FINAL REPORT

Construction Completion Report Slope Treatment Cap – Phase 1, Kinder Morgan Linnton Terminal, Portland, Oregon

Prepared for

Kinder Morgan, Inc.

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Executive Summary

CH2M HILL Engineers, Inc. (CH2M) has prepared this Construction Completion Report to document the Linnton Terminal Slope Treatment Cap Phase 1 construction project. The overall project consisted of permitting, design, and construction of a 65-foot-long portion of the augmented cap along the river bank for the Kinder Morgan Linnton Terminal, located at 11400 NW St. Helens Road in Portland, Oregon (the site).

The purpose of the project is to prevent intermittent sheening along the river bank where occasional sheen of non-aqueous phase liquid (NAPL) has been observed in the Willamette River. Phase 2 Slope Treatment Cap construction will be implemented in 2018 and will tie into the Phase 1 constructed cap, thus extending and completing the planned cap coverage on the river bank.

Phase 1 construction consisted of the following:

- Slope treatment cap construction (cap area)
- Fill mitigation area excavation
- Waste transport and disposal

Cap construction and fill mitigation area excavation occurred between October 4 and November 17, 2017. Waste transport and disposal occurred between December 4 and December 12, 2017. CH2M performed project design and permitting, construction management, and site inspection services. Arcadis U.S., Inc. served as the construction general contractor with LKE Corporation as subcontractor.

Contents

Acronyms and Abbreviations

CH2M	CH2M HILL Engineers, Inc.
GAC	granular activated carbon
Kinder Morgan	Kinder Morgan, Inc.
NAPL	non-aqueous phase liquid
NAVD 88	North American Vertical Datum 1988
OBB	oleophilic bio barrier
RFI	Request for Information
site	Kinder Morgan Linnton Terminal
USACE	U.S. Army Corps of Engineers

SECTION 1

Introduction

This Construction Completion Report provides a summary of the Linnton Terminal Slope Treatment Cap Phase 1 construction project at the Kinder Morgan Linnton Terminal, located at 11400 NW St. Helens Road in Portland, Oregon (the site). Phase 1 consisted of construction of a 65-foot-long portion of a significantly augmented cap along the river bank, excavation of the fill mitigation area, and waste transport and disposal. Phase 1 cap construction and mitigation excavation was substantially complete on November 17, 2017. Waste transport and disposal of removed, excavated, and stockpiled material was completed on December 12, 2017.

1.1 Purpose and Background

The purpose of the constructed cap is to prevent intermittent sheening along the river bank where occasional sheen of non-aqueous phase liquid (NAPL) has been observed in the Willamette River. Phase 2 Slope Treatment Cap construction will be implemented in 2018 and will tie into the Phase 1 constructed cap, thus extending and completing the planned cap coverage on the river bank. The constructed cap will meet the preliminary remediation goals of the Portland Harbor Record of Decision. The selected cap and basis of design, along with regulatory history, is presented in the *Source Control Measure Focused Feasibility Study*[1]. Construction was performed under an approved U.S. Army Corps of Engineers permit (Nationwide Permit [NWP]-2011-93-1 Kinder Morgan Linnton Terminal Slope Treatment Permit, Appendix H).

[1] CH2M HILL Engineers, Inc. (CH2M). 2017. *Source Control Measure Focused Feasibility Study Kinder Morgan Linnton Terminal.* September.

SECTION 2

Timeline

Major Phase 1 construction items are summarized below. Submittal 17, included in Appendix E, presents the final updated progress schedule in a graphic timeline from Notice to Proceed through site demobilization.

- October 4 to 10, 2017: Site mobilization and setup.
- October 11 to 13, and October 26 to 27, 2017: Removal of existing cap area riprap and excavation to completed subgrade.
- October 16 to 17, and October 24 to 25, 2017: Fill mitigation area excavation and erosion protective cover.
- October 30 and November 2 to 3, 2017: Cap area leveling layer installation.
- October 31 and November 1 to 2, 2017: Cap area anchor trench and geogrid installation.
- November 4 and 6, 2017: Cap area oleophilic bio barrier (OBB) installation.
- November 7 and 15, 2017: Cap area granular fill/carbon mix layer installation.
- November 9 and November 15 to 17, 2017: Cap area final riprap cover installation.
- December 4 to 12, 2017: Stockpiled material waste transport and disposal.
- December 13, 2017: Final site walkthrough; construction complete and contractor demobilized.

SECTION 3

Summary of Activities

Final As-built Record Drawings are provided in Appendix D. Daily reports and progress photographs are included in Appendixes A and B, respectively. Contractor means and methods, along with equipment specifications, can be found in Submittal 4, Construction Work Plan, presented in Appendix E.

3.1 Phase 1 Slope Treatment Cap Construction

Cap area construction was completed in conformance with the construction design drawings with no significant changes. Contractor Requests for Information (RFIs) 1 and 2 are presented in Appendix C.

Construction was primarily performed with a long-reach excavator from the top of the cap area bank. Timber crane mats were installed to support the excavator and stabilize and protect existing top-of-bank conditions. A small granular fill access ramp was installed at the northern top of the bank to allow access for a small excavator to perform removals and excavation in the toe area.

Equipment and material for the cap area construction was moved through the adjacent Harmer Steel property due to site access constraints. A signed access agreement was received from Harmer Steel on October 9, 2017 (Appendix G).

Existing cap area riprap material was removed from the slope and transported to the southern staging and material processing area via dump truck. Oversized existing riprap material was broken down and processed with a pneumatic excavator hammer to meet project specifications for reuse in final cap construction. Slope excavation was performed until final subgrade conditions were achieved. Timber retaining wall structures were encountered in the work area, and were demolished and removed as needed to complete excavation. All removed soils and timber retaining wall materials were considered impacted and stockpiled for sampling and waste characterization. Demolished timber retaining wall material was segregated from soils. All stockpiled material was contained with a plastic liner and cover and secured daily with sandbags.

Construction progress and tolerances were confirmed and verified with surveys, largely supported by LiDAR scanning equipment. LiDAR surveys provided the project with a high level of accuracy and consistency needed to support the project's permitted no-rise and no-fill requirements.

Additional stained and impacted soil in the northern toe area was observed during excavation and removed.

Granular fill material was used for both the leveling layer and carbon mix layer construction. Additionally, anchor trench and access ramp construction was also performed with the approved granular fill material. Per U.S. Army Corps of Engineers permit conditions, representative samples were collected from imported granular fill material and analyzed for compounds listed in Table 17 of the Portland Harbor Record of Decision. Results were compared against River Bank Soil/Sediment Cleanup Levels. Analytical results are included in Submittal 8, in Appendix E. There were no exceedances of the River Bank Soil/Sediment Cleanup Levels in import material. Granular fill gradation and compaction are presented in Submittals 6 and 9, respectively, in Appendix E.

Cap construction consisted of an initial leveling layer placed upon the completed subgrade to fill in voids and create a uniform surface for the geogrid installation. Geogrid panels were then installed in the anchor trench excavated at the top of the bank slope and worked downslope. Geogrid panel seams were field fit around the four existing timber pier locations to avoid damaging the integrity and strength of the geogrid. Anchor trench backfill compaction was confirmed by nuclear gauge testing performed by Carlson Testing, Inc. A second leveling layer was installed over the geogrid with a 6-inch-thick crown in

the middle of the cap area (along approximate Station 7+20), tapering to 3 inches thick at the north and south ends to promote lateral drainage in the overlying OBB material. Four OBB panels were installed over the second leveling layer and secured in place on the slope with pins. Detailed OBB panel as-built conditions are presented in Record Drawing C-502 (Appendix D). The granular fill/carbon mixed layer was constructed over the OBB panels and survey-verified to meet a layer thickness tolerance of 6 inches minimum to 7 inches maximum. Granular fill material was mixed with granular activated carbon (GAC) to achieve the specified 80 percent granular fill to 20 percent GAC dry weight ratio mixture. Material mixing was performed at the southern staging and material processing area in a 20-cubic-yard bin with a 2-cubic-yard excavator bucket and predetermined proportions. GAC mix calculations are presented in Submittal 13 (Appendix E). A geotextile fabric was installed over the granular fill/GAC layer and then topped by the final riprap cover layer. Riprap was survey-verified to be 2 feet thick over the Phase 1 treatment cap. All other disturbed slope areas adjacent to the cap were armored with a minimum 1-foot-thick riprap layer to restore the slope to pre-construction existing conditions. Riprap installed in the cap area consists of an approximate 14-inch average diameter riprap material. In general, the Phase 1 treatment cap was constructed from an elevation of 10 feet up to an elevation of 22 feet (North American Vertical Datum 1988 [NAVD 88]) along the river bank. The detailed cap system as-built conditions and survey control are presented in Appendix D, Final As-built Record Drawings.

Survey data demonstrate that 225 cubic yards of material was cut/excavated and 280 cubic yards of material was subsequently placed in the Phase 1 cap area during construction for a net result of +55 cubic yards of fill above pre-construction elevations.

All work was completed outside of the Willamette River, and planned erosion and sediment control devices (consisting of plastic covering during significant weather events, coir logs, silt fencing, and temporary absorbent booms) were implemented downslope to prevent sediment from impacting the river adjacent to the construction area.

3.2 Fill Mitigation Area Excavation

Fill mitigation area excavation and erosion protection cover construction was completed in conformance with the project design drawings with no significant changes.

Fill mitigation was primarily performed with an excavator for all major activities. Construction was completed above the ordinary high water level elevation of 20 feet (NAVD 88), and erosion and sediment control devices (consisting of plastic covering, coir logs, and silt fencing) were implemented to prevent sediment from impacting the Willamette River.

Excavated material was transported to the adjacent staging and stockpile area via dump truck. A subsurface timber retaining wall structure was demolished and removed as needed to complete the excavation. All removed soils and timber retaining wall materials were segregated and stockpiled onsite for sampling and waste characterization. All stockpiled material was contained with a plastic liner and cover and secured daily with sandbags.

Excavation was performed until final subgrade elevations were achieved in accordance with the design drawings. There were no observations of subgrade staining or impacted material. A final erosion prevention cover layer was then installed over the subgrade consisting of a 1-foot-thick layer of approximate 6-inch average diameter riprap material.

Survey data demonstrate that 525 cubic yards of material was cut/excavated and 90 cubic yards of material was subsequently placed in the fill mitigation area for a net result of -435 cubic yards below pre-construction elevations. All preceding quantities presented for the fill mitigation area are portions below elevation 31 feet (NAVD 88).

3.3 Waste Transport and Disposal

Stockpiled material generated during Phase 1 Slope Treatment Cap construction and fill mitigation area excavation was sampled with two four-point composite samples, plus two grab samples, and sent to an analytical laboratory for waste characterization testing. Analytical results are provided in Appendix F.

Waste hauling activities were completed by LKE Corporation with all material transported to the Waste Management Hillsboro Landfill, located at 3205 SE Minter Bridge Road in Hillsboro, Oregon. All waste bills of lading and waste disposal signed landfill receipts are included in Submittals 16 and 18, respectively, in Appendix E.