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Ms. Bobbi Coleman  
South Carolina Department of Health and Environmental Control  
Assessment Section, UST Management Division  
Bureau of Land and Waste Management  
2600 Bull Street  
Columbia, SC 29201



Subject: Free-Product Recovery Plan – Revision 4  
Lewis Drive Remediation  
Plantation Pipe Line Company  
Belton, South Carolina  
Site ID #18693, "Kinder Morgan Belton Pipeline Release"



Dear Ms. Coleman,

On behalf of Plantation Pipe Line Company (Plantation), CH2M HILL Engineers, Inc. (CH2M) has prepared this letter to modify the approach to free product recovery at the Lewis Drive Remediation site located in Belton, South Carolina. These changes were discussed with the South Carolina Department of Health and Environmental Control (SCDHEC) during a meeting in Columbia, SC on January 22, 2018. This plan supersedes the Interim Free Product Recovery Plan Revision 3, dated August 4, 2017<sup>1</sup>. The efficiency of product recovery by the current vacuum-enhanced method has declined significantly at the site, and we have prepared this plan to revise our approach.

As discussed at the meeting with SCDHEC, while remediation through air sparging has been highly successful, the efficiency of vacuum product recovery has declined significantly over time. The slides presented at that meeting are included as Attachment A.

Despite weekly product recovery events performed at great expense to Plantation, only 21 gallons of product have been recovered at the site per month in the last five months since September 1, 2017. This is a minute amount compared to 69,000 gallons per month that were recovered in the first two months after the release and approximately 2,700 gallons per month between February 2015 and August 2017<sup>2</sup>.

The inefficiency of vacuum-enhanced product recovery is supported by the results of mobility testing conducted at the site in 2017<sup>3</sup>. During these tests, product transmissivity at the six wells tested ranged

<sup>1</sup> CH2M HILL Engineers, Inc. (CH2M). 2017. *Interim Free Product Recovery Plan – Revision 3, Plantation Pipe Line Company, Lewis Drive Remediation Site, Belton, South Carolina, Site ID #18693, "Kinder Morgan Belton Pipeline Release"*. August 4.

<sup>2</sup> CH2M. 2018. *Lewis Drive – December 2017 Monthly Status Update, Plantation Pipe Line Company, Belton, South Carolina, Site ID #18693, "Kinder Morgan Belton Pipeline Release"*. January 18.

<sup>3</sup> CH2M. 2017. *Light Non-Aqueous Phase Liquid Mobility Testing Technical Memorandum, Lewis Drive Site, Belton, South Carolina*. May 25.

between 0.07 and 0.54 square feet (ft<sup>2</sup>) per day. Based on published literature, fluid recovery is considered impractical in wells with low transmissivities ranging from 0.1 to 0.8 ft<sup>2</sup>/day<sup>4</sup>.

Furthermore, product thickness data presented at the meeting in Columbia (Attachment A) indicate that the air sparging curtains established in the Brown's Creek Protection Zone and Cupboard Creek Protection Zone have halted migration of product toward these surface water bodies and there is no further risk posed by remaining product at the site. Indeed, air sparging has reduced product thicknesses by 95 percent in the Brown's Creek Protection Zone and by 81 percent in the Cupboard Creek Protection Zone.

The current method of enhanced vacuum product recovery also provides little resolution on the volume of product recovered by well. As a vacuum is applied to each well, product and water are emulsified and recovered together in indistinguishable quantities. Due to the large size of the recovery vessel, even after allowing product and water to settle, the volume of product recovered cannot be measured with a large degree of accuracy, and can only be obtained as aggregate over the whole site.

Therefore, as discussed with SCDHEC, Plantation is implementing the following plan to more accurately quantify the amount of product recovered by well which will allow us to focus future activities:

1. Product recovery skimmers (specifications presented in Attachment B) will be the primary method of product removal. They will be placed in monitoring wells, recovery wells, sumps, and trench risers that have 0.01 foot or greater of product present and sufficient depth below the oil/water interface to accommodate the height of the skimmer based on the manufacturer's recommendation. The skimmers will be left in place and emptied each week. To record the volume of product recovered, the skimmer canisters will be emptied into a graduated bucket or cylinder before returning them to the well. If the skimmer canisters are full, then any remaining product will be bailed out of the well, measured for volume, and recorded.
2. Petroleum-only absorbent socks will be used in wells that do not meet the minimum water column required by the manufacturer for the smallest size skimmer. The weight of each sock will be measured and recorded prior to installation. The socks will be withdrawn from each well and inspected weekly. If the sock is near or fully saturated, it will be weighed, recorded, properly disposed of, and replaced with a new sock. Otherwise, if not near or fully saturated, the sock will be returned to the well.

In accordance with previous plans, Plantation will continue to:

- Transport recovered product and water to an off-site disposal facility.
- Gauge all monitoring wells, recovery wells, recovery sumps, recovery trench risers, and piezometers monthly for depth to groundwater and free product thickness. If present, product recovery skimmers and socks will be removed from wells prior to gauging.

Based on water level gauging data from December 27, 2017, there are 22 features at the Lewis Drive site with greater than 0.01 foot of product and a 2-inch or greater diameter (Table 1 and Figure 1). Of those, four are monitoring wells, seven are recovery wells, seven are recovery sumps, and four are recovery trench risers. Table 1 presents the recommended product recovery method for each feature according to the guidelines above.

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<sup>4</sup> Interstate Technology & Regulatory Council (ITRC). 2009. *Evaluating LNAPL Remedial Technologies for Achieving Project Goals*. LNAPL-2. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. [www.itrcweb.org](http://www.itrcweb.org).

Although product is also measurable in three 1-inch piezometers (TW-28, TW-42, and TW-45), Plantation intends to abandon these features. Product recovery cannot be performed (by vacuum truck, skimmer, or standard size socks) in features with less than a 2-inch diameter. Also, capillary action makes product thickness measurements in these small-diameter piezometers inaccurate. Furthermore, there is now a network of 2-inch monitoring wells sufficient to provide enough data on groundwater elevation, product thickness, and analytical data such that the 1-inch piezometers are no longer necessary.

Plantation intends to install the skimmers and socks in the 22 features mentioned above the week of February 12, 2018. The skimmers and socks will be checked and emptied weekly for four weeks, after which the recovery volume data will be evaluated to develop a more focused plan.

If you have any further questions or concerns, please contact me at 919-760-1777 or Mr. Jerry Aycock with Plantation at 770-751-4165.

Regards,  
CH2M HILL Engineers, Inc.



William M. Waldron, P.E.  
Program Manager

**Enclosures:**

- Table 1 – Wells with Product Present and Recovery Method
- Figure 1 – Product Thickness Map
- Attachment A – Lewis Drive Remediation, SCDHEC Progress Update Presented January 22, 2018
- Attachment B – Oil Skimmer Specifications

**Cc (via e-mail):**

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**Table 1. Wells With Measurable Product Thickness**

*Plantation Pipe Line Company*

*Lewis Drive Remediation Site, Belton, South Carolina*

*Site ID #18693 "Kinder Morgan Belton Pipeline Release"*

<b>Well Identifier</b>	<b>Product Thickness (feet)</b>	<b>Depth to Water (feet)</b>	<b>Depth below oil/water interface (feet)</b>	<b>Well Diameter (inches)</b>	<b>Total Depth (feet)</b>	<b>Depth below oil/water interface (Inches)</b>	<b>Recommendation</b>
MW-08	0.01	11.61	8.19	2	19.8	98	2-inch diameter, 1-liter passive skimmer
MW-11	0.43	30.45	2.05	2	32.5	25	Oil-only absorbent sock
MW-15	0.01	14.02	7.20	2	21.22	86	2-inch diameter, 1-liter passive skimmer
MW-20	0.35	13.5	5.95	2	19.45	71	2-inch diameter, 1-liter passive skimmer
RS-01	0.42	14	9.60	4	23.6	115	4-inch diameter, 4-liter passive skimmer
RS-02	0.04	12.15	7.85	4	20	94	4-inch diameter, 4-liter passive skimmer
RS-05	0.65	13.15	12.05	4	25.2	145	4-inch diameter, 4-liter passive skimmer
RS-08	0.10	15	5.22	4	20.22	63	4-inch diameter, 4-liter passive skimmer
RS-10	0.10	10.15	9.91	4	20.06	119	4-inch diameter, 4-liter passive skimmer
RS-14	0.02	7.49	12.44	4	19.93	149	4-inch diameter, 4-liter passive skimmer
RS-17	0.01	6.39	13.52	4	19.91	162	4-inch diameter, 4-liter passive skimmer
RT-1A	0.05	14.87	6.02	4	20.89	72	4-inch diameter, 4-liter passive skimmer
RT-1B	0.05	14.82	6.28	4	21.1	75	4-inch diameter, 4-liter passive skimmer
RT-1C	0.05	15.41	5.86	4	21.27	70	4-inch diameter, 4-liter passive skimmer
RT-2K	0.01	1.25	2.89	4	4.14	35	4-inch diameter, 1-liter passive skimmer or oil-only absorbent sock
RW-02	0.59	24.1	1.62	4	25.72	19	4-inch diameter, 1-liter passive skimmer or oil-only absorbent sock
RW-03	0.05	24.25	9.14	4	33.39	110	4-inch diameter, 4-liter passive skimmer
RW-04	0.06	24.93	10.11	4	35.04	121	4-inch diameter, 4-liter passive skimmer
RW-05	1.34	34.19	4.06	4	38.25	49	4-inch diameter, 4-liter passive skimmer
RW-07	0.02	22.87	15.13	4	38	182	4-inch diameter, 4-liter passive skimmer
RW-08	0.02	17.83	15.67	4	33.5	188	4-inch diameter, 4-liter passive skimmer
RW-15	0.68	15.3	21.20	4	36.5	254	4-inch diameter, 4-liter passive skimmer
TW-28	0.60	23.7	8.14	1	31.84	98	Abandon
TW-42	0.45	26.55	0.95	1	27.5	11	Abandon
TW-45	0.11	27.76	9.10	1	36.86	109	Abandon

Note:

Only wells, sumps, and piezometers with measurable product thickness are shown.

Wells were gauged on December 27, 2017.



- LEGEND**
- ★ Release Point
  - ⊕ Monitoring Well
  - ⊕ Bedrock Monitoring Well
  - ◆ Seep Location
  - ⊕ Recovery Sump
  - ⊕ Piezometer ("R" indicates Replacement)
  - ⊕ Recovery Well (4-inch diameter)
  - ⊕ Vertical Bedrock Sparging Well
  - ⊕ Vertical Saprolite Sparging Well
  - ⊕ Surface Water Sampling Location
  - ▲ Septic Tank
  - ⊕ Recovery Trench Extraction Point
  - Recovery Trench
  - Surface Water Flow Direction
  - Horizontal Sparging Well Riser
  - Horizontal Sparging Well Screen
  - Pipeline
  - National Hydrography Dataset Stream
  - ⊕ Delineated Wetland
  - ⊕ Beaver Dam
  - ⊕ Detail Area
- 0.43 Product thickness in feet as of 12/21/2017 and 12/27/2017
- NP No product detected
- NM Not measured

Base Map Sources:  
 \*USDA, Farm Service Agency (FSA), National Agriculture Imagery Program (NAIP), Published 8/19/ 2015  
 \*United States Geological Survey (USGS) National Hydrography Dataset (NHD)



**Figure 1. Product Thickness Map**  
 Lewis Drive Remediation Site  
 Belton, South Carolina  
 Site ID #18693 "Kinder Morgan Belton Pipeline Release"



Attachment A  
Lewis Drive Remediation  
SCDHEC Progress Update  
Presented January 22, 2018