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MAR 2010
NMED Hazardous Waste Bureau

National Nuclear Security Administration
Los Alamos Site Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-4255/FAX (505) 606-2132

Date: MAR 0 8 2010
Refer To: EP2010-0100

James Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Replacement Pages for the Approval with Modifications Phase III Investigation Report for Material Disposal Area T, at Technical Area 21, Revision 1

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of replacement pages xi and 25–26, a new Appendix G, and revised electronic files of the complete Phase III Investigation Report for Material Disposal Area T, at Technical Area 21, Revision 1. The DVD for Appendix D are unchanged and are not included with this submittal.

This document is being delivered today, Monday, March 8, 2010, as a result of the New Mexico Environment Department furlough day on Friday, March 5, 2010, the due date of the document.

If you have any questions, please contact Bruce Wedgeworth at (505) 231-0108 (brucew@lanl.gov) or Ed Worth at (505) 606-0398 (eworth@doeal.gov).

Sincerely,

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

MG/DG/BC/BW:sm

Enclosures: Two hard copies with electronic files – Replacement pages xi and 25–26, a new Appendix G, and revised electronic files of the complete Phase III Investigation Report, Revision 1 (LA-UR-10-1135)

Cy: (w/enc.)
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Michael J. Graham, ADEP, MS M991
IRM-RMMSO, MS A150 (date-stamped letter emailed)

Appendixes

Attachments

6.3.1 VOCs

In an attempt to determine contamination source(s), profiles of average total and individual VOC concentrations for the four vapor-monitoring wells, as presented in Figures 6.3-1 and 6.3-2, were generated to assist in assessing overall spatial variability in VOC concentration in MDA T vapor. Total VOC concentrations are calculated by summing the concentrations, in micrograms per cubic meter, of all chemicals analyzed for in the pore gas; nondetections are assigned the value of their respective SQL. The June through November total concentrations are then averaged to compare overall trends independent of time. Other sampling events are not included because no earlier data are available for vapor-monitoring well 21-25262.

Although the June to November 2009 data from the four MDA T vapor-monitoring wells indicate variability in the distributions and concentrations of particular VOCs (as illustrated in the nature and extent discussion above) the data illustrate, on average, similar total VOC concentration profiles (Figure 6.3-1). The total VOC concentration profile of vapor-monitoring well 21-603058 at Port 1 deviates from other wells' total VOC concentration profiles at Port 1 because of the comparatively low PCE and TCE concentrations.

However, when the distribution signatures of the five representative COPCs are evaluated individually, differences between the four vapor-monitoring wells become more apparent, and two sets of VOC concentration trends are dominant: concentration trends illustrated by vapor-monitoring wells 21-603059 and 21-25262 and concentration trends illustrated by vapor-monitoring wells 21-603058 and 21-25264 (Figure 6.3-2).

Total VOC concentrations are generally greater in vapor-monitoring wells 21-603058 and 21-25264 as compared with vapor-monitoring wells 21-603059 and 21-25262. As illustrated by Figure 6.3-2, the June–November time-averaged concentrations of chloroform, carbon tetrachloride, and methylene chloride in vapor-monitoring wells 21-603059 and 21-25262 show similar concentration trends with depth and sampling event to each other as do vapor-monitoring wells 21-603058 and 21-25264. The similarity observed between VOC concentration trends in vapor-monitoring wells 21-603059 and 21-25262 and between VOC concentration trends in vapor-monitoring wells 21-603058 and 21-25264 is also illustrated by TCE and PCE concentrations but is less apparent.

These observations are most likely reflective of the relative spatial proximity of the vapor-monitoring wells to each other. Vapor-monitoring wells 21-603059 and 21-25262 are located ~35 ft apart on the south side of the MDA T facility; vapor-monitoring wells 21-603058 and 21-25264 are located ~215 ft apart on the north side of the MDA T facility. VOC concentration trends observed between vapor-monitoring wells 21-603059 and 21-25262 compared with wells 21-603058 and 21-25264 may reflect different sources of contamination. The hypothesis that different VOCs may have had slightly different sources is most illustrated by chloroform (Figure 6.3-2).

Unlike most other VOCs detected at MDA T, time-averaged chloroform concentrations observed in samples collected from Port 1 in vapor-monitoring wells 21-603059 and 21-25262 are distinctly higher than in vapor-monitoring wells 21-603058 and 21-25264, resulting in the S-shaped distribution with depth previously discussed in section 6.2 above. This distribution may indicate that chloroform may be derived from a different source (a source nearer to vapor-monitoring wells 21-603059 and 21-25262 such as the former building 21-035 influent pipes) than the other representative VOCs identified at MDA T. The other VOCs are generally more consistent with a source located nearer to vapor-monitoring well 21-25264, such as the former treatment plant outfall at building 21-257.

The former treatment plant outfall at building 21-257 located immediately east of MDA T has been identified as a potential source of subsurface vapor contaminants for MDA T (LANL 2009, 105645). This potential is partially based on the consistently higher concentrations of VOCs (with the exception of chloroform) in vapor-monitoring well 21-25264. Also, the maximum concentrations of VOCs (e.g., carbon tetrachloride, chloroform, and TCE) in vapor-monitoring well 21-25264 are, overall, at deeper depths than the other three vapor-monitoring wells (although this is clearly observed only for the VOCs with peaks within the depth of the shallower wells). In vapor-monitoring well 21-603058, concentration maxima occur most frequently at shallower depths compared with the other three vapor-monitoring wells.

In addition, the VOC data from the MDA T wells also support diffusion, both vertical and lateral, as the dominant transport mechanism for subsurface VOCs beneath MDA T, as proposed by the current conceptual model. VOC contaminant distribution profiles for methylene chloride and carbon tetrachloride in deep vapor-monitoring well 21-25262 clearly show a vertical distribution that is lowest at the surface and at depth, with the maximum concentration in the middle. The maximum concentrations for chloroform and TCE in vapor-monitoring well 21-25262 are also observed in vapor collected at intermediate depths, but high concentrations are also reported in near-surface vapor. Differences in contaminant concentrations between wells at equivalent depths are much less apparent than the vertical differences within wells. Laterally, concentrations are within the same order of magnitude and generally within a factor of 2. Vertically, there are several order of magnitude differences between concentration maxima and minima, suggesting that lateral diffusion may also provide some component to the VOC concentration trends observed at the MDA T wells.

Regardless of whether the data conclusively identify subsurface vapor contaminant sources and/or vapor transport mechanisms at MDA T, the similarities between vapor-monitoring wells 21-603059 and 21-25262 indicate that vapor-monitoring well 21-25262 (TD of 695 ft) might be a good representation of VOC trends for vapor-monitoring well 21-603059 (TD of 360 ft) at deeper depths. However, further sampling of both vapor-monitoring wells will yield additional data that may help confirm these observations.

6.3.2 Tritium

Overall, tritium in the various MDA T vapor-monitoring wells reflects the trends observed for VOCs. Figure 6.3-3 shows time-averaged tritium activities with depth in all four wells for samples collected during rounds 7–12.

Tritium activities were greater in vapor-monitoring well 21-25264 than in vapor-monitoring wells 21-603058, 21-603059, and 21-25262. At 155.5 ft bgs, a maximum tritium activity of 173,113 pCi/L was recorded in vapor-monitoring well 21-25264 in July 2009, almost 2.5 times the maximum activity recorded in vapor-monitoring well 21-25262 (73,332 pCi/L at ~380 ft bgs in October 2009). Tritium activities in vapor-monitoring wells 21-603059 and 21-25262 show similar trends to each other, overall, with depth and sampling event. Except for the tritium spike in vapor-monitoring well 21-25262 at 234 ft bgs in June 2009, tritium activities in both vapor-monitoring wells consistently increase with depth to approximately 380 ft bgs, which is the TD of vapor-monitoring well 21-603059. Tritium activities then decrease with depth to TD in well 21-25262. Tritium activities in vapor-monitoring wells 21-603058 and 21-25264 both show tritium spikes at shallower depths (~250 ft bgs), similar to the June 2009 spike in vapor-monitoring well 21-25262.

6.4 Time-Dependent Vapor Analysis

To determine whether trends observed for the nature and extent of vapor contamination remain consistent with time, data obtained during twelve rounds of vapor sampling in vapor-monitoring wells 21-25264, 21-603058, and 21-603059 and six rounds of vapor sampling in vapor-monitoring well 21-

Attachment G-1

Geotechnical Analytical Reports and Results
(on CD included with this document)

Appendix G

Geotechnical Results

G-1.0 INTRODUCTION

This appendix presents the 2009 geotechnical analytical results associated with Material Disposal Area (MDA) T Borehole (BH) 21-607955, located in Technical Area 21 at Los Alamos National Laboratory. Geotechnical samples were collected at BH 21-607955 in conjunction with samples collected for the analysis of specific inorganic chemicals, organic chemicals, and radionuclides.

Only some of these data were available from the analytical laboratory in December 2009 and included in the geotechnical data presented in the revised report (section 4.2). Since December 2009, all geotechnical analytical data associated with BH 21-607955 have been received and are appended to the revised report (in this appendix) for completion purposes.

G-2.0 GEOTECHNICAL CORE SAMPLES AND RESULTS

Twenty-six samples (24 characterization and 2 field duplicates) were collected for off-site laboratory geotechnical analysis of dry density, percent moisture, and unsaturated hydraulic conductivity. A summary of the 2009 core samples collected and the requested analyses is presented in Table 4.1-1 of the investigation report. A summary of the 2009 geotechnical sample results is presented in Table 4.1-2.

The results of the geotechnical sampling at BH 21-607955 are summarized in Table G-2.0-1. Depth profiles are presented in Figure G-2.0-1. Unsaturated hydraulic conductivity properties for BH 21-607955 are presented in Table G-2.0-2. All geotechnical analytical results and associated sample collection log/chain-of-custody forms are provided on CD as Attachment G-1.

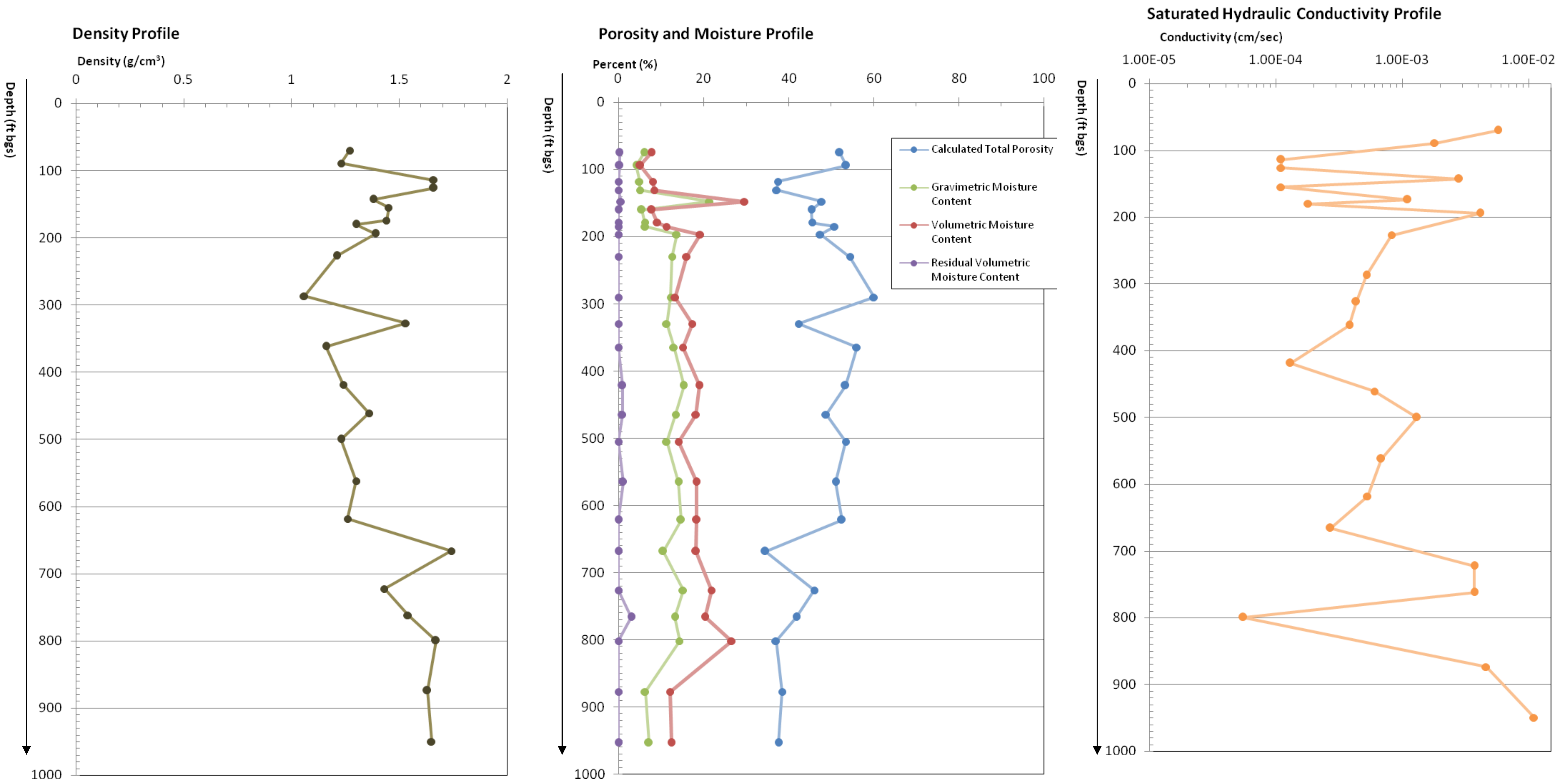

Figure G-2.0-1 Depth profiles of reported density; calculated porosity; gravimetric, volumetric, and residual volumetric moisture content; and saturated hydraulic conductivity for BH 21-607955

Table G-2.0-1
Summary of Geotechnical Sampling Results for Borehole 21-607955

Sample ID	Location ID	Depth (ft bgs)	Media	Collection Date	Calculated Total Porosity (%)	Density (g/cm³)	Volumetric Moisture Content (%)	Gravimetric Moisture Content (%)	Saturated Hydraulic Conductivity (cm/sec)
MD21-09-11594	21-607955	70–75	Qbt3	9/21/2009	52	1.27	7.7	6	5.7×10^{-3}
MD21-09-11595	21-607955	89–94	Qbt3	9/21/2009	53.5	1.23	5.1	4.2	1.8×10^{-3}
MD21-09-11596	21-607955	114–118	Qbt2	9/22/2009	37.4	1.66	8	4.9	1.1×10^{-4}
MD21-09-11597	21-607955	126–131	Qbt2	9/22/2009	37.2	1.66	8.4	5	1.1×10^{-4}
MD21-09-11598	21-607955	143-148	Qbt2	9/22/2009	47.8	1.38	29.6	21.4	2.8×10^{-3}
MD21-09-11599	21-607955	155–160	Qbt2	9/24/2009	45.3	1.45	7.8	5.4	1.1×10^{-4}
MD21-09-11600	21-607955	174–179	Qbt1v	9/24/2009	45.5	1.44	9.1	6.2	1.1×10^{-3}
MD21-09-11601	21-607955	180–185	Qbt1v	9/24/2009	50.8	1.3	11.2	6.3	1.8×10^{-4}
MD21-09-11602	21-607955	194–197	Qbt1v	9/27/2009	47.4	1.39	19.2	13.7	4.1×10^{-3}
MD21-09-11603	21-607955	227–230	Qbt1g	9/27/2009	54.4	1.21	16	12.6	8.2×10^{-4}
MD21-09-11604	21-607955	287–290.5	Qbt1g	9/28/2009	60	1.06	13.3	12.2	5.2×10^{-4}
MD21-09-11605	21-607955	327–329.8	Qct	9/29/2009	42.3	1.53	17.3	11.3	4.3×10^{-4}
MD21-09-11606	21-607955	362-364.8	Qbo	9/30/2009	56	1.16	15.1	13	3.8×10^{-4}
MD21-09-11607	21-607955	418.6–421.7	Qbo	10/1/2009	53.3	1.24	19	15.3	1.3×10^{-4}
MD21-09-11608	21-607955	461–464.6	Qbo	10/2/2009	48.8	1.36	18.2	13.4	6.0×10^{-4}
MD21-09-11609	21-607955	500–505	Qbo	10/3/2009	53.4	1.23	14.1	11.3	1.3×10^{-3}
MD21-09-11610	21-607955	562–565	Qbo	10/6/2009	51	1.3	18.3	14.1	6.8×10^{-4}
MD21-09-11611	21-607955	618.3–621.7	Qbo	10/7/2009	52.5	1.26	18.4	14.7	5.3×10^{-4}
MD21-09-11612	21-607955	666–668.4	Tp	10/8/2009	34.5	1.74	18.2	10.5	2.7×10^{-4}
MD21-09-11613	21-607955	722.7–726	Tp	10/9/2009	46	1.43	21.8	15.2	3.7×10^{-3}
MD21-09-11614	21-607955	762–766.2	Tp	10/10/2009	41.8	1.54	20.3	13.2	3.7×10^{-3}
MD21-09-11615	21-607955	799.6–801.9	Tp	10/12/2009	37	1.67	26.6	14.3	5.5×10^{-4}
MD21-09-11616	21-607955	874–877	Tp	10/13/2009	38.4	1.63	12.1	6.3	4.6×10^{-3}
MD21-09-11617	21-607955	950–953	Tp	10/15/2009	37.6	1.65	12.4	7.1	1.1×10^{-2}

Table G-2.0-2
Unsaturated Hydraulic Conductivity Properties for BH 21-607955

Sample ID	Location ID	Depth (ft bgs)	α[a] (cm^{-1})	N[b] (dimensionless)	θ_r[c] (% vol)	θ_s[d] (% vol)
MD21-09-11594	21-607955	70–75	0.0087	2.1712	0.19	45.75
MD21-09-11595	21-607955	89–94	0.0104	1.8575	0.24	42.72
MD21-09-11596	21-607955	114–118	0.0012	2.4755	0.00	33.88
MD21-09-11597	21-607955	126–131	0.0012	2.5312	0.00	32.54
MD21-09-11598	21-607955	143–148	0.0057	2.1309	0.53	39.49
MD21-09-11599	21-607955	155–160	0.0033	1.6212	0.00	34.22
MD21-09-11600	21-607955	174–179	0.0020	1.7900	0.00	29.02
MD21-09-11601	21-607955	180–185	0.0024	1.7149	0.00	33.32
MD21-09-11602	21-607955	194–197	0.0025	1.6673	0.00	33.87
MD21-09-11603	21-607955	227–230	0.0021	1.6816	0.00	40.82
MD21-09-11604	21-607955	287–290.5	0.0048	1.6599	0.00	47.53
MD21-09-11605	21-607955	327–329.8	0.0041	1.5122	0.00	35.05
MD21-09-11606	21-607955	362–364.8	0.0042	1.5661	0.00	48.43
MD21-09-11607	21-607955	418.6–421.7	0.0038	1.6486	0.88	47.28
MD21-09-11608	21-607955	461–464.6	0.0037	1.5562	0.92	42.60
MD21-09-11609	21-607955	500–505	0.0084	1.4720	0.00	41.60
MD21-09-11610	21-607955	562–565	0.0056	1.6504	1.06	44.57
MD21-09-11611	21-607955	618.3–621.7	0.0110	1.4221	0.00	45.40
MD21-09-11612	21-607955	666–668.4	0.0111	1.3156	0.00	35.74
MD21-09-11613	21-607955	722.7–726	0.4991	1.1901	0.00	46.08
MD21-09-11614	21-607955	762–766.2	0.0079	1.3857	2.97	40.34
MD21-09-11615	21-607955	799.6–801.9	0.0125	1.3044	0.00	39.33
MD21-09-11616	21-607955	874–877	0.0192	1.3933	0.00	31.59
MD21-09-11617	21-607955	950–953	0.0560	1.3369	0.00	35.03

[a] α = van Genuchten parameter, inverse air-entry value.

[b] N = van Genuchten parameter, pore-size distribution index.

[c] θ_r = Residual volumetric moisture content.

[d] θ_s = Saturated volumetric moisture content.