Appendix B Draft Monitoring and Adaptive Management Plan (MAMP) Framework

## Introduction

The purpose of this hydrodynamics and water and sediment quality Monitoring and Adaptive Management Plan (MAMP) is to provide a framework for the Los Cerritos Wetlands Restoration (Program) for monitoring, assessing, and managing potential hydrodynamic and water and sediment quality impacts to biological resources and human health from and to the program after construction. These potential impacts have been identified and discussed in the Sediment Dynamics and Sediment Budget Analysis Report (ESA 2020a), the Hydrodynamic Modeling Technical Report (ESA 2020b), the Sediment and Water Quality Investigation Technical Report (ESA 2019), and the Draft Programmatic Environmental Impact Report (PEIR; ESA 2020c). Due to a number of unknown factors regarding existing sediment quality and post-project processes, post-construction monitoring and assessment will be needed to confirm that impacts remain less than significant. In the case where impacts are indicated based on comparisons to regulatory thresholds, adaptive management measures will be needed. This framework provides a summary of the potential post-construction impacts, the program features that are being taken to make them less than significant, and the monitoring program that will be the basis for continued assessment of these features. Adaptive management measures are also presented that would be taken if impacts are identified based on multiple lines of evidence. This framework meets the requirements of the CEQA process and provides the basis to develop a more detailed final MAMP.

## Monitoring and Adaptive Management Framework

Figure 1 presents the MAMP framework that has been developed based on answering the following key questions for impacts from and to the program:

### Impacts from the program

- Has the program increased deposition in the San Gabriel River to a point that could cause flooding?
- Is the site experiencing erosion that could threaten levee stability?
- Have exposure and/or migration of legacy constituents above thresholds in marsh sediments resulted in potential impact to biological resources?

#### Impacts to the program area

• Have dry weather flows and stormwater from the watershed and adjacent lands resulted in accumulation of constituents in sediments within wetlands at concentrations that result in a significant impact to biological resources or human health?

## **Current Monitoring**

This MAMP has been developed with the recognition that existing monitoring can provide information to inform adaptive management of the Los Cerritos Wetlands Restoration project. The City of Long Beach conducts conditions surveys of the Alamitos Bay entrance as well as sediment sampling. Additionally, Los Angeles County and the Los Angeles County Flood Control District (LACFCD) lead the Alamitos Bay/Los Cerritos Channel Coordinated Integrated Monitoring Program (CIMP). Thirteen cities and the LACFCD manage the Lower San Gabriel River CIMP. CIMPs assesses compliance with the MS4 Permit and measures the effectiveness of pollutant control measures.

Cooperation with regional monitoring programs is also important, as these programs provide developed standard protocols, baseline data, and the ability to compare to other estuaries in Southern California. The regional program includes the Southern California Bight Regional Monitoring program, which has a coastal wetland assessment component. This assessment framework can be used in combination with the framework presented in this MAMP to provide multiple lines of evidence to assess the health of the wetlands and inform management actions. Collaboration with these regional programs is fundamental to the development of the final MAMP, which will include reference to these programs and the methods, protocols, and baseline data developed under these programs.

# Summary of Potential Impacts, Planned Mitigation Measures, and Effectiveness Monitoring

Potential hydrodynamic impacts may originate from the program due to increased deposition or erosion caused by the reconnection of the San Gabriel River to the Central Area and expansion of the connection to the South Area. Water and sediment quality impacts may originate from the program due to site grading that could cause exposure of sediment containing legacy constituents above regulatory thresholds. Impacts to sediment and water quality within the program may result from constituent loading from stormwater runoff from the watershed and surrounding urbanized areas adjacent the program area.

These and other potential impacts are summarized in Table 1 and categorized as either "impacts from the program" or "impacts to the program area." Table 1 also summarizes the planned program features to avoid potential impacts from the program. The regional watershed measures to address the impacts to the program are also summarized. Watershed measures are the responsibility of the Permittees and listed parties to the applicable total maximum daily loads (TMDL) enforced through the municipal separate storm sewer system (MS4) stormwater permit. In the final column of Table 1, the planned monitoring to confirm the effectiveness of these features is summarized.

Potential Impacts	Planned Program Features or Watershed Management Measures	Planned Post-Construction Monitoring to Assess Effectiveness of Mitigation Measures		
"From the Program"				
Channel Deposition – Deposition in the San Gabriel River or entrance to Alamitos Bay could cause flooding or increase the amount of dredging for navigation	New Levees in the Central Area – The proposed levees in the Central Area are designed to accommodate some level of channel deposition and maintain flood protection. The Hydrodynamic Modeling Technical Report shows that the program increases the freeboard on the levees as proposed. The exact height of the levees with be refined during project-level analysis and include assessment of the maintenance limit that would maintain the current level of flood protection.	<b>Channel Cross-Section Monitoring</b> – Based on annual channel surveys, any locations with substantial channel deposition would be identified and channel cross-sections would be surveyed. The survey results would be compared to the maintenance limits established for the project. If channel surveys show that channel dimensions are reduced below the established maintenance limit in any location along the channel, the potential effect of the deposition on flood levels would be assessed. This assessment would include updating the hydraulic model with the surveyed channel dimensions to test whether the deposition would negatively affect flood performance. This assessment would be overseen by a qualified licensed professional civil engineer. If flood performance was found to be impacted, channel maintenance would be performed. If no impact was found, surveys would continue to be performed with an adjusted focus on areas of deposition.		
		Alamitos Bay Monitoring – The City of Long Beach performs regular monitoring of elevations in the Alamitos Bay entrance. If significant erosion is observed in the program area, surveys would be performed to quantify the amount of erosion. Monitoring data from the harbor entrance would be assessed in coordination with the City of Long Beach to determine if a corresponding significant increase in deposition in the harbor entrance occurred. If such an assessment indicates that erosion from the wetlands could have potentially caused a significant increase in deposition, additional sampling of sediment deposits in the harbor entrance channel would be performed to assess sediment properties and compare them against sediment properties in the program caused a significant increase in deposition in the entrance channel, then the partners would coordinate and agree to a plan to accommodate the increase in sediment deposition. This could include cost-sharing proportional to the increase in deposition, sediment management measures to re-use/replace deposited sediment within the program area, or other measures.		

TABLE 1: SUMMARY OF POTENTIAL IMPACTS, MITIGATION MEASURES, AND EFFECTIVENESS MONITORING

Potential Impacts	Planned Program Features or Watershed Management Measures	Planned Post-Construction Monitoring to Assess Effectiveness of Mitigation Measures
Channel Erosion – Erosion or migration of the channel could threaten levee stability	<b>Erosion Protection</b> – The program would provide erosion protection by realigning the flood risk management levees to the perimeter of the Central Area around the restored wetlands and restoring a wide vegetated floodplain that slopes from wetland to upland habitats along the new perimeter levees. This broad marshplain is expected to reduce storm flow depths and velocities near the new levees, thereby reducing the potential for levee erosion. Some gradual channel migration and periodic localized bank erosion and sedimentation would be expected to occur as is typical for natural river and estuary systems. The restoration is designed so that (1) this level of change would be acceptable for the habitat restoration and flood risk management and (2) the channel would not require regular maintenance. During project-level design, erosion protection features may be included to address areas where higher flows do occur and scour potential is increased.	<b>Erosion Monitoring</b> – Levees and channel banks in the Central Area would be inspected for erosion. Any locations of significant erosion would by assessed for potential effects. Inspection and assessment should be performed by a qualified licensed professional civil engineer. In any locations where erosion is observed, the area would be assessed to determine if the erosion is negatively affecting the levee integrity. If negative effects are determined, a plan would be developed, which could include actions such as placement of armoring or buried armoring. Note that this is not expected. If any locations of significant channel bank erosion are observed, the areas would be assessed for potential continued erosion that could negatively affect habitat or adjacent levees/infrastructure. If negative effects were determined, a plan would be developed, which could include actions such as placement of armoring or buried armoring or buried armoring or buried armoring. This is not anticipated.
Erosion of marsh sediments with legacy constituents – Legacy constituents at concentrations above thresholds could become exposed and/or migrate through stormwater runoff or new channel scouring.	<b>Pre-Construction Sediment Sampling</b> – A pre-construction sampling analysis plan would identify sediments with high levels of constituents and designate those sediments for burial or use in less effected habitats. As part of the final permit and design process, pre-construction sampling and analysis of sediment for legacy constituents that will be exposed or used as foundation material for the wetlands and upland habitat will be performed. This pre-construction sampling will provide additional representative characterization to address any potential impacts from identified legacy constituents above threshold levels that pose a significant impact to biological resources and human health. The testing and analysis will also meet dredge material characterization requirements for marine placement. The results of this sampling and analysis will be used to develop the sediment management specifications for the program.	Monitoring of Marsh Sediment Quality – Potential impact will be monitored in coordination with Permittees' TMDL monitoring of the San Gabriel River. The TMDL monitoring of the channel will be supplemented by sampling of sediment in new wetland channels subject to erosion and accumulation of migrated sediment and analyzed for legacy constituents (metals, PCBs, DDT, PAHs) and compared to TMDL sediment criteria. If the results indicate concentrations of these legacy constituents exceed the criteria, toxicity and benthic surveys will be conducted and results compared to Sediment Quality Objectives (SQOs). Further testing to identify the source of these constituents. Management action will be taken based on results of the analysis, confirmation sampling, and source identification studies.

Potential Impacts	Planned Program Features or Watershed Management Measures	Planned Post-Construction Monitoring to Assess Effectiveness of Mitigation Measures
Deposition of sediments with high constituents in the marsh – Constituents that are hydrophobic such as many metals, pesticides, and PAH will adsorb to sediment that is carried by stormwater to the wetland and settle out, potentially impacting the existing and restored wetland biological resources.	<ul> <li>Tidal Channel Design – The program has been designed to allow for natural flushing and circulation within wetland channels to improve water quality.</li> <li>Stormwater Treatment Best Management Practices (BMPs) – The program will implement BMPs to collect and treat stormwater from outfalls that discharge directly to the wetlands. Bioswales are planned along the Central Area perimeter levee to remove sediment and constituents from runoff from the adjacent roadway.</li> </ul>	<ul> <li>Monitoring of Watershed Storm Flows and Dry Weather Flows – The Permittees under the Harbor Toxics TMDL will continue to monitor water and sediment quality from the watershed at the mouth of the San Gabriel River to track progress toward and confirm attainment of load reductions and TMDL targets.</li> <li>Monitoring of Wetland Channel Sediment Quality – Long-term monitoring of existing and new wetland channels, which are subject to stormwater discharge, will be performed in accordance with approach outlined in this MAMP. The TMDL monitoring of the river will be supplemented with sampling of sediment in existing and new wetland channels, which are subject to accumulation of migrated sediment from watershed and adjacent property, analyzed for legacy constituents (metals, PCBs, DDT, PAHs), and compared to TMDL sediment criteria. If the results indicate concentrations of these legacy constituents exceed the criteria, toxicity and benthic surveys will be conducted and results compared to Sediment Quality Objectives (SQOs). Further testing will be performed to confirm these results and determine the source of the constituents (Is the source from the watershed, site, or adjacent properties?). Management action will be taken based on results of the analysis, confirmation sampling and source identification studies. If stormwater is determined to be the source, additional BMPs may be implemented.</li> </ul>

Figure 1 Accretion and Erosion Monitoring and Adaptive Management Flow Chart



#### **Accretion and Erosion Framework Steps**

As presented in Figure 1, the MAMP framework provides steps that are to be taken in coordination with other monitoring efforts. The steps of the framework are highlighted in purple, which differ from the current monitoring elements, in teal. Each step includes decision points that determine if the next step is taken or if no further action is needed. The decision points are shown in Figure 1 as questions in green with yes or no responses.

**Step 1: Erosion and Accretion Monitoring.** The framework begins with program monitoring for evidence of scouring and sediment accretion. These site inspections and surveys are to be conducted on an annual basis.

**Step 2: Hydraulic Modeling.** If the surveys conducted in Step 1 show that the San Gabriel River has experienced enough accretion to reach the maintenance limits of the channel, hydraulic modeling will be conducted to determine any potential impacts to flooding. This assessment would include updating the hydraulic model with the surveyed channel dimensions to test whether the deposition negatively affects flood performance. This assessment would be overseen by a qualified licensed professional civil engineer.

**Management Actions.** If hydraulic modeling shows the accretion in the channel could cause flooding, channel maintenance would be performed.

**Step 3: Quantify Erosion.** In areas where the inspection in Step 1 shows substantial erosion, the erosion would be quantified through additional surveys.

**Step 4: Assess Cause of Erosion.** In areas where the inspection in Step 1 shows substantial erosion (as determined by Step 3) the cause of the erosion would be evaluated. A licensed civil engineer would assess whether erosion is due to an infrequent event and whether placement of sediment to re-bury and re-vegetate is likely to be sustainable. This assessment may include continuing focused monitoring.

**Management Actions.** If the erosion is determined to be due to infrequent storm events, sediment may be placed and re-vegetation could occur. If the erosion is occurring in an area without armoring, armoring could be placed to protect levee stability. This is not expected.

**Step 5. Sediment Sampling.** If surveys conducted by the City of Long Beach show an increase in the deposition in Alamitos Bay during the same period that substantial erosion from the marsh has been observed, sediment sampling will be conducted to determine sediment properties in the marsh. These properties will be compared to data from the City of Long Beach in the marina entrance to determine if the increased sediment is a result of the program.

**Management Actions.** If sediment sampling shows the increase in deposition or lowered sediment quality in the marina entrance is due to the program, then the partners will coordinate and agree to a plan to accommodate the increase in sediment deposition. This could include cost-sharing proportional to the increase in deposition, sediment management measures to re-use/replace deposited sediment within the program area, or other measures.

#### Water and Sediment Quality Framework Steps

**Step 1: Erosion and Accretion Monitoring.** The framework begins with program monitoring of the wetland channels for evidence of scouring and sediment accretion (Figure 2). These site inspections are to be conducted on an annual basis. Evidence of scouring or accumulation of sediments in new channels will be identified and recorded. The observed or likely source of the sediment that has accumulated will be assessed and recorded. Potential observations of scouring and erosion and likely potential sources are listed in the table below:

Example Potential Observations	Potential Likely Sources	
Accumulation of sediments in existing or new wetland channels near observed stormwater runoff outfall or erosion in upland area	<ul> <li>Stormwater runoff from adjacent land that may or may not be managed through program BMPs</li> <li>Stormwater from upland area that has</li> <li>channelized and eroded existing soils</li> </ul>	
Accumulation of sediments in wetland channels in areas that are predicted for higher sediment accretion from the watershed with no evidence of local channel scouring	Watershed storm flows	
Accumulation of sediments in wetland channels in areas that are predicted for higher sediment accretion from the watershed, but also show evidence of local channel scouring	<ul><li>Watershed storm flows</li><li>Localized scouring of wetland channels</li></ul>	
Scouring of the San Gabriel River observed and accumulation of sediments in adjacent and downstream wetland channels	San Gabriel River sediments	
Accumulated sediment in new channels with multiple observations of San Gabriel River and wetland channel scouring and likely loading from the watershed	<ul><li>Watershed storm flows</li><li>Localized scouring of wetland channels</li><li>San Gabriel River sediment</li></ul>	

These observational data are to be used in combination with previous baseline and preconstruction testing of sediments to determine if additional action is needed. If previous testing indicated no potential impact from sediments in areas that have been exposed, or in accumulated sediments from a known site source, then no further action is needed. If exposure or accumulated sediment is from an on- site source that has not been characterized, then further program monitoring is needed. This additional program monitoring would be conducted in coordination with the results of the Permittees TMDL monitoring of the San Gabriel River water column and sediments. If the TMDL monitoring identifies through SQO assessment that the sediments are impaired or likely impaired, than these results will inform further program monitoring as outlined in the framework in Figure 2.





**Step 2: Sediment Testing.** If the erosion and accretion monitoring and review of existing sediment quality data indicate further monitoring is required, then the second step would include the sampling and analysis of targeted sediment within wetlands channels. For this step the analysis will be limited to chemical analysis of legacy and identified new constituents such as synthetic pyrethroid pesticides. The concentrations of these constituents will be compared to TMDL sediment quality targets based on the effects range low (ER-Ls) or other applicable thresholds for the emerging pollutants.

**Step 3: Toxicity and Bioassessment Testing.** If the ER-L targets or thresholds are exceeded, further analysis of the sediment will be conducted to include toxicity and benthic bioassessment to assess the sediments using SQO methods.

**Step 4. Determine Source.** If the sediment is identified through the SQO process to be impaired or likely impaired, then the next step would be conducted. This step includes an assessment of all the data from the various monitoring programs and identification of the likely or known sources of the constituents that are predominant in resulting in the impaired condition. This may require additional monitoring and testing. For example, to determine the sources of sediment impairment in accumulated sediment in new wetland channels, evaluation of the chemistry data may indicate that the presence of synthetic pyrethroid pesticides above the  $L_{50}$  based threshold. Further testing of the sediments could indicate that the sediment results in a toxic response to marine arthropods. Toxicity identification evaluations (TIE) testing could then indicate that the toxicity is due to these pesticides. Since these pesticides have only recently been introduced and heavily use (last 10 years), the analysis could conclude that the source of sediment was from recent watershed or adjacent urbanized land storm flows. The analysis would show that the sediment is likely from the watershed where these pesticides are used.

**Management Actions.** Management actions will be taken if the results of steps 1 through 4 confirm sediment is impaired or likely impaired, or linked to fish tissue exceedance, and the source has been identified as from the Project. Management actions that may be taken by the Project to address the impairment include:

- Further testing to delineate impaired sediments further delineation of the sediment that contains constituents that are resulting in impairment may be needed to limit the extent and depth of sediment to be managed.
- Focused removal of impacted sediments in channel following delineation of the sediments that contain concentrations above the thresholds and result in SQO identified impaired or likely impaired conditions, management actions may require focused removal of sediment. Sediment removal would be balanced with impacts to sensitive species and habitat within the wetlands channels. No sediment removal outside the channels is recommended due to the potential impact to habitat.
- **Implementation of Additional BMPs** additional BMPs to treat stormwater from adjacent lands that discharge to the wetlands may be needed to remove constituents that continue to accumulate in sediments within the wetland channels.

Management actions will also be taken if the results indicate that the sources of impaired or likely impaired sediments or fish tissue exceedance are from constituents present in storm and/or dry flows from the watershed. For these management actions, the Project will work with Permittees and the Los Angeles Regional Water Quality Control Board through cooperation agreements to address the impairment. If the source of the impairment is identified directly due dry weather or storm flows from the Ballona watershed, and from constituents under an existing TMDL, than action will be taken by Permittees under Permit and TMDL requirements.

## Summary

This framework outlines the monitoring and assessment elements needed to determine if Project features and watershed actions are effective in addressing potential impacts to biological resources or human health. This framework also uses monitoring to assess sources, if impacts are determined through comparison to established thresholds and compliance targets. As Program features address potential accretion, erosion, and water and sediment quality impacts, the monitoring outlined in the framework is to assess the effectiveness of these features. In addition, this framework addresses the potential unknowns that include the potential erosion and accretion of sediments, the potential exposure and migration of sediment that has not been previously characterized and contains constituents above the thresholds, and the potential accumulation of emerging pollutant from the watershed that are not addressed in the current TMDL, such as synthetic pyrethroid pesticides. This monitoring and adaptive management framework therefore provides an additional Program feature to mitigate for the uncertainties that are not fully addressed by the Program or through the existing monitoring for the watershed and Alamitos Bay.