CLEANING UP THE THEA FOSS WATERWAY–A PHOTOGRAPHIC JOURNEY

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ABSTRACT

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INTRODUCTION

Manson Construction completed cleanup of the Thea Foss Waterway Superfund Project for the City of Tacoma in the spring of 2006. The Thea Foss Waterway has served the City of Tacoma as a center for marine industry and commerce for over 100 years. Manson Construction began cleanup of the Thea Foss Waterway in the fall 2002 with several specific cleanup actions for piling removal and shoreline stabilization in preparation for the major Superfund remedial action work, which followed in 2003. Typical sediment contaminants in the Thea Foss Waterway included polynuclear aromatic hydrocarbons (PAHs), petroleum hydrocarbons, phenols, PCBs, heavy metals, and pesticides (including DDT), as "chemical contaminates of concern." Although the primary basis for CERCLA arose from historical industrial and commercial use of the waterway resulting in sediment contamination, more recent vintage chemicals of concern, such as the phthalate esters, appear to have arisen from stormwater discharges into the Thea Foss Waterway.

Cleanup of the working waterway included hydraulic and clamshell dredging of over 500,000 cy of contaminated and non-contaminated sediments; construction of a confined disposal facility (CDF) in the former St. Paul Waterway; channel and slope capping, shoreline stabilization; marina demolition and new construction; new levee construction, infrastructure and facility construction; and habitat restoration and mitigation. Concurrent with cleanup of the Thea Foss Waterway, Manson Construction was also conducting the smaller Superfund remedial action cleanup of the adjacent Middle Waterway for the Middle Waterway Action Committee consisting of principal responsible parties (PRP's) contributing to the Middle Waterway adjacent to the Thea Foss Waterway.

This paper is presented to WODCON XVIII as a non-technical, photographic journey covering four years of superfund cleanup in a marine environment. Of the thousands of photographs taken during this superfund work, those represented cover major portions of the work. With a few exceptions, photographs presented were taken by the Manson Construction's Water Quality Monitoring Group to provide this unique on-the-water perspective as the work was promoted.

NATURE OF THE WORK

As prime contractor for these Superfund (CERCLA) remedial actions, Manson Construction and its subcontractors developed plans and implemented the cleanup action in keeping with EPA and Washington State Water Quality Monitoring requirements and related environmental objectives and guidelines. The Thea Foss work required an extensive set of project plans which included the Remedial Action Work Plan, Dredging and Disposal Plan, Erosion Control Plan, Quality Control Plan, Waste Management Plan, Sediment Sampling Plan, Quality Management Plan, Spill Response Plan, Vessel Management Plan, Disposal Monitoring Management Plan, Environmental Protection Plan, Project Health and Safety Plan, and the Water Quality Monitoring Plan. Additional plans were prepared on a task specific basis as dictated by the nature of the work. These plans included traffic control plans, task specific Health and Safety Plans, plan modifications, etc. Overall the planning phase of the work was substantial and covered hydraulic and clamshell dredging of over 500,000 cy of contaminated and non-contaminated sediments;

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construction of a confined disposal facility (CDF) in the former St. Paul Waterway; channel and slope capping, shoreline stabilization; marina demolition and new construction; new levee construction, infrastructure and facility construction; and habitat restoration and mitigation.

The water quality monitoring program was substantial and included real-time monitoring of water quality for dissolved oxygen, turbidity, total suspended solids, salinity (measured as conductivity), and temperature throughout the entire course of the project. Additionally, the Water Quality Monitoring Group managed sediment and water column sampling and monitoring of water quality for "chemical contaminants of concern" to assure that sediment and water quality objectives were met for cleanup.

Water Quality Monitoring

As prime contractor for these Superfund (CERCLA) remedial actions, Manson Construction and its subcontractors developed plans and implemented the cleanup action in keeping with EPA and Washington State Water Quality Monitoring and related environmental objectives. The water quality monitoring program was extensive and included extensive real-time monitoring of water quality for dissolved oxygen, turbidity, total suspended solids, salinity (measured as conductivity), and temperature throughout the project. In addition to real-time monitoring, the Water Quality Group collected samples at all stations and depths for analysis of Total Suspended Solids (TSS). All TSS samples were analyzed by an independent laboratory (Severn Trent Laboratory (STL), Fife, Washington) on a 24 hour turn around basis. TSS data was utilized to independently verify or to provide a usable correlation with Turbidity data generated with YSI equipment. Samples for TSS analysis were collected with either a stainless steel Wheaton sampler or more commonly with a Niskin sampler. Samples were immediately transferred to bottles for same day delivery to the laboratory under chain-of-custody to meet holding time requirements.

The Water Quality Monitoring Program for the Thea Foss Waterway project was initially mandated by EPA in a series of Water Quality Certifications that were amended as major portions of the work were completed or as the nature of the work changed. Nevertheless, the fundamental water quality paradigm was consistently applied throughout the project. Essentially, a mixing zone of 300 ft was allowed with compliance monitoring requirements to assess whether State of Washington Water Quality Criteria were met at the edge of the mixing zone at a series of depths in the water column (shallow, middle and deep). Background monitoring was also provided to assess the potential impact of other potential sources. As tides changed, compliance stations would become background stations and former background stations would become compliance monitoring stations. All monitoring stations were established with the navigational assistance of DGPS on equipment as well as the Water Quality Monitoring Boat. Essentially, we would plot in AutoCAD the derrick location and derive the mixing zone and associated compliance and background monitoring stations while on the water.

Manson Construction employed exclusively YSI multi-parameter equipment (YSI Sonde Model 6920, Yellow Springs, Ohio) throughout the project. The YSI Sonde was equipped with probes for measuring Temperature, Conductivity, Depth, Turbidity, and Dissolved Oxygen. Compliance criteria, established in the Water Quality Certification, required all but the measurement of Conductivity. Our initial assessment was that conductivity would be an important piece of data to have. As it turned out conductivity data was critical in assessing the impacts of fresh water and mixing within the water column at the compliance boundary. The Thea Foss Waterway is an urban waterway, and significant inputs of stormwater derived turbidity and cultural debris often factored into the daily assessment of overall water quality impacts of dredging and capping work.

In addition to compliance monitoring at the boundary of the continually changing mixing zone, Manson Construction also monitored within the mixing zone at a distance of 150 feet from the immediate work zone at a station frequently referred to as the Early Warning Station. This Early Warning Station provided the Water Quality Group and Manson crews with a head's up on potential water quality problems. As a consequence, adjustments to the work could be made as required in a more proactive sense, rather than just react to a non-compliance monitoring event or result. The value of monitoring at the early warning station was also supplemented by daily monitoring at a more distal reference station. Several reference stations were pre-established at locations within the Thea Foss, St. Paul and Middle Waterways to better assess the overall impacts of remedial actions on greater Commencement Bay.

The Water Quality Monitoring Group also conducted water column sampling and monitoring of water quality as well as provided management of sediment sampling by subcontractors for "chemical contaminants of concern." to assure that sediment and water quality objectives were met for cleanup. Typical sediment contaminants in the Thea Foss Waterway included elevated polynuclear aromatic hydrocarbons (PAHs), petroleum hydrocarbons, phenols, PCBs, heavy metals, pesticides (including DDT), and phthalates as primary chemical contaminates of concern. Water samples were collected with a Wheaton sampler and delivered to an independent laboratory for more extensive analysis of chemical contaminants of concern. Samples for priority pollutant analyses were typically analyzed by Severn Trent Laboratory or Analytical Resources, Seattle, Washington. Chemical data from the collection and analysis of water samples from the Thea Foss and St. Paul Waterways for chemical contaminants of concern proved to be very interesting and well beyond the scope of this photographic presentation. As might be expected, contaminants tended to be sorbed onto small particles, as distinguished by filtered and unfiltered sample preparations. More importantly, the measures taken by controlling effluent form the St. Paul Confined Disposal Facility for contaminated sediments (principally arising from the hydraulic dredging) proved to be effective based on chemical testing data collected at the outfalls.

Quality Control work for the Water Quality Monitoring Program was extensive and consisted of daily calibration of the YSI Sonde for turbidity and dissolved oxygen. Once calibrated, the temperature and conductivity probes tended to be much more stable and were occasionally checked against standards. A two point turbidity calibration was conducted to bracket the range for compliance with water quality criteria. Daily checks on calibration were also conducted to provide verification of continued calibration and acceptable performance. Preventative maintenance also tended to minimize problems and assure acceptable performance. Dissolved Oxygen data also compared very favorably with Winkler Titration data from samples collected concurrently. One major consequence of this program was the acceptance of our data by the regulatory community and by others within Manson Construction.

CORRECTIVE ACTIONS – PROACTIVE SOLUTIONS

The water quality monitoring program has provided a unique record of overall water quality in the Thea Foss and nearby project waterways. As expected, not everything went well and corrective actions were often necessary to deal with non-compliance issues (principally turbidity) over the course of four years. Corrective actions tended to be relatively simple and consisted of changing the rate of work, including ceasing all work until such time that water quality returned to background conditions. Preparation of detail project plans, while often viewed skeptically, provided the basis dealing with problems. Commonly, we were able to coordinate non-compliance with the actual sequence of work. For example, if there was a non compliance event during dredging, it was often possible to stop the work and change out a scow or to perform any needed maintenance while the system recovered to acceptable conditions. In this manner, we were able to minimize the impact on promotion of the work. Monitoring the Early Warning Station was also particularly valuable in this regard, because we were able to adjust our work to maintain compliance at the mixing zone boundary.

Because we were working in a waterway with significant industrial and commercial history, two water quality problems arose on almost a daily basis: (1) old pilings and wood debris would rise to the surface during dredging, and (2) the commonly present oil sheen of historic origins. The solution to these problems was never simple or perfect. As a standard operating procedure all dredging equipment worked within a containment zone of debris and oil absorbent booms. As floating debris came to the surface, crews were dispatched in skiffs to collect floating debris for off site handling. Oil sheens were handled in a similar manner. The dual array of booms around work zones tended to contain oil slicks that rose to the surface where crews could deal with the problem directly within a small contained area. The use of debris and oil absorbent booms was a proactive solution to working in a waterway where you never know what may come to the surface. A number of pictures in our PowerPoint presentation show crews managing these booms. Crews rapidly incorporated this aspect of environmental protection into their daily work routine. Ironically, as was often the case,after a severe storm event, the Thea Foss Waterway would be covered by oily sheen and high turbidity originating form stormwater outfalls. The ironic aspect is that surface water inside our protective boom system would be clear, free of debris and without sheen.

In addition to changing the way we commonly conducted business on the water, proactive planning efforts provided the basis for amendments to the work. For example, the standard paradigm for water quality monitoring was based upon a mixing zone of designed dimensions in an open-water configuration. In reality, the standard compliance

monitoring scheme often did not work because of boundary conditions that did not provide adequate mixing. These situations typically arose in the Wheeler-Osgood Waterway, adjacent to shorelines, or at the head of the Thea Foss Waterway. Additionally, Manson also frequently had multiple overlapping mixing zones arising from more than one piece of equipment operating at the same time in adjacent areas. These kinds of monitoring or work problems were typically handled in a proactive manner by seeking consultation with EPA and other agencies to develop contingency planning amendments to the work and to project plans. In this manner an uncounted number of problems were avoided, and the work was able to proceed with oversight approval.

Manson Construction also implemented a program during this work that had lasting relevance. Before each change in the nature of work or change of work in a new area, the Health and Safety Manager and the Environmental Protection Manager conducted task specific orientations and discussion with crews, foremen, superintendents, subcontractors, inspectors and the overall Construction Management Team (which often included representatives from EPA, the U.S. Army Corps of Engineers, and other regulatory interests). The purposes were to obtain the input from all involved as to their perspective' to see that the work was conducted in a safe and environmentally aware manner; and to assure that all had an opportunity to comment, raise questions, and to seek answers before the work commenced. The value of these meetings cannot be overstated. This aspect of proactive preparation was well managed and coordinated.

SUMMARY

The pictures provided in our presentation at WODCON XVII provide a unique photographic presentation of the Thea Foss Superfund Remedial Action taken from the perspective of those involved in the long-term water quality monitoring program. It has been over a year since construction work was completed for this remedial action. Nevertheless, some problems continue to exist. Stormwater inputs from adjacent urban areas will require additional work or risk the recontamination of the Thea Foss Waterway after so many millions have been spent to clean up the waterway.

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