NOTE: IF 12A OCCURS AND WELLS ARE TO REMAIN, GRADING AS SHOWN IF 12B OCCURS AND WELLS ARE REMOVED, AREA AROUND WELLS MAY BE GRADED.
FINISH GRADING FOR UPLANDS AREA "C" NORTH

LEGEND

- LIMITS OF GRADING

NOTE: GRADING TO BE DETERMINED

GMRS-NA17

CONSTRUCTION SEQUENCING #20

FINISH GRADING FOR UPLANDS AREA "C" NORTH

PLANS PREPARED BY:
PSOMAS

SHEET 20 OF 32
BIKE PATH, PEDESTRIAN WALK, AND AMENITIES

LEGEND
- DIRT ROADS
- LEVEE
- CONSTRUCT BIKE PATH
- AMENITY
- CONSTRUCT BIKE PATH
- BIKE/PEDESTRIAN BRIDGE

REVISION HISTORY:
[Details not visible in the image]
AREA "A" AND AREA "B" NORTH
REMOVE EXISTING LEVEES

CONSTRUCTION SEQUENCING #25

EXHIBIT

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

PSOMAS

300 South Flower Street, Suite 4300
Los Angeles, CA 90071
(213) 233-4800 (213) 233-1991 fax
www.psomas.com

LEVEE

LIMITS OF LEVEE REMOVAL

LIMITS OF LEVEE REMOVAL

LEVEE

LEVEE

REMOVE LEVEE

REMOVE LEVEE

BALLENA CREEK

HIKE/PEDESTRIAN BRIDGE

CULVER BLVD.
AREA "B" WEST
FIRE ACCESS ROAD

CONSTRUCTION SEQUENCING #26

EXHIBIT

EXHIBIT 32

AREA AVAILABLE 200' WEST PRE-TREATMENT AND DETENTION AREA

CLEAN-OUT EX. A2 PUBLSHED STORM DRAIN AND FLOW PATH TO PRE-TREATMENT DETENTION AREA
Appendix L
Miscellaneous Civil
<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Exhibit Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR031</td>
<td>Culver Blvd Stormwater Management &amp; Fire Access Exhibit</td>
</tr>
<tr>
<td>BR033</td>
<td>Levee Ends Geometric &amp; Structural Protection Exhibit</td>
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<tr>
<td>BR037</td>
<td>Area C Proposed Grading Exhibit</td>
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<tr>
<td>BR038</td>
<td>Area B Triangle Proposed Grading Exhibit</td>
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<tr>
<td>BR039</td>
<td>Existing Fresh Water Marsh Outlet Structure Exhibit</td>
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<tr>
<td>BR040</td>
<td>Storm Drain Piping Layout Exhibit</td>
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<tr>
<td>BR055</td>
<td>Jurisdictional Boundary Exhibit</td>
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<tr>
<td>BR048</td>
<td>Ballona Water Control Structures Discussion</td>
</tr>
<tr>
<td>BR049</td>
<td>Ballona West Area B Water Quality Discussion</td>
</tr>
<tr>
<td>BR050</td>
<td>Pedestrian Bridge Structural Narrative</td>
</tr>
<tr>
<td>BR051</td>
<td>Ballona Temporary Bridge Structural Narrative</td>
</tr>
</tbody>
</table>
EXISTING FRESHWATER MARSH OUTLET STRUCTURE

NOTES
1. ELEVATIONS BASED ON NGVD
2. THIS STRUCTURAL CONCEPT WILL BE CONSTRUCTED TO REPLACE IN KIND THE FRESHWATER MARSH OUTLET
3. GIRDER GATES WILL BE CONSTRUCTED AS SELF-REGULATING OR ADJUSTABLE
Water Control Structures Description

EXISTING CONDITIONS

There are three existing “Gate” structures within the project boundaries along the Ballona Creek that will be affected by the project. Two are toward the west end of Area B to allow muted and controlled tidal action into the small flow channels within Area B. Close scrutiny of these tide gates is maintained to avoid flooding of very low-lying development areas at the south-west corner of Area B, and of Culver and Jefferson Boulevards. A third gate structure is at the end of the main outlet culvert from the Freshwater Marsh. This structure contains a series of three, 60-inch diameter outlet pipes with flap gates. Tidal action occurs through this structure, but is precluded from entering the Freshwater Marsh by an internal structural weir within the Freshwater Marsh. The flap gates allow storm flows to be conveyed from the Freshwater Marsh to the Ballona Creek for minor storm events, and to close during large storm events for flood protection upstream of the Freshwater Marsh.

PROPOSED CONDITIONS

With the removal of the existing levees, all three of these gate structures will be removed. The area between the new levees will continue to enjoy full tidal action. The project goal is to expand that full tidal action south of the new southerly levee into the remainder of Area B (less the Freshwater Marsh) as much as possible without increasing the risk of flooding. The function of the outlet from the Freshwater Marsh will remain as it is in the existing condition, with construction of a new gate structure that will generally mirror the function and design of the existing structure, simply relocated to the new southerly levee alignment. Two new gate structures will be added through the southerly levee and extend under Culver Boulevard to South Area B to replace the two tidal gates. There are a couple of options for the type of gate used, and a number of geometric configurations to control the amount of tidal action.

The two types are self-regulating tide gates and adjustable gates, either manually or automatically adjusted. Generally self-regulating tide gates, when properly designed and installed, are preferable due to lower cost, maintenance, and reliability. However, adjustable gates can be designed for a wider range of use and could more easily accommodate future sea level rise. There are advantages for each type which will be reviewed with final design.

In order to control flow rates and flooding risk, the sizing and configuration of the gate structure can be configured in a number of ways. The general intent would be to allow greater volumes to pass in one direction than another. For example, we could provide one or two pipes with flap gates to control flow rates and volumes only for rising tides into Area B. And, we could provide three pipes, or larger diameter pipes for receding tides allowing a greater relative volume and flow rate out of Area B. Another example would be to have adjustable gates on both ends of a pipe with different settings for flows to accomplish the same flood protection goal.
**West Area B Water Quality Description**

**EXISTING CONDITIONS**

At the southwest corner of Area B is a developed commercial area fronting Culver Boulevard. This development is at a very low elevation in some cases below 6.0. This is a low point of Culver Boulevard and has historically had flooding problems at, and adjacent to, the intersection of Culver Boulevard and Nicholson. There are a number of storm drains in the area with the primary collection drain for flows from the Westchester Bluffs area conveyed westerly of the intersection toward the ocean. This drain is under sized for larger storm flow events. This was recognized and an overflow drain in Nicholson exists to convey the excess overflow to the north outletting on the north side of Culver Boulevard at the intersection. There is a small ditch that routes this overflow runoff into Area B to one of the small tidally influenced ditches in the area. Due to tidal action, the capacity of this overflow ditch and the surrounding area that is available for storm water storage is sometimes exceeded causing flooding of Culver and a few of the adjacent properties.

**PROPOSED DRAINAGE CONDITIONS**

With the construction of the proposed levees, tidal influence in this area will be eliminated. However storage volume for the excess overflow drainage will also be eliminated. Therefore, replacement storm water storage volume will be provided by creating a low area to approximately elevation 4.0 between the commercial properties and the proposed levee. This storage basin will be sized to accommodate the overflow volume as well as the local drainage in the area. A public storm drain pipe from a downstream drain system can be extended to dewater this area if desired, or storage volume could be provided to fully contain the overflow. This basin will also function as a water quality treatment measure to address the minor increase in pollutant load from the proposed paved fire access road behind the commercial properties, as well as a portion of the runoff from the existing paved area of Culver Boulevard. Other areas of Culver Boulevard further east will drain to a shallow roadway shoulder ditch provided to keep stormwater runoff away from the paved area, as well as provide an infiltration and treatment function for the roadway.
Ballona Wetlands Restoration Project

Pedestrian/Bike Bridge

Structural System

Overview

The proposed pedestrian/bike bridge will have a dual objective. It can be used as a vehicular bridge for H20 loading trucks during construction to facilitate the Earth Transportation and then it will be used as a pedestrian/bike bridge at its final objective. This bridge will span approximately somewhere between 380’ & 400’, at the location chosen next to the (E) Culver Blvd bridge. See Photo 1. See also preliminary layout by Psomas attached here under Fig. A.

Photo 1. Culver Bridge
Fig. 1: PRELIMINARY PEDESTRIAN/BIKE BRIDGE
A.1 Description, Proposed Material and Advantages of the Structural System

The proposed structural system for the bridge uses steel for the superstructure and concrete for the foundation piers system.

The clear advantage of our structural steel system starts from the weight reduction compared to a purely concrete structural system.

Having to design our structural system for reduced weight will permit us to use also reduced code design forces allowing us to reduce the size of the structural members as well as their foundation, providing a more economical design.

Using structural steel bridges also allows us to play with different configurations to explore the best option from both a structural and aesthetic standpoint.

From the initial geotechnical findings the North & South edges of the Ballona Creek do not seem to be adequate to provide structural support if the bridge is a simple span, therefore there is the need to have interior foundation piers. Our first option is to have a four span bridge.

Some of the possible structural configurations between piers are shown below:

All of the truss options shown above are preferred on Regions of High Seismicity as is a concern at our site.
To illustrate some of the Pedestrian/Bike bridges built based on these configurations, see photos below.

B.1 Design Criteria

Basic Design Criteria shall follow the codes and standards from:

- US Army Corps of Engineers (USACE)
- Los Angeles County Department of Public Works (LA County DPW)
Ballona Wetlands Restoration Project

Temporarily Bridge Across Lincoln Between Areas A & C

Structural System

Overview

Earth movements between areas A & C will be required. A possibility to build a bridge using the (E) concrete piers can be studied. See (E) concrete piers on Photo 2.

Photo 2: (E) concrete piers between areas A & C.
A.1 Description, Proposed Material and Advantages of the Structural System

A temporarily bridge across Lincoln and between areas A & C can greatly increase the productivity during construction speeding up the earth movement between areas A & C. This could also contribute to have better logistics & access during construction.

In order to assess this possibility a further structural detailed evaluation of the (E) concrete piers is needed. Based on the findings of this detailed structural evaluation a temporarily bridge with a capacity limited to the capacity of the (E) piers can be build.

Some of the possible structural configurations are shown below:
A temporarily bridge can be a new designed bridge or a prefabricated bridge. See below for some samples:

**B.1 Design Criteria**

Basic Design Criteria shall follow the codes and standards from:

- US Army Corps of Engineers (USACE)
- Los Angeles County Department of Public Works (LA County DPW)