Schuyler Heim Bridge Demolition Project

Long Beach, CA

Project Background

Mackworth-Enviro designed and installed an Enclosed Turbidity Control Curtain (ETCC) as part of a bridge demolition project in the Cerritos Channel in Long Beach, CA. The channel experiences mixed semidiurnal tides, with an extreme tidal range of 3.2 meters or 10.5 feet.

As part of the design process, Mackworth used computational fluid dynamic (CFD) modeling to assess the effect of the barrier on increased current velocity (Figure 1).

The ETCC design for this project was an engineered, full-depth curtain based on currents of 1 fps. It was supported at the surface by a continuous, impermeable hood containing polystyrene flotation billets and sealed to the seafloor with an impermeable, heavy bottom skirt ballasted with chain. The primary permeable curtain component, located between the hood and the skirt, was a non-woven geotextile that controlled sediments and associated contaminants while allowing the passage of tidal water into and out of the enclosed area (Figure 2). The ETCC was held in place (1) by attachment of mooring lines, top and bottom, to adjacent piles, such that the top is free to move up and down with the tides, (2) by deadweight anchors positioned on the bottom of the Cerritos Channel in the area between the Schuyler Heim Bridge and the Badger Bridge (west of the Schuyler Heim Bridge), and (3) by an anchoring system in other areas of the alignment not adjacent to existing trestle-supporting piles (Figure 3).

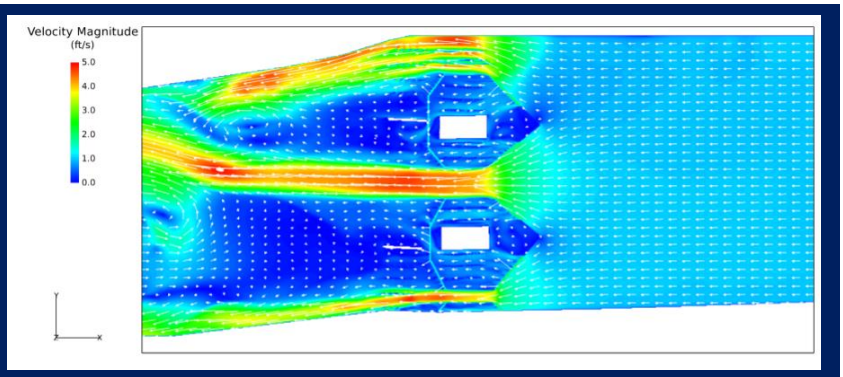

Figure 1. CFD model showing Incoming Tide, 45-degree ETB apex alternative, near the top of the water column.

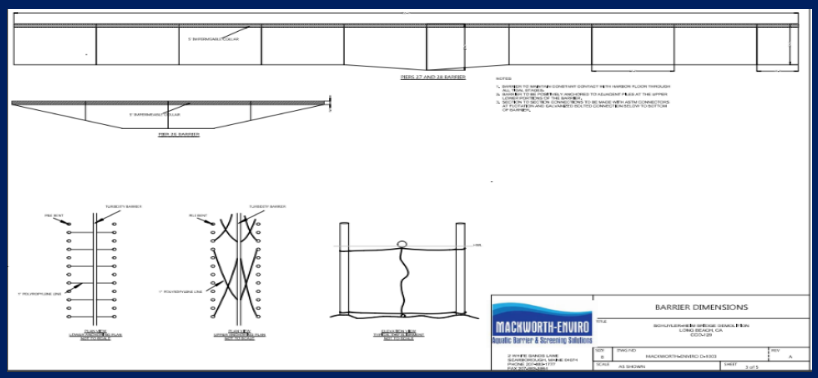

Figure 2. Barrier dimensions of Enclosed Turbidity Containment Curtain (ETCC)

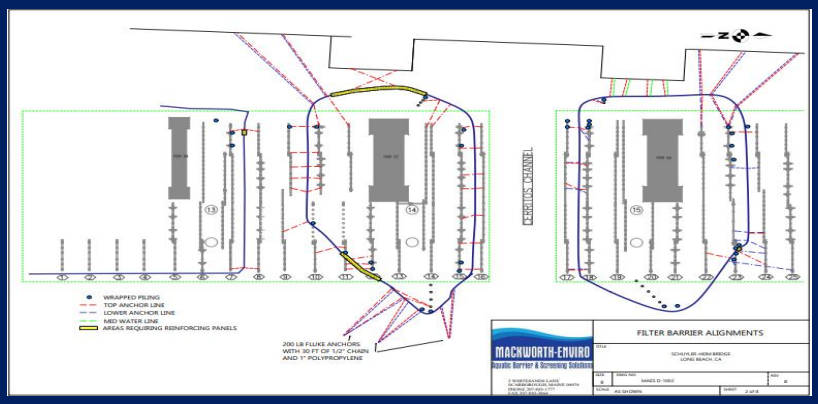

Figure 3. Filter barrier alignments and anchor layout

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Performance

Mackworth-Enviro conducted water quality sampling prior to construction to establish background levels. Ambient turbidity concentrations were > 1.0 NTU, so anything above 1.0 NTU was recorded during monitoring. Water quality criteria for turbidity was based on the Federal Effluent Guidelines of 25 NTU as the discharge limit. At 25 NTU discharges are not considered to adversely affect the receiving water. According to a 2014 watershed report, total suspended solids (TSS) concentrations average about 227 mg/L in wet weather and 27 mg/L in dry weather in the Cerritos Channel.

Water quality measurements were taken daily during construction activities. Four sampling stations were established 100 and 300 feet east and west of the work area in the tidal Cerritos Channel. The protocol was to sample one station up-current and two down-current. Samples were collected near-surface (3-4 ft from surface), near-bottom (~3 ft from bottom) and in the middle of the water column at buoy-anchored locations. Each of the three piers was surrounded by an ETCC (Figure 4).

Out of a total of 51 samples taken during construction activities, 4 samples between May 23rd and July 31st were greater than 1.0 NTU. These samples were all near bottom samples and the higher reading was most likely due to human sampling error from the instrument hitting the sediment.

On July 18th, all nine sampling points reported turbidity exceedances with levels ranging from 29-61 NTU. Monitors noted a significant amount of debris in the water outside of the ETCCs and that no debris appeared to have escaped from the curtains. Water quality samples were taken the next two consecutive days and while all sampling points were still elevated, turbidity levels had dropped to 4-14 NTU. Monitors also noted container ship activity east of the bridge on July 15, 16, 19 and 21. The movement of these ships into and out of the dock creates significant observable turbulence in the channel. The elevated turbidity readings noted in July are not believed to be related to on-site demolition work.

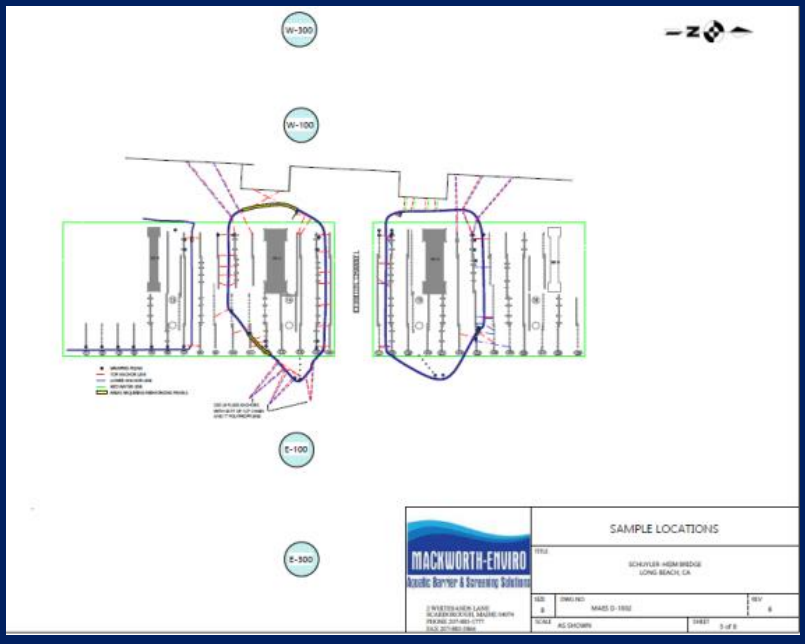

Figure 4. Water quality sampling stations near pier 27

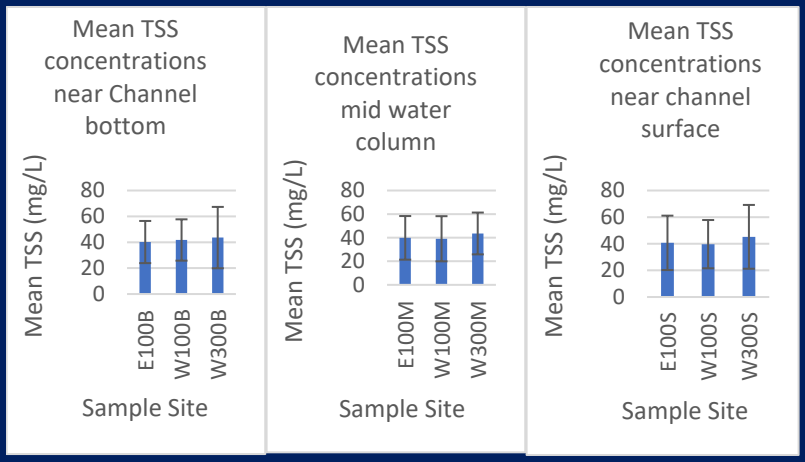

Figure 5. Mean TSS concentrations during construction activities from May 23-June 30th

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