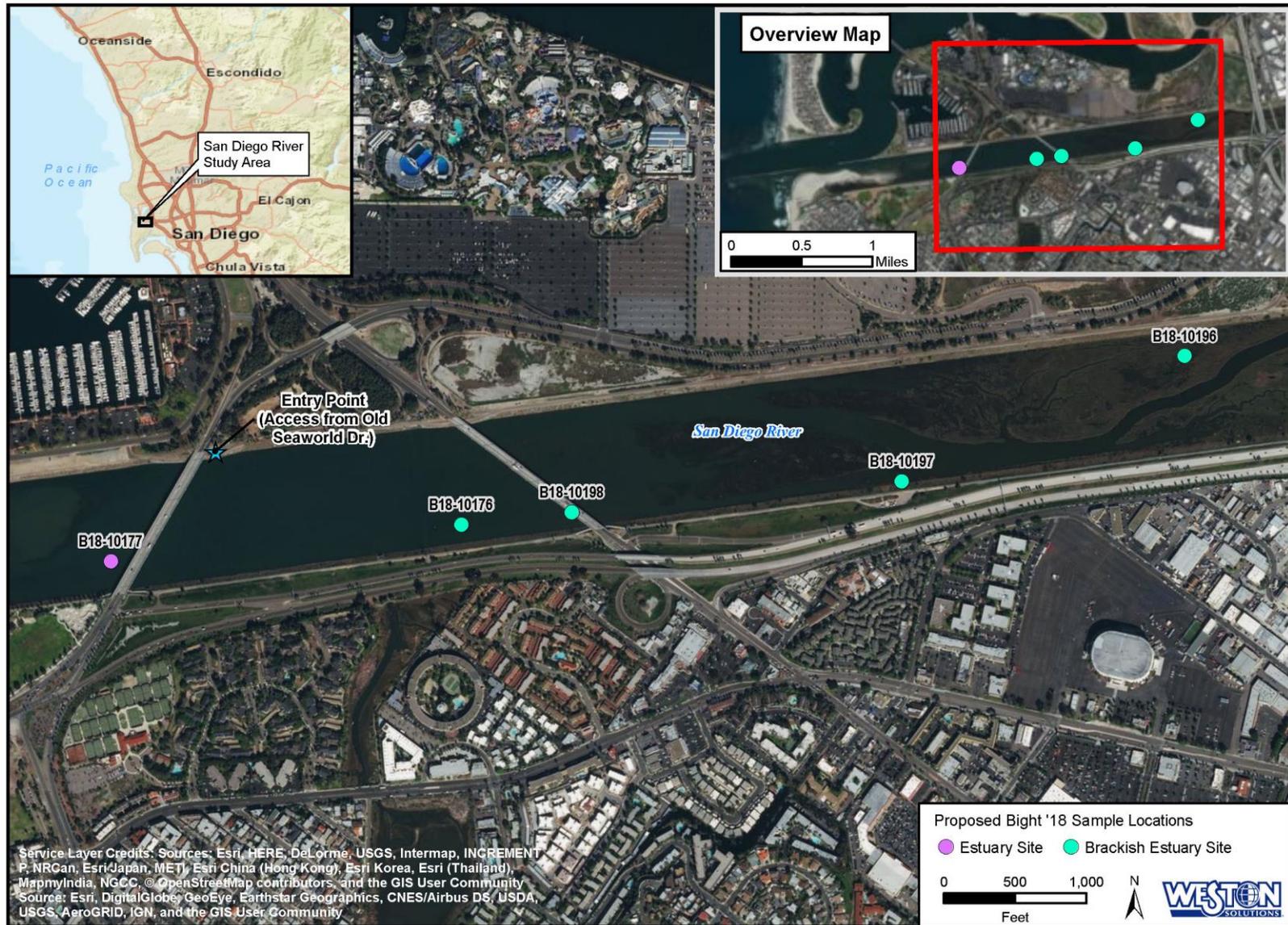
San Dieguito Lagoon



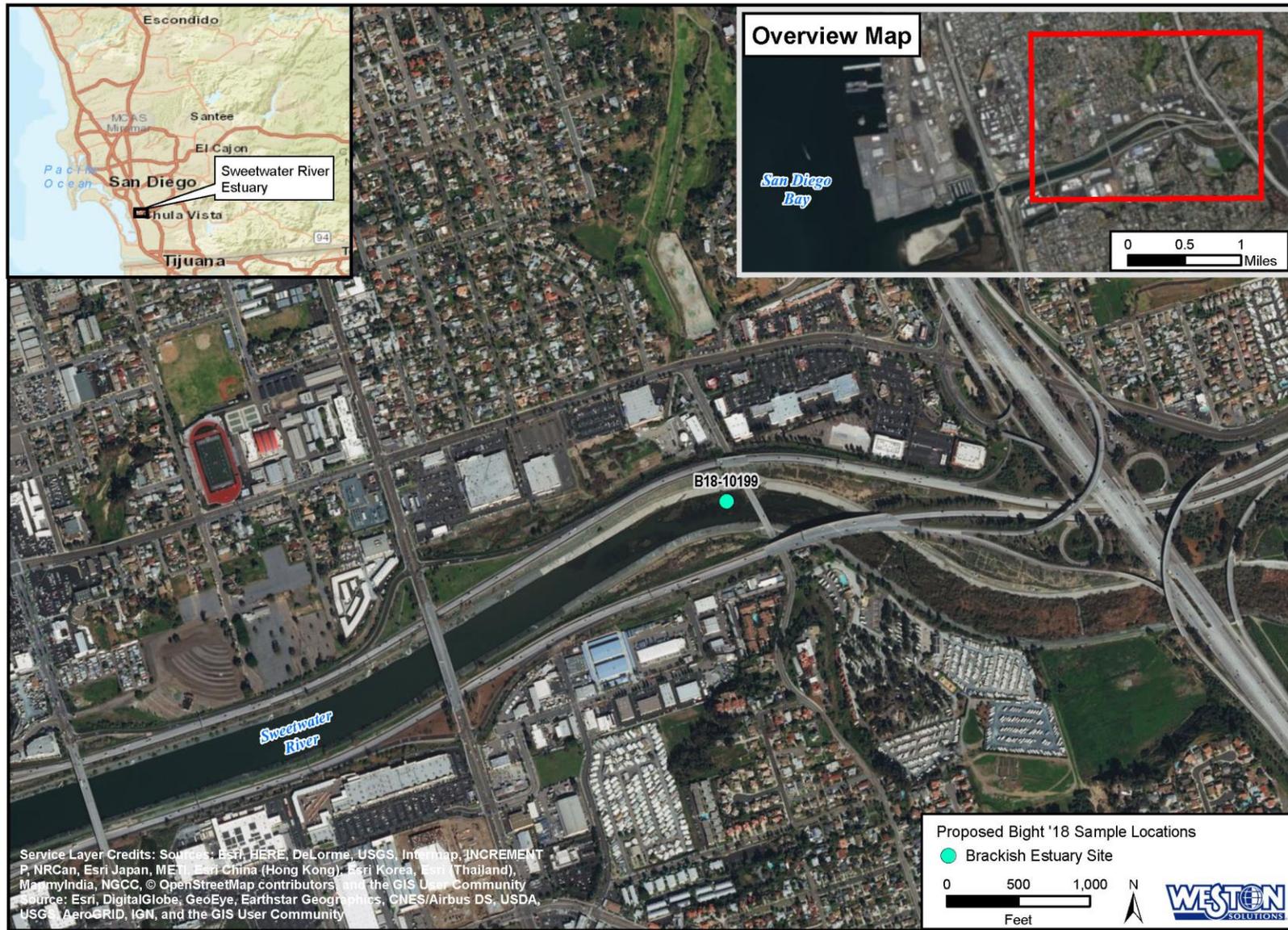
Los Peñasquitos Lagoon



Rose Creek- Mission Bay



San Diego River Estuary



Path: W:\GIS\California\San_Diego_County\13245_SDS\stormwater\Stormwater18\MXD\Bight18\Sweetwater_marsin_proposed_locations.mxd 5/21/2018

Sweetwater River Estuary



Otay River Estuary



Tijuana River Estuary

APPENDIX B

Bight '18 Sediment Quality Assessment Workplan (Separate attachment)