Work Plan for Supplemental Soil-Vapor Extraction Pilot Test Implementation/Reporting at Material Disposal Area G, Technical Area 54, Revision 1

Purpose	This document describes the scope of work for conducting a supplemental soil-vapor extraction (SVE) pilot test at Material Disposal Area (MDA) G. This document also describes the activities needed to install the supplemental SVE pilot test system and the associated operational requirements. As directed by the New Mexico Environment Department (NMED), the objectives of the supplemental pilot test are to determine the capabilities and optimal design for a SVE system at MDA G, and to determine whether SVE has the potential to be an effective part of the remediation at MDA G. The supplemental pilot test is designed to target the permeable zones identified in the Tshirege Member of the Bandelier Tuff, the contacts between the stratigraphic units, and any permeable layers in the geologic column. It is also designed to assess the ability of major stratigraphic units, such as the Cerro Toledo unit and Otowi Member, to act as either a barrier to contaminant migration or as an effective extraction interval. This work plan presents the strategy and operational conditions for performing the supplemental SVE pilot test at MDA G. Because SVE and permeability system equipment and instrumentation must first be evaluated and approved as part of the design basis and readiness review process, specifications and information regarding operational capabilities of the SVE system will be provided as part of the final pilot test report.
Previous Investigations	In June 2007, NMED approved the Addendum to the "Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54" (LANL 2007, 096110), which detailed the nature and extent of the three subsurface volatile organic compound (VOC) plumes identified at MDA G. Pore-gas monitoring conducted at MDA G since 1985, and conclusions of the September 2005 "Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54" (LANL 2005, 090513) and the 2007 Addendum indicate the highest VOC concentrations are beneath the eastern portions of MDA G in the vicinity of the shaft field west of Pits 2 and 4. The dominant VOC contaminant present in subsurface vapor in the eastern and central portions of MDA G is 1,1,1-trichloroethane (TCA); whereas, trichloroethene is the dominant VOC in the western portion of MDA G. Results of the original SVE pilot test conducted at MDA G in 2008 were presented to NMED in October 2008, with a revision (LANL 2009, 105112) provided in January 2009. The results of the 2008 pilot test indicated that SVE was an effective method for extracting vapor-phase VOC contamination from higher permeability geologic units in the vadose zone beneath MDA G. Based on U.S. Environmental Protection Agency (EPA) guidance regarding site- and chemical-specific parameters for determining the suitability of SVE, the conditions at MDA G met or exceeded the EPA recommendations. A numerical analysis was conducted in January 2009 to determine the potential extraction radii of influence (ROI), and to further validate that SVE is an effective method for removing subsurface VOCs from MDA G. From this evaluation, Los Alamos National Laboratory (LANL or the Laboratory) determined that with an operational airflow extraction rate of 100 standard cubic ft per min (scfm), the potential extraction ROI in the Tshirege Member of the Bandelier Tuff was approximately 150 ft. Results of the numerical analysis were reported to NMED in the "Numerical Analysis of the Soil-Vapor Extraction Test at Material Disposal Area G, Technical Area 54" (LANL 2009, 105413).
Extraction Borehole Design	Because the steel casing in the existing deep-extraction borehole cannot be removed to provide a suitable extraction interval length and depth, a new extraction borehole will be installed approximately 24 ft from the existing shallow-extraction borehole and approximately 150 ft from existing pore-gas monitoring borehole 54-01117 (Figure 1). The observation wells range approximately 24 ft to 150 ft from the new extraction borehole location.

Extraction Borehole Design (continued)	The new extraction borehole will be completed within the Otowi Member of the Bandelier Tuff to a total depth of approximately 177 ft below ground surface (bgs) and will be steel-cased from ground surface to a depth of approximately 55 ft bgs. Construction details of the proposed new extraction borehole are shown in Figure 2. The open interval from 55 ft bgs to 177 ft bgs will provide access for a dual packer assembly such that extraction step tests can be conducted in stratigraphic units and at unit contacts Qbt 2/Qbt 1 v-u, Qbt 1 v-u, Qbt 1 v-u/Qbt 1 v-c, Qbt 1 v-c, Qbt 1 v-c/Qbt 1g, Qbt 1g/Qbtt, and Qct. Stratigraphic units and unit contacts are shown in Figure 2. The extraction borehole will be installed using hollow-stem auger (HSA) drilling methodology. The borehole will be logged in accordance with section IX.B.2.c of the Compliance Order on Consent (Consent Order). Following installation, the extraction borehole will be caliper and camera logged to ensure borehole integrity and ensure that the packer assembly can achieve an adequate seal during the extraction tests. The existing deep-extraction borehole will be abandoned prior to the permeability testing and the extraction tests, in accordance with section X.D of the Consent Order.
Monitoring Borehole Design	One new pore-gas monitoring borehole will be installed within 25 ft of the proposed new extraction borehole using HSA drilling methodology (Figure 1). The existing shallow-extraction borehole will be converted to a second new pore-gas monitoring borehole. The newly installed monitoring borehole will be logged in accordance with section IX.B.2.c of the Consent Order. The new monitoring borehole and the converted shallow-extraction borehole will be constructed to evaluate differential pressure responses and VOC concentrations in the stratigraphic units and at unit contacts specified in Table 1 and shown in Figure 2. Because the Qbt 1 v-u/Qbt 1 v-c contact and the Qbt 1 v-c/Qbt 1g contact are less than 10 ft apart, construction of sampling ports at each of these contacts in a single monitoring borehole is not possible. The proposed new monitoring borehole will be constructed with sampling ports as follows: • Within the Qbt 2, Qbt 1g, and Qbo intervals, and • Across the contacts of the Qbt 2/Qbt 1 v-u, Qbt 1g/Qbtt, and Qbt 1 v-u/Qbt 1 v-c The proposed converted shallow-extraction borehole will be constructed with sampling ports as follows: • Within the Qbt 1 v-u and Qbt 1g intervals, and • Across the contact of the Qbt 1 v-c/Qbt 1g. The sampling ports will consist of nominal 0.5-in.-diameter, 12-in.-long, stainless-steel well screens connected to sampling tubing extending to the ground surface. The sampling tubing will consist of 0.25-in.-diameter stainless-steel tubing connected with Swagelok fittings. The screens will be placed in 5-ft sampling intervals filled with 10/20 silica sand. The annular space between the sampling intervals will be filled with bentonite chips to isolate the sampling intervals. The bentonite chips will be tremied into the borehole and hydrated as they are emplaced. The surface completion of the boreholes will consist of a steel casing with a locking steel cap. Construction details, including port depths and corresponding stratigraphic units and contacts, for both the proposed new and the existing monitoring boreholes are shown in Figure 2. Proposed borehole locations are shown in Figure 1.

Permeability Testing	Prior to conducting extraction step tests, discrete permeability testing of each stratigraphic unit will be conducted in the proposed new extraction borehole and in the existing shallow-extraction borehole (prior to conversion to a monitoring borehole). Permeability testing will be conducted within the open interval of each borehole at intervals no greater than approximately 3 ft. Permeability testing will be conducted using a dual packer assembly and a down-hole instrument package that measures airflow, differential pressure, and temperature. Targeted permeability intervals include the Otowi, Cerro Toledo, Qbt 1 v, and across the contacts for the Qbt 2/Qbt 1 v, Qbt 1 v-u/Qbt 1 v-c, Qbt 1g/Qbtt, and Qbt 1 v-c/Qbt 1g.
SVE System Design	The Laboratory proposes using a portable, skid-mounted SVE system similar to the design of the system used during the 2008 SVE pilot test. The SVE system will be capable of operating at extraction vacuums ranging from 3.7 kilopascals (kPa) (15 in. of water [in. H_20]) to 29.9 kPa (120 in. H_2O). The system will include a blower, vapor/liquid separator, and heat exchanger. All extracted air will be directed to suitably-sized drums or canisters, plumbed in series, containing granular activated carbon (GAC) for treatment. During each phase of the pilot test (baseline monitoring, active extraction, and rebound monitoring), differential pressure values will be collected from each pore-gas monitoring borehole sampling port using a Dwyer Series 475 Mark III Digital manometer, or equivalent. During each extraction test, extraction airflow will be determined using a Dwyer Series PE in-line orifice plate flow meter and Dwyer model 677-8 differential pressure transducer, or equivalent. The airflow rate will be established by closing the SVE system's dilution valve to the differential pressure corresponding with the desired flow rate (calculated per equations provided by Dwyer). Extracted air temperature and relative humidity will be collected using a Viasala HMP45AC humidity and temperature probe, or equivalent. Vacuum at the top of the extraction borehole will be monitored using a 0- to 150-in. H_20 vacuum gauge, or equivalent. Differential pressure, extraction air temperature, and relative humidity measured at the extraction wellhead will be recorded every 15 min using a Campbell Scientific CS-23X data logger, or equivalent. TCA is the major VOC contaminant in this area of MDA G, making up approximately 80% of the total VOC mass (based on the results of historical pore-gas sampling activities), and as such, will be the only VOC monitored during the pilot test. A B&K photo-acoustic multi-gas analyzer will be used to monitor TCA, carbon dioxide, and water vapor in the monitoring boreholes during the baseline and rebound monitoring stages of the pilot test. The same constituents will be monitored in the extraction borehole during the active extraction tests. Oxygen will be monitored using a Landtec GEM 500 gas analyzer, or equivalent. During active extraction tests, measurements will be collected every 15 min from the extracted air and recorded to a portable laptop computer, or equivalent data-logging instrument.

Readiness Review	The Laboratory has an established standard operating procedure (SOP) for identifying, sequencing, and scheduling all applicable and relevant activities and logistics associated with fieldwork planning and fieldwork authorization. The purpose of this procedure is to ensure compliance with applicable LANL, local, State, and Federal procedural requirements, standards, and regulations. These include the Environmental Programs-Environment and Remediation Support Services division's quality, health, safety, security, and environmental concerns. No work is performed on any LANL environmental site until integrated fieldwork planning is complete and fieldwork is authorized. Because the project site is located in a Hazard Category 2 nuclear facility, additional planning and engineering rigor is required. The integrated fieldwork planning and authorization process (EP-ERRS-SOP-5018, Rev. 0) involves nine basic planning steps. Within each step, there are a number of authorizations that are required. The nine planning steps are as follows: 1. Procurement 2. Regulatory Basis 3. Conduct of Engineering 4. Conduct of Operations 5. Integrated Safety Management/Integrated Safeguards and Security Management 6. Safety Basis 7. Configuration Management 8. Waste Management 9. Work Requests/Permits The Laboratory will initiate and perform the fieldwork planning and authorization process concurrent with the design and specification of the SVE system equipment and instrumentation. Experience has shown that fieldwork planning and authorization for a project of this complexity and scope in MDA G typically requires a minimum of 90 d to complete due to the requirements and rigor appropriate to a Hazard Category 2 nuclear facility.
SVE Pilot Test Operation	The SVE supplemental pilot test will evaluate the relationship between extraction airflow rates and ROI as a function of extraction vacuum within the stratigraphic units and unit contacts specified in Table 1. Eight extraction tests corresponding to the units and contacts specified in Table 2 will be conducted. Each extraction test will include six steps conducted at vacuums ranging from 3.7 kPa (15 in. H_2O) to 29.9 kPa (120 in. H_2O). The eighth test will evaluate air flow and ROI as a function of the six vacuum steps over the full open interval of the extraction borehole. Each step of each test will be conducted for 4 h. However, because MDA G is an operating Hazard Category 2 nuclear facility, operational access is available a maximum of 8 to 10 h/d. A maximum of only two steps can be conducted each operational day. Additionally, because the system will be shut down each night, the system will be run for 2 h at the previous extraction vacuum to reach static conditions. Each test for a given extraction interval (consisting of the six vacuum steps) will therefore require a minimum of 1 wk to complete. The active extraction tests will be conducted over 8 wk, as summarized in Table 2. Pressure conditions and TCA concentrations will be monitored in each monitoring borehole for 2 wk prior to the active extraction tests to evaluate baseline conditions.

SVE Pilot Test Operation (continued)	During the active extraction tests, a dual packer system will be used to segregate extraction intervals within each stratigraphic unit and unit contact of interest. Each extraction interval will be no greater than 10 ft in length. Vacuum, differential pressure, extraction air temperature, relative humidity, TCA, percent oxygen, percent carbon dioxide, and H_2O will be measured at the extraction wellhead every 15 min during the active extraction tests. All data collected at the wellhead will be recorded using an automated data-logging system. Differential pressure will be monitored in each monitoring borehole sampling port every 15 min during active extraction. Tritium sampling is not proposed due to the time constraints associated with tritium sample collection (~24 h per sample). Also, SVE is not a viable remedial treatment option for tritium given the low Henry's law constant for tritiated water vapor (e.g. tritium vapor in the vadose zone). Pressure conditions and TCA concentrations will be monitored for 2 wk after the active extraction tests to evaluate post-extraction and rebound conditions (e.g., reduction in TCA concentrations at monitoring locations immediately after active extraction and 2 wk after active extraction). Pilot test monitoring parameters are summarized in Table 3. In the event that any of the proposed extraction vacuums cause debris to be extracted from the extraction borehole, or if the Laboratory believes the extraction borehole integrity is compromised, the test will be terminated (with NMED notification).
Data Evaluation	Data generated during the supplemental SVE pilot test will be used to address SVE effectiveness and ultimate design questions. Extraction data (e.g., vacuum pressure responses and airflow rates) and discrete permeability data will be used to conduct an enhanced numerical analysis that evaluates the relationship between applied vacuum, airflow rate, and ROI. The analysis will be used to make predictions of the ROI for the different stratigraphic units at MDA G under different operational conditions (e.g., vacuum and operational timeframe). Results of this analysis will be used to evaluate preliminary conceptual design options for an SVE system at MDA G. In addition to the data generated during the supplemental SVE pilot test, pore-gas field data collected as part of historical and routine sampling of MDA G will be analyzed and used to estimate VOC plume mass and distribution with respect to different stratigraphic units. VOC pore-gas concentrations sampled with SUMMA canisters will be combined with B&K field-screening values to generate three-dimensional concentration data sets for discrete time frames. Sequential data sets may be combined to yield more complete spatial data sets. This analysis may show time trends in the overall mass that yields information source release that may be useful for conceptual SVE system designs and operational strategies. VOC screening data collected during the baseline monitoring stage of the supplemental SVE pilot test will be compared with VOC baseline and rebound screening data collected during the 2008 SVE pilot test to evaluate potential long-term rebound effects (e.g., full or partial rebound of VOC concentrations over a 1-yr timeframe).
Investigation-Derived Waste Management	Extracted air will be directed through GAC canisters for treatment and the effluent monitored for emissions compliance. Waste GAC containers will be managed in accordance with a waste characterization strategy form.
Status Updates	Electronic status updates will be provided to NMED at the conclusion of each test. The update will include field-data measurements, deviations from the work plan, and field observations that may affect test results. The update will be provided within 2 wk of completion of each test at a given extraction interval.

Report	The supplemental SVE pilot test report submitted to NMED will provide quantitative and qualitative discussion of the results of the SVE pilot test and permeability testing. Quantitative results will include a discussion of differential pressure responses and airflow rates observed in each stratigraphic unit and at each unit contact as a function of extraction test vacuums. Quantitative results will also include a discussion of the total mass of VOCs removed during the pilot test. The supplemental SVE pilot test report will provide a discussion of the numerical analysis results for evaluating the relationship between applied vacuum, airflow, and ROI, as well as a discussion of the VOC data evaluation for better defining VOC plume mass and distribution. VOC data collected during the supplemental SVE pilot test baseline monitoring will be compared to baseline and VOC rebound data collected during the 2008 SVE pilot test to evaluate potential long-term rebound effects. As-built drawings and detailed specifications for all SVE system equipment and instrumentation will be included in the final supplemental SVE pilot test report provided to NMED. The report will also detail the methodology and equipment specifications used to conduct discrete permeability tests. Where appropriate, the report will provide performance details of the SVE system in comparison to the manufacturer's specifications. All data collected during the pilot test will be provided as Appendices, in electronic format. The pilot test report will present data in the units summarized in Table 4.
Schedule	Upon receipt of NMED Approval of the work plan: • Complete readiness requirements to perform work in a Hazard Category 2 nuclear facility 90 d following NMED Approval. • Complete installation of new observation wells and extraction well. Conduct discrete permeability testing 30 d following completion of readiness requirements. • Perform baseline monitoring, extraction tests, and rebound monitoring 90 d following installation of new observation and extraction wells: ❖ Complete baseline monitoring – 2 wk ❖ Complete Test 1 – 1 wk ❖ Complete Test 2 – 1 wk ❖ Complete Test 3 – 1 wk ❖ Complete Test 4 – 1 wk ❖ Complete Test 5 – 1 wk ❖ Complete Test 6 – 1 wk ❖ Complete Test 7 – 1 wk ❖ Complete Test 8 – 1 wk ❖ Complete rebound monitoring – 2 wk. • Submit status reports by email to NMED – 2 wk after completion of each test. • Prepare supplemental pilot test report – 60 d following completion of rebound monitoring.

REFERENCES

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), September 2005. "Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54," Los Alamos National Laboratory document LA-UR-05-6398, Los Alamos, New Mexico. (LANL 2005, 090513)

LANL (Los Alamos National Laboratory), May 2007. "Addendum to the Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54," Los Alamos National Laboratory document LA-UR-07-2582, Los Alamos, New Mexico. (LANL 2007, 096110)

LANL (Los Alamos National Laboratory), January 2009. "Pilot Test Report for Evaluating Soil-Vapor Extraction at Material Disposal Area G at Technical Area 54, Revision 1," Los Alamos National Laboratory document LA-UR-09-0565, Los Alamos, New Mexico. (LANL 2009, 105112)

LANL (Los Alamos National Laboratory), March 2009. "Numerical Analysis of the Soil-Vapor Extraction Test at Material Disposal Area G, Technical Area 54," Los Alamos National Laboratory document LA-UR-09-0995, Los Alamos, New Mexico. (LANL 2009, 105413)

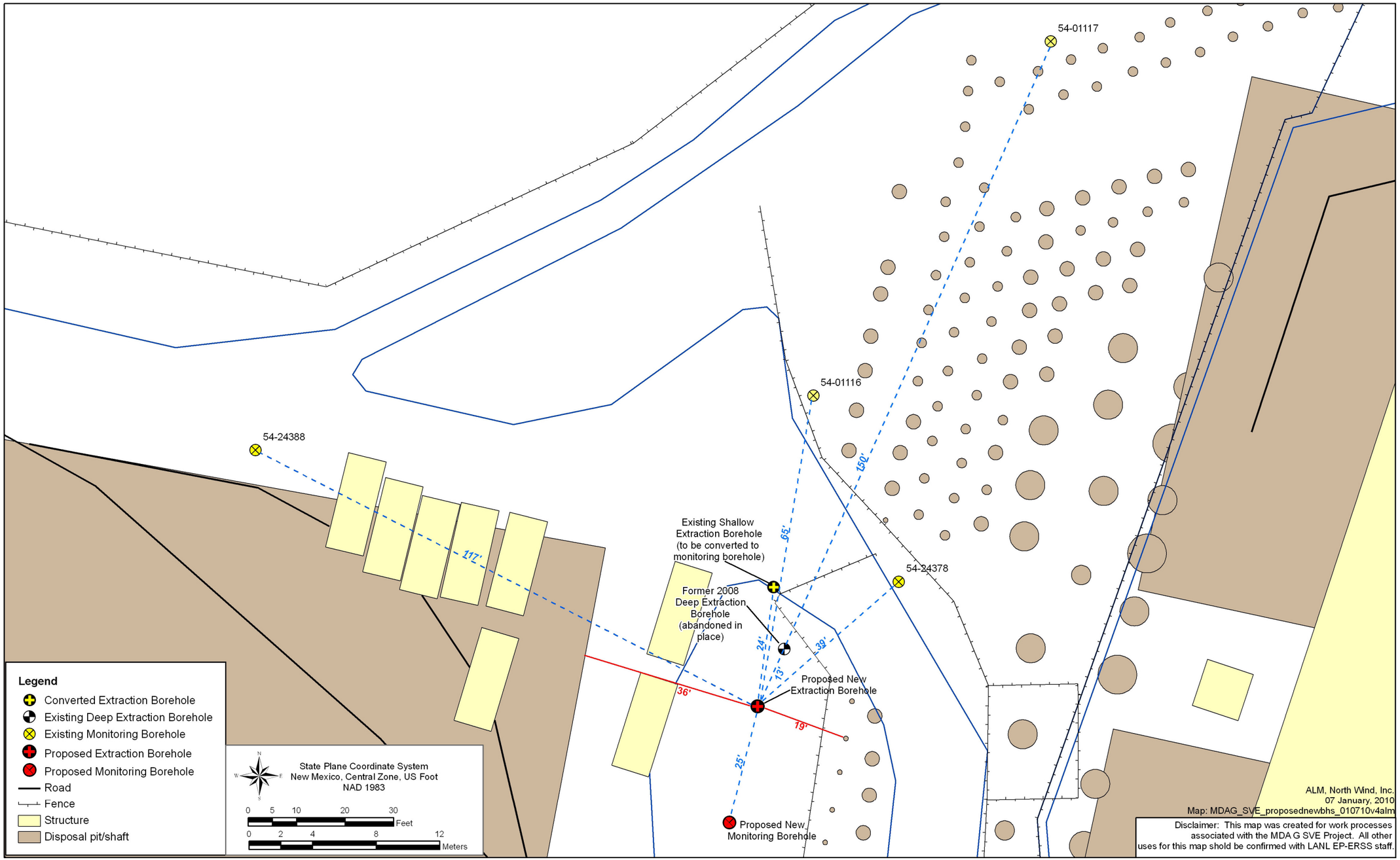

Figure 1 MDA G supplemental SVE pilot test extraction and monitoring borehole locations

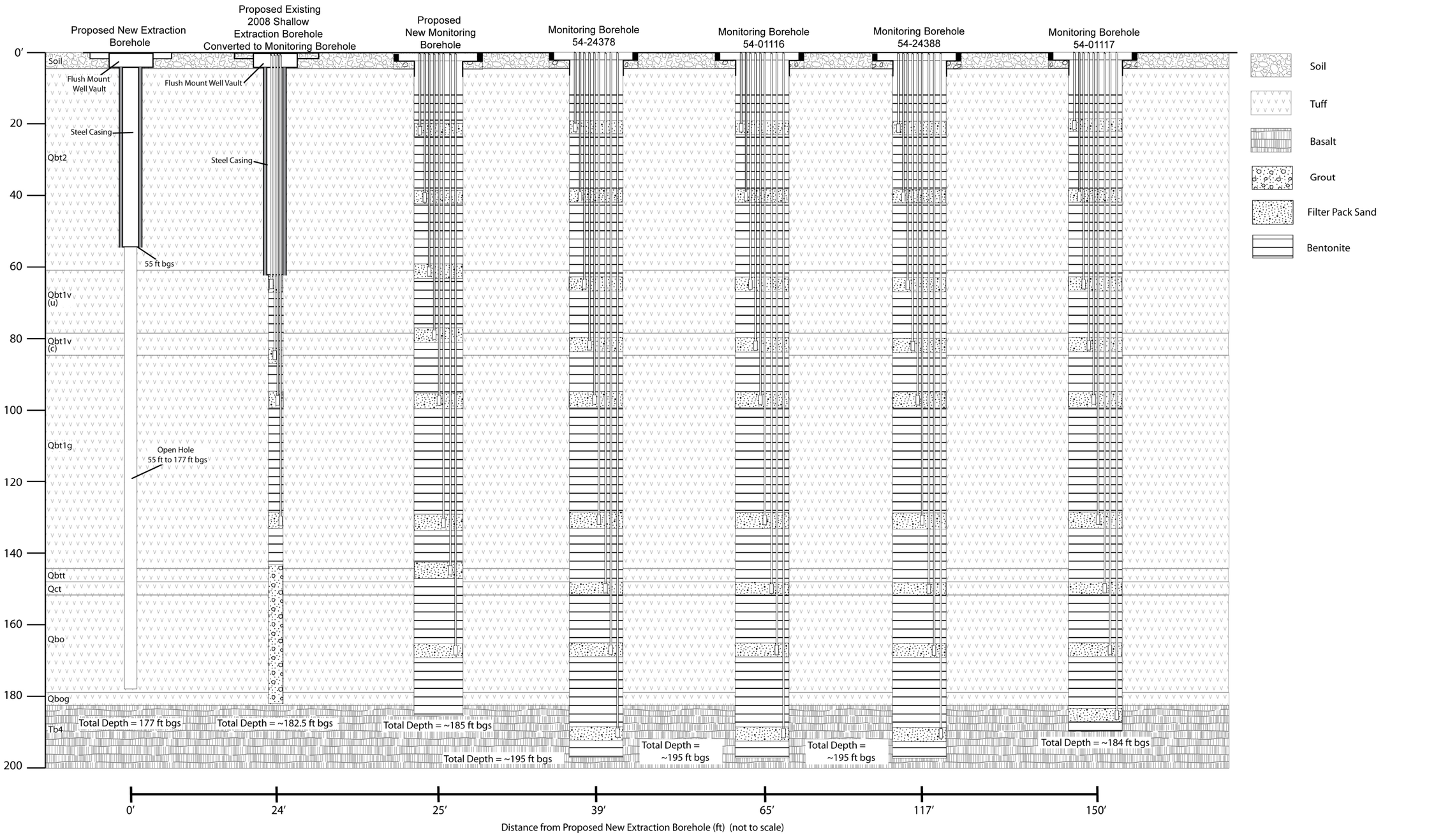

Figure 2 MDA G supplemental SVE pilot test extraction and monitoring borehole construction details

Table 1
Monitoring Borehole Location Port Depths and Corresponding Stratigraphy

Formation	Member	Unit	Proposed New Monitoring Borehole Port Depths (ft)	Proposed Converted Existing Shallow Extraction Borehole Port Depths (ft)	Existing Monitoring Borehole 54-24378 Port Depths (ft)	Existing Monitoring Borehole 54-01116 Port Depths (ft)	Existing Monitoring Borehole 54-27388 Port Depths (ft)	Existing Monitoring Borehole 54-01117 Port Depths (ft)
Bandelier Tuff	Tshirege	Qbt 2	22.5	n/a*	22.5	22.5	22.5	20
		Qbt 2	42.5	n/a	42.5	42.5	42.5	42.5
		Qbt 2/ Qbt 1v-u Contact	~60	n/a	n/a	n/a	n/a	n/a
		Qbt 1 v-u	n/a	66.5	66.5	66.5	67.5	67.5
		Qbt 1 v-u/ Qbt 1 v-c Contact	~78	n/a	n/a	n/a	n/a	n/a
		Qbt 1 v-c	n/a	n/a	82.5	82.5	82.5	82
		Qbt 1 v-c/ Qbt 1g Contact	n/a	~85	n/a	n/a	n/a	n/a
		Qbt 1g	97.5	97.5	97.5	97.5	97.5	97.5
		Qbt 1g	132.5	132.5	132.1	132.5	132.5	132.5
Bandelier Tuff	Tshirege	Qbt 1g/ Qbtt Contact	~145	n/a	n/a	n/a	n/a	n/a
Cerro Toledo interval		Qct	n/a	n/a	151.5	151.5	151.5	150
Bandelier Tuff	Otowi	Qbo	167.5	n/a	167.5	167.5	167.5	159.5
Cerros del Rio basalt		Tb4	n/a	n/a	190	190	189.5	179.5

*n/a = Not applicable.

Table 2
Active Extraction Test Schedule

Test[a] (Stratigraphic Unit or Contact)	Step (Vacuum, kPa/in. H_20)	Time[b] (hours and days)	Date
1. Qct	1. 3.7 / 15	4 h, Day 1	Week 1
	2. 7.5 / 30	4 h, Day 1; 2 h, Day 2	
	3. 12.4 / 50	4 h, Day 2; 2 h, Day 3	
	4. 17.4 / 70	4 h, Day 3; 2 h, Day 4	
	5. 22.4 / 90	4 h, Day 4; 2 h, Day 5	
	6. 29.9 / 120	4 h, Day 5	
2. Qbt 1g/Qbtt contact	1. 3.7 / 15	4 h, Day 6	Week 2
	2. 7.5 / 30	4 h, Day 6; 2 h, Day 7	
	3. 12.4 / 50	4 h, Day 7; 2 h, Day 8	
	4. 17.4 / 70	4 h, Day 8; 2 h, Day 9	
	5. 22.4 / 90	4 h, Day 9; 2 h, Day 10	
	6. 29.9 / 120	4 h, Day 10	
3. Qbt 1 v-c/Qbt 1g contact	1. 3.7 / 15	4 h, Day 11	Week 3
	2. 7.5 / 30	4 h, Day 11; 2 h, Day 12	
	3. 12.4 / 50	4 h, Day 12; 2 h, Day 13	
	4. 17.4 / 70	4 h, Day 13; 2 h, Day 14	
	5. 22.4 / 90	4 h, Day 14; 2 h, Day 15	
	6. 29.9 / 120	4 h, Day 15	
4. Qbt 1 v-c	1. 3.7 / 15	4 h, Day 16	Week 4
	2. 7.5 / 30	4 h, Day 16; 2 h, Day 17	
	3. 12.4 / 50	4 h, Day 17; 2 h, Day 18	
	4. 17.4 / 70	4 h, Day 18; 2 h, Day 19	
	5. 22.4 / 90	4 h, Day 19; 2 h, Day 20	
	6. 29.9 / 120	4 h, Day 20	
5. Qbt 1 v-u/Qbt 1 v-c contact	1. 3.7 / 15	4 h, Day 21	Week 5
	2. 7.5 / 30	4 h, Day 21; 2 h, Day 22	
	3. 12.4 / 50	4 h, Day 22; 2 h, Day 23	
	4. 17.4 / 70	4 h, Day 23; 2 h, Day 24	
	5. 22.4 / 90	4 h, Day 24; 2 h, Day 25	
	6. 29.9 / 120	4 h, Day 25	
6. Qbt 1 v-u	1. 3.7 / 15	4 h, Day 26	Week 6
	2. 7.5 / 30	4 h, Day 26; 2 h, Day 27	
	3. 12.4 / 50	4 h, Day 27; 2 h, Day 28	
	4. 17.4 / 70	4 h, Day 28; 2 h, Day 29	
	5. 22.4 / 90	4 h, Day 29; 2 h, Day 30	
	6. 29.9 / 120	4 h, Day 30	

Table 2 (continued)

Test[a] (Stratigraphic Unit or Contact)	Step (Vacuum, kPa/in. H_20)	Time[b] (hours and days)	Date (estimated)
7. Qbt 2/ Qbt 1 v-u contact	1. 3.7 / 15	4 h, Day 31	Week 7
	2. 7.5 / 30	4 h, Day 31; 2 h, Day 32	
	3. 12.4 / 50	4 h, Day 32; 2 h, Day 33	
	4. 17.4 / 70	4 h, Day 33; 2 h, Day 34	
	5. 22.4 / 90	4 h, Day 34; 2 h, Day 35	
	6. 29.9 / 120	4 h, Day 35	
8. Open Interval: 55 ft–177 ft bgs	1. 3.7 / 15	4 h, Day 36	Week 8
	2. 7.5 / 30	4 h, Day 36; 2 h, Day 37	
	3. 12.4 / 50	4 h, Day 37; 2 h, Day 38	
	4. 17.4 / 70	4 h, Day 38; 2 h, Day 49	
	5. 22.4 / 90	4 h, Day 49; 2 h, Day 40	
	6. 29.9 / 120	4 h, Day 40	

[a] Extraction tests will be conducted in each unit or contact of interest in ascending order, beginning with the deepest unit, to mitigate potential sloughing in the extraction borehole.

[b] Schedule assumes access will only be provided to MDA G approximately 8 to 10 h/d.

Table 3
Pilot Test Monitoring Parameters

Monitored Parameters	Baseline Monitoring	Active Extraction Monitoring	Rebound Monitoring
Barometric Pressure[a]	every 15 min	every 15 min	every 15 min
TCA, %O2, $\%CO_2$, and $\%H_2O$	monitoring boreholes all sample ports, approximately three times per wk extraction borehole NA[b]	monitoring boreholes NA extraction borehole every 15 min	monitoring boreholes all sample ports, approximately three times per wk extraction borehole NA
Differential Pressure	monitoring boreholes all sample ports, every 15 min extraction borehole NA	monitoring boreholes all sample ports, every 15 min extraction borehole NA	monitoring boreholes all sample ports, every 15 min extraction borehole NA
Extracted Airflow Rate	NA	monitoring boreholes NA extraction borehole measured every 15 min	NA
Wellhead Vacuum	NA	monitoring boreholes NA extraction borehole measured every 15 min	NA
Extracted Air Temperature	NA	monitoring boreholes NA	NA
Extracted Relative Humidity	NA	extraction borehole measured every 15 min	NA

[a] Collected from the TA-54 weather station.

[b] NA = Not analyzed.

Table 4
Units of Measurement

Test	Unit of Measure
Air Temperature	Degrees Celsius (°C)
Differential Pressure	Kilopascals (kPa) / in. of Water (in-H_2O)
Barometric Pressure	kPa / in. of Mercury (in-Hg)
Air Flow Rate	Cubic meters per second (m^3/s) / standard cubic ft per min (scfm)
VOC Concentrations	Parts-per-million volume (ppmv) / milligrams per cubic meter (mg/m^3)
Percent Oxygen	Percentage (%)
Percent Carbon Dioxide	%
Moisture (Water Vapor)	ppmv / mg/m^3
Relative Humidity	%