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February 24, 2012

Ms. Maura O'Brien  
Washington State Department of Ecology  
Northwest Regional Office  
3190 160th Avenue SE  
Bellevue, Washington 98008-5452

Sent via FedEx Saver

Subject: Sulfate Application Remediation Workplan Addendum  
Kinder Morgan Harbor Island Terminal  
Seattle, Washington  
Antea Group Project No. KMHI-001A  
KMLT File No. 29.79.02 (81171)

Dear Ms. O'Brien,

On behalf of Kinder Morgan Liquids Terminals LLC (KMLT), Antea™ Group is pleased to submit this Addendum to the Sulfate Application Remediation Workplan (Workplan), dated December 2011, and prepared for the KMLT Harbor Island Terminal located at 2720 13th Avenue Southwest in Seattle, Washington. The Workplan was prepared to provide detailed information for the design and installation of the components, and implementation of the selected cleanup action for on-site groundwater restoration at the site. The purpose of this Addendum is to address issues regarding the Workplan as discussed in a February 14, 2012 conference call between the Washington State Department of Ecology (Ecology), KMLT, and Antea Group, and to append the Workplan accordingly.

## **SCOPE OF ADDENDUM**

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This Addendum is not intended to duplicate the information presented in the Workplan, but rather to supplement and/or supersede sections of the workplan as specified herein.

### ***Performance and Compliance Monitoring***

The majority of Ecology's inquiries regarding the Workplan focused on providing additional details concerning performance and compliance monitoring during the sulfate application implementation phase of the project. Accordingly, KMLT proposes to replace Section 8.0 of the Workplan with the following:

## **8.0 PERFORMANCE AND COMPLIANCE MONITORING**

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The cleanup action incorporates monitoring to determine that cleanup standards are achieved and maintained after remedial actions have been completed. During the implementation of the remedial action, performance monitoring will be conducted to confirm that cleanup actions have attained cleanup standards and treatment goals. After the remedial action has been performed, compliance monitoring will be conducted to confirm that the cleanup action has attained cleanup standards and performance standards.

### **8.1 Performance Monitoring**

#### **8.1.1 Temporary Well Installations**

Eight temporary groundwater monitoring wells are proposed to be installed concurrent with installation of sulfate application trenches to monitor sulfate concentrations, sulfate usage, and hydrocarbon concentrations. The proposed location of these wells is shown on Figure 1. All monitoring wells will be installed by a professional well driller licensed in the state of Washington using a hydraulic-push probe drill rig. Temporary groundwater monitoring wells will be constructed of 2-inch diameter, schedule 40, polyvinyl chloride (PVC), installed to approximately 15-feet deep with 10-feet of 0.010-inch slotted screen. All groundwater monitoring wells will be backfilled with sand to 2-feet above the screen, followed by a 1-foot bentonite seal. The groundwater monitoring wells will then be backfilled with bentonite grout to 6-inches bgs. All groundwater monitoring wells will be completed to ground surface using flush-mounted well vaults and lids.

#### **8.1.2 Performance Monitoring Well Network**

The 8 temporary wells and existing wells MW-7 and MW-19 will be used to evaluate performance and modify application volumes and/or frequency as indicated. Additionally, Well 12 will be gauged for the purpose of monitoring for SPH or sheen only. Sheen has periodically been observed in this well. During the performance of the remedial action, performance monitoring will be conducted to confirm that the cleanup action is progressing to attain cleanup standards and treatment goals.

#### **8.1.3 Performance Monitoring Sampling and Analysis**

Baseline and performance sampling of groundwater will be performed on the proposed performance monitoring well network. Prior to each sampling event, groundwater levels in all performance monitoring wells will be gauged. Water levels will also be measured in wells MW-5, MW-6, TMW-B1, MW-9, 11, 12, and 16. Baseline groundwater samples will be collected prior to initiating sulfate application. Following the initial two sulfate application events, performance groundwater monitoring will be performed on a monthly basis. Thereafter, performance groundwater monitoring will be performed on a quarterly basis, or as otherwise indicated based on performance evaluation.

Wells will be sampled using low-flow sampling techniques. Purging will be conducted in a manner such that water levels do not drop more than two feet below static. Wells will be purged using dedicated downhole tubing

connected to a surface portable peristaltic pump. The pump rate will be monitored and set at a rate of less than 1,000 ml/min. During purging, the following parameters will be monitored: dissolved oxygen, pH, specific conductance, temperature, turbidity, and depth to water. Field parameters will be measured in a flow-through container. Water level data will be collected with an electronic indicator probe. Measurements will be taken beginning with the first water purged from the well. Groundwater samples will be collected after specific conductance and dissolved oxygen measurements are within 10 percent for 3 consecutive readings. Samples will be pumped directly into laboratory-supplied sample containers, labeled, placed into ice filled coolers, and will be delivered to the analytical laboratory under standard Chain-of-Custody protocol.

Groundwater samples will be analyzed for

- Total petroleum hydrocarbons in the gasoline range (TPH-G) using Northwest Total Petroleum Hydrocarbons Method NWTPH-Gx;
- Total petroleum hydrocarbons in the diesel (TPH-D) and oil range (TPH-O) using Northwest Total Petroleum Hydrocarbons Method NWTPH Dx;
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) using U.S. Environmental Protection Agency (USEPA) Method SW8260B;
- Nitrate, sulfate, and sulfide by USEPA Method 300.0/SW9056-NO3-N and USEPA Method 300.0/SW9056-SO4, and USEPA Method 376.1, respectively.

#### **8.1.4 Performance Monitoring Evaluation**

Evaluation of the performance monitoring data will include:

- Preparation of groundwater contour maps for the baseline sampling event and each performance monitoring event to monitor groundwater gradient in the treatment area and any potential influence of the sulfate application.
- Comparison of baseline and performance monitoring concentrations for sulfate, TPH-G, TPH-D, and BTEX
- Evaluation of concentration reductions, concentration trends, reduction rates for respective constituents.
- BTEX constituents typically degrade at different rates, as was demonstrated in the pilot study. Further discussion of this variance in detail in a paper entitled Comparison of Attenuation Rates by Bruce, Kolhatkar and Cuthbertson which can be found at <http://scholarworks.umass.edu/intljssw/>. This will be a primary line of evidence that hydrocarbon reductions are the result of sulfate reduction and not dilution or dispersion.
- Confirm that sulfate and hydrocarbons are not migrating beyond the treatment zone

## **8.2 Compliance Monitoring**

The achievement of cleanup levels in groundwater shall be measured at points of performance and compliance located within the plume area. Following the completion of the sulfate application program, groundwater monitoring will be performed on the 8 temporary performance wells and existing compliance wells MW-7 and MW-19 on a quarterly basis to confirm that the cleanup standards are achieved and maintained after remedial

actions have been completed. When quarterly groundwater monitoring demonstrates that no sheen is observed and that concentrations of contaminants of concern are below cleanup criteria for four consecutive quarters, this remedial action will be considered complete in accordance with the Section 4.0 Compliance Evaluation Criteria of the Compliance Monitoring Plan, included as Appendix F of the Consent Decree.

Please call if you have any questions regarding the contents of this letter.

Thank you,



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Dawna Leong  
Senior Engineer  
ANTEA GROUP



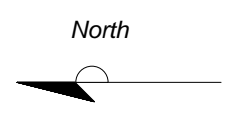
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James Cuthbertson  
Consultant  
ANTEA GROUP

Enclosures:

Figure 1      Conceptual Sulfate Application Network

cc:            Mr. Andrew Holbrook, KMLT, Portland, OR (CD copy)  
               Mr. Robert Truedinger, c/o Stephanie Randall, KMLT, Orange, CA (CD copy)  
               Ms. Stephanie Randall, KMLT, Orange, CA (File copy)  
               File Copy, Antea Group

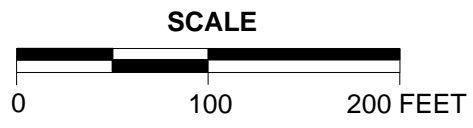
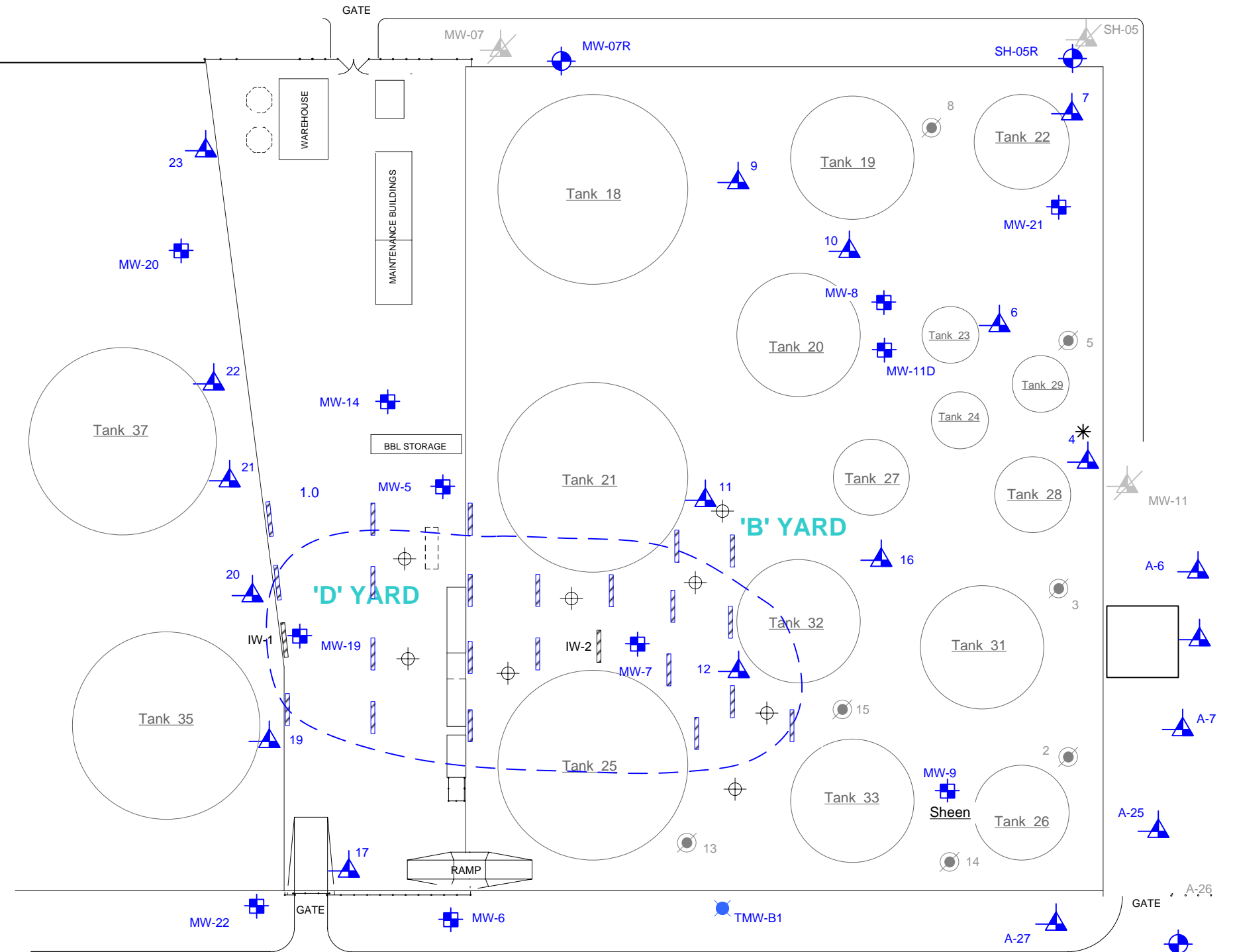


11th AVENUE S.W.

13th AVENUE S.W.

**LEGEND**

- SH-02 GROUNDWATER MONITORING WELL (INSTALLED BEFORE 1993)
- MW-7 GROUNDWATER MONITORING WELL (INSTALLED AFTER 1993)
- MW-12R REPLACEMENT GROUNDWATER MONITORING WELL (INSTALLED BETWEEN JANUARY 31 AND FEBRUARY 21, 2002)
- MW-25 MONITORING WELLS INSTALLED SEPTEMBER 30, 2003
- A-13 DESTROYED, DAMAGED OR DECOMMISSIONED DUE TO CONSTRUCTION ACTIVITIES
- 3 ABANDONED GROUNDWATER MONITORING WELL, JUNE 2003
- NEW MONITORING WELLS INSTALLED OCTOBER 21, 2009
- TPH-G ISOCONCENTRATIONS IN mg/L, MAY 23-25, 2011
- EXISTING SULFATE INJECTION TRENCH
- PROPOSED SULFATE INJECTION TRENCH
- PROPOSED TEMPORARY MONITORING WELL



**FIGURE 1**  
**CONCEPTUAL SULFATE APPLICATION NETWORK**  
 KINDER MORGAN LIQUIDS TERMINALS, LLC  
 HARBOR ISLAND TERMINAL  
 2720 13<sup>TH</sup> AVENUE SOUTHWEST  
 SEATTLE, WASHINGTON

PROJECT NO. STKM-001-W-0002	DRAWN BY MM FEBRUARY 2012
FILE NO. STKM-001-W-0002	PREPARED BY MM
REVISION NO. 0	REVIEWED BY DL