TECHNICAL MEMORANDUM

Date: **October 5, 2007**

Subject: **Water Quality Data Gap Investigation**
                        Ballona Wetlands Restoration Project

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This Technical Memorandum has been prepared at the request of the Water Quality Committee as a guideline for discussion of water quality data gaps and sampling strategies to address these gaps. This memo includes a brief introduction of the water quality issues and gaps, the potential monitoring activities to address the gaps and the sampling strategy.

Introduction:

As part of the Existing and Historical Conditions Report for the Ballona Wetlands Restoration, existing and future water quality was evaluated for potential sources of fresh and tidal waters into Areas A, B and C. Available water quality data was summarized in the Baseline Conditions Report and data gaps identified. These data gaps included water quality data from the tidal prism of Ballona Creek, Fiji Ditch, and stormwater flows into Area B from Culver and Lincoln Boulevards.

Although water quality data exists above the tidal prism in Ballona Creek, it was identified in the Baseline Report that only sediment quality data are available in the tidally influenced segment of the channel. These sediment data indicated toxicity to aquatic organism potentially from organic compounds present in these sediments. Based on the proposed restoration alternatives for Areas A, B and C; waters from the tidally influence portion of Ballona Creek have been identified as a potential source of tidal flows into restored areas. There is concern that waters from Ballona Creek and the surrounding urban landscape may introduce constituents of concern to current and future restored tidal marsh areas, resulting in a negative impact on the habitats and biological resources.

Based on these data and the potential for impact to restored areas, it was recommended that sediment quality be investigated within the existing Area B channels subject to muted tidal flows from Ballona Creek through the existing tide gate. The investigation of sediment quality within Area B was identified as the first phase in addressing the water quality data gaps, because sediment quality provides a component in the assessment of longer term water quality issues. In addition, it was identified that in order to investigate water quality in the tidal prism, various wet and dry flow and tidal conditions would need to be sampled to obtain a representative data set to evaluate water quality. Sediment sampling and analysis including toxicity testing therefore provided an initial, less intensive, assessment approach.

The results of the sediment sampling and analysis indicated potential toxicity effects to aquatic organisms from sediment located close to the tide gate in Area B that controls tidal flows from Ballona Creek; and, along Culver Boulevard where urban runoff from Playa del Rey enters the wetland. Based on these findings, the Water Quality Committee identified the need for further

investigations to address the remaining water quality data gaps.   These include water quality within the tidal prism of Ballona Creek which has been identified in the proposed alternatives as a potential source of tidal flow for Areas A, B and C; and significant stormwater flows into Area B. In addition, the water quality of tidal flows from Marina del Rey into Fiji Ditch should also be investigated as this represents an additional likely source of tidal flow into Areas A and C.

Purpose of Memorandum:

The purpose of this Technical Memorandum is to outline the stormwater monitoring activities that will address the water quality data gaps identified by the Water Quality Committee based on the evaluation of existing data and the results of the sediment investigation in Area B. This Memorandum also summarizes the recommended field equipment to complete these monitoring activities. It is the intention of this memorandum to serve as guidance document for the Water Quality Committee to coordinate with the City, County and other agencies who are conducting water quality sampling in addressing the identified data gaps.

Water Quality Monitoring Activities:

In order to address the identified water quality data gaps regarding constituent loading and potential impact to the wetlands from Ballona Creek, a water quality monitoring program is recommended that includes sampling during a significant storm event at the proposed inlets to restored wetland areas based on the current restoration alternatives. In addition, sampling should also be conducted where significant stormwater flows enter the wetlands, specifically were stormwater enters Area B from Playa del Rey at Culvert Boulevard, and from stormwater flows from Lincoln Boulevard not captured and monitored at the fresh water marsh. The overall strategy for this water quality monitoring program is to obtain data on the constituent loading and potential toxicity of fresh and tidal water flows into the existing and restored wetlands.

The following monitoring program provides a guideline for developing a monitoring plan and Quality Assurance Project Plan for the Ballona Westland Restoration project. This program also provides the California Coastal Conservancy and the Water Quality Committee with an opportunity to coordinate with other agencies who may be collecting water quality samples in the estuary and could provide elements of this program.

The components of the water quality program include:

- **Ballona Creek Tidal Prism Sampling** – The purpose of this sampling is to address the data gap on the water quality data within the tidal prism of the Ballona Channel that is a current and likely future source of flows into Area B and potentially into Areas A and C. During dry weather, tidal flows provide the inflow into the wetlands. The question that is to be answered is the constituent loading from combined fresh water stormwater flows and tidal flows during a storm event and the tidal flows following the storm. These conditions that are the likely highest to lead to the highest constituent loading. Samples should be collected at locations along the channel that provide a representation of potential flows into the restored wetlands. To develop loading estimates, flow measurements are required.   Pollutagraph sampling is recommended to capture the variably of water quality during a storm event and to identified the portion of the wet weather flows that may need to be diverted until water quality in the channel improves. Sampling after the storm will further provide

data to assess the effectiveness of fresh water flow diversion with regard to long term loading and potential impact to the wetland. Sampling in the channel should also include sampling at different depths to capture the varying water quality in the fresh and salt water strata and interfaces.

- **Marina del Rey and Fiji Ditch Sampling** – The purpose of this sampling is to fill in the data gap regarding the water quality of tidal flows into Fiji Ditch from Marina del Rey. This may be a primary source of tidal flows to Areas A and C. Water quality in the main channel of Marina del Rey is higher than in the Ballona estuary. However, back inlets have lower water quality due to lower circulation and source inputs. Conditions during rain events are likely to be less variable than the Ballona Channel, and more tied to tidal fluctuations. Therefore the strategy for these samples should include sampling during dry and potentially wet weather under low and high tide conditions. Since there is likely less variability during storm events, grab samples at these locations are more applicable. During the storm events the grab samples should be collected during or directly after the peak flows in surrounding outfalls.

- **Direct Stormwater Inputs** – This sampling should be targeted to significant inflows of stormwater from surrounding uplands that include storm flows from Culvert Boulevard and Lincoln Boulevard that is not captured and monitored by the fresh water marsh. These significant flows should be monitored during storm events and include pollutagraph samplings to assess the constituent loads over the storm events. Flow and constituent concentrations should be monitored.

- **Existing Tidal Inlets** – The purpose of this sampling is to supplement the proposed three channel locations in determining the water quality of the tidal and stormwater flows into the wetland. This location corresponds to the existing tidal inlet. Flow is controlled through tide gates. Since this sampling location provides supplemental data, the sampling approach would collection of grab samples during rise, peak and fall of the storm event hydrograph. These samples would be used to develop a targeted pollutagraph that could be compared to the other channel sites where additional samples would be collected. A grab sample would also be collected following the storm when the salinity has returned to the pre-storm condition. This data will supplement the sediment data collected in the channel within the wetlands that receives tidal flow from this inlet.

The potential sampling locations to complete each of these components are shown on Figure 1. These sites include restoration alternative inlet sites and where substantial urban runoff may enter the wetlands. The sampling sites are listed in the table below and are grouped according to the four components listed above. Also summarized in Table 1 are the recommended sampling approaches and conditions to be monitored that will be discussed in more detail in the following discussion.

Figure 1: Suggested Water Quality Monitoring Locations -Ballona Wetlands

Table 1 – Potential Water Quality Sampling Locations and Sampling Approach

Site Locations	Monitoring Component	Conditions Monitored	Sampling Approach	Pollutagraph	Wet Weather	Tidal Flucuat.	Various Depths	Flow & Field Measure.	Dry Weather
BALLOCH-1	Ballona Creek Tidal Prism	Storm Event and Tidal Fluctuations	Pollutagraph Sampling – Flow Measurements – Sampling during storm event until salinity levels return to pre-storm conditions – Sampling at different depths to capture fresh and salt water strata/interface	√	√	√	√	√*	
BALLOCH-2				√	√	√	√	√*	
BALLOCH-3				√	√	√		√	
MdR Inlet	Potential Inlets to Areas A and C from Marina del Rey	Dry and Wet Conditions under varying tidal conditions	Grab Sampling during dry and wet weather at low and high tide conditions – wet weather flows have less impact – flows are predominantly tidal		√	√		√	√
Fiji Ditch Inlet					√	√		√	√
Fiji Ditch					√	√		√	√
Stormwater at Playa del Rey	Significant Stormwater Flows into the Wetlands	Stormwater Flows	Pollutagraph Sampling – Flow Measurements – Sampling during storm event	√	√			√	
Stormwater at Lincoln				√	√			√	
Ballona Site 1	Existing Inlet to Area B	Storm Event and Tidal Fluctuations	Pollutagraph Sampling – Flow Measurements – Sampling during storm event until salinity levels return to pre-storm conditions	√	√	√		√	

* Continuous Measurement of Flow and Field Parameters during the wet season (approximately 2-3 months)

Sampling Strategy:

The following discussion presents a summary of the sampling strategy for the four components listed above:

Ballona Creek Tidal Prism Sampling

- **Continuous Monitoring of Physical Water Quality** -Continuous monitoring should be conducted at the Ballona Channel sites (BALLOCH-1, -2, and -3) for salinity, pH, conductivity, and temperature. Monitoring will utilize a continuously deployed data sonde for a one to two month period coinciding with the storm water monitoring event. Sampling frequency should be every ten minutes for the duration of deployment. At two sites (BALLOCH-1 and -2) continuous monitoring should be conducted at two depths in order to investigate the interaction between the tidal prism and the stormwater.

- **Storm Event Pollutagraph Monitoring** -Pollutograph monitoring should be conducted at each site during at least one storm event between October 1, 2007 and April 30, 2008. Additional storm events will provide a more robust data set. At least three events are needed to develop a statistical analysis of variability.

  Weather should be monitored from October 1, 2007 through April 30, 2008. Any storm predicted to produce 0.20" of rain or greater in any 24 hour period should be considered viable for monitoring. Once rainfall appears probable, teams should be mobilized to sample the storm event.

  Monitoring should attempt to capture the rise and fall of the hydrograph from first flush until the salinity returns to pre-storm levels and/or the flow is within 10% of base flow conditions. However, rainfall intensity and duration may vary the periodicity of sampling. During a 24 hours period, eight to ten samples should be selected for analysis.

- **Pollutagraph Sample Analysis** - Grab samples will be collected and analyzed for:
    - Total metals,
    - Dissolved metals
    - PCBs
    - Chlorinate
    - Organic pesticides
    - Synthetic pyrethroids
    - PAHs
    - Nutrients
    - Hardness
    - Total suspended solids
    - Total dissolved solids

  In addition toxicity testing would be recommended on a target number of samples.

- **Quality Control Samples** - A minimum of one field blank and one blind duplicate sample will be submitted to analytical laboratories for analysis. This represents a QA rate of 10%. All samples will be delivered to the analytical laboratory within the required holding times following chain-of-custody procedures.

- **Field Equipment -**Anticipated equipment includes, but is not limited to the following items:

  Automated Sampler Equipment
  Sigma 900SD Auto sampler with standard base (discrete) or composite base (composite)
  12 V gel battery
  Gel battery charger
  RS232 communication cable
  Peristaltic Tubing
  Teflon lined tubing
  Sample intake strainer
  >   Composite sample bottle
  >   19 L borosilicate glass bottle
  >   Silicon Stopper
  >   Discrete sample bottles
  >   Bottle rosette (plastic or glass)
  >   Bottle retainer
  >   Distributor arm

  Flow Sampling Equipment (depending on site recon)
  920 AV flow meter
  AV sensor w/ 150' cable

  Data sondes
  YSI 6920 w/ pH, salinity/conductivity, temperature, dissolved oxygen, and turbidity probes
  YSI 600 MDS controller

  Other Miscellaneous Supplies
  Field computer
  Communication Cable
  Grab poles
  Sample bottles
  Coolers
  Foul weather gear
  Vehicles
  Locks
  Chain or cable to secure equipment
  Buoys if samples are needed at different depths
  Possibly concrete pads to anchor strainers or flow sensor
  6 V Lantern Batteries

AA Batteries
Nitrile Gloves
Various installation power tools
Various installation hardware

Additional gear may also include scuba gear and a diver depending on installation depth.

Marina del Rey Sampling

- **Wet and Dry Weather Grab Sampling** – The proposed inlets from Marina del Rey are less affected by stormwater inputs than the Ballona Channel inlets. Therefore, a single grab sample is recommended at these locations during dry weather conditions and during a storm event. Grab samples should be collected during these dry and wet conditions at both low and high tide periods to evaluate these conditions.

- **Field Measurements and Sample Analysis** – Field measurements should include salinity, temperature, pH, dissolved oxygen, conductivity and turbidity. Flow in the culvert and channel should be measured at the time of sample collection. The sample analysis should include the same list of analytes listed for the Ballona Channel Samples.

Direct Storm Water Inputs

- **Storm Event Pollutagraph Monitoring** -Pollutograph monitoring should be conducted at each site during at least one storm event between October 1, 2007 and April 30, 2008. Additional storm events will provide a more robust data set. At least 3 events are needed to develop a statistical analysis of variability.

  Weather should be monitored from October 1, 2007 through April 30, 2008. Any storm predicted to produce 0.20" of rain or greater in any 24 hour period should be considered viable for monitoring. Once rainfall appears probable, teams should be mobilized to sample the storm event.

  Monitoring should attempt to capture the rise and fall of the hydrograph from first flush until the flow is within 10% of base flow conditions. However, rainfall intensity and duration may vary the periodicity of sampling. During a 24 hours period, six to eight samples should be selected for analysis.

- **Pollutagraph Sample Analysis** - Grab samples will be collected and analyzed for:
  - Total metals,
  - Dissolved metals
  - Organic pesticides
  - Synthetic pyrethroids

- PAHs
- Nutrients
- Hardness
- Total suspended solids
- Total dissolved solids

- **Field Measurements–** Field measurements should include temperature, pH, conductivity and turbidity, and show be measured at the time each grab sample is collected. Flow in the culvert and channel should be measured continuously or at least at the time each grab sample is collected.

Ballona Channel Existing Inlet Site

- **Storm Event Pollutagraph Monitoring** -Pollutograph monitoring should be conducted at this site during at least one storm event between October 1, 2007 and April 30, 2008. Additional storm events will provide a more robust data set. At least 3 events are needed to develop a statistical analysis of variability.

  Monitoring should attempt to capture the rise and fall of the hydrograph from first flush until the flow is within 10% of base flow conditions. Since this sampling point provide supplemental data to the three channel sites, pollutagraph grab samples can be targeted to the initial rise, peak, and fall or approximately 4 samples.

- **Pollutagraph Sample Analysis** - Grab samples will be collected and analyzed for the same parameters as was listed for the three channel sites.

- **Field Measurements–** Field measurements should include salinity, temperature, pH, conductivity and turbidity, and should be measured at the time each grab sample is collected. Flow in channel on the wetland side of the inlet should be measured at least at the time each grab sample is collected.

Sampling Priority Strategy:

Depending on the monitoring being conducted by other agencies and the resources available, the sampling presented in this memorandum may be prioritized and implemented in a phased manner. The prioritization should be based on the data gaps identified and their importance to the restoration alternative analysis and finalization. Based on the data gaps identified a proposed prioritization is listed below (listed in order of higher to lower priority):

1. Two Ballona Channel Sample Sites – BALLOCH-1 and -2
2. Fiji Ditch and Inlet Sites
3. Stormwater Site at Culvert Blvd.
4. Marina del Rey Inlet
5. Tide Gate Inlet site in Area B
6. Stormwater Samples from Lincoln