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15 November 2016

Ms. Aimee Reynolds  
Project Officer, Remediation Division  
Montana Department of Environmental Quality  
1225 Cedar Street  
Helena, Montana 59601

**Re: *Joint Livingston Restoration Group (LRG) and BNSF Railway Company (BNSF)  
Submittal – Addendum to Final Air Sparge/Soil Vapor Extraction Pilot Test Work  
Plan***

Dear Ms. Reynolds,

The BNSF Railway Company and the Livingston Restoration Group jointly submit the *Addendum to Final Air Sparge/Soil Vapor Extraction Pilot Test Work Plan, Burlington Northern Livingston Shop Complex, Livingston, Montana* to expand the existing air sparge/soil vapor extraction (AS/SVE) system to the north-northwest in order to enhance the systems effectiveness.

Please feel free to contact me with any questions.

Sincerely,



Allen M. Stegman

cc: Pat Thomson, WET  
David Erickson, WET  
Yueh Chuang, BNSF  
Todd Miller, Kennedy/Jenks Consultants  
Courtney Lawellin  
Lezlie Nelson, LRG



November 15, 2016

Ms. Aimee Reynolds  
Project Officer  
Remediation Division  
Montana Department of Environmental Quality  
1100 North Last Chance Gulch  
Helena, MT 59601

**Subject: Addendum to Final Air Sparge/Soil Vapor Extraction Pilot Test Work Plan  
Burlington Northern Livingston Shop Complex; Livingston, Montana**

Dear Ms. Reynolds:

With this letter, Water & Environmental Technologies, Inc. (WET) is requesting approval to expand the existing Air Sparge/Soil Vapor Extraction (AS/SVE) system as described in the Final Air Sparge / Soil Vapor Extraction Pilot Test Work Plan (Work Plan), dated September 23, 2015 (Figure 1). The purpose of the expansion is to adapt to the localized flow path, improve treatment of the center of plume, and provide better flow-line monitoring to quantify mass removal rates.

The recent Technical Memorandum - AS/SVE Pilot Test: 6-Month Operations Summary, dated August 26, 2016, provided the 6-Month operational review of the system including details regarding flow paths and mass flux calculations. Concentration variations across the AS curtain and the seasonal oblique angle of flow to the AS curtain are the primary reasons for the request to extend the system. Elevated tetrachloroethene (PCE) concentrations at the northern end of the system monitoring network indicate the center of the peak contaminant concentration flow path is near the northern extent of the existing system. Therefore, WET proposes to extend the footprint of the AS/SVE system to the north-northwest to enhance the system's effectiveness. The alignment of the curtain wells will be oriented perpendicular to the dominant flow path, based on existing groundwater flow data. In addition, the expansion will include two additional AS wells to the south to increase treatment footprint.

Based on results of the initial steady state operational period for the AS/SVE system, the system is effective in removing mass from groundwater and will assist in reducing migration of PCE-impacted water downgradient of the facility. As such, this memorandum requests an extension to the existing curtain wall following the same well spacing and completion detail specified in the September 23, 2015, Work Plan. Except for minor delivery adaptations to reduce pressure and flow drops, the mechanical components and layout for the annex system will be constructed in accordance with the existing approved design.

## New Well Construction

12 AS wells will be installed. Included will be two rows of 4 and 5 extending the sparge curtain approximately 150 feet north of the current system (Figure 1). Also, two wells will be installed at the southern end of the current system to extend the reach of the system. In addition, a single well will be installed upgradient of the bend in the curtain within the central portion of the peak concentration flow path. Finally, one SVE well will be installed near the northern end of the expansion. The northernmost SVE well from the existing system (DG-SVE-1) and the northernmost AS wells (DG-AS-2, DG-AS-3, and DG-AS-9) will manifold to the expansion system shed to balance flows between the two systems and improve overall air delivery. This will improve overall capture radius of the existing system and generate improved capture radius for the northern system. The new AS wells and SVE wells will be installed in accordance with the September 23, 2015, Work Plan.

In addition to system expansion wells, seven groundwater monitoring wells will be installed. Two wells will be installed upgradient of the northern extension of the expansion, four downgradient including one on the bend in the expansion, and one south of the existing system and south of the MRL access road. The southern well will provide additional performance monitoring and assist in establishing concentrations at the southern end of the treatment area. Northern performance and plume extent monitoring will be determined using existing well 89-7, located approximately 50 feet north of the expansion air sparge wells. New monitoring wells will be single completion wells and will be constructed in accordance with monitoring well construction details described in the September 23, 2015, Work Plan.

Wells will be installed beginning with the monitoring wells. This will allow sampling and characterization of localized hydraulics (gradient and flow direction) to assist in accurately placing air sparge wells to assure adequate treatment of the PCE plume to the north. The upgradient monitoring wells will be sampled immediately following installation and the samples submitted to Energy Laboratories for rush analysis for Volatile Organic Compounds (VOCs) using EPA Method 8260.

## Lateral Piping and Remediation Equipment Installation

The system infrastructure will be installed consistent with the September 23, 2015, Work Plan. A review of the lateral piping, manifold, and valves is being conducted to improve efficiencies of air delivery. Although the results of this review will not affect the overall system design, they may cause a change in individual components (e.g., pipe size, valve size). System design changes will be provided to DEQ for review prior to installation.

Upon approval of this request for expansion, WET will schedule well and lateral installation to take place as soon as possible prior to onset of winter. Full installation of the mechanical shed(s) and electrical service will be completed at the earliest possible time.

Sincerely



Patrick Thomson, PG

Cc: Lezlie Nelson, Livingston Restoration Group  
Courtney Lawellan, Lawellin Law Firm  
Allen Stegman, BNSF Railway Company  
Yueh Chuang, BNSF Railway Company  
Todd Miller, Kennedy/Jenks Consultants

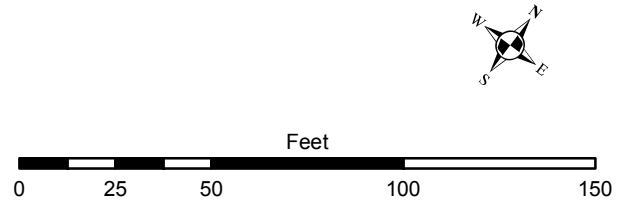
**FIGURE**




**Legend**

-  Existing Wells
-  Expansion System AS Well
-  Expansion System Monitoring Well
-  Expansion System SVE Well
-  System Enclosure

**Notes:**  
 Groundwater samples collected on 1/7/16  
 Static water level measurements from 1/18/16 prior to startup testing.  
 "NM" indicates not measured  
 GWE - Groundwater Elevation, ft amsl  
 PCE - PCE Concentration, ug/L



	<b>AS/SVE EXPANSION PLAN</b>	
	<i>Proposed Well Locations</i>	
	Job#: LRGM01 Task 8	<b>FIGURE 1</b>
	Date: 11/9/2016	
Path: M:\LRGM01\Task8\AS/SVE_Expansion.mxd, Author: jleprosse		