

August 19, 2020



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Mr. Jeffery E. Mendenhall
South Carolina Department of Health and Environmental Control
Assessment Section, UST Management Division
Bureau of Land and Waste Management
2600 Bull Street
Columbia, South Carolina 29201



Subject: Request to Conduct Shallow Bedrock Zone Air Sparge Test
Plantation Pipe Line Company
Lewis Drive Remediation Site
Belton, South Carolina
Site ID #18693, "Kinder Morgan Belton Pipeline Release"

Dear Mr. Mendenhall,

This correspondence is being submitted on behalf of Plantation Pipe Line Company (Plantation) to request approval to conduct a shallow bedrock zone air sparge test at Plantation's Lewis Drive Remediation Site (Site ID #18693), located in Belton, South Carolina (site).

As you are aware, the horizontal air sparging has shown phenomenal performance in the Hayfield Treatment Zone. As Plantation continues to evaluate expansion of the air sparge system to address impacts in the area of MW-38, horizontal air sparging would be preferred. Unfortunately, bedrock is fairly shallow in the MW-38 area, and as such, use of a horizontal air sparge well(s) will need to be installed in shallow bedrock to be effective. In order to evaluate this concept and confirm its viability, the shallow bedrock sparge points installed near the compound need to be tested. This letter presents the overall rationale and approach for the test.

1. Objective and Background

This abbreviated work plan documents the proposed approach for testing air sparging into the three bedrock biosparging wells at the Lewis Drive site (VBS-01, VBS-02, and VBS-03). The primary objectives of the testing will be to evaluate the feasibility of injecting air into the bedrock, particularly injection pressure, flow rate, and the horizontal and vertical extent of air propagation in the subsurface (orientation of air dispersal and the potential propagation of a "zone of influence").

The test will be conducted in two steps. The first step will involve injecting air in the three wells, individually at first, and then collectively, to evaluate if the formation will take air, the general magnitude, and related pressures. Provided the first test is successful, a second test will be performed that involves either expanding the monitoring network in the vicinity of the three

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biosparging wells and/or using water to wet the area to be able to see potential air sparging influences. This document focuses on the first step of the testing.

Shallow bedrock biosparging wells VBS-01 (35.5 ft bgs), VBS-02 (29.0 ft bgs), and VBS-03 (34.2 ft bgs) were installed in March 2017 under Underground Injection Control (UIC) permit-to-construct #SCHE03020469M. The permit-to-operate these three wells was received from South Carolina Department of Health and Environmental Control (DHEC) shortly after installation was complete, although it had since expired. The permit was renewed on June 24, 2020 and expires November 19, 2024.

The bedrock biosparging wells were installed by coring into rock until water-producing fractures were encountered, then the wells were constructed using a two-foot long, 2-inch ID, 0.006-inch slotted well screen, with 40/70 filter sand installed around the screen. Since there are few bedrock wells in the area to evaluate residuals in this portion of the site, these wells were opened and redeveloped in February of 2020. Groundwater samples were collected from the wells and analyzed for BTEX, 1,2-dichloroethane, MTBE, and naphthalene in March (VBS-02 and VBS-03) and July (VBS-01) 2020. March sampling results revealed minor impacts to these wells. Benzene was the only analyte detected, at a concentration of 1.43 µg/L (VBS-02). July results for VBS-01 are pending. Prior to the test, all three wells will be reconnected to the biosparging system via existing subsurface HDPE piping.

As shown in the Site Overview (**Figure 1**), VBS-01 and VBS-02 are approximately 80 ft apart. VBS-02 and VBS-03 are approximately 100 ft apart. The nearest monitoring well, MW-22, is located approximately 100 ft from VBS-03. Other monitoring wells, MW-01/01B, MW-11, MW-18, and MW-44/44B are located more than 150 ft from the nearest bedrock sparge well. Recovery wells RW-01, RW-02, and RW-03 are located 80-140 ft from VBS-01 and recovery sumps RS-01, RS-02, and RS-04 are located approximately 170 ft from VBS-01 (to the northwest across Lewis Drive).

Based on review of the drilling logs for VBS-01, VBS-02, and VBS-03, bedrock was encountered at 5 – 12 ft bgs; fracture orientation is on the order of 5 to 30 degrees from horizontal.

2. Initial Pressure and Flow Tests

An initial pressure and flow test will be conducted on a VBS-01 to determine overall feasibility of sparging in the shallow bedrock zone, as well as evaluate initial flows and pressures. If flow is favorable into the biosparging wells, nearby monitoring features will be monitored to see if any effects of sparging can be detected in the nearest monitoring features. Flow will be initiated at VBS-01 at 5 standard cubic feet per minute (scfm) or less, and subsequently increased in steps. The duration of each step will be dependent upon observations in the field combined with stability of air flow, pressure, and water table elevation. Downhole transducers will be used to continuously monitor water table elevation and dissolved oxygen in select 2-inch monitoring wells. Water table elevation and dissolved oxygen concentrations in 1-inch wells will be recorded manually using downhole instruments.

Pending favorable outcome of the initial test on VBS-01 and observations in nearby monitoring features, a second test may be conducted on each biosparging well and/or on the wells as a group. This test will use the optimum flowrate and pressure determined from the test on VBS-01 to

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observe potential influence in nearby monitoring features. Should air sparge effects be observed in nearby monitoring features, sulfur hexafluoride (SF₆) gas will be injected at approximately 0.05% by volume as a tracer in the group well test to try and see influence in nearby monitoring features. Should this portion of the test be viable, groundwater samples will be collected from all monitoring wells, recovery wells, and recovery sumps within 150 ft of the three bedrock sparge wells. All baseline samples will be analyzed for BTEX, MTBE, and SF₆. If we see only slight influence in nearby monitoring features, this portion of the testing may be performed during the second step of testing.

Depending on the outcome of this initial testing a second series of tests may be performed. It is anticipated that the second series of testing may involve the installation of additional monitoring points and/or the use of surface wetting to observe and monitor test effects. This series of testing will likely use some of the same monitoring techniques used for the initial test. Also, depending on the effects observed during the initial tests, the sulfur hexafluoride may not be used until the second series of testing. This is because we do not want to introduce the sulfur hexafluoride until a denser monitoring network is installed. The second series of testing will be presented along with key findings from the initial test for SCDHEC's approval.

We look forward to any comments you may have and your approval of our plan. As always, if you have any questions, please call my cell since I am still working from home.

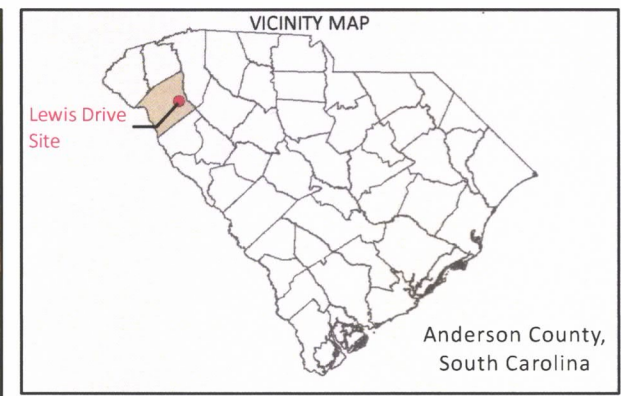
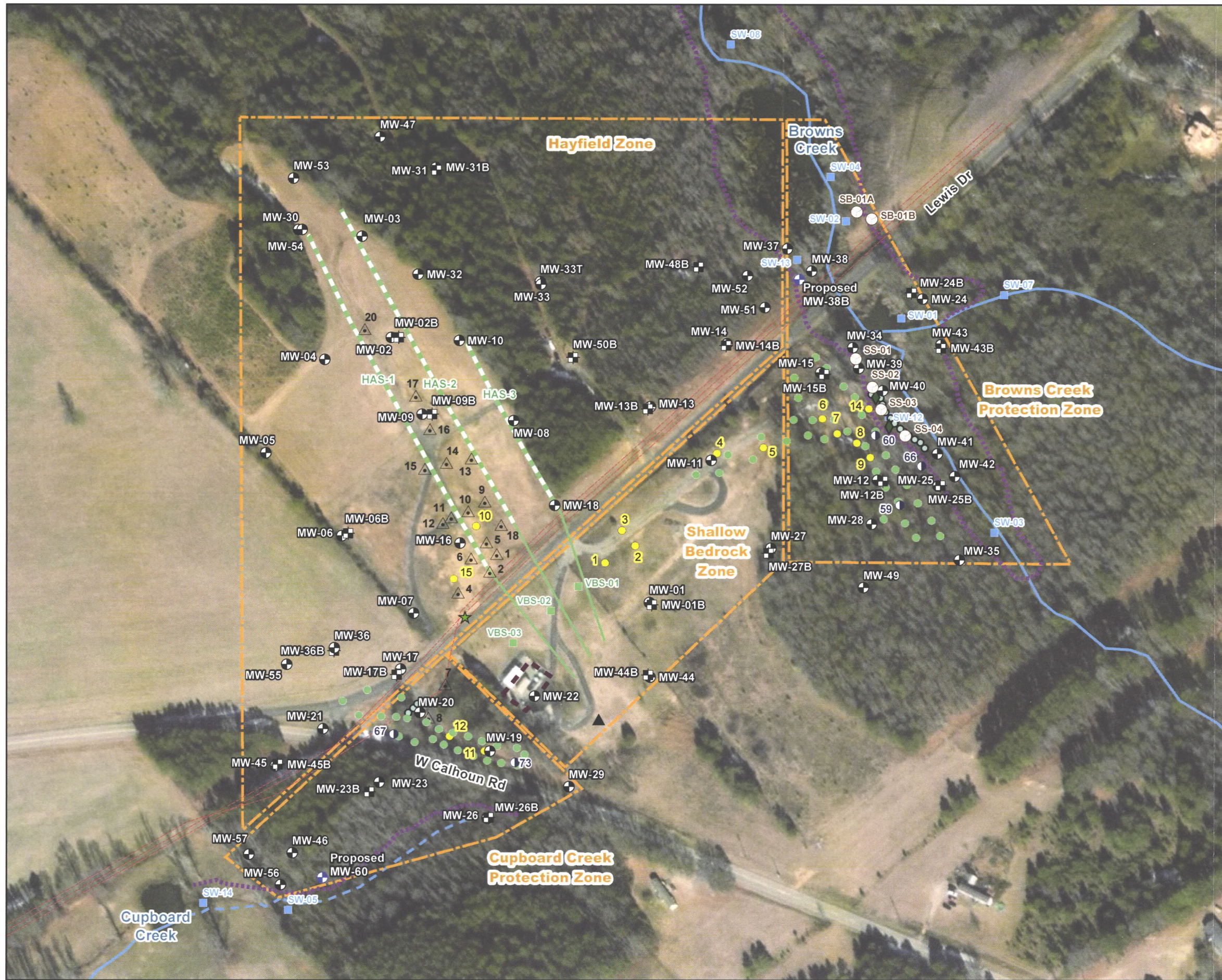
Regards,



William M. Waldron
Program Manager

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Figures



LEGEND

- ★ Release Point
- ⊕ Residuum Monitoring Well
- ⊞ Bedrock Monitoring Well
- ⊕ Proposed Monitoring Well
- ⊙ Piezometer
- △ Recovery Sump
- Soil Boring Location
- Recovery Trench Point
- Recovery Well (4-inch diameter)
- Surface Water Sampling Location
- ▲ Septic Tank
- ◆ Seep Location
- Vertical Bedrock Sparging Well
- Vertical Saprolite Sparging Well
- Pipeline
- Horizontal Sparging Well Riser
- Horizontal Sparging Well Screen
- Waterbody
- - - Intermittent Stream
- ⋯ Inspection Route for Sheen or Distressed Vegetation
- ⊞ AS System Compound
- ⊞ Remediation Zone

Base Map Sources:
 *Environmental Systems Research Institute (Esri)
 ArcMap World Imagery, 2018. Basemap features are approximate.
 *United States Geological Survey (USGS) National Hydrography Dataset (NHD)

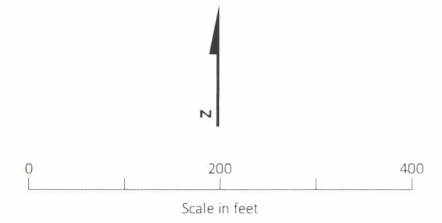


Figure 1. Site Overview
 Lewis Drive Remediation Site
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